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Research Papers

INFLUENCE OF DAILY COW POPULATION ON DAILY COW MILK PRODUCTION IN INDONESIA PERIOD 2009-2019 AND GOVERNMENT POLICY TO REALIZE WHITE REVOLUTION IN INDONESIA

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ABSTRACT

The purpose of this study was to determine the effect of the population of dairy cows on milk production of dairy cows in Indonesia for the period 2009-2019 and government policies to realize the white revolution in Indonesia. The research method used is a descriptive analysis approach regarding the development of the dairy cow population and its relationship to dairy cow's milk production in Indonesia. The type of data used is annual time series secondary data starting from 2009-2019. Based on the results of the regression, the coefficient value was 0.6677752, indicating that an increase in the population of dairy cows by 1 unit will increase the production of dairy cows in Indonesia by 0.6677752 units. The increase in dairy cow's milk production is relatively low due to the lack of understanding of local breeders regarding dairy cow rearing and feeding to provide adequate nutrition for cows. Government policies in realizing the white revolution by paying attention to the provision of fresh milk for poor children, counseling local farmers, increasing the economic value of cow waste and making cooperatives as a place for dairy farmers.

Keywords: population, production, dairy cows, white revolution

RESEARCH BACKGROUND

Public health is an important factor in the nation's development process to achieve prosperity. The more developed a country, the government's response to people's health will increase. One of its manifestations is by increasing the consumption pattern of dairy cow's milk (fresh milk), especially for children as the forerunner and next generation of the nation with healthy Indonesian Human Resources (HR).

The reality of dairy cow's milk consumption in Indonesia is lagging behind other Southeast Asian countries such as Vietnam, the Philippines, Malaysia and Thailand. According to data from Tetra Pack (2007), Indonesia's milk consumption level has only reached 7.7 liters per capita per year, while they have reached 8.5; 11 and 25 liters per capita per year. In fact, we are left behind by India, which consumes about 45 liters of milk per capita per year (Prabowo Subianto, 2013).

The low level of consumption can be seen from two directions, namely the demand and supply sides. This research focuses more on the development of dairy cow's milk production in Indonesia. The main reason for the news that the low consumption of dairy cow's milk is followed by its production (https:// lokaldata.id, article,consumption-susu-masih-low). Meanwhile, Indonesia, as a country with a large area, has the potential to increase dairy farming for various economic and social purposes.

To find out the development of milk production and dairy cow population in Indonesia during the period 2009-2019 as shown in Tabel 1 and Figure 1 below:

Table 1: Cow Population and Milik Production

	Year	Cow Population [per Head]	Milk Production [Tons]
1	2009	474701	827249
2	2010	488448	909533
3	2011	597213	974694
4	2012	611940	959731
5	2013	444266	786849
6	2014	502516	800749
7	2015	518649	835125
8	2016	533933	912735
9	2017	540441	928108
10	2018	581822	951004
11	2019	565001	944537
	Source:	https://www.bps.go.id/indicator/24/470/1/populasi-sapi-perah-menurut-provinsi.html	
		https://www.bps.go.id/indicator/24/493/4/produksi-susu-segar-menurut-provinsi.html	
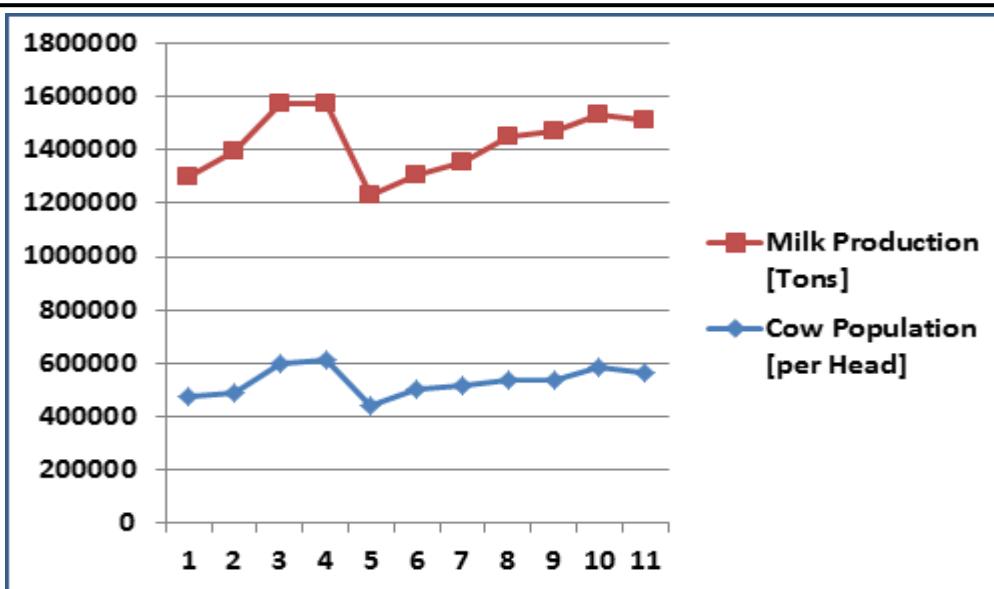
Figure 1: Development of dairy cow population and milk production in Indonesia
Source: https://bps.go.id/indikator/24470/1-7/populasi-sapi-perah-menurut-propinsi.html
https://fdokumen.com/document/27705sni-31411-2011-susu-segar-bag1-sapi.htm

From Figure 1, it can be seen that the population of dairy cow in Indonesia in 2009 was 474,701 heads and in 2019 it became 565,001 cows or an increase of 19.02%. The dairy cow population fluctuated, with the lowest being 444,266 in 2013 and the highest at 581,882 in 2018. Likewise, the milk production of dairy cows increased from 827,249 in 2009 to 944,537 tons in 2019. The lowest production of dairy cows was 786,849 tons in 2013 and the highest was 9,746. 249 tons in 2011. Although the development of the two variables looks in the same direction, from 2011 to 2012 when the population of dairy cows increased from 597,213 to 611,940, the milk production of dairy cows actually decreased from 974,694 tons to 959,731 tons.

Based on this description, it is very important to examine the influence of the dairy cow population on dairy cow milk production in Indonesia and government policies in realizing the white revolution (Prabowo S., 2013).

The white revolution, namely the national development process requires effective government development policies so that development goals, targets and targets can be achieved more efficiently. The policy is divided into three interrelated parts, namely:

1. The policy of major incentives for quality sources of economic growth;

2. Resource optimization policies: policies needed to optimize the utilization of national resources to support quality growth;

3. Policies to suppress leakage: policies to suppress inefficiencies and leakages that occur in the national economy. (Prabowo S. 2013).

Formulation of the Problem
Based on the description of the background of the problem, the formulation of the problem proposed is:

1. What is the effect of the dairy cow population on dairy milk production in Indonesia?

2. What policies can the government take to bring about the white revolution?

RESEARCH PURPOSES

The Aim of this Research Is:
1. To determine the effect of the population of dairy cows on dairy milk in Indonesia.

2. To find out the policies that can be done by the government to realize the white revolution.

THEORITICAL REVIEW

Production Theory
Production theory emphasizes the relationship between output and input. Inputs or factors of production are everything needed in the production process to increase the utility of an item. Factors of production are divided into four, namely: 1. Land (natural resources) = R; 2. Labor (labor) = L; 3. Capital (capital) = K; 4. Skill (expertise/entrepreneurial) = S.

The relationship between the factors of production used and the output achieved is called the production function. When associated with the four factors of production, the complete production function can be written:

Q = f(R, L, K, S)

Based on this equation, it shows that the amount of output is strongly influenced by the size of the factors of production. The analysis that discusses the relationship between output and input is what gave birth to the concept of Production Theory (Lia A, 2012).

In its application, the production function can be general, characterized by the freedom to enter the factors of production as expected, whether one or more. The production function is widely practiced in the agricultural sector.

Mathematically it can be written:

$Q = f(X1, X_2, ...X_n)$

Explanation
Q = output

$X_1, x_2,...X_n$ = input

While the specific production function is limited to only two variables, namely capital and labor. Therefore, it can be formulated:

Q = f(L,K)

Explanation
Q = output

L = labor

K = capital

From the elaboration of the two formulas, it will be seen that the elasticity value has different meanings. In the general production function, if the elasticity is elastic (e > 1), then an increase in factors of production will give a greater increase in output and vice versa if it is inelastic (e < 1). As for the specific production function, the elasticity value obtained aims to describe the choice of technology desired by the company. If the elasticity of labor is greater than capital (eL > eK) then it is called labor intensive and vice versa (eL < eK) (Case & Fair, 2007).

Framework
The progress of a country's Human Resources (HR) is strongly supported by people's consumption patterns, both nutritious food and drinks (Sulistyo, 2021). Dairy cow's milk is a fresh milk drink that contains protein and other nutrients that can help brain growth so as to increase the nation's intelligence. The importance of consuming dairy cow's milk has not been reached by poor children in Indonesia, so handling is needed from the production side. Especially with regard to Indonesia, a country that has a fairly large and fertile area, of course, has the potential to raise dairy cows which can increase dairy cow's milk production.

In addition to relying on cow production factors owned by farmers, increasing dairy cow's milk production must be supported by appropriate government policies. Thus, raising dairy cows will provide benefits for rural communities to produce dairy cow's milk that can meet their nutritional needs and welfare. It will further assist government programs in eradicating poverty in villages and have a high multiplier effect on other related fields such as health, education and so on.

The influence of the dairy cow population on the milk production of dairy cows in Indonesia for the 2009-2019 period can be described as follows:

Research Hypothesis
The influence of the dairy cattle population on the milk production of dairy cows in Indonesia for the period 2009-2019. The increase in the population of dairy cows will encourage an increase in milk production of dairy cows in Indonesia. This statement is in accordance with the production theory which states that the production of a commodity is influenced by the production factors used. Dairy cows as an element of natural resources are

the main input for farmers to be able to produce dairy cow's milk. The increasing population of dairy cattle owned by local farmers will encourage an increase in milk production of dairy cows in Indonesia. The impact is an increase in the population of dairy cows will have a positive impact on milk production of dairy cows in Indonesia.

Research related to commodity production in Indonesia has been carried out by the researcher himself using the independent variables, namely land area and the dependent variable of corn. By using the data limit from 1990 to 2006 it is obtained that there is a positive and significant relationship (Sugiarti, 2013). The main factor is land area is the capital for farmers to be able to plant corn in Indonesia. If the land area is increased, the corn production that can be harvested will also increase. Thus in accordance with the case of milk production of dairy cows being studied.

Based on This Statement, The Proposed Hypothesis Is:
Ha: The population of dairy cows will have a positive effect on milk production of dairy cows in Indonesia.

RESEARCH METHODS
This study uses a microeconomic approach, namely the theory of production. The research method uses a quantitative descriptive approach, namely the relationship between the population of dairy cows and milk production of dairy cows in Indonesia. The data used in this study is classified as secondary annual time series data where the population of dairy cattle in Indonesia is sourced from the Central Statistics Agency (https://bps.go.id/indikator/24470/1-7/population-sapi-perah-according to-province.html).

Meanwhile, the production of dairy cows in Indonesia is sourced from the Director General of Livestock & Animal Health of the Ministry (https://www.bps.go.id).

The research period is limited from 2009 to 2019. The selection of data is 2009 because it has passed from the world economic crisis that hit Europe and America. The 2019 limit is due to the peak of Indonesia's economic cycle before being hit by the COVID-19 pandemic, so that more concrete analysis results will be obtained on sustainable development in Indonesia.

The model that analyzes the effect of the dairy cow population on dairy cow milk production in Indonesia for the 2009-2019 period uses the following general production function:

$$QS = aPS^b \qquad (1)$$

Explanation:
QS = milk production of dairy cows in Indonesia

PS = dairy cows population in Indonesia

a,b = parameters

Considering that the general production function is still in the form of a non-linear equation, so to regress it must transform it into log form like equation 2 below:

$$\text{Log } QS = \log a + b \text{ Log } PS \qquad (2)$$

From the regression results, the anti-log value is sought to estimate the amount of milk production for dairy cows if the dairy cow population has not been operationalized. The estimation of parameter b is the elasticity of milk production of dairy cows to the population of dairy cows in Indonesia (Domoinick Salvatore, 2002).

Hypothesis Testing Design
In this study, the t, F and R^2 tests will be used. The three tests can be described as follows:

Regression Equation Partial Test

Equation of the Effect of Dairy Cow Population on Dairy Cow Milk Production in Indonesia for the 2009-2019 Period

The population of dairy cows has a positive effect on milk production of dairy cows in Indonesia for the period 2009-2019

Ho: $r < 0$ population of dairy cows has a negative effect on milk production of dairy cows in Indonesia for the period 2009-2019

Ho: $r > 0$ population of dairy cows has a positive effect on milk production of dairy cows in Indonesia for the period 2009-2019

Ho is rejected when r > 0

Simultaneous Test of Regression Equation

Equation of the Effect of Dairy Cow Population on Dairy Cow Milk Production in Indonesia for the 2009-2019 Period

The population of dairy cows has an effect on the milk production of dairy cows in Indonesia for the 2009-2019 period.

Ho: r = 0 The population of dairy cows simultaneously has no effect on milk production of dairy cows in Indonesia for the period 2009-2019

Ho: $r^1 \neq 0$ The population of dairy cows simultaneously affects the milk production of dairy cows in Indonesia for the period 2009-2019

Ho is rejected if $r^1 \neq 0$

RESULTS AND DISCUSSION
The results of data processing against the regression equation for the 2009-2019 period obtained the following results:

produksisusuton	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
populasisapiekor	.6677752	.1292812	5.17	0.001	.3753209	.9602295
_cons	2.127358	.7400816	2.87	0.018	.4531773	3.801539

From the regression results, QS is the variable of milk production of dairy cows in Indonesia and PS is the population of dairy cows in Indonesia. The calculation results show that the log a is 2.127358 then the anti-log is searched to be 134.0781. This shows the amount of dairy cow's milk production in Indonesia before there was a dairy cow population of 134.0781 tons. Estimated 0.6678 is the value of elasticity of production to the population of dairy cattle in Indonesia during the study period. This means that an increase in the population of dairy cows by 1% will increase the production of dairy cows in Indonesia by 0.6677752 %.

Statistical Test
Statistical testing of the coefficients of the regression equation in this study used the t, F and R^2 tests.

Regression Equation Partial Test
Ha: The population of dairy cows in Indonesia has a positive effect on milk production of dairy cows in Indonesia for the period 2009-2019.

From the results of the t-statistical test, the dairy cattle population variable in Indonesia has a t-count value of 5.17. The t-value proved to be greater than the t-table at a significance level of 1% (t-table = 3.250) (Salvatore, 2002).

Simultaneous Test of Regression Equation
Ha: The population of dairy cows in Indonesia has a positive effect on milk production of dairy cows in Indonesia for the period 2009-2019.

From the results of the F-statistics test, it looks like the following table:

Source	SS	df	MS			
				Number of obs	=	11
				F(1, 9)	=	26.68
Model	.008528034	1	.008528034	Prob > F	=	0.0006
Residual	.002876745	9	.000319638	R-squared	=	0.7478
				Adj R-squared	=	0.7197
Total	.011404779	10	.001140478	Root MSE	=	.01788

This F-statistic value of 26.68 looks bigger than the F-table at a significance level of 1% (F-table = 4.96) (Salvatore, 2002).

R^2 test

The contribution of the dairy cow population variable in Indonesia to dairy cow milk production in Indonesia for the 2009-2019 period can be seen in the table above, which is 0.7478. Thus, the contribution of the dairy cows population in Indonesia to the milk production of dairy cows in Indonesia is 0.7478 or 74.78%. The remaining 25.22% excluding the independent variables used. The contribution of the dairy cow's milk population is quite large in accordance with the characteristics of pure milk products which are highly dependent on the productivity of dairy cows.

DISCUSSION

Equation of the Effect of Dairy Cattle Population on Dairy Cow Milk Production in Indonesia for the 2009-2019 Period.

Ha: The population of dairy cows has a positive effect on milk production of dairy cows in Indonesia for the period 2009-2019.

The population variable of dairy cows has a positive effect on milk production of dairy cows in Indonesia. This statement is in accordance with the mycoeconomics premise that the dairy cow population is the main factor for farmers to be able to produce dairy cow milk. If the population of dairy cows kept by farmers increases, the milk production of dairy cows will also be abundant.

Judging from its capacity, a dairy cow can produce 12 liters per day so that a year it can produce 4,320 liters. If the specific gravity of dairy cow's milk is 1.027gr/ml, the milk production of dairy cows per head is 4,320 liters/year or 4,437 tons/year (https://fkode.com/document/27705sni-31411-2011-susu-segar-bag1-sapi.htm). This target can be achieved if the quality of dairy cattle is maintained in terms of food, cages, land and all the necessary capital goods. A good dairy cow food is king grass type grass added with concentrate to meet the cow's nutrition. While the productive period of dairy cows is 10 years and the peak of the best milk production is in the fourth to fifth year. This attention was carried out at the Baturraden Center for Superior Cattle Breeding and Forage (BPPTU-HPT) so that dairy cows' milk production could reach 15 to 20 liters per day (https://amp-kontan-co-id.cdn.amproject.org/v/s/amp.kontan.co.id/news/capacity-production-milk-peternak-lokal-limited?amp...).

Although the results of data processing show a positive relationship, it is still inelastic during the period under study. Thus the increase in milk production of dairy cows in Indonesia is relatively low. This is different from the prediction above that the increase in milk production of dairy cows per head can reach a high number (4,437 tons/year).

The small increase in dairy cow's milk production is inseparable from the condition of local farmers. Many Indonesian farmers do not know how to raise good dairy cows. The main factor is the limited knowledge of local farmers regarding the maintenance of dairy cows and the provision of feed that is still not sufficient for cow nutrition. Besides being caused by a lack of understanding, the low feed for dairy cows is also triggered by the limited area of land for feed. (https://amp-kontan-co-id.cdn. amproject. org/v/s/ amp. kontan. co.id/ news/ kapasitas-hasil-susu-peternak-lokal-limited?amp...).

The impact is that the production of dairy cows in Indonesia has not been optimal and has not been able to provide welfare for both farmers and the general public.

Then to increase the high environmental economic value of fresh cow's milk production is the utilization of cow waste, especially manure to be used as biogas. Talking about biofuel biotechnology, we already know four generations, namely bioethanol, biohydrogen, algae fuel and electro fuel & solar fuel. So biogas is the first generation by utilizing animal waste, garbage and compost (Theresia, 2021). In Indonesia, the use of biogas as fuel in the kitchen has been introduced since the New Order by the government. This action not only reduces environmental pollution but also reduces the cost of living for farmers and the user community. Thus, the government is still obliged to preserve this biogas as well as to use it for higher levels such as transportation.

Finally, to balance the interests of various related parties who need dairy cow's milk for direct consumption and industrial raw materials, the government is obliged to appoint cooperatives as a forum for farmers to be more fair. Cooperatives must be able to serve the needs of the people with high volumes and low prices. On the other hand, cooperatives can meet the needs of industrialists with appropriate stock and prices. Thus the cooperative can treat dairy cow's milk as a public good that is abundant and affordable for the poor. For the backward side, the cooperative must be able to serve the needs of cattle farmers, starting from cow food, medicine, all needs for dairy cows and providing fresh funds for farmers to survive in order to be protected from moneylenders.

CONCLUSION

1. The population of dairy cows has a positive effect on milk production of dairy cows in Indonesia for the period 2009-2019.

2. Government policy to increase milk production for dairy cows by realizing the white revolution in Indonesia by paying attention to the provision, counseling, processing of cow waste and the role of dairy cooperatives.

SUGGESTION

1. In future research, it is necessary to add other production factors that influence the milk production of dairy cows in Indonesia.

2. The need for government protection to better educate the nation through the policy of milk production for dairy cows in Indonesia.

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THE EFFECT OF WORKING FROM HOME DURING COVID-19 PANDEMIC ONFAMILIES PERSONAL BENEFITS

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ABSTRACT

In today's scenario, a highly educated individual wants to marry a partner who is also highly educated and career-oriented. The recent study talks about the dual-earner in the family and personal benefits (PB) experienced while working at home during the Covid-19 pandemic situation. Working from home during a pandemic was not a new concept for the employees, and during pandemic situations, organizations and institutions have found an alternative way to reduce social contact and prevent the spread of coronavirus. Work from home (WFH) influencedinterpersonal relationships within a family; they were able to take care of their household responsibilities which directly promote work and family balance. During the Covid-19 pandemic, the pressure to work from home increased, but couples still have more time to help their loved ones; there is an increase in their productivity and a positive family environment. Few researchers concluded in their study that working at home leads to a high level of work performance than working from the office location. Due to working from home nowadays, the technical knowledge of employees has been increased because they have to continuously face thetechnical demands of their professional work. Through our research work, we aim to study the influence of working couples while WFH and experienced personal benefits (PB) during the pandemic. Thus keeping in mind the present study was conducted on dual-earner couples in 5 districts of Uttarakhand state. A study was conducted on a total of 150 dual-earning couples with a self-structured scale to assess the personal benefits. The result reveals that the majority of the dual-earning couples faced a low level of personal benefits while working from home (WFH) during a pandemic situation.

Keywords: Dual earner, work from home (WFH), Personal Benefits (PB)

1. INTRODUCTION

Working couples were involved in captivating full responsibilities of their family and for the financial stability both the couples work outside their home. The number of working couples in each society is increasing simultaneously in India. The Covid-19 pandemic has affected the working tradition and relocated the employee's work to their home, the majority of the dual- earner couples were working remotely during the Covid-19 situation. Working from home was not a new concept for some sectors of Indian society (Davidson, 2020).Whereas working from home has been accepted by some sectors like schools, colleges, and other educational/ teaching institutes BMC, BPO, and ITES to carry out their work without getting affected by the coronavirus. This telework tradition has saved the working sector and its employees from the huge crises i.e., Covid-19.A dual-earning couple has worked from their home which helped the family to breakdown the chain of spreading the coronavirus.

Couples who work from home have to juggle between two major responsibilities: their household work and their professional work. Couples enjoyed increased flexibility in their work schedules, which allowed them to adjust their working patterns to match their own needs withoutdisrupting their work life schedules. This allowed for individual growth to be enhanced without any interruption. The working couples spend quality time with the family because working remotely saves a lot of time like commute time to work location, reduces office parties, and couples get time for communication with their partners.

Dual working couples experience high level of physical and mental benefits, couples share their feeling with their spouse, family time has been increased, and individuals take care of their health by taking enough sleep, and doing meditation on daily basis. The emotional support of thefamily members during Covid-19 had a significant effect on work-life balance (Xiao, 2021).

2. MATERIAL AND METHODS

The data was selected through the snowball sampling technique, and dual working couples were selected who worked or still working from home during the Covid-19 situation. A totalof 150 dual-earning couples were selected who belong to the expanding stage of the family life cycle. The questionnaire has been sent to the couples individually through Whatsapp, Facebook, and Email. The dual working couples were asked to fill their responses for the personal benefits they have experienced during working from home. A5-

point"Likert"type category has been used to monitor their responses and to measure the statements scoring pattern has been used as; strongly agree, partially agree, neither agree nor disagree, partially disagree, and strongly disagree. The personal benefits tool applied in the present study was developed by the researcher and was reviewed by the 5 members from the Maharana Pratap University of Agriculture and Technology for validation of the tool.

Total Split-Half Reliability Score of the Personal Benefits (N=25)

Dimension	Reliability Score
P.B.	0.91

3. RESULTS

While encountering the personal benefits of the work from home couples due to the onset of pandemic, it was observed that both individuals tried to share their feeling. Couples take care of their household responsibilities as well as look after their children, communication within the family is strengthened, and they spend more quality time with each other enhancing the family cohesiveness, and adopt a healthy lifestyle due to avoiding food from outside. The level of personal benefits (PB) for dual-earning while WFH during Covid-19 has been shown below.

Table- 3.1: Percentage distribution for the level of the personal benefits experienced by dual-earner

Level of Personal Benefitsof Dual Earners	Husbands n1=150		Wives n2=150	
	f	%	f	%
High	1	0.67	-	-
Moderate	46	30.66	65	43.33
Low	103	68.67	85	56.67

Table 3.1 depicts that majority of the husbands 68.67 percent had faced a low level of personal benefits and 30.66 percent has experienced a moderate level of PB, and only 0.67 percent of husbands experienced a high level of PB while working from their home. 56.67 percent of wives encountered a low level of PB, whereas 43.33 percent of wives experienced a moderate level of PB, and none of the wives experienced a high level of personal benefits (PB) while WFH during the pandemic.
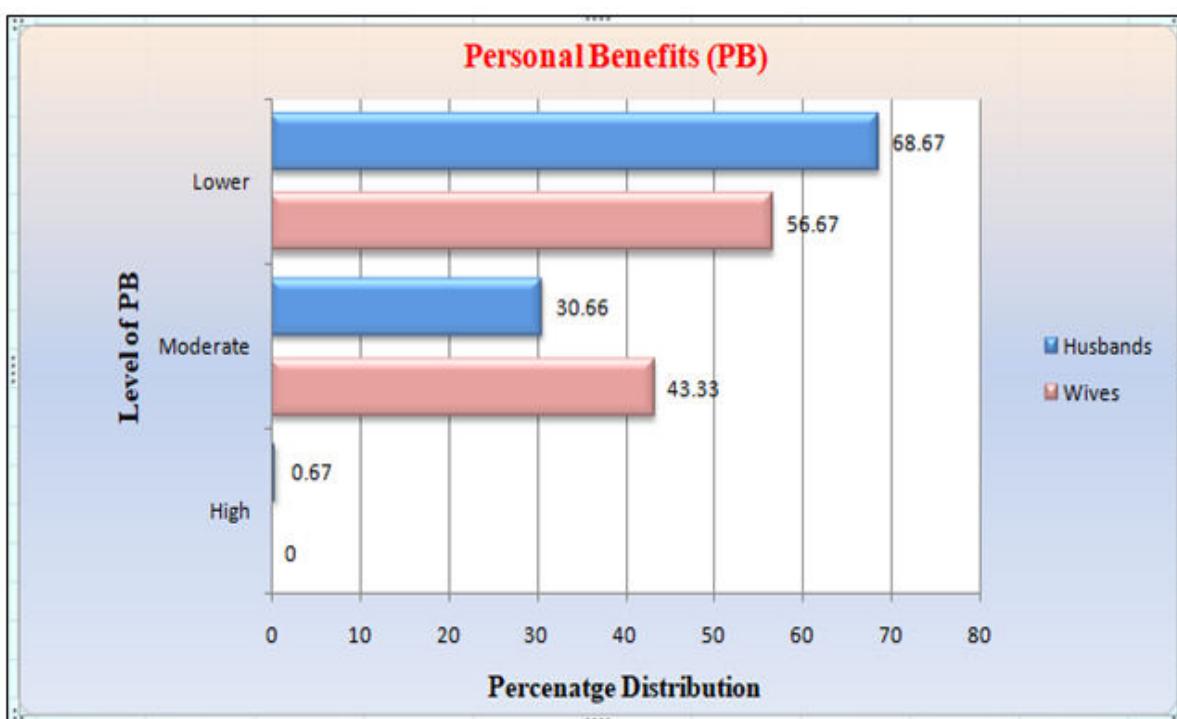
Fig. 3.1: Percentage distribution of the level of the PB experienced by dual-earner

Hence from the results, it can be concluded that the personal benefits experienced by husbands were low in level than their wives during WFH in the pandemic situation. The reason behind the low level of PB among dual earners is that during Covid-19 their stress level has increased on a personal front, due to the confined limited space, and balancing their family and work life and this leads to a lack of me-space, and they experienced high role expectations assumed to carry out with their partner.

Boca et. al. (2020) stated that due to avoiding the economical crises and recessions during Covid-19, the dual-earner couples accepted virtual office work. WFH is leading to social isolation and working in the same environment for a long period of time with tremendous work and the family burden is affecting the couple's personal space. The couple encountered the household responsibilities and helped their children with school assignments. The couples who worked from their office space and locations due to the occurrence of Covid-19, work suddenly

shifted to their home and they spent more time on household responsibilities than before. Couples with preschool children's had more difficulties finding a balance between work and their own life. According to Moroni et. al. (2020), as working parents were so much anxious because homeschooling has increased their tasks, the workload was high related to children's tasks. Couples were worried about the cancellation of the examinations and promoting to the next class that might have an empirical impact on the child's education and affects the mental peace of the couples.

CONCLUSION

Dual earner couples had reallocated their office to their home during the Covid-19 pandemic. Working husbands and their partners have experienced numerous problems while working full- time from home. Most individuals felt isolated due to less or no interaction with friends and extended family members, their physical movements are comparatively reduced, and with the tremendous escalation leads to exhaustion, fatigue, tiredness, eye-irritation and lack of stability in work and family life conflicts arise with the couples. This is the major reason for the low level of PB of dual-earner while working from their home during the Covid-19 situation.

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A STUDY ON THE ORIGIN, GROWTH AND DEVELOPMENT OF TEACHER EDUCATION IN ASSAM

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ABSTRACT

The history of teacher education in India is as old as the history of Indian education itself. In the Vedic India, the teacher enjoyed a special status and position. He was held in high esteem by the society and this was due not only to learning and scholarship, but also to qualities of head, heart and hand. The Guru or the teacher was an embodiment of good qualities, a fountain of knowledge and an abode of spirituality. The monitorial system was in vogue during medieval period too and was the method of preparing the future teachers. The teachers were held in high esteem and were respected by the society and their students. The teacher education in the modern sense began in India only with the coming of Britishers as well as the Christian missionaries. This is more so in case of Assam as well as. The Danish Missionaries established a normal School for training of teachers at Serampur near Calcutta by Carey, Marshman and ward in 1793 and there was not a single teacher training institution in Assam in the 19th century. Thus, Assam was lagging behind the other states of India in the field of teacher education also from the very beginning of the British rule. In this paper an attempt has been made to trace the origin of teacher education in Assam as well as the constant growth and development during colonial as well as post-colonial period. The paper is delimited from beginning of colonial period in Assam i.e., 1826 to the Kothari Commission or Secondary Education of 1964-66. So far as the methodology is concerned, both Primary and secondary sources have been used and the extensive use of internet has been undertaken.

Keywords: Teacher Education, Assam, Colonial, Post-Colonial, College.

INTRODUCTION

Teacher education or teacher training refers to the policies, procedures, and provision designed to equip prospective teachers with the knowledge, attitudes, behaviours, and skills they require to perform their tasks effectively in the classroom, school, and wider community. The major significance of teacher education is focused upon the impartment of training to the teachers, with the main purpose of achieving the desired academic outcomes. Teachers have an important role to play in leading to effective growth and development of the students. Though it is said that history of modern teacher education in India can be traced back to early 19th century, but the history of teacher education in India is as old as the history of Indian education itself. In the Vedic India, the teacher enjoyed a special status and position. He was held in high esteem by the society and this was due not only to learning and scholarship, but also to qualities of head, heart and hand. The Guru or the teacher was an embodiment of good qualities, a fountain of knowledge and an abode of spirituality. Manu remarked that the son of the teacher sometimes helped his father, by teaching in his father's place. The monastic system which was an important feature of Buddhism required that every novice on his admission should place himself under the supervision and guidance of a preceptor is called Upajjhaya (Bhattacharjee: 2015). The monitorial system was in vogue during medieval period too and was the method of preparing the future teachers. The teachers were held in high esteem and were respected by the society and their students(ibid:215). However, the teacher education in the modern sense began in India only with the coming of Britishers as well as the Christian missionaries. This is more so in case of Assam as well as. The Danish Missionaries established a normal School for training of teachers at Serampur near Calcutta by Carey, Marshman and ward in 1793 and there was not a single teacher training institution in Assam in the 19th century. Thus, Assam was lagging behind the other states of India in the field of teacher education also from the very beginning of the British rule. In this background efforts have been made here to study the genesis, growth and development of Teacher Education in Assam.

OBJECTIVES OF THE STUDY:

In this paper an attempt has been made to trace the origin of teacher education in Assam as well as it's constant growth and development during colonial as well as post-colonial period. Before discussion on teacher education in Assam a brief historical development of teacher education in India is also being discussed. Lastly, it tries to discuss on different institutions of teacher education in Assam.

METHODOLOGY OF THE STUDY:

The present study is based on both primary and secondary sources. The primary records have been collected through different archival and official records as well as contemporary journals and newspapers. The Secondary sources consists of library works and review of related literature. Extensive use of internet sources has also been

undertaken. Moreover, the period of study has been demarcated from 1826 to 1964-66, i.e. beginning of Colonial annexation in Assam to the Kothari Commission of 1964-66. The area of study is also covered whole of present North-East India while discussing on colonial period, and in post-colonial period it is present state of Assam.

Historical Background of Teacher Education in India:

The Danish Missionaries established a normal School for training of teachers at Serampur near Calcutta. In June 1826, the first normal school was started in Madras under the management and with the finances of the British government. Initially it prepared teachers for the district schools. Later, this normal school developed into the Presidency College. In 1847, in Bombay a normal school was started in the Elphinstone Institution and in 1849, Calcutta too had a normal school(ibid:216). In 1882 there existed 106 Normal Schools, including 15 institutions meant exclusively for women. About the training of secondary teachers, training classes were added to Government Normal Schools, Madras (1856) and Central Training School, Lahore (1877). In 1886, the first training college to prepare secondary school teachers was set up at Saidapet in Madras followed by the opening of a Secondary Department in the Nagpur Training School in 1889. Towards the end of nineteenth century, there were only six training colleges in India(ibid.). The Government of India Resolution on Education Policy (1904) recommended opening of more training colleges and schools, which had far reaching importance because universities instituted B.T. degree for graduate teachers(ibid.).The Government of India Resolution on Education Policy (1913), the second resolution on educational policy emphasized that no teacher should be allowed to teach without a certificate and that there should be a constant exchange of ideas amongst the training college staff members and that they should visit different colleges.

The Calcutta University Commission (1917-1919), known as the Sadler Commission recommended establishment of University Departments of Education to provide leadership and conduct research. It further wanted s professional body and registration arrangements for teachers. The recommendations of the Sadler Commission had salutary effect on the teacher training programme in India. Mysore University started a faculty of Education in 1925(Saddler Report, 1917: 325-328). The institutions which train teachers for secondary schools were of two kinds, training colleges and the first-grade training schools. The training colleges were affiliated to Calcutta University. They admitted either graduates or those that passed the intermediate examinations of the university courses. There were only three training colleges in 1917(Kumar, 1994: 41).

The work initiated by the Saddler Commission was further carried on by the Hartog Committee. Working on the recommendations of the Sadler Commission, 13 out of 18 universities set-up faculties of education. The Lady Irwin College was set up in New Delhi. Andhra University started a new degree the B.Ed in 1932. Bombay launched a post-graduate degree the M.Ed. in 1936. Some other important changes in the field of education also took place in the thirties. The Central Advisory Board of Education was revived. Basic Education was started by Mahatma Gandhi in 1937, leading to the training of teachers for basic schools. In 1938, a Basic Training College was set-up at Allahabad and the Vidyamandir Training School was started at Wardha in 1918. According to the Abbot-Wood Report (1937), the duration of training should be 3 years to enable the pupil to continue with general education along with professional training. In 1941, there were 612 normal schools out of which 376 were for men and 236 for women. These schools provided one- or two-years' training. There were 25 training colleges for graduate which were inadequate to meet the needs of the time. In 1941, the Vidya Bhawan teachers' College was started in Rajasthan and the Tilak College of Education in Poona. Bombay took the lead in starting a doctorate degree in education in the same year (Bhattacharjee, 2015: 215-216).

The Central Advisory Board of Education (CABE) in 1944 presented a scheme of education "Post War Educational Development in India," popularly known as the "Sergeant Plan" recommended that suitable boys and girls should be picked out into the teaching profession after high school; standard duration of training for different courses (Pre-primary 2 years, junior basic 2 years, senior basic 3 years, graduates in high schools-one year); organization of refresher courses for giving in-service training to teachers; provision of research facilities; and strengthening of teaching practice. In 1947, the number of secondary teachers training colleges in the country had risen to 41. On the eve of independence, there were 650 training schools and 41 training colleges. The number teachers were 5,66,398 of whom 3,48,500 were trained teachers, constituting 61.5 percent of the total population (Kohlatkar, 2012:57).

The first commission in free India, University Education Commission, in 1948 critically scanned the existing courses in teacher training programme and suggested that the courses must be flexible and adaptable to local circumstances. In this context, the commission recommended that the courses should be remodelled, suitable schools to be used for practical training and more time to be given to school practice. In 1950, the First Conference of Training Colleges in India was held at Baroda to discuss programmes and functions of training

colleges. In this commission, 'teacher training' was given a new nomenclature and it became 'teacher education'.

History of Teacher Education in Assam:

Assam was lagging behind the other states of India in the field of teacher education also from the very beginning of the British rule. There was not a single teacher training institution in Assam in the 19th century although the first normal school was set up at Serampore(Bengal) by Carey, Marshman and Ward, in 1793(Devi,1968:4). However, an attempt had been made to improve the efficiency of a teacher through supervision. Mofussil Committees were set up with the 'Choudhury' or the 'Patgiri' and a few respectable inhabitants of the locality during the rule of East India Company. Local committees were also constituted at Sadar Station with the 'Principal Assistant' as Chairman. In 1841, with a view to affect a 'vigilant control' and to introduce a 'uniform system of instruction' William Robinson was appointed as the Inspector of Schools under the Commissioner, who then acted something like the D.P.I. of today. Yet the schools were not managed properly. The quality of instruction given by the teachers was very poor (Barpujari, 1951-52:11).

The Wood's Despatch emphasized the training of teachers for the improvement of instruction and suggested certain practical measures for the recruitment and training of teachers which had impact in Assam as well (Devi, opcit:8). The Indian Education Commission of 1882 emphasized the importance of teacher training and recommended that 'an examination in the principles and practices of teaching be instituted. As a result, teacher training institutions were set up all over the country except Assam (Nurulla & Naik, 1949: 149). Along with Normal Schools, a special system which was also sprung up in Bengal and Assam in 1885-86 was that of the "Guru System". According to this system, the headmasters of M.V. (Middle Vernacular) schools, who themselves had undergone the prescribed course of training in Normal Schools, tried to impart instruction to gurus in neighbouring Pathsalas. Subsequently a few guru training schools were established in Assam. In 1884, the Provisional government accepted the principal of establishing one Normal School in each district. But by 1888-89, only six Normal Schools were established one each in districts of Kamrup, Sivsagar, Lakhimpur, Khasi and Jayantia Hills and two in Darrang. In 1904, Government of India had adopted teacher education as a regular policy; accordingly, Government of Assam had also revised its policies in the matter of maintaining only a small number of training schools.

However, towards the beginning of the present century when a separate department of education was created in Assam in 1905, attempts were made to impart training to the primary school teachers. With this in view, the first Normal School of Assam, the Jorhat Normal School was set up by the Government of Assan in 1906. This was followed by the Silchar Normal School. The main purpose of these schools was to provide teacher education to MV (Middle Vernacular) and ME (Middle English) school teachers. Special classes were also attached to these schools for education of village school masters. By 1920, there were total 11 Normal Schools, 7 Government aided and 2 other Government aided women's Normal schools. But the number decreased to 7 in 1931 due to financial difficulties. The duration of these in-service Normal Schools course was for the period of 3 years and teachers were appointed after the completion of the education in Normal Schools (Swain & Borah, 2016:99-104).

In the post-independent period in Assam, with the passing of the second Primary Education Act in 1947, Government of Assam started Guru Training Centres for training of the primary school teachers in most of the plains sub-divisions of the state. In 1951-52, the number of training institutions rose to 20 with accommodation for training of approximately 1000 candidates annually(ibid). The Government of Assam decided to convert traditional elementary schools into the Basic pattern through the Assam Basic Education Act of 1954. With a view to gain success in this transformation a number of Basic Training Centres were also started to train teachers for the Junior Basic Schools of the state, mostly in the rural areas. A Post-Graduate Basic Training College was also started at Titabor, near Jorhat for the training of teachers for the Senior Basic Schools and Sub-Inspectors of Schools. Prior to the establishment of these Basic Training Centres, some teachers were deputed to Wardha to receive training on the Basic pattern. Unfortunately, Basic Education has failed in Assam although the training centres, except the Post-Graduate Training College, have been still functioning. In 1967-68, there were 27 Basic Training Centres and 10 non-Basic Training schools and one pre-primary training centre for the training of primary school teachers (Statistical Handbook Assam, 1969).

In the field of teacher training at the secondary level, Assam occupies one of the lowest positions among the states of India. The development of secondary teacher education in Assam is of recent origin. Next to Nagaland, the percentage of trained teachers in Assam is the lowest all over India. The question of training secondary school teachers drew the attention of the Government of Assam towards the first quarter of the present century. Some teachers, depending on the financial resources of the state, were deputed for B.T. and L.T. to the Dacca

Training College in East Bengal under the Dacca University (Dasgupta, 1962:332). This arrangement, although inadequate, continued till 1936 when a Christian Missionary opened the B.T. Class in the St. Edmund's College at Shillong. The Government of Assam did not consider it necessary to establish a training college for the secondary school teachers as the number of secondary schools in Assam during those days did not justify the establishment of a training college. The development of teacher training at the secondary level in Assam since the establishment of first B.T. College in 1936 is as follows. The three training colleges in Bengal mention above admitted students from North East India till 1938 except the B.T. classes which were started in St. Edmunds College in 1936 and in St. Mary's College in 1937. These classes were affiliated to Calcutta University (Kumar,1994: 41).

After independence, for education of secondary level teachers, Gauhati University as well as Government of Assam established B.T. Colleges under its direct management. Gauhati University started a B.T. department in 1949. The first post graduate training college was established at Jorhat in the year 1957 by the Government of Assam. The college is affiliated to the University of Dibrugarh now. A training college in the Cachar district was a long felt need of the people of Cachar. Some local people, therefore, started a training college in 1960 in a local school. Now, it is affiliated to Assam University, Silchar. In Assam, first private B.T. College i.e, Banikanta B.T. College was established in Guwahati in 1966. The college is affiliated to the Gauhati University. The college was taken over by the Government of Assam on 1st April 1983.Now it is upgraded as Institute of Advanced Study in Education (IASE). The Second University of Assam was set up in 1965 at Dibrugarh and the B.T. Course was offered by the university under the Education Department.

The St. Edmund's College, Shillong opened the B.T. classes in 1936 which was then affiliated to the University of Calcutta. In the first batch, there were 38 students and the staff consisted of some renowned teachers like Rev.Br. I.O'leary, M.A.(Dub), H. Dip. Edn(Dub), Rev. Br. M.A. O'shea, M.A.(Dub), Mr. A.C.Roy, M.A.(Edn). Of the 38 students, 24 were deputed from the various states (then provinces). The B.T. Class was discontinued after 1948 when the Gauhati University opened the B.T. Department on the 10th January 1949(Principal's letter, dated 23rd April, 1970). The St. Mary's College at Shillong opened the B.T. classes in 1937 with ten students on the Roll. History, Geography, English, Modern Indian Languages, Home Science and primary subjects were taught as method subjects. **T**he B.T. Department is one of the oldest departments of the Gauhati University which was started on the 10th January 1949. After the opening of the B.T. Department, Government of Assam stopped deputing secondary school teachers for B.T. Training to the St. Edmund's College and the St. Mary's College at Shillong. Since 1949, the Government of Assam deputes 31 teachers to undergo training in the B.T. Department of the Gauhati University.

The Post-Graduate Training College, Jorhat, Assam is the only training college for the secondary school teachers run by the Government of Assam, established in the year 1957 at Jorhat. Teachers' Training College, Silchar is a training college in the Cachar district was a long felt need of the people of Cachar. Some local people, therefore, started a training college in 1960 in a local school. The college was   affiliated to the Gauhati University. Another post-graduate college was started at Shillong in 1964. Classes were held in a local school in the beginning and a building of its own was constructed later with financial assistance from the Government of Assam. The second University of Assam was set up in 1965 at Dibrugarh in Upper Assam and an Education Department was opened in that year. The Department initially offered only the B.T. course and later M. Ed course also introduced. Unlike other parts of India, educational expansion in the context of teacher education could be started earlier in Assam. The provision for providing training to then in-service teachers teaching in secondary level of school education was imparted at St. Edmunds College in Shillong which was later shifted to St. Mary's College.

CONCLUSION

From the above discussion we come to the conclusion that teacher education was late-comer in Assam in comparison to other parts of India. The British Government as well as the Christian missionaries were the pioneers to introduce teacher education program in Assam. The educational development of a region can be measured both quantitatively and qualitatively. Growth of teacher education institutions and their enrolment is regarded as one of the criteria of quantitative improvement. The constant growth of teacher education in Assam during post-independence period was the result of the combined efforts of the Government and the public. However, this growth and development still cannot be considered sufficient because Assam is lacking trained teachers to enhance effective teaching-learning process.

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ECONOMIC DISPATCH OF REAL POWER GENERATION USING LAGRANGE MULTIPLIER ALGORITHM

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ABSTRACT

The economic dispatch of generators is a key element in the optimal operation of power generation systems. Many power system optimization problems including economic dispatch (ED) have nonconvex characteristics with heavy equality and inequality constraints. Although, in this paper, the dynamic economic dispatch (DED) problem with active power flow limits and transmission line loss is solved using Lagrange multiplier algorithm (LMA). The objective of the DED problem is to find the optimal power output of each unit at each time so as to minimize the total generation cost. In addition, this optimal solution must meet the demand power in a given time interval. The performance and effectiveness of the proposed algorithm are verified via numerical studies on the 26-bus test system network. The results of simulation are obtained using matlab Simulink.

Keywords: Economic Dispatch problem, Lagrange multiplier optimization, costs of generation, demand power, power losses.

I. INTRODUCTION

The daily electricity consumption for an electrical energy system goes through different phases describing a cycle. This operating cycle is repetitive for each day. Power generation needs to be adjusted and planned in order to keep up with hourly variations in demand for electricity. The planning of this production is programmed over a time horizon of 24 hours (T = 24h) discretized in time intervals of one hour (t = 1h).

The dynamic dispatching problem is an extension of the static problem. This determines the economic combination of generator output to meet a single load demand forecast at a specified time. Due to large variations in the load in the electrical system, static dispatching may not meet the practical constraints of generators, such as ramp constraints. The goal of the dynamic dispatching problem is to find the optimal solution taking into account the characteristics and constraints relating to the system for a given time horizon and within a reasonable execution time. This problem is formulated as being a multi-objective problem and which aims to minimize certain objective functions such as the production cost, the total emission of polluting gases and the active losses of an energy transmission network. With industrial growth around the world and the emergence of large industrial establishments over the past two decades, the need for electrical energy has continued to increase.

The recent upheavals in the field of electricity supply have placed the managers of the electricity networks in front of new challenges. Technically, it is possible to remedy the lack of electricity by creating new conventional generators. In practice, for some reasons, this is not always feasible or preferable. The creation of new conventional power stations and / or the extension of existing substations may prove to be too costly and require excessively long construction times, which is not profitable in the short and medium term. The problem of the optimal distribution of power between thermal power stations, in order to meet the electrical energy needs of customers, has received considerable attention since the 1920s or even earlier [1]. Several studies have considered this problem to be a minimization problem where the total cost of production function is taken into account [1]. a highly nonlinear problem with non-convex and discontinuous fitness functions.

A considerable amount of research has been suggested to resolve this kind of problem. Some publications have used classical methods, such as dynamic programming [2], linear programming [3] and the λ-iteration method [4]. New techniques based on artificial intelligence have been proposed for the resolution of DDEE. In [5-7], approaches based on neural networks were applied for the optimal distribution of powers by considering economic and / or environmental constraints. These techniques have shown their effectiveness compared to conventional methods. However, they have weak points. Using these techniques, the computation time is strongly linked to the size of the power network. In addition, their performance is very sensitive to the quality and size of the training data set. Recently, meta-heuristic search algorithms have shown good performance and high efficiency in complex optimization problems. These optimization procedures are classified into different groups in terms of optimization methodology. Population-based evolutionary algorithms such as AG [8,9], PSO [10,11], SA [12-13], ABC [14], the taboo search method [15], the evolution algorithm differential [16] and BFA [17] are the most applied in the literature.

II. PROBLEM FORMULATION

In this DED problem, one objective function to be minimized, which is the total cost of the fuel in order to find the power production of the thermal power plants according to expected load demands. The description of objective and constraints is as follows.

2.1 OBJECTIVE FUNCTION

The higher nonlinearity due to the VPLE which has been neglected in conventional methods, and which is caused by the sequential operation of thermal units with multi-steam intake valves, is considered constrained in this study. For this reason, a sinusoidal form will be included in the non-smooth total cost function expressed in ($ / h), as shown in equation (1).

Conventionally, the unit production cost can be expressed as a quadratic function of the unit output power in the following equation:

$$PC\left(P_{i,t}\right) = \sum_{t=1}^{T}\sum_{i=1}^{N_u}\left[a_i + b_i P_{i,t} + c_i P_{i,t}^2\right] \tag{1}$$

Where, N_u number of generator units, $P_{i,t}$ the power produced in MW of unit i at time t and a_i, b_i, c_i are the cost coefficients of the ith generator unit.

Where,

a_i, b_i, c_i, d_i and e_i are the cost coefficients of the i-th unit. While, α_i, β_i, γ_i, η_i and λ_i are the emission coefficients. P_i is the output power in MW at the the i-th unit.

2.2 Problem Constraints

The resolution of the problem DED is obtained by minimizing the F_T function that is defined by equation (3) subject to the following constraints.

• Generation capacity

Depending on the unit design, the output active power of each unit must fall between its minimum and maximum limits respectively $P_i^{\min}$ and $P_i^{\max}$

$$P_i^{\min} \le P_i \le P_i^{\max}, i = 1,\ldots, N \tag{2}$$

• Power balance constraints

Respecting the balance of power constraints given by equation (6), the total electricity production must cover the total power required more total transmission losses P_L^t for each period t.

$$\sum_{i=1}^{N} P_i - P_D - P_L = 0 \tag{3}$$

Where P_L can be calculated using constant loss formula, as given below.

$$P_L = \sum_{i=1}^{N}\sum_{j=1}^{N} P_i B_{ij} P_j + \sum_{i=1}^{N} B_{oi} P_i + B_{oo} \tag{4}$$

Where, B_{ij}, B_{oi}, B_{oo} are the loss parameters also called B-coefficients.

III. Lagrange Multiplier Applied To Economic Dispatch

Using the lagrange multiplier and adding additional terms to include the inequality constraints, we obtain

$$\mathcal{L} = Ct + \lambda\left(P_D + P_L - \sum_{i=1}^{n_g} P_i\right) + \sum_{i=1}^{ng}\mu_{i(max)}\left(P_i - P_{i(max)}\right) + \sum_{i=1}^{ng}\mu_{i(min)}\left(P_i - P_{i(min)}\right) \tag{5}$$

The constraints should be understood to mean the $\mu_{i(max)} = 0$ when $P_i < P_{i(max)}$ and that $\mu_{i(min)} = 0$ when $P_i > P_{i(min)}$ in other words, if the constraint is not violated, its associated μ variable is zero and the

corresponding term in (5) does not exist. The constraint only becomes active when violated. The minimum of this unconstrained function is found at the point where the partials of function to its variables are zero

$$\frac{\partial \mathcal{L}}{\partial p_i} = 0 \tag{6}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0 \tag{7}$$

$$\frac{\partial \mathcal{L}}{\partial \mu_{i(max)}} = P_i - P_{i(max)} = 0 \tag{8}$$

$$\frac{\partial \mathcal{L}}{\partial \mu_{i(min)}} = P_i - P_{i(min)} = 0 \tag{9}$$

Equations (8) and (9) imply that P_i should not be allowed to go beyond its limit, and when P_i is withing its limits $\mu_{i(min)} = \mu_{i(max)} = 0$ and then Kuhn Tucker function becomes the same as the Lagrnagian on. First condition, given by (6), results in

$$\frac{\partial C_t}{\partial P_i} + \lambda \left(0 + \frac{\partial P_L}{\partial P_i} - 1 \right) = 0 \tag{10}$$

Since

$$C_t = C1 + C2 + \cdots + C_{n_g} \tag{11}$$

Then

$$\frac{\partial C_i}{\partial P_i} = \frac{dC_i}{dP_i} \tag{12}$$

And therefore the condition for optimum dispatch is

$$\frac{dC_i}{dP_i} + \lambda \frac{\partial P_L}{\partial P_i} = \lambda \qquad\qquad i = 1, \dots, n_g \tag{13}$$

The term $\frac{\partial P_L}{\partial P_i}$ is known as the incremental transmission loss. Second condition, given by (7) results in

$$\sum_{i=1}^{ng} Pi = P_D + P_L \tag{14}$$

VI.   RESULTS AND DISCUSSION

Having been applied to solve one of the main power system problems which is the DED problem, the LMA will be tested in this section. Results have been obtained using MATLAB R2009a installed on a PC with i7-4510U CPU @ 2.60 GHz, 64 bit.

The 26-unit system with quadratic cost and emission functions is used to test the LaGrange multiplier algorithm in solving the DED problem. The system data given in the following section.

5.1. Description of Study 26-Bus System

The system that contains six thermal units, 26 buses, and 46 transmission lines is shown in Figure 2[18]. The load demand is 1263 MW. The detailed characteristics of the six thermal units with the valve-point loading effects are given in Table 1. Let Bus 1 denote the slack bus; the bus data, branch data, transformer-tap data, and shunt-capacitor bank data of the system are shown in [19]. The system has a total of 27 control variables as follows:5-unit active power outputs, 6 generator-bus voltage magnitudes, 7 transformer-tap settings, and 9 var-injection values of shunt capacitor. The adjustable range of the transformer-tap is from 0.9 pu to 1.1 pu, and the shunt admittance of shunt capacitor is 0.0 to j0.05 pu. The adjustable step size is from 0.01 pu in the transformer-tap settings, and the changing step size is j0.005 pu in the shunt admittance. According to (24), the M values of the two discrete variables above are 20 and 10, respectively. The upper and lower limits of the generator-bus and load-bus voltages are 0.95 pu and1.05 pu, respectively.
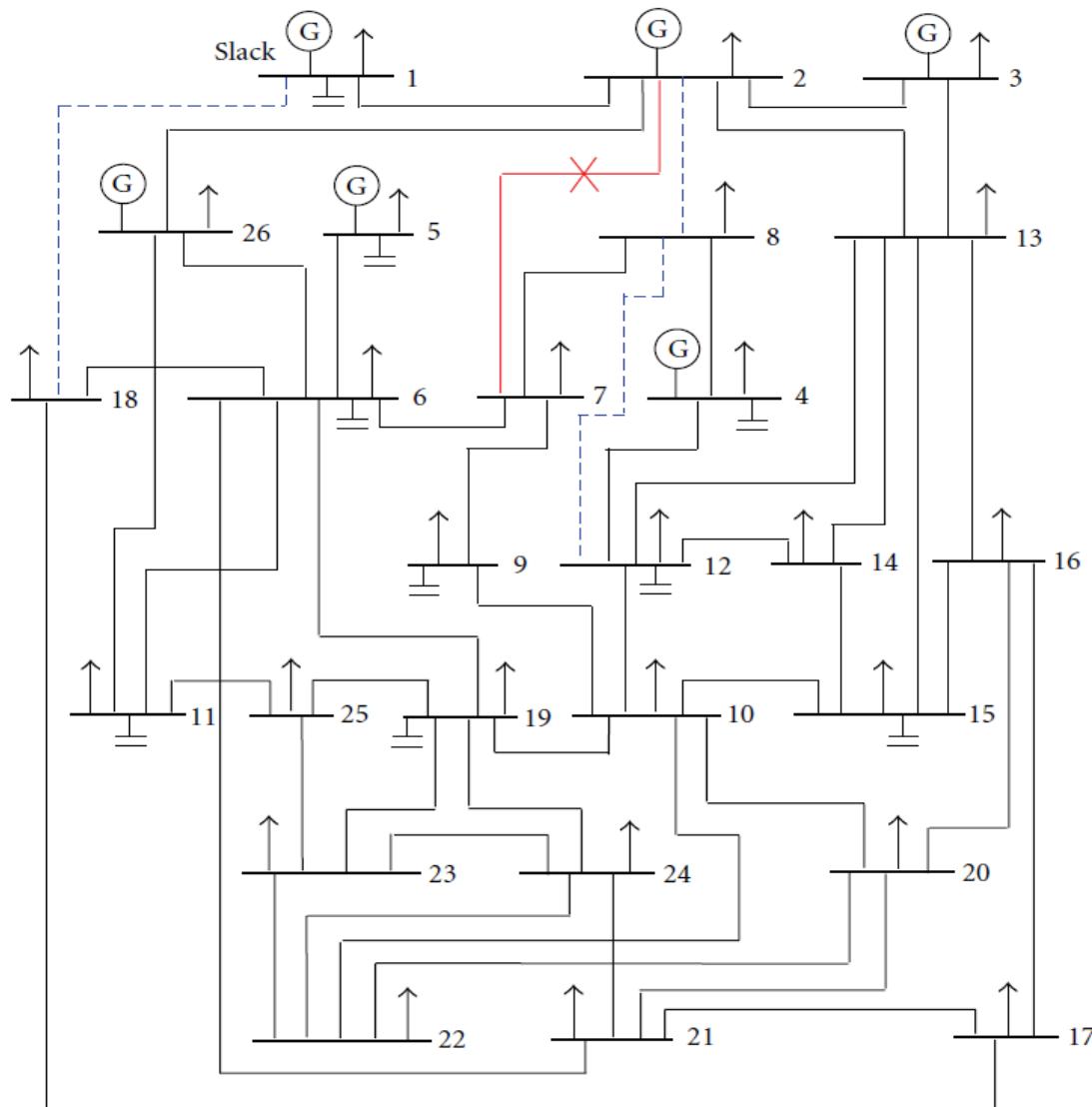
Figure 2: One-lone diagram of 26-bus system.

Table1: Generating unit capacity and coefficients in 26-bus System

Bus no.	P_i^{min}	P_i^{max}	Q_i^{min}	Q_i^{max}	S_i^{max}	a_i	b_i	c_i
1	100	500	80	300	550	240	7.0	0.0070
2	50	200	40	250	300	200	10.0	0.0095
3	80	300	40	150	350	220	8.5	0.0090
4	50	150	40	80	200	200	11.0	0.0090
5	50	200	40	160	250	220	10.5	0.0080
26	50	120	15	50	150	190	12.0	0.0075

5.2. RESULTS OF SIMULATION

Table 2 gives the total power losses and the total cost of generation with hourly variations in demand power. The planning of this production is programmed over a time horizon of 24 hours (T = 24h) discretized in time intervals of one hour (t = 1h).

Table 2. Dynamic economic dispatch solution

H	PD	optimal Combinaison (MW)	
		P_{Losses} (MW)	Cost ($/h)
t1	600	10.0159	8475.52
t2	634	10.0069	8745.83

t3	682	10.5194	9159.75
t4	757	10.899	9867.98
t5	835	11.456	10691.04
t6	924	12.1945	11736.47
t7	1013	13.5497	12903.13
t8	1142	12.1435	13851.87
t9	1166	12.1013	14162.46
t10	1191	12.8221	14498.68
t11	1213	12.7019	14786.86
t12	1263	12.8	15447.72
t13	1263	12.8	15447.72
t14	1213	12.7019	14786.86
t15	1191	12.8221	14498.68
t16	1166	12.1013	14162.46
t17	1142	12.1435	13851.87
t18	1013	13.5497	12903.13
t19	924	12.1945	11736.47
t20	835	11.456	10691.04
t21	757	10.899	9867.98
t22	682	10.5194	9159.75
t23	634	10.0069	8745.83
t24	600	10.0159	8475.52
Total		282.4204	273397.58

Figure 3 represents the daily power demand curve of the proposed case study and demonstrates that the 12th and 13th hours are the peak hours in this test system.
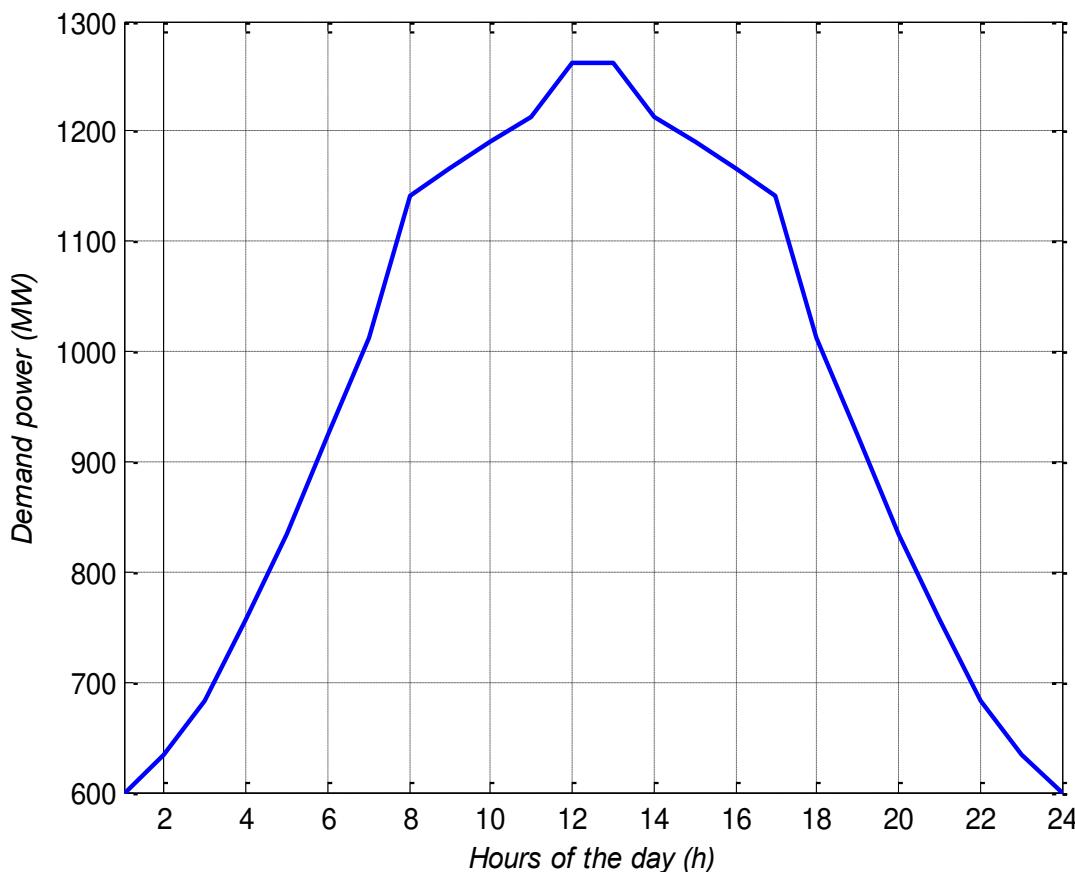
Figure 3. Hourly demand

figure 4 shows the significant participation of production unit number 1 in the total generation of the different loads during a day, since it represents the most powerful in our system.
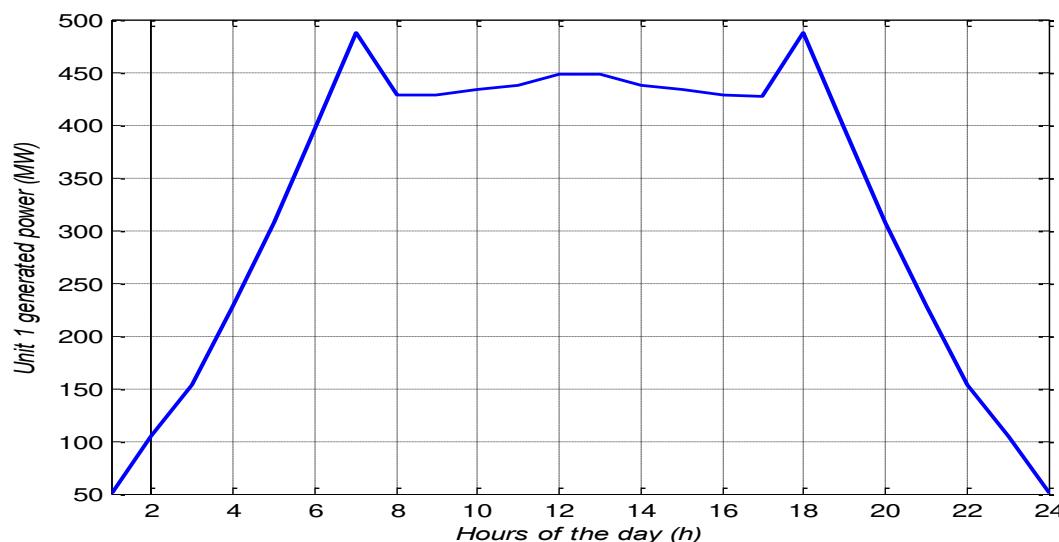
Figure 4. Unit 1 generated power

V. CONCLUSION

In Standard LaGrange Multipliers Algorithm, initial economic load dispatch has been formulated using Standard LaGrange Multipliers, which is intended to be optimized in this paper. This economic dispatch ED is a difficult optimization problem in the operation of the electrical system. The quality of its optimal solution is influenced by the operating constraints, such as the prohibited operating zones and the load effects of the valve. In addition, the power balance constraint was considered. The validation of the proposed optimization algorithm has been verified on 26-unit test system. The results show that the proposed algorithm can be used to find the DED solutions. Therefore, according to the results, LMA can be presented as an algorithm able of DED problem.

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ADAPTIVE CLOTHING DESIGNS FOR SEASONAL COUGH AND COLD RELATED ALLERGIC PROBLEMS AMONG ELDERLIES

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ABSTRACT

Clothing is one of the basic needs of human life. It plays a significant role in the development of an individual, which is equally true with growing age causing restrictions in the muscles movement and thereby affecting physical health and make them prone to seasonal problems like cough and cold, allergic reactions due to weather change, variations in temperature, etc.Looking into the frequent occurrence of common health illnesses among elderlies, researcher surveyed elderlies aged 70 years and above to understand their problem, causes,needs and developed 15 adaptive clothing designs to make their dressing simpler and provide them more comfort and relaxation with seasonal breathing problems.A panel of experts evaluated the fifteen developed distinct designs for breathing problems with specific features on a developed Rating proforma using five-point continuum scale. Findings showed promising results in terms of acceptability of the developed designs for elderlies on selected parameters of aesthetic, functional, constructional, and comfort aspects. The mean scores obtained by all the design codes were found in the higher range, i.e., above 3.30 to 4.55.

Keywords: Elderly, design, breathing, problems, adaptive, clothing

INTRODUCTION

Ageing is a process that must be assessed in terms of its social, psychological, and physical aspects. Changes in body structure and slowing of physical movement are results of physiological aging [1,2]. These changes include an increase in aerobic capacity, adjustments to cognitive function and body postures, a loss of skin elasticity, the development of wrinkles, and cell losses that cannot be repaired with age [3]. Elderly people's physiological and physical changes that occurred during this phase, limits certain of their activities or make them miserable since many activities are hampered [4]. Ageing brings some changes in understanding in a variety of memory-related domains, including perception, learning, and problem-solving. In this regard, alterations in psycho-social orientation capacity associated with aging happened concurrently with the individual's physical losses from psychological aging [5].

Although clothing primarily provides to protect the body's natural heat against meteorological conditions, it is occasionally thought of as the goal of life. Thus, clothing has a significant role in the relationship between a person and their environment [6]. Additionally, clothing acts as a means of transmitting contemporary cultural values and aesthetic forms while also benefiting people physically and socially [7].

Elderly people appreciate clothing more because individuals seek to form new social connections and to cover up physical flaws brought on by aging [8]. The physical changes in the body that occur as people age cause changes in clothing features. Bodily limitations, physical changes, functional features, and good model selection all have an impact on consumer behavior and preferences [9]. Elderly persons can benefit from clothing in three separate ways. They are described as drawing attention to a person's positive qualities, obscuring their flaws, and mentally unwinding [10].

METHODOLOGY

Present study is based on an experimental research design, to create adaptive clothing designs for elderly people. Sixty respondents (30 male and 30 female category)were selected for preliminary survey and based on their specific clothing need, researcher designed 10 Health-friendly adaptive clothing designs (5 each for male and female) to cover upper body portion specially chest area and 5 unisex designs of face mask for elderly respondents who commonly suffer from seasonal cough and cold related allergic breathing problems. The study was conducted in the Textiles and Apparel Design studio at the College of Community and Applied Sciences, Udaipur based on the study's goals.

FINDINGS

The investigation's results and relevant discussion have been organized under the following headings:

Health-friendly clothing styles for breathing issues (Chest for both male and female and face designs for unisex):

The researcher developed free hand fifteen adaptive clothing designs for breathing ailment on paper. Each of the generated designs possessed a few distinctive elements that improved its suitability and appropriateness in terms of the aesthetic, comfort, functionality, and constructional aspects. In addition to gathering data from secondary sources about the need for acceptable clothing elements in old-age clothes, the researcher initially analyzed the surveyed data about clothing preferences of the elderly.

The designs for chest and face with portable features were developed based on the findings by incorporating the desired attributes in terms of full front opening, increased garment length, slits in side seams, front buttons attachment and velcro strap support, sleeveless, elastic support, shoulder opening in the garment, and comfort, padding in the shoulder for warmth, bias-cut fabric, use of raglan, and use of Epaulet sleeve for providing more ease in armhole and sleeve area for comfort.

The researcher also recommended the use of compactly woven/knitted organic cotton, of moderate thickness and stretchability for all the developed designs for the upper body specially 'chest and face' to provide the additional warmth and comfort needed during old age due to physical changes that occur with aging and make the elderly more susceptible to temperature changes in their surroundings.

Specifications of Adaptive Clothing Designs For Elderlies

Researcher developed three categories of adaptive clothing designs- Adaptive design for breathing problem male with code A.D.B.P.M, Adaptive design for Breathing Problem female with code A.D.B.P.F and Adaptive design of Unisex Face mask having code A.D.U.F.M.

Design features of each of the developed fifteen designs for common breathing Problems (Chest and Face), having design code numbers i.e., A.D.B.P.M.-1 to A.D.B.P.M.-5, A.D.B.P.F.1 to A.D.B.P.F.-5, A.D.U.F.M.-1 to A.D.U.F.M.-5 with health-friendly clothing features have been presented in i.e., Plate-1, Plate-2 and plate- 3.

Category-A. Adaptive clothing designs for breathing problem males

Design Code no.	Design	Specific Features
A.D.B.P.M.**1**		• Double layer • Cotton /knitted fabric (as per availability) • Sleeveless • Round Neck • Waist length
A.D.B.P.M.**2**		• Front zip double layer • Cotton/ knitted fabric (as per availability) • Sleeveless • Deep round neck
A.D.B.P.M.**3**		• Cotton /knitted fabric (as per availability) • Overlap layer • Half Sleeves • Front Button attachment
A.D.B.P.M.**4**		• Cotton /knitted fabric (as per availability) • Double layer • Attach shoulder velcro strap support

Design code no.	Design	Features
A.D.B.P.M.**5**		• Cotton /knitted fabric (as per availability) • Reglan full length sleeves • Full upper body cover • Round neck

Plate: 1 Developed Adaptive clothing for male chest area

Category-B. Adaptive clothing designs for breathing problem females

Design code no.	Design	Features
A.D.B.P.F.**1**		• Woven /knitted fabric (as per availability) • Velcro attachment • Cover the chest part • Sleeveless ,Overlap cover
A.D.B.P.F.**2**		• Chest belt with shoulder velcro support • Woven /knitted fabric (as per availability) • Shoulder opening with Velcro support
A.D.B.P.F.**3**		• Double layer in upper part • Shoulder opening with press button • Half sleeves • Round neck • Woven /knitted fabric (as per availability)
A.D.B.P.F.**4**		• Front zip opening • Knitted fabric • Half sleeves • Round Neck • Woven /knitted fabric (as per availability)
A.D.B.P.F **5**		• Woven /knitted fabric (as per availability) • Elastic chest support • Round neck, neck cover • Sleeveless

Plate: 2 Developed Adaptive clothing designs for female chest area

Category-C. Adaptive design of Unisex Face mask

Code details	Design	Features
A.D.U.F.M.**1**		• Knitted /cotton fabric quilted double layer • Fabric attaches in nose top Elastic belt • Round shape nose and mouth cover
A.D.U.F.M. **2**		• Pleated attach with tie • Cover mouth and nose • Double layer cotton /knitted fabric (As per the availability)
A.D.U.F.M.**.3**		• Elastic support back opening with velcro • Cover mouth and nose • Double layer knitted fabric
A.D.U.F.M.**4**		• Four-way elastic mask • Double layer knitted fabric • Full face cover with velcro
A.D.U.F.M. **5**		• Attach tie band • Double-layered knitted fabric • Cover whole nose and mouth part • Strip design
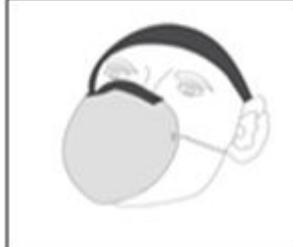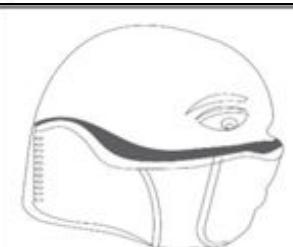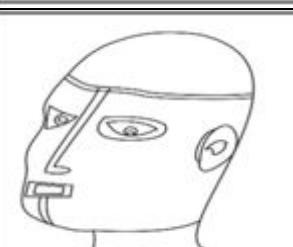
Plate: 3 Developed Adaptive design of Unisex Face mask

Evaluation of Developed Adaptive Clothing Designs:
Designed sketches of adaptive clothing designs were set in an orderly manner for evaluation by panel of experts to find their relative ranking. In order to assess the acceptability of the developed designs, a Rating Performa was developed having selected parameters for evaluation of developed designs based on five points scale and given to the judges.

The developed clothing designs for upper body -chest and face mask for both males and females were evaluated as per the laid criteria. Mean Scores of each design were calculated and ranks were given. The table-1 and figure-1, 2 and 3 shows the mean scores and ranks obtained by diverse designs of adaptive clothing under the breathing problems category for judging their suitability for the elderly.

Table: 1 Ranking and Mean score of developed adaptive clothing designs for breathing problems

(Chest for male, and female, and Face mask)

Design category	Design code	Mean Score	Ranking
Designs for breathing problems in the chest area for male	A.D.B.P.M.**1**	**3.87**	**I**
	A.D.B.P.M.2	3.32	V

	A.D.B.P.M.3	3.55	II
	A.D.B.P.M.4	3.5	IV
	A.D.B.P.M.5	3.52	III
Designs for breathing problems in the chest area for female	A.D.B.P.F.1	3.3	V
	A.D.B.P.F.2	3.67	II
	A.D.B.P.F 3	3.6	III
	A.D.B.P.F.4	3.37	IV
	A.D.B.P.F.**5**	**3.70**	**I**
Designs for breathing problems in the face area for both male and female	A.D.U.F.M.1	3.80	V
	A.D.U.F.M 2	3.97	II
	A.D.U.F.M.3	3.87	IV
	A.D.U.F.M 4	**4.55**	**I**
	A.D.U.F.M.5	3.95	III

The Mean scores obtained by all the design codes were found in the range of 3.32 to 3.87 for breathing problems in the chest area for males, 3.30 to 3.70, for breathing problems in the chest area for females, and 3.80 to 4.55 in breathing problems in the face area. This clearly shows that all the developed designs for breathing problems for elderlies were found highly acceptable in terms of aesthetic, functional, constructional, and comfort attributes by the respondents. Design code no. A.D.B.P.M.-1, A.D.B.P.F.-5, and A.D.U.F.M.-4 obtained the first rank followed by design code no. A.D.B.P.M.-3, A.D.B.P.F 2, and A.D.U.F.M.-2 who got the second rank, respectively as shown in Table 1. which clearly shows that all the developed designs for chest and masks for the elderly were found highly acceptable in terms of aesthetic, functional, constructional and comfort attributes by the judges.

Adaptive clothing designs of Kurtis for elderly womenwere designed by researcher based on their clothing needs to make comfortable dressing for them. The researcher designed 20 different designs of Kurtis with adaptive features which were evaluated by panel of judges on selected parameters in developed rating scale. [11].

Elderly people are those who are above 60 years of age. The major characteristics of old age include a decline in physical activity and the onset of several illnesses such as heart disease, kidney failure, dementia, unconsciousness, etc. Therefore, there is a need for such clothing types that do not make it difficult for elderly people.

Studies have been conducted on developing adaptive clothing designs for elderlies using urinary catheters and their caregivers to dress and undress. [12,13].

CONCLUSIONS
It is obvious that aging brings about physical changes and associated health problems that are specific to the aged, which has implications for clothing choice, needs, and care. Results showed that the all fifteen of the produced designs for the chest and face with portable characteristics for improved comfort, movement of the arms and body, as well as making dressing and undressing easier, were found to be enormously acceptable. More researches need to be carried out in this field for elderly population to give them a life full of respect and pride in the society.

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BIOACTIVE PRINCIPLES CONTENT AND ANTIOXIDANT ACTIVITY OF INDIGENOUS DANDELION (TARAXACUM OFFICINALE L) FROM DOBRUDJA REGION OF ROMANIA

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ABSTRACT

Dobrudja is a special region of Romania, located in the southeast of the country, between the Danube and the Black Sea, being surrounded by three parts of water and generally has a pronounced continental climate, with summers, usually hot and dry and winters with strong winds. The characteristic soil type of this region is chernozemic, clayey-sandy and alluvial. Due to these specific characteristics, the spontaneous flora of Dobrogea has certain therapeutic peculiarities, that reflect the specific climatic conditions, being well-known for its ability to resist because it is equipped with a good antioxidant system that includes enzymatic and non-enzymatic components, it developed mechanisms for adapting to stress tolerance, including an increase in the activity of antioxidant enzymes. The aim of this paper was to valorize medicinal plant dandelion (Taraxacum officinale L.), an important source of bioactive compounds and to evaluate some bioactive principles contents of the plant collected in autumn and spring, from the Dobrudja saline habitats and overall antioxidant potential of the hydroalcoholic extracts of plant organs, as herba, radix and the whole plant. Fresh plant was dried at room temperature, grind to a fine powder and extracted 10% concentration in ethanol 50% and 70% concentrations, using cold maceration standard method, followed by filtration at normal pressure. Obtained hydroalcoholic extracts were analyzed by UV-Vis spectrophotometry for determining total carotenoids, β-carotene, lycopene, tannins and anthocyanins content. The total antioxidant capacity was quantified through photochemiluminescence method by comparison with Trolox standard substance used for calibration, by Antioxidant Capacity of Lipid Soluble Substances procedure using Photochem apparatus, Analytik Jena AG, Germany. Total anthocyanins content were highest in 50% ethanol extracts, but for total carotenoids and tannins concentration were highest in 70% ethanol extracts for the applied cold maceration extraction method. Total antioxidant capacity of vegetal organs was variable, with increased values in 70% ethanol. The values registered for the bioactive principles content and the antioxidant activity of the vegetal product for the two studied periods were relatively close. The promising results obtained, offer us the support for continuation of the studies regarding the therapeutic activity of this valuable vegetal product from spontaneous Dobrudja flora.

Keywords: Taraxacum officinale, hydroalcoholic extracts, bioactive principles, antioxidant activity

INTRODUCTION

Dobrudja region is located in the southeast of the Romania (the city of Sulina, located at 29°41'24 "east longitude is the eastern most town in Romania), between the Danube river and the Black Sea, being surrounded by three parts of water - the Danube to the west and north and the Black Sea to the east. This region extends between 450°30' north latitude, 430°40' south latitude, 290°50 'east longitude and 270°30' west longitude. Continental Dobrogea lies between the Danube, Razelm lakeside, the Black Sea Coast and the Bulgarian border, from Ostrov to Vama Veche, and covers approximately 12,550 km^2 (Doniță et al., 1992). The climate of Dobrogea generally has a pronounced continental character, but it can be distinguished from the temperate-continental climate throughout the rest of the country. This is caused by the geographical position, the relief and the nearness of the sea. In summer, Dobrogea receives warm air masses, which brings drought and heat. In winter, masses of continental subpolar air generally penetrate, but, sometimes, masses of warmer air come from the south, leading to an early spring (Făgăraş et al, 2008). The average annual air temperature is around 11 ºC, the lowest average is in January -2 ºC, -1 ºC on the coast, and the maximum temperatures recorded in summer vary between 39 ºC and 42 ºC. Due to these specific characteristics, the flora of Dobrogea has certain peculiarities that must be explored. The spontaneous flora in turn reflects the climatic conditions, which explain

the nature of the chernozemic, clayey-sandy and alluvial soils. Halophyte plants growing near seashores have been collected since ever as food, for their medicinal qualities, and for their high salt contents (Lieth et al, 2003). Halophytes are known for their ability to resist because they are equipped with a good antioxidant system that includes enzymatic and non-enzymatic components; they developed mechanisms for adapting to stress tolerance, including an increase in the activity of antioxidant enzymes (Ivan et al, 2012). The synthesis of secondary metabolites under stress is considered to protect cellular structures from oxidative effects (Jaleel et al, 2007). In the biochemistry of plants, the synthesis of total polyphenols and flavonoids is stimulated in response to biotic or abiotic stress, as salinity is in our geographical area (Navarro et al, 200). Natural antioxidants occur in all parts of the plant, and typical compounds that exhibit antioxidant activity include polyphenols, tannins, carotenoids, and vitamins (Chanwitheesuk et al, 2005; Negreanu-Pirjol et al, 2015).

Many phytopharmaceuticals protect us against oxidative damage by scavenging free radicals and they do not cause adverse side effects. So, the solution to this problem is to consume natural antioxidants from food supplements and to use traditional nutraceutics (Daffodil et al, 2013). The active principles composition of different nutraceutical products with vegetable origin is correlated with the botanical plants' provenience (Negreanu-Pirjol et al, 2015; Negreanu-Pirjol et al, 2021; Popoviciu et al, 2020a). The active substances, in relationship with the geology and climate area, are important indicators for the identification of the special chemical characteristics of the medicinal plant Taraxacum used for the nutraceuticals and phytopharmaceuticals products (Negreanu-Pirjol et al, 2015; Popoviciu et al, 2020b).

Taraxacum officinale (L.) Weber ex F.H.Wigg. species, also known as dandelion, has been used for hundreds of years as a traditional remedy for liver, kidney, lung disorders and diabetes due to its anti-inflammatory, antioxidant, immunostimulatory and antimicrobial effects. It is a herb that can thrive in a wide range of conditions, it can be found in almost continents (Stewart-Wade et al. 2002). It can grow from the sea level to alpine zones, on every soil type.

Dandelion of Dobrudja is a perennial plant, up to 30-50 cm tall, with a branched taproot, the stem has 1-2 cm long and the leaves form a radial rosette. The leaves are variates, oblanceolate, obovate, often are pinnatisect. Margins of the leaves may have different depthness of the lobes, from lobeless to triangular dentate edges (giving it the name dandelion from French "dent de lion", meaning lion's tooth). A terminal, yellow capitulum (inflorescence) of 2–5 cm diameter arises from the rosette on cylindrical scapes (peduncles) (Gleason, 1963; Holm et al., 1997). Each capitulum is a group of approximately 250 yellow-orangish florets. Each of the florets makes a single seed that attaches to a pappus via the beak. The cypsela of the perennial dandelion is an anthocarp. An anthocarp is a fruit formed from the ovary and attached floral parts, which has undergone complet development after fertilization to aid the dissemination of the seeds. In folk medicine all parts of dandelion are used. However, each part of the plant is harvested at a certain time, when it contains the maximum amount of useful trace elements and macroelements, that is why we used distinct vegetal parts of the plant for extraction. When harvesting dandelion roots, leaves and flowers for medicinal purposes, we must consider the maturity of the plant. Dandelion root can be collected twice, when the nutrient concentration is maximum, spring before flowering (May) and autumn (September-October), while leaves should be collected before flowering, in spring, when the concentration of nutrients in them is extremely high. The collection of dandelion flowers takes place between May and October, but the flowers collected during active flowering, in May, are more valuable (Grauso et al, 2019).

BIOMEDICAL EFFECTS

The first mentioned use of Taraxacum officinale as a remedy is in the works of the Arabian physicians of tenth and eleventh centuries, who speak of it as a sort of wild Endive, under the name of Taraxcacon. In the past, dandelion roots and leaves were used to treat liver problems (Grieve, 1931). Native Americans used boiled dandelion to treat kidney disease, swelling, skin problems, heartburn, and upset stomach (Bensky et al., 2004). In French, dandelions are known for their diuretic activity. In India, dandelions are used in the whole Himalayan belt. In Kashmir Himalaya, paste of boiled leaves with a small quantity of salt and turmeric (haldi) is especially used to treat bone fractures (Malik et al., 2011). It is also used as a vegetable in Kashmir and in Himachal Pradesh, the roots are used in kidney and liver complaints. The whole plant is crushed into a paste and given orally in case of snakebites and also paste is applied externally on the wound (Rasool and Sharma, 2014.

Although it has multiple uses, dandelion is considered primarily a medicinal plant and it is used for this purpose (Maggi, 2019) pointed out in his article that the European Pharmacopoeia (2005) and the Committee for Herbal Medicinal Products of the European Medicines Agency, decided that the dandelion plant, in its entirety, including the roots, can be used in therapeutic remedies. Dandelion is considered to be a non-toxic herb with exceptional biological activity (Lis and Olas B, 2019).

Aqueous and organic extracts of different plant parts of Taraxacum officinale exhibit promising in vitro antimicrobial activity relevant for controlling fungi and Gram-positive and Gram-negative bacteria. Therefore, this genus represents a potential source of bioactive phytochemicals with broad-spectrum antimicrobial activity, concluded Sharifi-Rad et al, in 2018. It was also concluded by Faria et. al, 2019, that the leaf and root of Taraxacum officinale has an anti-inflammatory, anticancer and antimicrobial action that is more significant than the flower of this species.

A study made by Khan et. al., 2019, revealed that hydro-alcoholic extracts exhibited a better antioxidant activity as compared to aqueous extracts. They concluded that "the phenolic contents of Taraxacum officinale portray the fact that the extract from this herbal plant may help discover new antibiotic substances for chemotherapy and control of chronic infectious diseases".

In 2021, Hosseini Shekarabi et al. demonstrated the effect of dietary dandelion flower extract (DFE) on skin mucosal and humoral immunity, immune-related gene expression and disease resistance in rainbow trout. Fish mortality after Streptococcus iniae infection was "significantly reduced from 43.33% in the control group to 73.33% in 3 g/kg DFE group. This study confirmed the beneficial effects of DFE as an immunostimulant in rainbow trout diet at the recommended dose."

The paper aim was to valorize local medicinal plant Taraxacum as a new source of bioactive substances, the aim of our study was to evaluate the total cartotenoids, β-caroten, licopen and tanins contents of the plant collected in autumn and summer, from a representative Romanian saline habitat.

MATERIAL AND METHODS
Mature vegetal product (whole plant) of Taraxacum sp. was collected in the period September-October 2021 and May-June 2022 from spontaneous flora of the South Dobrudja area of Romania.

The raw material was represented by roots (Radix) (Fig. 1. A), scapes, leaves and capitulum (Mix) (Fig. 1. B) and the arial parts of the plant (Herba) (Fig. 1. C), collected from plants at full maturity and all parts of the plant were separated, washed thoroughly with tap water.

Fig. 1. *Taraxacum* sp: (A) radix; (B) mix; (C) herba (original photos, Tănasă (Acreței) M.V.)

Fresh plant was dried at room temperature on metal sieves and grind to a fine powder (Fig. 2).
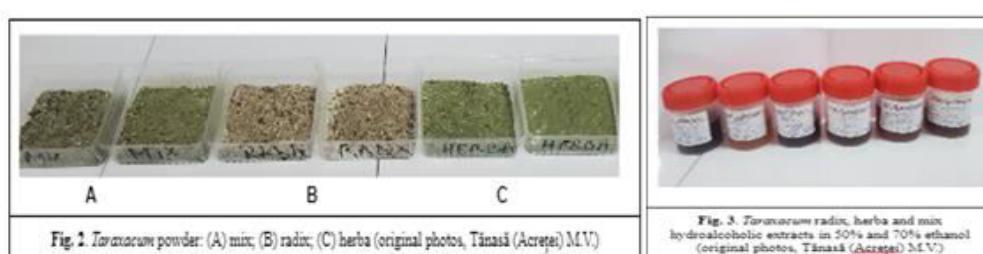
Fig. 2. *Taraxacum* powder: (A) mix; (B) radix; (C) herba (original photos, Tănasă (Acreței) M.V.)

Fig. 3. *Taraxacum* radix, herba and mix hydroalcoholic extracts in 50% and 70% ethanol (original photos, Tănasă (Acreței) M.V.)

Vegetal fluid extracts were obtained using standard method - cold maceration method. Taraxacum Radix, Herba and Mix powder was mixed with 50% and 70% ethanol in a conical flask – 10 g/100 mL. The mixture was stirred thoroughly with a glass rod. The conical flask was kept with intermittent shaking for 12 days, in darkness. The mixture was filtered at normal pressure through quantitative Whatman filter paper, extractive solutions present an assortment of colours, from light-brown to green-brown (Fig. 3).

Obtained hydroalcoholic extracts were analysed by UV-Vis spectrophotometry method for determining total carotenoids, tannins, β-carotene, lycopene, and anthocyanins content.

- For determining the concentration of total carotenoids, 1 mL of vegetal extract was diluted in 9 mL 80% acetone (triplicate samples for each species). The resulting extract was filtered at normal pressure through

Whatman blue band filter paper and the spectrophotometric absorbance was read (using a S106 WPA UV-Vis spectrophotometer) against an 80% acetone blank, at 470 nm of wavelength (Lichtenthaler and Buschmann, 2001). Absorbance values were used to calculate carotenoids concentration, according to the specific equations (Lichtenthaler and Buschmann, 2001; Popoviciu et al, 2017; Negreanu-Pirjol et al, 2019).

- For determining the concentration of β-carotene and lycopene: 1 mL vegetal extract was

Diluted in 9 mL acetone: petroleum ether (2: 3), absorbance readings at 453, 505, 645, 663 nm of wavelengths, following by using specific equations (Branisa et al., 2014).

- For determining the concentration of tannins 0,5 mL vegetal extract was diluted in 2 mL distilled water. 1.25 mL of 25% gelatin and 2.5 mL saturated solution acidified with 1% NaCl were added, followed by 30 min stirring and filtration, Folin-Ciocalteu. Spectrophotometric absorbance was read at 765 nm of wavelength (Lima et al., 2011). The value was subtracted from the concentration of total phenolic compounds, determined by reacting 1 mL of each plant extract to 5 mL Folin-Ciocalteu reagent (10%) and 4 mL sodium bicarbonate (7.5%) and reading the absorbance at 765 nm wavelength, compared to a calibration curve made with gallic acid (Stanković, 2011; Tanasa et al., 2022).

- For determining the concentration of anthocyanins: absorbance of the extract was read at 520 and 700 nm of wavelengths, (Branisa et al., 2014).

- For determining total antioxidant capacity (TEAC), a quantity of 10 g of fine powder of

Dried vegetal product was cold-extracted in 50% ethanol (100 mL total volume), at room temperature and darkness, for 12 days, with regular shaking. After decantation, normal pressure filtration and homogenization (Vortex Velp Scientifica, Italy agitator), 10 µL of supernatant were taken for analysis. Each determination lasted 120 sec. Analyses employed the photochemiluminescence method by Antioxidative Capacity in Lipid Soluble Substances (ACL) procedure of Analytik Jena AG and Photochem apparatus Analytik Jena AG, Germany (Fig. 4). Triplicate samples of hydroalcoholic extract were quantified by comparison with the standard substance Trolox®, Hoffman-LaRoche's trade name (6-hydroxy-2,5,7,8-tetramethyl-chroman-2-carboxylic acid) vitamin E derivative. For calibration, the standard kit of reagents, Analytik Jena Germany was used: R_1 (dilution solvent), R_2 (buffer reagent), R_3 (photosensitive reagent), R_4 (calibration curve reagent). For the calibration curve (Fig. 5), standard solutions containing 0.5, 1.0, 2.0, 3.0 nmol Trolox were measured (suitable for 5 - 30 µL of R_4). The results were expressed as nmol Trolox equivalents/sample volume (Popov and Lewin, 1999; Artem et al, 2021; Negreanu-Pirjol et al, 2014; Negreanu-Pirjol BS. et al, 2014, Bratu et al, 2012). For total antioxidant capacity (TEAC) determination, the samples were prepared, according to Table 1.

Table 1. Working scheme (volumes, µL) (Popov and Lewin, 1999)

Kit reagent	Reagent R_1 volume (µL)	Reagent R_2 volume (µL)	Reagent R_3 volume (µL)	Reagent R_4 Volume (µL)	Sample volume (µL)
Blank	2300			0	0
Calibration curve - Trolox standard	2295	200	25	5	0
	2290			10	0
	2280			20	0
	2270			30	0
Measurement sample	2295			0	10

Fig. 4. Photochemiluminometer PHOTOCHEM Analytik Jena AG, Germany (original photos, Tănasă (Acreţei) M.V.)
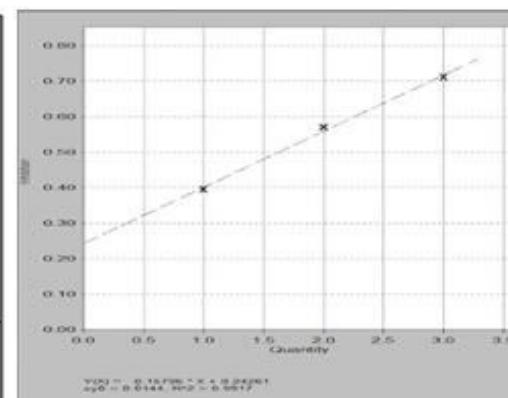
Fig. 5. Calibration curve for Trolox® standard substance, photochemiluminescence method, ACL procedure, Analytik Jena AG, Germany

RESULTS AND DISCUSSIONS

- **Determination of β-carotene and lycopen pigments content**

High β-carotene concentration was found in Taraxacum Herba hydroalcoholic extract in 70% ethanol (35,05 mg/kg DW) and similar to β-carotene concentration in hydroalcoholic extracts of concentration 50% ethanol Taraxacum Herba (21.30 mg/kg DW) and 70% ethanol Taraxacum Mix (21.93 mg/kg DW), Fig. 6. Lycopene concentration was below detection limit for all analyzed samples, Fig. 6.

- **Determination of tannins, anthocyanins and carotenoids content**

The comparative study of the anthocyanins content of hydroalcoholic extracts of vegetal products Taraxacum Herba, Radix and Mix shows a better extraction of this bioactive substance in 50% ethanol hydroalcoholic extracts for all three types vegetal extracts: 264,45 mg/kg DW in 50% ethanol almost double towards 138,43 mg/kg DW in 70% ethanol Radix extract, Fig. 7. The highest anthocyanins content was determined in Taraxacum Herba – 519 mg/kg DW in 50% ethanol extract and 455,38 mg/kg DW in 70% ethanol extract.
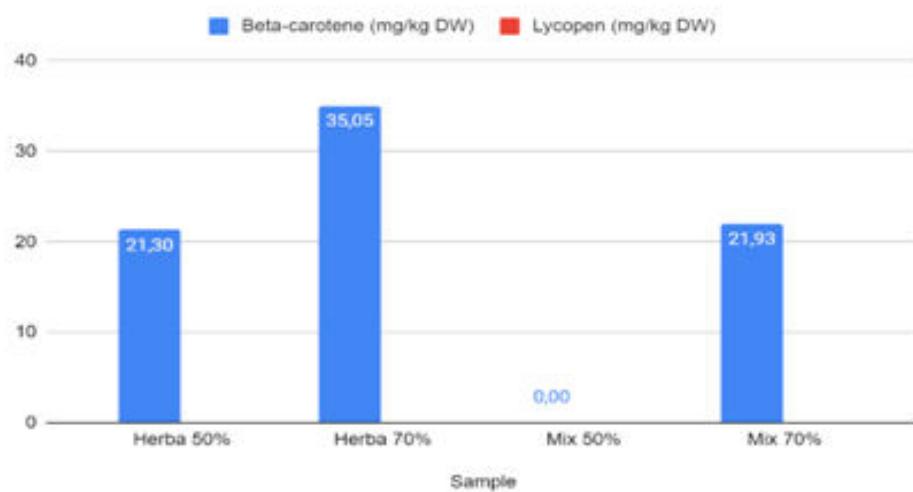
Fig. 6. β-carotene (mg/kg DW) and lycopene (mg/kg DW) content in different hydroalcoholic extracts of Taraxacum, average values for the analyzed period

Total tannins content was less variable with the concentration of ethanol higher in 70% ethanol extracts, and also less variable in different vegetal parts of plant, with the highest value in hydroalcoholic extract of Taraxacum Herba in 70% ethanol (53,11 g/kg DW) and the lowest value for Taraxacum Radix hydroalcoholic extracts of concentration 50% ethanol, 22,65 g/kg DW, Fig. 7.

The highest total carotenoids content was determined for cold macerated hydroalcoholic extracts of concentration 70% Taraxacum Mix (134.441 mg/kg DW), Fig. 7, respectively Taraxacum Herba (104.01 mg//kg DW).
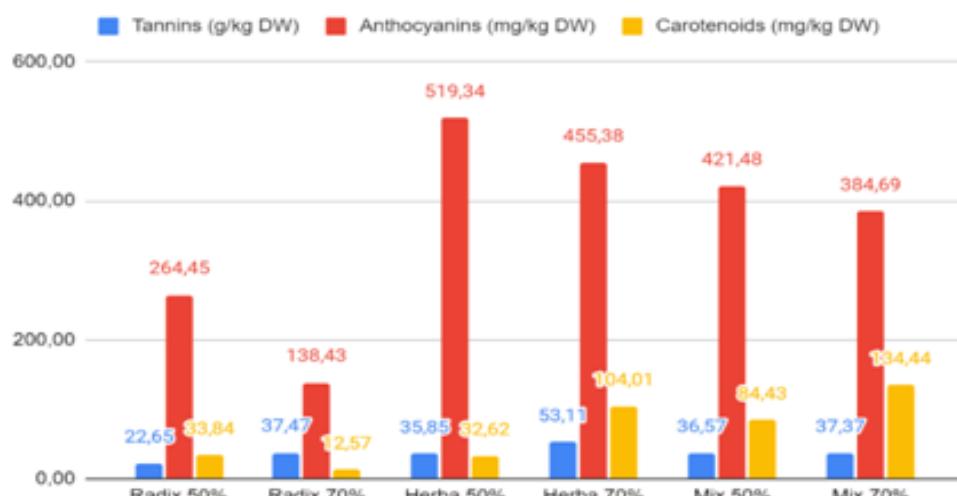
Fig. 7. Tannins (g/kg DW), anthocyanins (mg/kg DW) and carotenoids (mg/kg DW) content in different hydroalcoholic extracts of Taraxacum average values, for the analyzed period

The results regarding the total antioxidant capacity (TEAC) of the hydroalcoholic extracts of Taraxacum sp. (Radix, Herba and Mix) are presented in Fig. 8. The voltage (V) recorded is proportional to the luminescence generated as a function of time (sec.); inhibition of free radicals by antioxidants in the samples was compared with the Trolox standard substance (for 0.5, 1.0, 1.5, 2.0 and 3.0 nmol/sample volume). The registered TEAC values of each plant organ extract exceeded the calibration curve, therefore the experiment required dilutions of stock solution extracts with methanol (R_1), in molar ratios of 1:1, 1:30, 1:50.

The analysis of the obtained results in case of different molar dilution reports highlights the following aspects:

- The comparative study of the total antioxidant capacity of hydroalcoholic extracts of Vegetal products Taraxacum Herba, Radix and Mix shows highest values for all three types of extractions in ethyl alcohol of concentration 70%.

- The hydroalcoholic extract obtained from the vegetable product Taraxacum sp. Herba

Obtained by cold maceration in ethyl alcohol of 70% concentration evidenced the highest values of antioxidant activity. In hydroalcoholic extracts of Taraxacum sp., Herba and Mix, obtained by cold maceration in ethyl alcohol of concentration 70%, a significant total antioxidant capacity was registered for Herba 70%, 1:1 sample for both period of collection (14.238 μmoli echiv. Trolox/g tissue for Taraxacum sp. collected in September-October and 14,221 μmoli echiv. Trolox/g tissue for Taraxacum sp. collected in May-June) and for Mix sample (14.059 μmoli echiv. Trolox/g tissue for Taraxacum sp. collected in September-October and 14,222 μmoli echiv. Trolox/g tissue for Taraxacum sp. collected in May-June), both at the maximum dilution of the stock solution in concentration 10% of 1:1; the result indicates that the influence of pedoclimatic conditions is quite small and the antioxidant activity of the extracts has slightly higher values.

- In all types of hydroalcoholic extracts obtained by cold maceration of Taraxacum sp. collected in May-June, and all the dilutions was determined a slightly higher total antioxidant capacity compared to extracts obtained from Taraxacum sp. collected in September-October, except for Herba 70%, 1:1.
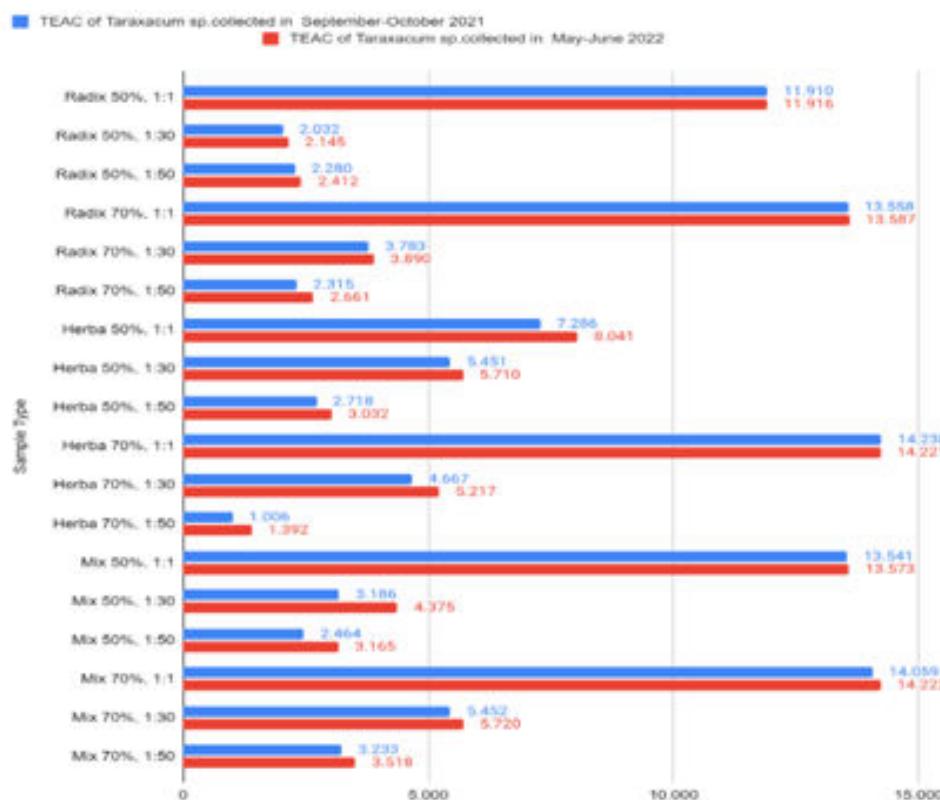
Fig. 8. Total antioxidant capacity (μmol equiv. Trolox/g tissue) of 50% and 70% ethyl alcohol extracts of Taraxacum sp. samples at different molar ratio dilution, for the analyzed period

CONCLUSIONS
Hydroalcoholic extracts 10% concentration of Taraxacum vegetal product Herba, Radix and Mix obtained by cold maceration in ethyl alcohol of concentration 50% and 70%, did not have modifications in quality

parameters change during 120 days of observation. Cold maceration standard extraction method in ethyl alcohol of concentration 70% of vegetal products Taraxacum Herba and Taraxacum Mix emphasized a better extraction of carotenoids pigments compared to extraction in 50% ethanol concentration, the highest value being registered for Taraxacum Mix 70% hydroalcoholic extract.

The β-carotene and tannins content does not vary significantly between hydroalcoholic extracts of plant organs or the whole Taraxacum plant, nor between plant extracts obtained by the cold maceration extraction method in the two concentrations of ethyl alcohol of 50% and 70%.

The highest anthocyanins content of hydroalcoholic extracts of Taraxacum vegetal organs was registered in ethyl alcohol of concentration 50% of Taraxacum Herba, Radix and Mix products.

The total antioxidant capacity (TEAC) emphasized higher values in Taraxacum hydroalcoholic extracts in 70% ethanol, compared to those in 50% ethanol, both for plants harvested in September-October and for plants harvested in May-June. Also, for hydroalcoholic extracts of Taraxacum Herba in 70% ethanol, the highest value of total antioxidant capacity (TEAC) was registered.

Further research is needed to assess, in detail, the best method of extraction for each class of bioactive compounds and to confirm the antioxidant potential of this vegetal product from spontaneous Dobrudja flora.

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CHILD ABUSE AND ONLINE EDUCATION: CYBERCRIME AND SEXUAL EXPLOITATION OF CHILDREN DURING A LOCKDOWN

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ABSTRACT

The Indian government has consulted with the States and UTs at various levels during the COVID-19 pandemic. In order to review and close the learning gap during the Covid-19 pandemic phase, a brainstorming workshop with Civil Society Organizations (CSOs) was convened in January 2021. An array of strategies has been used to guarantee that every kid has access to education going forward. As part of the Atma Nirbhar Bharat Abhiyan, a comprehensive project named PM e-VIDYA was launched on May 17, 2020. It unites all initiatives connected to digital, online, and on-air education to offer multi-mode access to education. School closings have an impact on more than 1.5 billion children and teenagers globally. Many of these students are currently enrolled in classes and engaging in greater online socialization. As predators try to take advantage of the COVID-19 epidemic, spending more time on virtual platforms might make kids more susceptible to online sexual exploitation and grooming. Lack of in-person interactions with friends and partners may encourage risk-taking behaviors like sharing sexualized photographs, while more unstructured internet time may expose kids to potentially hazardous and violent material and raise their chance of becoming the target of cyberbullying.

Keywords: Online Education, Cybercrimes, Sexual Exploitation, Child Abuse, Crime in Covid-19.

INTRODUCTION

Globally, one in five girls and one in thirteen boys have experienced sexual exploitation or abuse before turning age 18. Worldwide, child sexual exploitation or abuse is a common occurrence, though rates vary by nation. Child sexual exploitation and abuse includes a range of sexual behaviors committed against children and is one of the most terrible types of violence against children. School closings have an impact on more than 1.5 billion children and teenagers globally. Many of these students are currently enrolled in classes and engaging in greater online socialization. As predators try to take advantage of the COVID-19 epidemic, spending more time on virtual platforms might make kids more susceptible to online sexual exploitation and grooming. Lack of in-person interactions with friends and partners may encourage risk-taking behaviors like sharing sexualized photographs, while more unstructured internet time may expose kids to potentially hazardous and violent material and raise their chance of becoming the target of cyberbullying. It quickly became apparent that many students were not prepared for the type of full-time, digital education that was now required once schools started to make the switch to emergency remote learning. Not all pupils have access to the necessary equipment, such as laptops or a reliable Internet connection. Additionally, many educational institutions lacked adequate cybersecurity safeguards, which raised the potential of cyberattacks on online classes. After pranksters and malicious people started using Zoom's security flaws to enter private meetings, the term "Zoom bombing" entered the common vernacular this spring. Schools were among the casualties; there have been multiple instances when individuals have disrupted online classes by posting vulgar remarks or streaming offensive 18+ films. Microsoft's Global Threat Activity Tracker identified more than 8 million malware occurrences between July and August 2020, with the education sector being the most severely hit. Due to the current rush to implement e-learning, there has been an uptick in cyberattacks; criminals are using these possibilities to scam schools, steal private information, or use ransomware to demand payment. The FBI's Internet Crime Complaint Center (IC3) recently issued a public service message warning that attackers are increasing their targeting of virtual environments, including those used by schools, as a result of the shift to online learning brought on by COVID-19.

The Significance of Cyber Crime and Sexual Exploitation

The use of a kid for sexual reasons in return for money or in-kind benefits between a customer, middleman, or agent and those who profit from the trade in children for these purposes—parent, family member, procurer, teacher—between a client, intermediary, or agent and these others. "Criminal behavior (such as fraud, theft, or distribution of child pornography) committed using a computer, particularly to unlawfully access, transmit, or alter data," according to the definition of **cybercrime.**

Zoom-Bombing

Professionals and students can have online meetings and participate in online classes using the video conferencing app Zoom. Recently, though, concerns regarding the app's security have surfaced. A meeting can be "zoom bombed" by hackers, who get access to it and then flood it with offensive material. Unacceptable

content, such as a pornographic movie, has occasionally been played during meetings or online classes recently. The organization has taken steps to stop incidents of zoom bombing by deactivating Personal Meeting IDs for arranging or beginning a meeting and requiring a password for all meetings. Furthermore, by default, the host will be the only one with access to the shared screen.

The term **"Sexual Exploitation"** refers to the actual or attempted abuse of a person's position of vulnerability (such as a person who depends on you for food rations, school, books, transportation, or other services), differential power, or trust in order to obtain sexual favors, including but not limited to by offering money or other social, economic, or political advantages). Prostitution and human trafficking are included.

As is common knowledge, anyone may readily get internet services nowadays due to their ease of use and low cost. However, a lot of individuals are abusing these online resources, threatening people, demanding money, or pressuring them to do crimes. Due to their vulnerability and susceptibility to manipulation, these criminals frequently target youngsters. With the use of social media, many criminals formed friendships with young people. Because these kids have innocent hearts and little information, they are easily manipulated and persuaded to commit crimes by these criminals. There are a number of elements that contribute to online sexual exploitation of children, such as sexual exploitation of children, such as.

Use of a Mobile Device and the Internet
This is the biggest cause of children being sexually exploited online. Colleges and universities have begun to hold online lectures as a result of the shutdown of the institutions, giving students access to smart phones and the internet. Students are use the internet more often and spending more time on their cellphones as a result. As a result, there has been an upsurge in the production and dissemination of media depicting child sexual abuse as a result of abusers' extensive use of the internet.

According to a research by the Indian Child Protection Fund (ICPF), during the shutdown, consumption of child pornography in the nation increased alarmingly by 95%. Cybercrime increased as a result of more people using internet services. The well-known "boy's locker room" case involves the unlawful use of internet resources during a lockdown, in which some guys who belonged to the Boy's locker room Instagram group uploaded indecent pictures of young girls, offensive words, and discussed plans for "gang raping" females. The head of the Delhi Commission for Women, Swati Maliwal, and the National Commission for the Protection of Child Rights took notice of the issue and sent various notices to Instagram and the Delhi Police for further investigation after screenshots of these chats were leaked and quickly went viral on social media. The members of the aforementioned organization are juveniles and 11th and 12th grade students, but due to their misuse of social media and internet services, they turned into criminals and were apprehended by Delhi Police.

Negligency from Parents
Many parents failed to care for their children during this lockdown since they were required to stay at home and requested to work from home. Parents have a duty to supervise their children as they use cellphones and the internet. Some parents are unaware of the dangers of internet abuse, misuse, and child exploitation online. Parents have a key role in preventing this mistreatment and abuse of their children. Before granting their children access to cellphones, parents must educate themselves on the internet and properly teach their children about its correct usage and the repercussions of its abuse.

AWARENESS DEFICIT
Everyone needs to be aware of and cautious about every event happening in the society in the age of rising cybercrime rates. The person who is knowledgeable and takes all necessary safeguards is never held responsible for the results of his ignorance. The internet services have greatly facilitated our job, but on the other hand, they also provide those who are impatiently awaiting the opportunity to defraud others of their money a platform.

IMPROPER SEX EDUCATION
Minors lack awareness of what is healthy for them and are like seeds that require more time to mature. Other significant contributors to child sexual exploitation include the influence of pornographic media and a lack of sexual education. According to data from the largest pornographic website in the world, "porn hub," searches for terms like "sexy child," "teen sex movies," and "child porn" have grown exponentially. Concerningly, in only 11 days, the government's child abuse hotline received 92,000 SOS calls from those seeking safety. Since the Covid -19 epidemic broke out, cases of online harassment have increased by five times, according to Rekha Sharma, chair of the National Commission for Women (NCW).

Cyber Crime's Impact on Child during Lockdown

The Covid-19 pandemic, which has already presented new challenges to the world, is causing every doctor and scientist to work on developing a treatment and vaccine to stop the spread of the virus. Children throughout the world are required to stay at home, are kept out of school, and are encouraged to attend online lectures despite the fact that there are extremely few incidents of COVID-19 among youngsters. This gives sexual predators the chance to take advantage of children.

Technologies advancement and easy access to such technology have both positive and negative effects on children and society. According to data from the department of telecommunications, India used an average of 3,07,963 gigabytes of data between March 22 and March 28 (the first day of the shutdown). Children who are confined to their homes and spend more time online communicate with strangers and make new acquaintances, which has a negative influence on how often they get themselves into trouble. Children who are sexually exploited online can suffer substantial physical and psychological harm. Sexual abuse has a devastating impact on a child's mental health. The emotional divide is a result of parents and children not communicating with one another. The fact that these predators and sexual abusers are occasionally revealed in the news to be known individuals or family makes victims feel alone and helpless, which can lead to despair.

Cyber Crime Prevention and Child Exploration Laws in India

According to the philosophy of punishment, rigorous rules, punitive provisions, and severe application of such laws are necessary to prevent any crime in society. The development of internet technology and its use require supervision and some limitations. The prevention measures must be implemented through laws and regulations in order to dissuade perpetrators. The Indian Parliament has approved a number of legislation, including the following, to safeguard children's rights, stop child sexual exploitation, and combat cybercrime.

1) The Indian Penal Code,1860

2) The Information and Technology Act,2000

3) POCSO Act of 2012: (The Protection of Children from Sexual Offenses)

4) The Indian Constitution of 1949

The Indian Penal Code, 1860

The Indian Penal Code, 1860, which is addressed under sections 354 A through 354D, has penalties for cyberbullying and cyberstalking of women. Sexual harassment and its penalties are covered in Section 354 A. Section 354B: Criminal force or assault against a woman with the goal to cause her to undress. Voyeurism, Section 354C.Stalking, Section 354 D.

The Information and Technology Act, 2000

The Information Technology Act, 2000, which addresses cybercrimes, was passed on October 17, 2000. The statute was modified multiple times, but the most significant change was made in 2008. The introduction of Section 66 A made transmitting insulting texts illegal. It also included laws for voyeurism, child porn, cyberterrorism, and pornography.

POCSO Act of 2012: (The Protection of Children from Sexual Offenses)

The POCSO Act, 2012, is a new special law that the government has passed to address situations of child sexual abuse. The aforementioned act includes penal provisions that, among other things, punish the use of children for pornographic purposes and the storage of pornographic material involving children in order to protect children from the crimes of sexual assault, sexual harassment, and pornography as well as online sexual exploitation.

The Counstitution of India, 1949

The right to a life with dignity is one of the fundamental rights granted to children by Article 21 of the Indian Constitution, and anybody who infringes on this right shall be punished.

How to stay secure

With the use of vigilance and diligence, one can protect themselves from such scams and frauds. You can keep in mind the following advice:

- Check the app's details, which include information about the creator, reviews, ratings provided by other users, and their website, if any, before downloading any apps from the Play store.

- Avoid downloading apps from third-party websites' shops and only do it through the Apple Store or Google Play store for iOS and Android devices, respectively.

- Use efficient and dependable antivirus for mobile and desktop to avoid the installation of bogus and harmful programs.

CONCLUSION AND SUGGESTIONS

The future of this country's growth is in the hands of the children, who are one of our society's most valuable assets. Thus, it is the responsibility of the state to ensure that children receive a decent education and to defend their rights. More stringent legislation should be passed and put into place by the state to stop child sexual exploitation and cybercrime. Children are naïve, and they aren't aware of how the internet may ruin their future. Parents have a duty to advise and inform their children about the advantages and disadvantages of using the internet, as well as the repercussions of doing so. Children and their parents should have a sex discussion. Instead of keeping it secret, sexual education for youngsters must be provided by schools and institutions. The risk linked with internet use will lessen if the youngster is informed of these crucial items. It's crucial to have a conversation with your children about appropriate and inappropriate behaviour before handing them a computer or mobile device. For stronger compliance, it is preferable to involve your children in the decision-making process rather than forcing rules on them. Helping children set time limits for their online activities is one strategy; if they are active, they are less likely to wander into questionable sections of the internet or become victims of phishing emails and dangerous links. It's best to limit their use of these programs because even trustworthy social networking websites may have malware plugins, apps, and other harmful stuff.

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FATIGUE ANALYSIS OF FEMUR BONE USING ANSYS

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ABSTRACT

Fatigue analysis of bones is a demanding topic because of the variable mechanical properties and geometric shapes. All the mechanical properties vary with respect to age, race, sex, environmental conditions, loading conditions etc. Fatigue analysis of bones is very essential while designing prosthetics, fracture analysis of bone, in biomechanical field. Mechanical Analysis of bone is usually performed with Finite Element Analysis (FEA).FEA provide a near to accurate result for such complex analysis. This report discusses about such applications and the procedures of previous researches. Exhaustive literature survey is carried out to study and understand the different methods and procedures performed to do fatigue life analysis of bones. Methods ranging from basic mechanical testing of dead bones from cadavers to novel methods of deriving an equation have been discussed in this report. Fatigue analysis of femur bone considering isotropic homogeneous cortical bone, using ANSYS has been performed and results displayed in the report.

Keywords: ANSYS, bone mechanics, FEA, fatigue analysis

1. INTRODUCTION:

Femur is the longest and most loaded bone of human body. It makes it an important bone to study and carry out fatigue analysis. There have been studies carried out to perform mechanical analysis on femur bone. Bone being a living complex tissue its mechanical properties depends on many factors; also its structure is not as explicit as it also depends on many factors. This report tries to perform fatigue analysis on femur bone using ANSYS. Accuracy of the FEA (Finite Element Analysis) analysis depends on mainly three things; 1) Mechanical properties of the bone, 2) 3D model of the bone and 3) Boundary conditions applied to the bone.

Being a biologically active tissue and having mechanical properties dependent on many factors such as, density[1], position and length[5], force[6], shape[8], age[7], sex[9] etc. it becomes immensely difficult to carry out FEA analysis in effective and accurate way. Bone is considered to be orthotropic material which further makes the problem complex. The 3D cad model can be easily generated from the CT scan image. This being out of the scope of this research, a readily available femur bone 3D CAD model was used. To know the accurate boundary conditions, proper motion and orientation of human body needs to be known. Application of load and its orientation depends on the function being performed and the muscle in action. Though FEA provides high accurate results for irregular shapes and complex boundary conditions, its main disadvantage is that it depends on mesh statistics and quality, and for complicated problems like these, millions of elements are required [10]. Coarser the mesh size less is the accuracy and finer the mesh size it takes high computation time. This can be controlled with mesh convergence and we can get the most accurate result.

The main objective of the report is to 1) Validate the fatigue analysis results from ANSYS and 2) Fatigue analysis of femur cortical isotropic homogeneous bone.

Bone is made up of two parts namely Cortical and Trabecular. Out of which Cortical is the outer hard layer of bone and its main function is to provide support. While bone is essentially brittle, bone does have a significant degree of elasticity, contributed chiefly by trabecular bone tissue. And due to continuous cyclic loading on the bones it becomes necessary to do the fatigue analysis. This report discusses about the different methods of fatigue analysis of bones, and studies fatigue analysis of Femur in ANSYS.

The report is divided into five sections. First section gives an introduction to the topic. In second section different methods for mechanical analysis of bone are discussed from the research papers. Method for performing fatigue analysis with validation to get optimum results is explained in the methodology section three. Result and conclusion are discussed in the section four and five respectively.

2. LITERATURE SURVEY

Some studies have been carried out to physically test and measure the mechanical properties of bones. To do proper calculation and analysis of fatigue life we need accurate S-N curve of the specific bone and required other parameters as discussed above. Swanson et al (1971) [4] carried out fatigue tests using bones from cadavers of different age, sex and positions. Specimens were taken from 22 human cadaver femora, with ages at death ranging from 35 to 98 year, were examined. The femora were taken from routine autopsies and were stored after removal from the cadaver at -20 degrees until the time of the experiment. They performed rotating

cantilever test on standard bone specimens taken from mid shaft of each bone with the axis along the length of the bone. Cycles to failure were measured for different bending loads applied to bones. The Figure 1 below displays the median S-N curve of the test specimens considered. The drawback of the study was that dead bones were under considerations which cannot repair or remodel themselves as live bones can do.

Similarly D. C. Wirtz et al (2000) [2] surveyed more than 300 [published] studies related to material properties of human femur bone. After analysis of all the data, mean value plots for material properties were approximated along with power law functions. Young's Modulus and compressive stress of cortical bone is a function of density and thus it should be considered inhomogeneous material. 2 The empirical equation of Youngs modulus with respect to density of bone is given as; $E = 2065\rho^{3.09}$. Also the Poisson's ratio are between 0.2 and 0.5 (average: 0.3) for cortical bone. [2]

Ghasemi et al (2019) [3] considered the random variation in mechanical properties of bones such due to age, sex, races, environmental conditions, general health conditions etc. Fatigue analysis of tibia was performed considering probabilistic approach to incorporate the randomness of mechanical properties. 3D model was generated using the image processing technique to develop the stress distribution based on the load-gait history. The statistical parameters of the fatigue loading conditions and the mechanical properties of the tibia were presented for the concept of reliability analysis. It was observed that increasing the age and the lifetime service of the considered cases lead to the lower reliability indices. [3]

L.L. Loundagin, et al (2020) [11] explained that fatigue life of cortical bone exhibits a large degree of scatter that is potentially due to the underlying microarchitecture. Vascular canals are described as stress concentrators within bone matrix, the magnitude and volume of it is dependent on that canal morphology, and may reduce fatigue-life. It was explained by them that stressed volume was able to account for a majority of the scatter in fatigue-life measurements and a large stressed volume was associated with a short fatigue life. And cause of increase in stressed volume was mostly due to higher levels of intra-cortical porosity and larger canal diameters. [11]

K.C. Nithin Kumar et al (2015) [12] and Raji Nareliya et al (2011) [13] in there research paper have performed biomechanical analysis of Femur bone in various loading conditions using ANSYS. It was limited study considering selected femur bone of fixed density and isotropic material.

3. METHODOLOGY

There is a limited study regarding fatigue analysis of bones in ANSYS. As discussed earlier, non-homogeneous and anisotropic nature of bone and also multi-parameter dependent properties makes it difficult to carry out fatigue analysis. Rather it is difficult to carry out fatigue analysis on a living tissue which can continuously remodel itself and heal the cracks. Maximum stress and fatigue failure must occur on longest and maximum loaded bones. Femur bone is the most proximal and longest bone of the leg in vertebrates. It helps in walking or jumping. It is responsible for supporting largest percentage of the body weight. For the same reason Femur bone was considered for fatigue analysis.

3.1. Analytical Validation:

To validate the results of ANSYS, three models of taper rod with and without taper hole having isotropic homogeneous cortical bone material properties were tested. The results were validated analytically and are discussed further. Following were the material properties considered;

Density $(\rho) = 1.9 \text{gcm}^{-3}$; $E = 2065\rho^{3.09} = 15\text{GPa}$; Poisson's ratio = 0.3

And the SN curve values were referred from Swanson et al (1971) [4]. Goodman theory of fatigue life analysis was considered with completely reversible load.

3.1.1. Taper Rod with Axial Load (Tensile)

Solid taper rod was modeled in ANSYS Workbench. Axial loading with increased amplitude was applied to evaluate the result at the weakest point of the taper rod. The number of hexahedral elements after meshing was 891 with 4465 nodes. The average element quality was 0.926. Fatigue analysis was performed considering axial load on the taper rod and the results were captured in excel sheet. The plots in the Figure 1 compare Normal stress and fatigue life for increased loading between analytically calculated results and ANSYS results. The graph shows that the analytical values are very much in agreement with the ANSYS results for the weakest point of the rod.
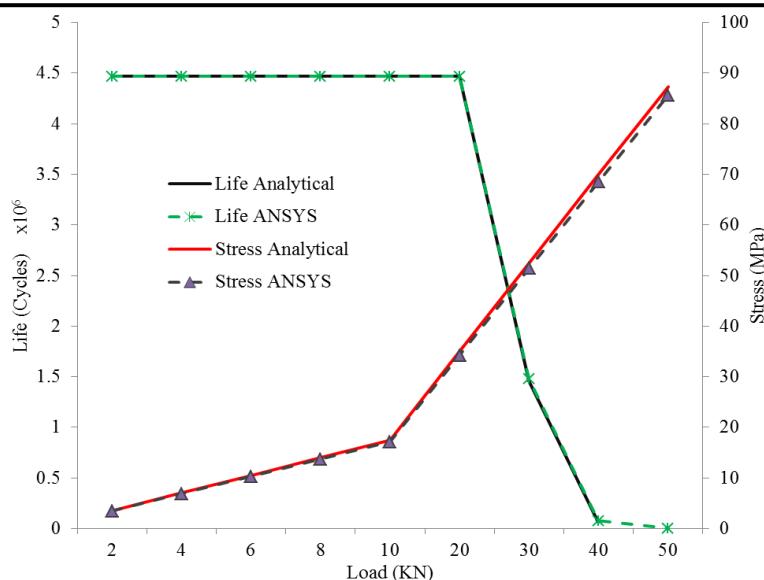
Figure 1: Analytical validation of Fatigue Life and Stress for solid taper rod [Source: Author]
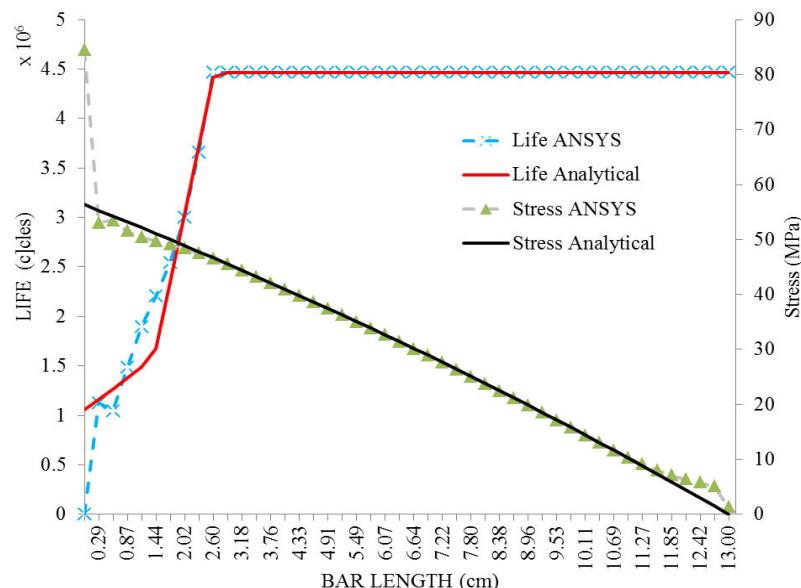
Figure 2: Analytical validation of Fatigue Life and Stress for Annular taper rod [Source: Author]

3.1.2. Taper Annular Rod with Bending Load

Taper annular rod with the similar material properties as above was modeled and tested for fatigue. Completely reversing normal bending load of amplitude 1 KN was applied on one end of the rod and variation is noted along the upper most elements along the length. The results from the specific physical quantity are captured into excel and analytical comparison is done. Figure 2 shows the variation of normal bending stress and life variation along the axis of the taper rod at the top most elements. It can be observed that the normal bending stress as per ANSYS is similar to the analytical calculation result, except at the extreme two ends of the rod. And Fatigue life is also comparatively similar except at the extreme ends. The main reason for the difference in the result is due to singularity errors at the fixed end. This can be reduced but can't be completely neglected. Simple solution to this problem is to setup the boundary conditions such that the Region of Interest is not affected due to singularity at the fixed end.

3.2. Femur Bone Analysis

Similar Fatigue analysis is performed on a readily available femur bone CAD model as done on the validation model. As discussed before, cortical bone has much higher yield stress and plays main role of supporting load thus CAD model with only cortical bone is considered i.e. femur is hollow. Material properties of femur bone such as density, Young's modulus and Poisons ratio are the same as considered for validation. One of the important steps in FEA is meshing the model. To reduce the error in the result the mesh was generated and then converged for Equivalent stress. The number of elements and nodes after convergence, with change within 10% is shown in Table 1 below. Final mesh generated on the left femur bone with the section view depicting the hole in the bone is shown in the Figure 3.

Iteration	Equivalent Stress (MPa)	Change (%)	Nodes	Elements
1	16.468		39879	22617
2	18.154	9.7402	87738	54235

Table 1 : Convergence Report depicting the optimum number of Elements and Nodes for a change within 10%
*[**Source:** Author]*

Boundary conditions were reffered from Kumar et al(2015) as discussed in the literature survey. A person of average weight of 750N performing repetetive jumps would lead to a load of 850N and moment of 10000 N-mm on the medial and lateral condyle surface. The head was considered as fixed support to perform analysis. Figure 4 depicts the boundary conditions applied.

4. RESULT

The fatigue analysis for femur bone with the above boundary conditions and material properties was performed and following results were available for observation on ANSYS. The Maximum equivalent stress generated in the bone was 18.154 MPa in the femur neck and shaft region as can be seen from the Figure 5. This shows us that possibility of fracture is more on the neck and shaft region if the load is increased. And it is also clinically observed that maximum fractures occur in the femur neck region, thus our result is acceptable. With the maximum total deformation of upto 3mm as can be seen from Figure 6
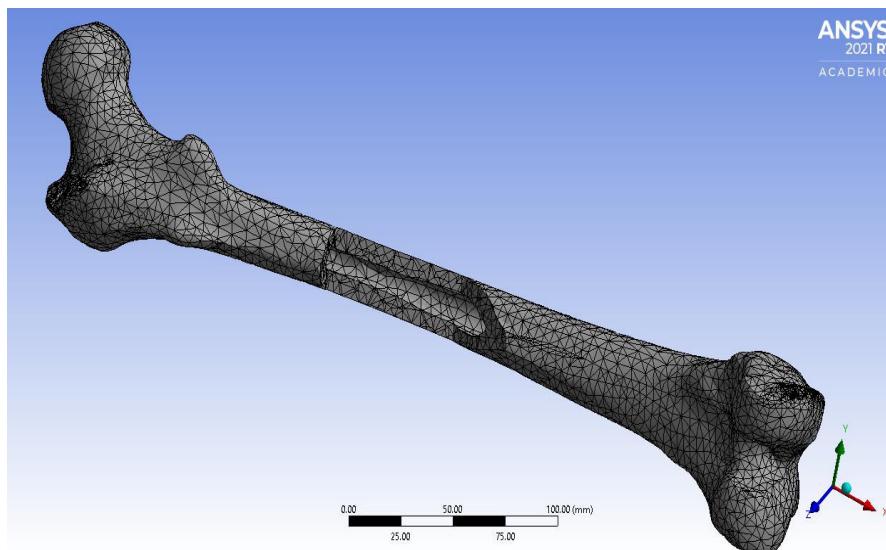
Figure 3 : Meshed Femur bone with cavity in the center visible in the section view. [Source: Author]
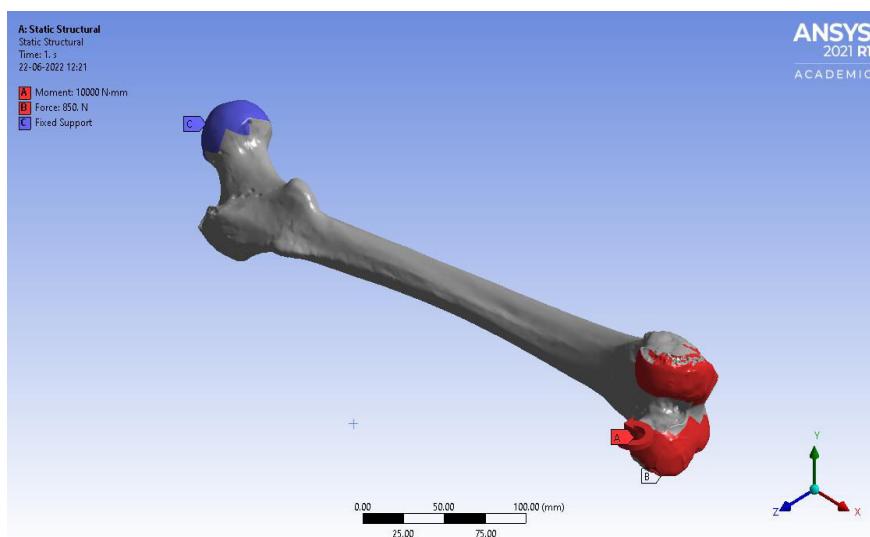
Figure 4 : Boundary Conditions applied to femur bone. [Source: Author]

The main objective of the report was to do fatigue analysis of femur, fatigue life and FOS results can be observed from the Figure 7 and Figure 8 respectively. The fatigue life for the applied loading is found to be infinite, this is because the stress is within the acceptable ultimate tensile stress. And the average FOS was 2.57, with minium FOS at the femur neck and shaft region.
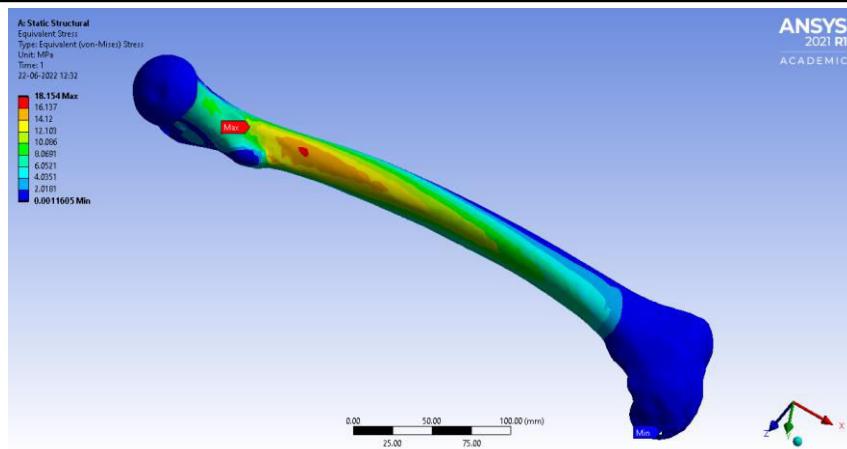
Figure 5
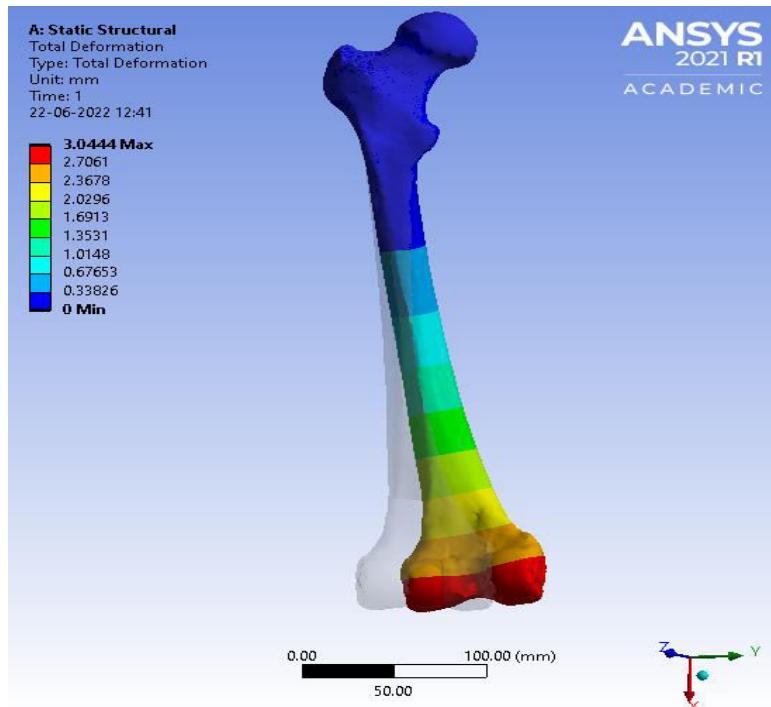
Figure 6

Figure 5 depicts the variation of equivalent stress throughout the femur. Maximum stress occurs in the femur neck and shaft region and agrees with the clinical observation that maximum failure occurs in neck region. [Source: Author]

Whereas Figure 6 above shows the variation is total deformation throughout the bone. For comparison, un-deformed bone is displayed alongside too. [Source: Author]
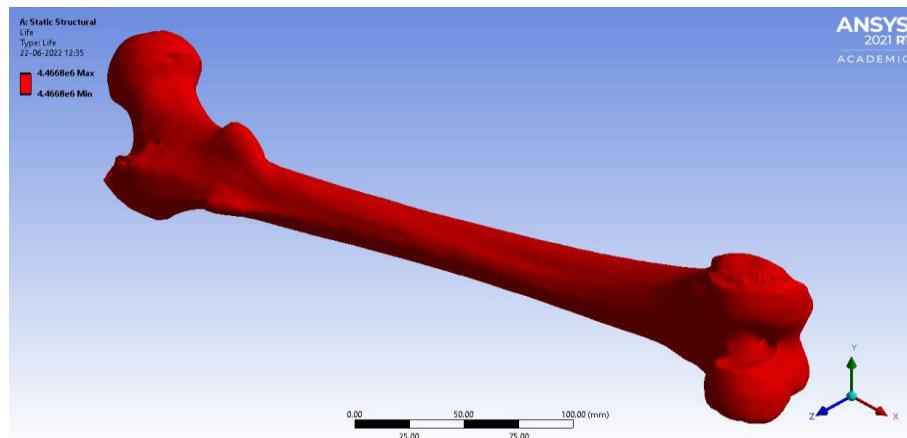
Figure 7
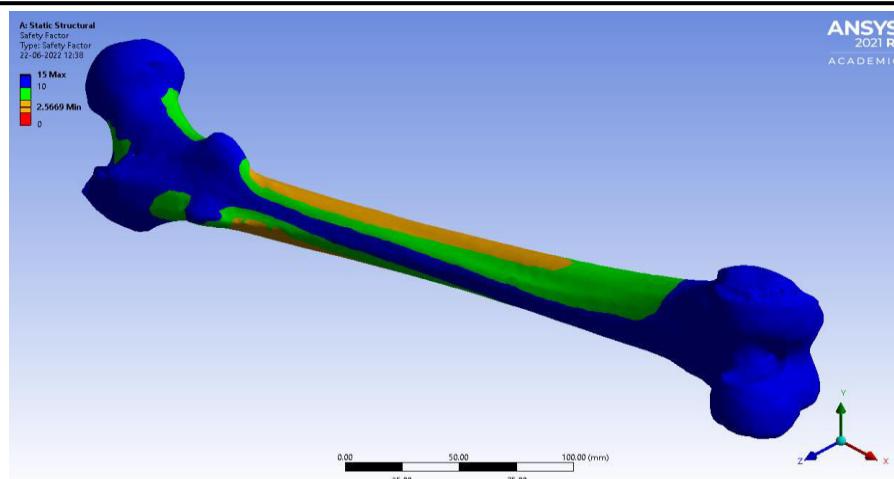
Figure 8

Figure 7 and 8 respectively show the result of fatigue life and Factor of Safety (FOS). Fatigue life for the given loading is infinite throughout the bone and minimum FOS at the shaft and neck region as can be seen from the figure. [Source: Author]

5. CONCLUSION

It can be observed from the analytical comparison of the results from ANSYS that it provides almost accurate results. The only deviation that occurred was on the fixed end due to the singularity that arises due to corner edges or the fixed support. Instead of performing test for the entire solid, a region of interest should be defined and analyzed. Thus it can be seen from the above comparisons that ANSYS is an effective tool to perform bone mechanics up to certain limits. Since, the accuracy depends on many factors.

Fatigue analysis of femur bone was done in ANSYS after validation. The results obtained were found to be in agreement. For simplification purpose isotropic homogeneous material was considered, but the bone is considered to be orthotropic non homogenous material. This provides a chance for further research and improvement in the results. The main objectives of the paper are achieved as the results were compared and validated for axial and bending load conditions for an isotropic material and found to be in agreement with each other. And fatigue analysis for femur bone was performed on isotropic homogeneous material.

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CONTEMPORARY CHALLENGES FACED BY THE PERSONS WITH DISABILITY (DIVYANGJAN) IN MANIPUR

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ABSTRACT

Being India is a signatory to the 1990 United Nations World Declaration on Education for All (EFA) held in Jomtien, Thailand which reaffirmed the right of all children including children with disabilities to access education in regular schools settings, In December 1995, the Government India passed a bill in Parliament Called "The Equal Opportunities, Protection and Right and Full Participation Bill for Person with Disability" or The Disability Act or PWD Act 1995 in short. Consequently, The Right of Person with Disability Act 2016 was passed by parliament and became an act of Parliament. The Right of Person with Disabilities Act promotes and protects the rights and dignity of people with disabilities in various aspects of life – educational, social, legal, economic, cultural and political. According to the Census of India 2011, the total populations of Manipur is 28,55,794 and the population of persons with disabilities in territory is 54,110 i.e. 2.11% of the total population. For the welfare of disability, the government of India launched Deendayal Disabled Rehabilitation Scheme intending to provide financial assistance to voluntary organizations to make available the whole range of services necessary for rehabilitation of persons with disabilities including early intervention, development of daily living skills, education, skill-development oriented towards employability, training and awareness generation. Under this Scheme, there are 15 Non- Governmental Organizations are operating special schools receiving funding from the central Government under the strict supervision of Manipur State Social Welfare Department. The main aim of this article is to investigate the deferent forms of challenges faced by persons with disabilities in Manipur in respect of their facilities, development and the prospective opportunities available in their present social status.

INTRODUCTION

India is a signatory to the 1990 United Nations World Declaration on Education for All (EFA) held inJomtien, Thailand participating 1500 delegates from 155 countries and representative of some 150 governmental, non-governmental and international organizations which reaffirmed the right of all children including children with disabilities to access education in regular schools settings. The Biwaiko Millennium Framework Economic and Social Commission for Asia and the Pacific Decade of Disable Persons which was held on 25-28 October 2002, Otsu City, Japan focusing on an inclusive, barrier free and rights-based society for person with disabilities in Asia and the Pacific. The commission, it fifty eight session, adopted resolution 54/4 of 22 May 2002 on promoting an inclusive, barrier free and right based society for the people with disabilities in the Asia and Pacific region in the twenty first century, by which it proclaimed the extension of the Asia and Pacific Decade of Disable Persons, 1993-2002 for another decade 2003-2012. The Document sets out a draft regional framework for action that provide regional policy recommendation for action by Government in the region and concerned stakeholder to achieve an inclusive, barrier free and rights-based society for person with disabilities in the new decade, 2003-2012. The regional framework for action identifies seven areas for priority action in the new decade. Each priority area contains critical issues, target and the action required. The regional framework for action explicitly incorporates the millennium development goal and their relevant target to ensure that concerns relating to person with disabilities become an integral part of efforts to achieve the goal. This framework acts towards an inclusive, barrier free and rights based society for person with disabilities, the declaration on the full Participation and Equality of Person with Disabilities in the Asia Pacific Region. India also subscribes to the philosophy of the 1993, UN Standard Rules on the Equalization of Opportunity for Person with Disabilities and the Salamanca Statement and Framework for Action (1994). This perhaps set out in concise terms for the first time the concept of inclusive education and as one needing global consensus and urged governments to adopt as a matter of law and policy the principle of inclusive education and emphasized that "children with special needs must have access to regular schools. Wolf Wolfernsberger's book Normalization the principle of normalization in human service mentioned "the normalization principle means making available to all person with disabilities patterns of life and condition of every living which are as close as possible to the regular circumstances and ways of life or society". Normalisation is a rigorous service that can be applied to disability service. The Normalisation Principle of Wolfensberger had much have earlier placed focus on the person with disabilities and the slogan "change the environment to suit the child not the child to suit the environment" become a well known quote. The logical follow on was therefore the recognition and conceptualization of a major shift from integrated schools to one which was more inclusive. In December 1995,

the Government India passed a bill in Parliament Called "The Equal Opportunities, Protection and Right and Full Participation Bill for Person with Disability" or The Disability Act or PWD Act 1995 in short. This bill very specifically mandates that every child with disability should have access to free and adequate education. Government has recognized the need for certain amendments in this Act and has begun the process. The principal areas for rectification have been identified and the major focus is on lack of a specific mention of services to those doubly handicapped by poverty and disability.

A Draft National policy for Person with Disability has been circulated on 15 of June 2005 requesting comments from stakeholders. With specific reference to education and in recognition of the fact that one model may not be suited to a country with disability with such a diverse population and the wide diversity of needs for persons with disability in different environmental and social conditions, the policy covers a variety of educational options such as special education, distance education, itinerant teacher models, remedial teaching, home based, Community-based Rehabilitation (CBR) model, home based education, education through an open learning system, alternative schooling. Many specialized and national as well as state level institution have already been established to advise and assist the Ministry and the one pertinent to intellectual disability is the National Institute for handicap (1984). The Constitution of India does not explicitly include children with disabilities in the provision made for education, but Article 41 does not mention people with disabilities and says in part "the state shall within the limits of its economic development make effective provision for securing the right work, to education and to public assistance in cases of unemployment, old age, sickness, disablement and in other cases of undesired want". It does not mandate the free and compulsory education as a fundamental right and is merely a directive principle to guide state policy but Article 45 does rectify this by stating that free and compulsory education should be provided for ALL children until they complete the age 14. The ALL is never specifically explained. But the 93rd amendment to the India Constitution passed in December 2001, affirms the Government's Commitment to EFA or Education for All. In Sanskrit it is SarvaShikshaAbhiyan (SSA). The preamble explicitly state that includes children with disabilities. This policy aims at all children in the 6-14 age groups being able to complete eight years of schooling by the year 2010. The SSA gives importance to early childhood education care and education and appropriate intervention for children with special needs and also makes special reference to the education of the girl child. The positive factor is the change incorporated in the Education Act by adding a pertinent clause which clarifies that "ALL" includes children with disabilities. On the 21st of March 2005, the Honorable Minister of Human Resource Development in the RajyaSabha presented a comprehensive statement on the subject of inclusive education of Children with disabilities. In 2016, the Government of India passed a bill in the Parliament called "The Right of Person with Disability 2016". The parliament received the assent of the president of India on 27th December, 2016 and it hereby called "THE RIGHT OF PERSON WITH DISABILITIES ACT 2016". This act replaced the earlier act "The Equal Opportunities, Protection and Right and Full Participation Bill for Person with Disability".

The Right of Person with Disabilities Act promotes and protects the rights and dignity of people with disabilities in various aspects of life – educational, social, legal, economic, cultural and political. It applies to government, non government and private organizations. It has mandates and timelines for establishments to ensure accessibility of infrastructure and services. It has implementing mechanisms like Disability Commissioner's Offices at the Centre and State level, District Committees, Boards and Committees for planning and monitoring the implementation of the Act, Special Courts at District level and so on. It has penalties in case of violation of any provisions of the Act.

Addressing the issues of people with disabilities through the lens of "equality" surfaced in India in the early 1980s, more particularly with the declaration of the year 1981 as International Year of Disabled Persons. But, 1996 was the year when the historic change happened in India. After a series of petitions and protests, the government passed the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 (or PWD Act). It was succeeded in, in both visibility by numbers (Census 2001) and voting rights (Elections 2004), though each preceded by huge protests, rallies, self-immolation drives and symbolic assemblies. The greatest weakness was the law that penal provisions for violating the provisions of the 1995 Act were weak. Further, the Officer of Chief Commissioner and State Commissioner for PWDs was not vested with enough strength and power. It also had limited focus on social security i.e. only financial assistance and insurance coverage. The recreational approaches were ignored. Moreover, there was no protection against discrimination.

After India signed and ratified the UNCRPD (United Nations Convention on the Rights of Persons with Disabilities) in 2007, the process of enacting a new legislation in place of the Persons with Disabilities Act, 1995 began in 2010 to make it compliant with the UNCRPD (United Nations Convention on the Rights of Persons with Disabilities). After six years of lobbying, advocating and waiting patiently during days of

disruptions and adjournments in the heated Winter Session of the Parliament in 2016, India finally witnessed the compassion of Parliamentarians with the unanimous passage of the much awaited Rights of Persons with Disabilities (RPwD) Bill on 14th December, 2016 in the RajyaSabha and subsequently in the LokSabha on 16th December, 2016. The Bill was further approved and signed by the Hon'ble President before the year end and 'notified' by the Government in its official Gazette on 28th December, 2016. This Law is a game changer for the estimated 70-100 million disabled citizens of India with its strong rights based backbone.

In the new Law, Disability has been defined based on an evolving and dynamic concept and the types of disabilities have been increased from existing 7 to 21 and the Central Government will have the power to add more types of disabilities. Speech and Language Disability and Specific Learning Disability, acid attack and Parkinson's disease have been added for the first time. The new Law provides for penalties for offences committed against persons with disabilities and also violation of the provisions of the new law. Special Courts will be designated in each district to handle cases concerning violation of rights of PwDs. Reservation in vacancies in government establishments has been increased from 3% to 4% for certain persons or class of persons with benchmark disability. The Office of Chief Commissioner of Persons with Disabilities has been strengthened who will now be assisted by 2 Commissioners and an Advisory Committee comprising not more than 11 members drawn from experts in various disabilities. Every child with benchmark disability between the age group of 6 and 18 years shall have the right to free education.

OBJECTIVE OF THE STUDY

1. To find out of rural-urban distribution of population of persons with disability in the state of Manipur.

2. To ascertain the number special schools under the Deendayal Disabled Rehabilitation Scheme in Manipur.

3. To examine the aspects of Ministry of Social Justice and Empowerment and Manipur State Social Welfare Department.

Aspects of Ministry of Social Justice and Empowerment

The Department of Empowerment of Persons with Disabilities in the Ministry of Social Justice & Empowerment facilitates empowerment of the persons with disabilities. The main objective of the department is to assist the needy disabled persons in procuring durable, sophisticated and scientifically manufactured, modern, standard aids and appliances that can promote their physical, social and psychological rehabilitation, by reducing the effects of disabilities and enhance their economic potential.The Constitution of India guarantees "equality, freedom, justice and dignity" of all individuals. The Ministry of Social Justice and Empowerment, in May 2012, established the Department of Empowerment of Persons with Disabilities (Divyangjan) to ensure focused attention to policy issues related to persons with disabilities and work towards their empowerment. Some of the critical schemes introduced by the government of India for the welfare of persons with disabilities are Deendayal Disabled Rehabilitation Scheme which aims to provide grants to non-governmental organisations for projects involving the rehabilitation of persons with disabilities, and related activities.

Aspects of State Social Welfare Department

In the state, Social Welfare Department is responsible for the welfare, rehabilitation and development of the Persons with Disabilities, the Social Deviants, and the Other Disadvantaged who require special attention of the State because of the disabilities and vulnerabilities they suffer from.

The Social Welfare Department implements many schemes for disabled persons to assist them to secure education, academic, technical or professional training on the shop/floor of the industrial establishment as would enable them to earn a living and to become useful members of the society. The Constitution of India ensures equality, freedom, justice and dignity of all individuals and implicitly mandates an inclusive society for all including Person with Disabilities. The Department of Social Welfare is the nodal department of Manipur for the Welfare of Persons with Disabilities and believes in the fact "Help the Differently Abled Persons to help themselves". According to the Census of India 2011, the total populations of Manipur is 28,55,794 and the population of persons with disabilities in territory is 54,110 i.e. 2.11% of the total population. According to the National Sample Survey Organization (NSSO) 5% of our population of 102 crores is with disabilities in India. The Manipur Government through its various initiatives and programme which rendering full support to the Welfare of Persons with Disabilities, so that they can live with full participation and have equal involvement in the every aspect of Society. A full time State Commissioner for Persons with Disabilities has been appointed of Manipur for taking steps to safeguard the rights of Persons with Disabilities for monitoring and implementations of the Act and Rule. Dr. R.K. Kumarjit is the present State Commissioner for Persons with Disabilities, with Office at Secretary Social Welfare and Commissioner, (Disabilities) Old Secretariat, Govt. of Manipur, Imphal – 795 001. He is the Nodal Officer for Implementation of Act and Rule pertaining to Welfare of Persons with Disabilities in Manipur.

Disability population of the State of Manipur as per Census 2011

Type of disability			Imphal East	Imphal West	Thoubal	Bishnupur	Churachanpur	Chandel	Senapati	Ukhrul	Tamenglong	Total
Visual Impairment	0-19 years	Male	691	772	186	117	125	433	412	357	100	3193
		Female	653	745	135	107	124	439	413	361	78	3064
	20-59 years	Male	997	1288	282	200	197	735	646	447	170	4962
		Female	949	1287	249	192	169	669	554	417	142	4628
	60 years & above	Male	212	306	118	97	48	135	101	113	61	1191
		Female	180	285	136	81	79	134	77	96	63	1111
Hearing Impairment	0-19 years	Male	289	469	253	147	207	118	257	183	110	2033
		Female	253	421	214	164	188	98	262	176	80	1856
	20-59 years	Male	563	798	493	375	402	240	374	253	180	3642
		Female	567	828	360	339	287	241	337	257	149	3365
	60 years & above	Male	174	271	176	139	169	68	103	144	120	1334
		Female	170	254	177	137	157	52	87	89	99	1222
Locomotor Disability	0-19 years	Male	75	77	107	59	44	24	51	41	37	515
		Female	66	71	72	33	36	17	29	23	25	372
	20-59 years	Male	281	364	331	225	131	69	111	114	72	1698
		Female	167	240	220	150	77	55	62	84	58	1113
	60 years & above	Male	131	189	197	125	38	21	28	46	52	827
		Female	87	156	100	77	35	23	13	42	37	570
Mental Retardation	0-19 years	Male	133	154	106	48	35	39	47	56	36	654
		Female	103	164	96	70	42	41	38	51	37	642
	20-59 years	Male	324	410	298	170	68	66	74	77	62	1549
		Female	248	323	203	126	88	64	182	69	34	1337
	60 years & above	Male	42	62	43	25	10	6	8	10	7	213
		Female	45	54	34	17	13	9	11	9	7	199
Mental Illness	0-19 years	Male	15	21	18	8	22	3	8	6	14	115
		Female	11	14	20	8	12	3	7	5	5	85
	20-59 years	Male	102	172	71	74	59	12	24	43	37	594
		Female	67	100	62	40	48	10	24	20	23	394
	60 years &above	Male	14	43	13	17	11	7	0	3	5	107
		Female	20	43	7	16	9	1	8	3	2	109
Multiple Disability	0-19 years	Male	74	96	115	54	34	15	34	39	31	501
		Female	65	81	74	36	33	21	48	28	18	405
	20-59 years	Male	134	210	143	91	69	43	80	63	39	872
		Female	104	169	113	60	41	27	50	46	40	650
	60 years & above	Male	51	78	70	49	49	19	24	41	72	453
		Female	45	89	65	60	36	17	27	52	80	471
Any others	0-19 years	Male	259	342	184	115	140	60	126	141	59	1426
		Female	253	348	156	97	129	56	102	110	69	1320
	20-59 years	Male	416	647	321	184	237	107	152	185	92	2341
		Female	400	574	283	162	189	106	128	146	80	2068
	60 years & above	Male	50	130	82	41	45	20	11	45	28	452
		Female	64	129	60	45	48	16	23	38	20	443
Total			9544	13274	6443	4377	3980	3429	5165	4499	2520	54110

Source: Census of India, 2011

Statistical Profile of Persons with Disability: Manipur

Statistical Profile of Persons with Disability: Manipur (all figure are given in %)									
	Rural			Urban			Rural+Urban		
	Male	Female	Person	Male	Female	Person	Male	Female	Person
Person with Any type of disability	0.9	0.7	0.8	0.9	0.7	0.8	0.9	0.7	0.8
Person with Locomotor Disability	0.5	0.2	0.4	0.5	0.3	0.4	0.5	0.2	0.4
Person with Visual Disability	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1
Person with Hearing Disability	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Person with Speech and Language Disability	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Person with Mental Retardation/Intellectual Disability	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Person with Mental Illness	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Person with Other type of Disability	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Person having disability since birth	44.2	43.4	43.9	38.3	41.2	39.5	42.5	42.7	42.6
Person with disability who are living alone	0.0	0.0	0.0	0.2	0.7	0.4	0.1	0.2	0.1
Persons with disability having certificate of disability	16.7	17.7	17.1	24.6	24.7	24.6	19	19.7	19.3
Literacy rate of persons of age 7 years and above with disability	63.8	43.9	55.7	78.6	60.2	71.1	68.1	48.7	60.2
Persons of age 15 years and above with disability having highest level of completed education secondary and above	25.8	15.6	21.5	54.9	34.1	46.4	34.6	21	28.9

Source: NSS Report No.583: Persons with Disabilities in India

Percentage of persons with disability who receive any assistance in Manipur									
	Rural			Urban			Rural+Urban		
	Male	Female	Person	Male	Female	Person	Male	Female	Person
Aid/help received from Govt.	9.4	7.0	8.4	10.8	10.6	10.7	9.8	8.0	9.1
Aid/help received from organisation other than Govt.	2.7	1.1	2.0	2.2	1.9	2.1	2.5	1.3	2.1

Source: NSS Report No.583: Persons with Disabilities in India

Percentage distribution of persons with disability by arranging of regular care giver in Manipur									
	Rural			Urban			Rural+Urban		
	Male	Female	Person	Male	Female	Person	Male	Female	Person
Where caregiver is available	64.7	66.8	65.6	77.1	78.3	77.5	68.2	70.2	69.0

Where caregiver is required but not available	0.0	0.6	0.2	0.0	0.0	0.0	0.0	0.4	0.2
Where no caregiver is required	35.2	32.5	34.1	22.9	21.6	22.4	31.7	29.4	30.7

Source: NSS Report No.583: Persons with Disabilities in India

Recently, The Manipur State Transport Department issued a public notice on 10th June 2022 under the Memo no. No.1/1/MST/-Estd/2022 stated that In pursuance of the Ministry of Road Transport & Highway, Government of India letter No.RT-23019/3/2020-T dated 12/05/2022 and Secretariat: Transport Department letter No. RWS-303/7/2022-T(MV)-TPT dated 08/06/2022, notice is hereby given to the general public that all public transport bus services (MST bus service as well as private bus services) operating in the State will provide 100% concession in Bus Fare to the persons suffering from disability (with disability certificate of > 40% disability) and 50% concession to 1 (one) companion accompanying such disabled person with immediate effect.

These persons have to produce disability certificate in original and show it to the authorized employee/driver/handyman to avail the facility. The notice was issued by the Dr. NiveditaLairenlakpam, Director of Transport for the welfare of disabled persons to reduce inconvenience experienced by the disables while travelling to different places in Manipur.

Deendayal Disabled Rehabilitation Scheme:
Deendayal Disabled Rehabilitation Scheme is to provide financial assistance to voluntary organizations to make available the whole range of services necessary for rehabilitation of persons with disabilities including early intervention, development of daily living skills, education, skill-development oriented towards employability, training and awareness generation. With a view to inclusion of persons with disabilities in the mainstream of society and actualizing their potential, the thrust would be on education and training programmes. Under this Scheme,there are 15 Non- Governmental Organizations are operating special schools receiving funding from the central Government under the strict supervision of Manipur State Social Welfare Department.

List of the organization running special schools in the state of Manipur with the grant in aid from Ministry

Sl. No.	Name and Address of Organization	Type of Project	Project Site	District
1.	Manipur Guidance Centre	Special School	NambolKabowakchingMayaiLeikai	Bishnupur
2.	Achievement of Rising Maiden	Special School	Lakhipur, Jiribam	Jiribam
3.	Type Writing Institution and Rural Development	Special School	Khongman Zone 1	Imphal East
4.	The Social and Health Development Organisation	Special School	ChingarelTejpurWaitonLmkhaiBPOSawombung, Imphal East	Imphal East
5.	People Advance in Social Service(PASS)	Special School	PhaikhothangVillege, KhugaDam,Churachanpur 795128	Churachanpur
6.	Educational and Rural Development Organisation	Special School	ThoubalThoudam	Thoubal
7.	Council for Development of Poor and Labourers	Special School	LilongChajing	Imphal West
8.	Society for Empowerment of Disabled	Special School	PhiwangbamLeikaiMoirang	Bishnupur
9.	Centre for Mental Hygiene	Special School	ChangangeiUcheckon Airport Road	Imphal West
10.	Social Human Action For Rural Empowerment Society	Special School	New Mata, Teddim Road	Chuchanpur
11.	Recreation	Special School	Spastic Society of Manipur, Tapokpi Bazaar, Langthabal	Imphal West
12.	Imphal Guardian Society	Special School	KongpalkhongkhamLeikai	Imphal East

13.	Bishnupur District Rural Social Welfare Society	Special School	IthingAwangLeikai, Thanga, P.O-Moirang, P.S- Keibul	Bishnupur
14.	Regional Institute of Handicapped Person	Special School	YairipolBamonLeikai	Thoubal
15.	Kangchup Area Tribal Women Society	Special School	Charhazare, Motbung, KangpokpiDstrict	Kangpokpi

In addition to this, the state government is running two special Schools in Manipur under the supervision of Social Welfare Department, they are-

1. Govt. Deaf and Mute School, Takyelpat, Imphal.

2. Govt. Ideal Blind School, Takyelpat, Imphal.

Recently, the state government has also taken the decision to run two special schools in the state of Manipur, They are-

1. B.B. Paul Mental Development Home, Mongshangei, Imphal West.

2. Mission Blind School, Heikakpokpi, Chandel District.

CONCLUSION

The North East (NE) region of India is home to 44 million persons who live in eight states – Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. It is an area of enormous ethnic, cultural, religious and linguistic diversity. The NE region has been affected by numerous conflicts for decades, which continue to flare up periodically. Due to all these reasons, the development of infrastructure, institutions, communication and services is lagging behind the rest of the country. However, in recent years, the national Government has made ambitious plans to promote the development infrastructures in the region, improving its connections with rest of India and linking it with neighboring countries. Significant challenges affect the disability and rehabilitation services in the North East. Lack of accessible information about disability and rehabilitation services is another key issue that makes it difficult to understand the gaps and the challenges. Apart from the data collected during national censuses, very little statistical information is available about the lives of PwDs and their families in the region. SarvaShikshaAbhiyaan, a Government programme promoting Universal Access to Education is often the only source of periodic reports on this theme, though these reports focus only on the children, including the children with disabilities, of the school-going age. Yet, in spite of all these challenges, the last decade has seen some impressive gains in many areas, including the setting up of services for Persons with disabilities. The National Education Policy 2020 clearly mention in the Clause 6.5 of the First Part (School Education) that the Policy is in consonance with and fully endorses the recommendation of the Right of the People with Disabilities Act 2016. In Manipur, the state commissioner for person with disabilities is the Nodal Officer for Implementation of Act and Rule pertaining to Welfare of Persons with Disabilities in Manipur. With the strict supervision of commissioner assist by the subordinate staff the state is implementing the right of Children to Free and Compulsory Education Act 2009, every child with benchmark disability between the age of six to eighteen years shall have the right to free education in a neighborhood schools, or in a special school, of his choice under the Chapter VI of the Clause 31 sub section (1) of the Right of Persons with Disabilities Act, 2016. The state government is endeavoring to execute appointment policies that the state government shall appoint every establishment, not less than four percent of the number of vacancies in the cadre strength in each group of posts meant to be filled with persons with benchmark disabilities of which, one percent each shall be reserved for the persons with benchmark disabilities under clause (a) blind and low vision, (b) deaf and hard of hearing, (c) locomotor disabilities including cerebral palsy, leprosy cured, dwarfism, acid attack victims and muscular dystrophy, (d) autism, intellectual disability, specific learning disability and mental illness, (e) multiple disabilities from amongst persons under clauses (a) to (d) including deaf and blindness in the post identified for each disabilities.

Despite all odds, Manipur appears to be at the crossroad in regard to the implementation of policies and programme of persons with disabilities, even though, the Manipur Government demonstrating its determination by implementing some policies, programmes and legislation for persons with disabilities, it is high time to monitor closely in administration and management of government programmes and policies.

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GREEN TEA (CAMELLIA SINENSIS) NIOSOMES: MODERN TREATMENT FOR ACNE VULGARIS

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ABSTRACT

This review focuses on the acne vulgaris and its treatment by herbal based nanocarriers such as niosomes. Acne vulgaris in patients may start during adolescence and persist or have onset in adulthood. Acne has various psychosocial effects that impact patients is quality of life. Plant extracts have been widely used as topical applications for various skin conditions, the EGCG is a potent antioxidant found in green tea extract (camellia sinensis).EGCG received increased attention because of its anti-inflammatory, anti-microbial properties which are beneficial for the treatment of acne vulgaris but due to its hydrophilic nature it has low skin permeation. To overcome this problem the use of nanocarriers such as niosomes one of the best option as it has vesicular system which helps to transfer the hydrophilic as well as lipophilic moieties across the skin membranes. It also increases the retention time of active substances on the stratum corneum and epidermis solving the problem of penetration of active substance. These may act depot to controlled release of drug to give effective action for longer duration because of which the frequency of application reduces. This article summerizes the study of acne vulgaris and the conventional treatments or therapies and their drawbacks which are overcome by the novel approaches such as nanocarriers (Niosomes) by loading the plant extract into it. Which may results in effective treatment for the acne vulgaris without causing severe side-effects.

Keywords: Acne vulgaris, Green tea extract, Niosome, EGCG.

1. INTRODUCTION

The skin of most human body has average surface area of 1.8 m^2, which contains average 200-300sweat ducts and 40-70 hair follicles on sq.cm of the skin. Skin pH varies from 4 to 5.6 which depends on secreation from sweat glands.Cutaneous membrane is divided into three parts epidermis, dermis and hypodermis. The dermis contains oil secreating glands, sweat glands, nerve endings and hair follicles. Acne vulgaris (AV) is a disease of the pilosebaceous unit that causes noninflammatory lesions (open and closed comedones), inflammatory lesions (papules, pustules, and nodules), and varying degrees of scarring. AV is an extremely common condition with a lifetime prevalence of approximately 85% and occurs mostly during adolescence. AV can persist into adult hood, with a 50.9% prevalence rate of acne in women ages 20 to 29 years versus 26.3% in women ages 40 to 49 years. Female patients account for two thirds of visits made to dermatologists for acne, and one third of all dermatology office visits for acne are by women who are older than 25 years. Acne leads to significant morbidity that is associated with residual scarring and psychological disturbances such as poor self-image, depression, and anxiety, which leads to a negative impact on quality of life[1].

1.1 Pathogenesis

Four key pathogenic processes lead to the formation of acne lesions [2]:

a) Alteration of follicular keratinization that leads to comedones.

b) Increased and altered sebum production under androgen control.

c) Follicular colonisation by Propionebacterium acnes.

d) Complex inflammatory mechanisms that involve both innate and acquired immunity.

Genetics, diet including chocolate and dairy consumption and environ mental factors also contribute to the pathogenesis of acne event. The pathogenesis of acne in adult women is particularly complex. Androgens play a major role, as evidenced by the response of acne in adult women to hormonal treatments, especially in the context of hyperandrogenism disorders such as polycystic ovary syndrome (PCOS) and the use of hormone-based therapies such as oral contraceptive and anti-androgen medications in women with normal androgen levels.In addition, the lack of acne in androgen-insensitive women and rising levels of dehydroepiandrosterone sulfate in association with the onset of acne in premenarchal girls and a subset of patients with PCOS also play a major role. Androgens stimulate sebum production via androgen receptors on the sebaceous glands.

1.2. Clinical Presentation:

Acne most often affects the face, but it may spread to involve the neck, chest and back, and sometimes even more extensively over the body.Individual lesions are centred on the pilosebaceous unit, i.e. the hair follicle and its associated oil gland. Several types of acne spots occur, often at the same time. They may be inflammatory papules pustules and nodules; or non-inflamed comedones and pseudocysts[3].

- **Superficial Lesions**
- ✓ Open and closed comedones (blackheads and whiteheads)

- ✓ Papules (small, tender red bumps)

- ✓ Pustules (white or yellow "squeezable" spots)

- **Deeper lesions**
- ✓ Nodules (large painful red lumps)

- ✓ Pseudocysts (cyst-like fluctuant swellings)

- **Secondary lesions**
- ✓ Excoriations (picked or scratched spots)

- ✓ Erythematous macules (red marks from recently healed spots, best seen in in fair skin)

- ✓ Pigmented macules (dark marks from old spots, mostly affecting those with dark skin).

- ✓ Scars of various types.

Individual acne lesions usually last less than 2 weeks but the deeper papules and nodule persist for months. Many acne patients also have oily skin (seborrhoea).

1.2.1 Clinical Features Vary in Different Types of Skin:

All characteristic lesions of acne vulgaris can occur in skin of colour, but it usually presents less discernible redness and more post inflammatory hyperpigmentation (pigmented macules) which persists long after the acne lesion has gone. Post-inflammatory hyperpigmentation is often the major reason for seeking medical attention, causing significant psychological effects. Pomade acne occurs more commonly in people with skin of colour due to cultural practices with hair styling products in African American and Hispanic populations. The use of greasy hair products leads to follicular plugging and comedones along the hairline.Keloid scarring is more common in skin of colour following acne lesions, particularly along the jawline, chest, and upper back[4].

1.3. Classification and acne grading:

Acne may be classified as mild, moderate or severe. As shown in table below:

Table No.1: Classification of acne on basis of grade[5].

Sr.No.	Grades Of Acne	Representation
1.	**Mild Acne:** Contains<20 comedones, <15 inflammatory lesions/ total lesion count < 30	
2.	**Moderate Acne:** contains 20-100 comedones,15-50 inflammatory lesions Or total lesion count 30-125	

3.	**Severe Acne** contains > 5 pseudocytes Total comedon count >100Total inflammatory count >50Or, total lesion count>125	

1.4. Complications of Acne Vulgaris:

- Post-inflammatory hyperpigmentation.

- Scarring including keloid scars.

- Psychological effects of acne

2. CONVENTIONAL TREATMENT OF ACNE VULGARIS [6]:
The conventional therapies of acne vulgaris include:

- **Topical Therapy:** Topical retinoids, topical antibiotics, benzoyl peroxide, other topical agents or combination therapy such as salicylic acid azelaic acid, lactic acid, Tea tree oil 5%, Picolinic acid gel 10%. Dapsone gel 5%.

- **Systemic Therapy:** Systemic antibiotics like tetracycline, doxycycline

- **Hormonal Therapy**: Oral contraceptives, spironolactones, cyproterone acetate, flutamide.

- **Physical Treatment:** Lesion removal and phototherapy.

2.1. Disadvantages of Conventional Therapy:
Conventional topical therapy can cause irritant dermatitis, burning sensation, erythema, peeling, dryness, scaling. Some of the antibiotics can cause gastrointestinal upset, vaginal candidiasis, pigment deposition in skin, teeth and mucous membrane. Long term therapy can cause resistance of P. acne and it can also cause negative effect on staphylococcus. Duration of therapy is limited. Oral contraceptive can cause musculoskeletal, mucocutaneous, headache and have effect on central nervous system.

3. NANOTECHNOLOGY AND NANOCARRIERS (NIOSOMES):
Rapid and significant progress in the use of nanotechnology in treatment and diagnosis of skin diseases has made a new field called nanomedicine and related subfields, such as pharmaceutical nanocarriers known as new branches of medical science. Nanostructures can be made from various materials including polymers, metals, metal oxides, nanogel, lipid-based carriers (liposomes) and surfactantbased carriers (niosomes). Reducing the size of drug carriers to a nanoscale has many benefits including: (1) improving the pharmacokinetics and biodistribution of therapeutic agents, (2) reducing toxicity by accumulation of the drug in the target site, (3) facilitating drug passage between the cells and (4) increasing their retention time in biological systems that increase the efficacy of the drug. Novel drug-delivery systems play major roles in drugs development. This technology is an approach to improve the drug release profile, absorption, distribution, and elimination of drugs. To create a new drug-delivery system, two requirements must be considered: First, the drug should be released in accordance to a programmed rate. Second, it should release effective amount of the active ingredient at the target site; doses of traditional forms are not able to meet these goals. Vesicles systems with a bilayer membrane and hollow space in the interior have attracted more attention as drug-delivery systems. The main purpose of the development of vesicular structures is modification of distribution profiles, to control the release of drug in a sustained way and targeted delivery of the drug to the particular body site[7].

3.1. Niosomes:
Vesicular systems that are able to accommodate larger amounts of drug and create an acceptable surface for targeting enable the drugs to carrying both hydrophilic and lipophilic components. The unique structure of these vesicles is noisome, that was produced from non-ionic surfactants in the aqueous phase, a system with the advantages of liposomes and the permeability of membranes. An important prerequisite for the use of niosomes as a drug carrier is their integrity in biological fluids. As a carrier, niosomes are able to circulate in the body and also protect the drug for specified periods of time and are able to interact with the target site and delivery of their contents to the interior of cells. Niosomes are preferred over other bilayer structures due to chemical stability. Biodegradability, biocompatibility. low production cost, low toxicity, and easy storage and handling.

Niosomes have been studied with different methods of administration including oral, intramuscular, intravenous, transdermal, and so forth. These vesicles also increase the absorption rate of some drugs from the cell membranes. Production of niosomes in the last decade is an efficient tool in drug delivery due to the development of drug-delivery systems.
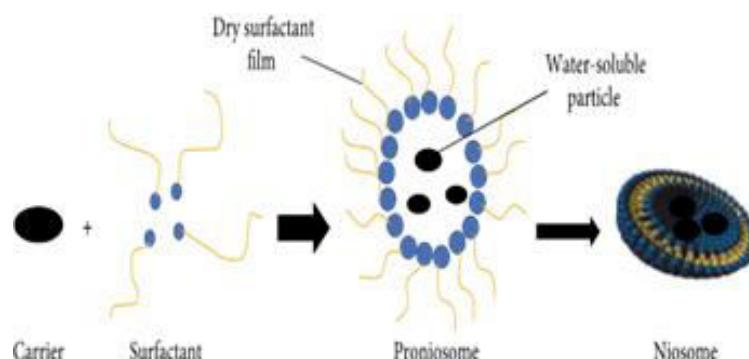
Fig 4: Structure of niosome

3.1.1. Types of Niosomes:

Many types of niosomes are mentioned in the literature, they can be classified according to the size of niosomes in nanometre's (SUV, LUV, etc.) or on the basis of the number of bilayers (SUV, MLV, etc.)[8]. Based on these factors, niosomes can be divided into the categories described in the following figure.
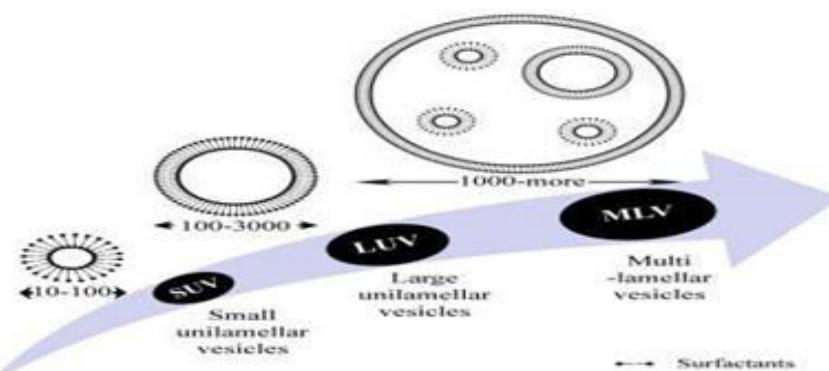
Fig 5: Types of Niosomes: (1) Small uni-lamellar vesicles (2) Large uni-lamellar vesicles (3) Multi-lamellar vesicles.

3.1.2.   Mechanism of Action of Niosomes:
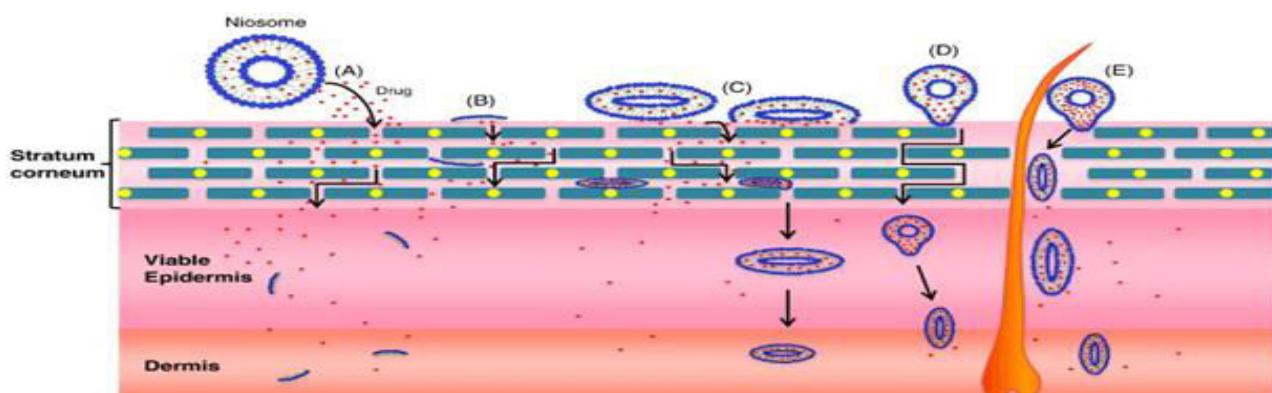
Fig 6: Possible mechanisms of action of surfactant vesicles for dermal and transdermal applications: (A) drug molecules are released by niosomes; (B) niosomes constituents act as penetration enhancer; (C) niosome adsorption and/or fusion with stratum corneum; (D) intact niosome penetration through the intact skin; (E) niosome penetration through hair follicles and/or pilosebaceous units[9].

Niosomes have been shown to act as skin permeation enhancers via various mechanisms including transient alteration in the stratum corneum, increased skin hydration with loosening of the tightly-packed stratum corneum, increased drug partitioning through the stratum corneum, and/or adsorption and fusion with the cellular membranes in the skin. Thus, they have been exploited for the transdermal delivery of a wide diversity of drugs such as antibiotics, antioxidants, anti-inflammatory drugs, and immunosuppressives[10].

4. EFFECT OF GREEN TEA EXTRACT NIOSOMES ON ACNE VULGARIS:

Green tea extract (Camellia sinensis) contains bioactive chemicals and it is particularly rich in the flavanol group of polyphenols known as catechins, which may constitute up to 30% of dry leaf weight (Graham, 1997). Epigallocatechin-1-gallate (EGCG) and epicatechin-3-gallate (ECG) are the most effective antioxidant compounds found in green tea. EGCG is easily oxidized and unstable when heated or exposed to light. EGCG has a low skin-penetrating ability because of its chemical interaction with the skin lipid bilayer. It is soluble in water or has high hydrophilicity making it difficult to penetrate the cell membrane. Therefore it is necessary to create a delivery system that can protect EGCG from degradation as well, so that it will increase the green tea extract's effectiveness. Niosomes are the vesicle system that can overcome this problem as it can enhances the penetration of hydrophilic moieties because of their structural chareteristics as mentioned above[11].
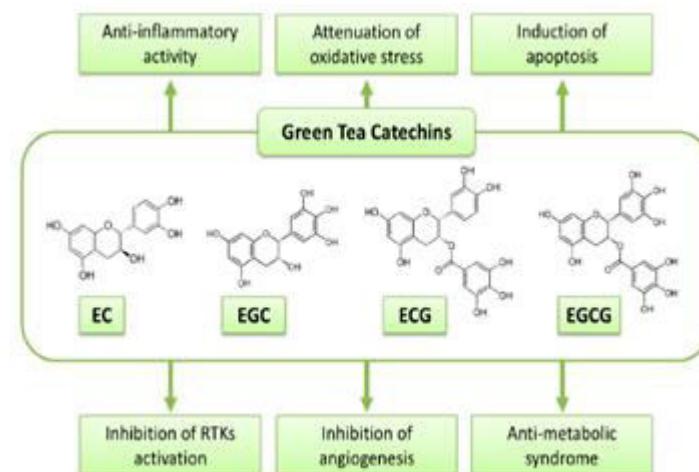
Fig 7: Green tea extract constituents and their therapeutic properties

The major polyphenol epigallocatechin-3-gallate (EGCG) has received increased attention because its promising in management of acne vulgaris by targeting following causative factors:

a) Reducing sebum production in the skin and it has been shown to have potent antimicrobial, anticarcinogenic, and anti-inflammatory properties.

b) EGCG decreases lipogenesis in sebocytes.

c) Inhibits growth of P. acnes.

d) Reduces inflammation caused by P. acnes.

e) They have ability to modulate the production and actions of androgens and other hormones.

Research studies shown that niosome formulations containing different concentrations of green tea extract i.e. (1%, 2%, 5%) have effectiveness on decreasing total lesions count in all trials. Therefore, green tea, a cost-effective, more safe, natural substance could potentially play a role in decreasing and treating acne vulgaris. This systematic review evaluates two double blind RCTs (randomized controlled trials) and one case study to determine if the EGCG in green tea can effectively reduce lesion counts in men and women and it is a effective treatment on acne vulgaris[12].

5. CONCLUSION

Acne vulgaris is a condition suffered by millions and though treatments exist there is not one best option for all patients with equal efficacy. Effective treatments which focus on all factors in the development of acne, such as isotretinoin, do not come without extremely serious side effects. During the past few decades, the use of plant-derived extracts received increased interest due to their concern over possible adverse health effects caused by the synthetics drugs. Niosomes are some of the best new drug delivery carriers that have great potential for targeted drug delivery. The advantage of niosomes as they increase the time active substances can remain in the stratum corneum and epidermis, solving the problem of penetration of the active substance. In addition, niosomes may be used for the delivery of labile and sensitive active substances.Due to presence of hydrophilic, amphiphilic and lipophilic moieties in the structure, these can accommodate drug molecules with a wide range of solubility. These may act as a depot, releasing the drug in a controlled manner. The therapeutic performance of the drug molecule can also be improved. In recent years, in the field of nanomedicine and drug delivery, a lot of attentions have been paid to vesicular systems, especially noisome. They are vesicle systems with non-ionic surfactants that can be made easily in the laboratory. Non-ionic surfactants have been shown to facilitate the

transport of active substances through the skin. Niosomes have advantages over other drug delivery carriers and can be used in various fields of pharmaceutical sciences. They are a very useful tool for targeted drug delivery and diagnostic approaches. The niosomal formulation of green tea extract containing the EGCG as main constituents having anti-inflammatory, anti-microbial, and antioxidant peoperty in different concentrations shows the effectiveness in decreasing lesion count in both men and women suffering from acne vulgaris and it is a effective and cost-efficient treatment for acne vulgaris without causing any serious side effects as like conventional therapies. In future prospective the niosomal formulations of green tea extract (camellia sinensis) can further converted into the various dosage forms.

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TRENDS IN DIGITAL ETHICS AND EDUCATIONAL TECHNOLOGY SYSTEM IN THE PRESENT CLIMATE

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ABSTRACT

In the twenty-first century, educational technologies are causing profound changes in the whole education field from initial stage education to higher education. It is one of the important domains of adapting to change the educational system with ethics. The most important educational technology developments of the twenty-first century include e-learning, Whatsapp groups, email, Google forms, video conferencing, virtual learning, Google meet, and zoom meeting. However, the technological system has emerged as the dominant paradigm. This epidemic time has significantly altered the way we teach and learn. Due to the pandemic's spread, students are now pursuing education via various digital channels. This digital education tendency may be developed in future educational system. The most recent Educational Technology trends in 2001, and farther into the twenty-first century, are revolting with a strong emphasis on connectivity, usability, and student-centred education. As a result, every human being should be exposed to instructional technology that incorporates digital ethics.

Keywords: Digital, Ethics, Education, Technology, Internet, Machine learning

INTRODUCTION

Educational technology emphasizes both technical and educational ways. It means supporting learning and teaching instruction. It is the basis for the success of the digital learning revolution in this pandemic situation. Technology-based education can beat traditional classroom-based education in quality. It can promote motivation, engaging, efficient, and effective learning (Huang, Spector, and Yang 2019). Higher education institution has many ethical issues in educational technology (Ifenthaler and Tracey 2016). Educational technology is one of the important domains of adapting to change educational system with ethics. In the twenty-first century, educational technologies are causing profound changes in the whole education field from initial stage education to higher education. The internet and machine learning are the two most important educational technology trends of the twenty-first century. The most recent Educational Technology trends in 2001, and farther into the twenty-first century, are revolting with a heavy focus on connection, usability, and student-centred teaching (Spector 2001). As a result, every human being should be exposed to instructional technology that incorporates digital ethics.

DEFINITION

Educational Technology

"Educational Technology is concerned with the application of modern skills and techniques to requirements of educational training. This includes the facilitation of learning by manipulation of media and methods, and the control of the environment is so far as this reflects on learning (Ruben 1999)

Robert M. Gange and V.K.Maheshwari (2016) defined Educational Technology as "The Development of asset of systematic techniques and accompanying practical knowledge for designing, testing and operating schools as educational systems."

Digital Ethics

Ethics refers to the standards, norms, and procedures that regulate everyday life and interaction and exchange in institutions, civilizations, and cultures are referred to as ethics (Dewey, 2008). According to (Wilden 1972) digital activities, whether clicking or tweeting, publishing, sharing, or like, are social by definition; as such, they are utilized for goal-seeking objectives with actual pragmatic repercussions and consequences.

Digital ethics is a tool for measuring how a person responds to unnecessary questions by controlling their mind while using the digital environment and not only moving toward the goal.

OBJECTIVE

As humans, we would follow digital ethics in educational technology.

Development of Educational Technology with Digital Ethics

There Are several reasons why educators are now required to focus on the development of instructional technology with digital ethics. Educational Technology is a part of technologies innovation. Nowadays teachers and students are advised to use technology due to the pandemic COVID-19. Teachers are being used

educational technology to provide moving pictures, live videos, pdf files, word documents etc. Furthermore, the advancement of Educational Technology allows for the creation of online material through which students may gain information at their own pace and under digital ethics. Nowadays, technology has made it possible for teachers and students to connect, discuss, share their opinion, perform, write the exam and finally get the result. According to (Kumagai et al. 2007) students have connected to learn using WhatsApp groups, email, Google meets, and zoom meet platforms, engaging with their group students, rather than being face to face in a classroom and attending to teachers' lectures for a timeframe. Digital ethics and educational technology are intended to assist students in developing their technological skills. The technological development strategy has bridged the gap between teachers and students while also assisting pupils in adhering to digital ethics.

Challenges in Digital Ethics and Educational Technology

"Learning without Burden", The Yash Pal Committee's report (1993), went into great detail on the flaws in the current educational system. It has now demonstrated how the educational system has become extremely centralized, examination-driven, joyless, impersonal, and completely unrelated to the world of the child. The inaccurate usage of technology in the educational system is terrible enough, but it is now required to tackle the problems of a rapidly changing world. As the world shrinks due to technological advancements, these changes influence the quality of education, values and ethics in Indian education and other nations in many ways. The globe has become a global village, and no country can exist in isolation. This poses unprecedented difficulties to the Indian educational system. This fact has an impact on educational processes both globally and in India, but the pace of change in the globe has accelerated significantly in the recent year. As a result, both instructors and students need to pursue digital ethics education both online and offline. At the same time, students can learn anything, anytime, anywhere at free of cost or moderate cost basis through technology (Ifenthaler et al. 2014). Technology facilitates improves education at the same time have to act ethically.

Trends in The Educational Technology System

"Education is our way of the future because tomorrow belongs to those who prepare for it today," said (Curtis 2015). Margaret Mead's (2016) iconic saying, "Children must be taught how to think, not what to believe," must be put into reality to raise inventive children. Because today's youngsters will be the future generation, they should be educated to use technology with digital ethics. What we learn about technology ethics now will be put to use tomorrow. However, it will be difficult to compete in the future if just bookish ethics are used. For many years, technology has been applied to the field of education. Decades back, technology entered the realm of education. From preschool to higher education, smart applications have mostly replaced books. Following trends of Educational Technology Systems are used in the present digital education situation.

Sms/Texting Application

SMS applications which involved banking industry, social activities, ringing tones downloading, games, quizzes, puzzles, e-voting, information services such as horoscope and prayer time and so on which are possible to prioritize the business agendas and the commercial needs of certain parties are used for their profit, (Al Said and Al-Said 2020). In recent years, educational institutions have barred students from carrying cell phones or other similar devices. However, as part of e-learning, every educational institution today employs text messaging as a method to communicate with students (from nursery students to researchers). SMS information, quizzes, surveys, and texting questions to students are all part of it. Text messaging may also be used to remind students to bring study materials or perform homework, as well as to connect a reluctant student.

Parent-Teacher Application

Parental involvement includes communication between educators and parents, communication about children's homework and their difficulties, participation in school activities etc. So, the parent-school partnership is extraordinarily complex, including various domains (Hornby and Lafaele 2011)(Lekli and Kaloti 2015)(Chena and Chena 2015). Before the pandemic, parent-teacher communication referred to in-person parent-teacher meetings. Due to the epidemic, students are unable to attend school. As a result, parents may employ relevant applications for online schooling. The Parent-Teacher app allows parents and teachers to communicate with one another whenever they have free time. Parents are also offered updates on their child's performance in online schooling.

Social Media

We never imagined that social media would impact every aspect of the educational process. To communicate with our friends and family, we usually use a social media network. But now that every student, whether young or old, spends a great deal of time on social media, at the same time, every educational institution turns it into a valuable instrument for enhancing learning. Studies have shown that students enjoy expressed enjoyment using online social media sites for learning purposes as a means of complementing and enriching their learning

activities due to its supportive element for their learning activities and its ability in enriching their learning experiences (Veletsianos and Navarrete 2012), (Balakrishnan and Gan 2016). Education institutions have come up with the concept of connecting with students using social media platforms such as Twitter, WhatsApp, and telegrams to hold lectures and debates about their educational topic with digital ethics. Many educational institutions have begun to use social media with digital ethics as an instructional tool via which students may easily learn alongside others. Students and teachers can use educational technology to distribute study materials and get feedback from others in a group.

Teachertube

TeacherTube's goal is to make an online community for sharing educational videos and educational content. TeacherTube gives how to manage educational technology systems with digital ethics for teachers, schools, and home learners. As well, experts and teachers are used to posting videos designed for every educational learner to view to learn concepts or skills. It is an educational video or information sharing site for experts and teachers. A new site for educators, TeacherTube, takes the sharing, production, and community-building aspects of YouTube and offers an educator's version. According to TeacherTube's founders, "We seek to fill a need for a more educationally focused, safe venue for teachers, schools, and home learners." O'Neal, C. (2007). Most of the educational institutions blocked YouTube but not TeacherTube because there are unethical issues in YouTube. The structures are the same as YouTube. This TeacherTube creates lessons worth sharing and posts with digital ethics where students could easily contact and give and get the educational videos of their friends. Teachers will find many short, instructional videos like "The Pythagorean Theorem in 3 minutes" and "The Rapping Algebra Teacher." It's also a great place to share videos of your snippets of instruction so your students can see you demonstrate lessons. The videos are free and, like most new media/Web 2.0 sites, users can subscribe and be updated when new videos are uploaded that meet predefined criteria (Lin and Davis 2005).

E-LEARNING

E-learning became the top 2020 educational technology trend overnight due to the outbreak of COVID-19. Education and training are offered online through eLearning. Academic content is delivered to students via email, WhatsApp group, text message, Google form, and other means via eLearning. E-learning has been used very effectively in university teaching for enhancing the traditional forms of teaching and administration. Students on many courses in many universities now find they have web access to the lecture notes and selected digital resources in support of their study, they have personalised web environments in which they can join discussion forums with their class or group, and this new kind of access gives them much greater flexibility of study (Arabasz 2003). There are several eLearning systems to choose from, including Zoom, Google Meet, and Microsoft Teams. E-learning not only saves time but also provides new opportunities for interactive connection. Whenever and wherever teachers and students can pick what they need to study. For example, due to the Covid-19 pandemic, all educational institutions and schools in Tamil Nadu have been shuttered, especially in India, which was the world's largest lockdown. This massive lockdown and quarantine have been badly impacted by school children academically and psychologically. As a result, the worldwide education department has opted to educate via the digital platform. In India For, a new website, www.e-learn.tnschools.gov.in has been launched on the Internet. It contains all subject bases and modules, detailed classes, for school students. In this scenario, Tamil Nadu School Education Department has made this service available to kids who are now unable to attend school.

Television Education

Together, Television Education creates and delivers programs for teachers and students ranging from kindergarten to higher education, as well as how to practice digital ethics in everyday life. Experts, educators, and human resource development pioneers collaborate to generate curriculum-based concepts, explanations for competitive examinations, human development career guides, and in-depth knowledge of educational television shows (Ostman and Parker 1987). Television is an important, perhaps even necessary, ingredient of high-quality open and distance education, but only when it exploits fully its unique teaching characteristics. Secondly, the effectiveness of television depends to some extent on how the material is structured and to some extent on the technology available to the student (Bates 1988). All television educational programs are created by government and non-government professionals in a way that promotes learning and minimizes interruptions. Television education, in particular, devotes 50% to syllabus-based programs, 10% to competitive tests and 10% to government job examinations, and 40% to human development, humanitarian sustainability, digital ethics, and environmental protection.

RESULT

This article emphasizes that educational technology systems should be used with digital ethics.

DISCUSSION

Digital Ethical challenges can be addressed successfully by fostering the development and application of digital technology innovations while ensuring the respect of human rights and the values shaping open, pluralistic, and lenient societies (Floridi, Cath, and Taddeo 2019). Accordingly, digital ethics is important to develop educational technology systems and a future good learner society.

ABBREVIATION AND MEANING

SMS

SMS stands for "Short Message Service," and it is the oldest, most widely used, and widely supported texting system that is supported by every mobile network and device today.

COVID-19

COVID-19 is a viral infection caused by a recently identified coronavirus. The majority of persons infected with the COVID-19 virus will have mild to moderate respiratory disease and will recover without the need for specific treatment (WHO, 2020).

CONCLUSION

The digital revolution offers huge opportunities to improve private and public life, and our environments, from health care to smart cities and global warming. Inappropriately, such opportunities come with significant digital ethical challenges. Digital Ethical challenges can be addressed successfully by fostering the development and application of digital technology innovations while ensuring the respect of human rights and the values shaping open, pluralistic, and lenient societies (Floridi, Cath, and Taddeo 2019). Accordingly, digital ethics in educational technology systems is important to develop human resources and completely future society in our world. Nowadays everybody must be followed digital ethics in the technology educational system. Otherwise, we will be lost money and time. In addition, we are prone to depression and misbehaviour. Especially educational technology is an educational tool but also that should be manageable with digital ethics among the learning community. Digital ethics in educational technology should be about getting the true value of learning and inspiring learners.

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A STUDY OF JHAVERCHAND MEGHANI AS A FOLKLORIST

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ABSTRACT

Jhaverchand Meghani is a household name in Gujarati literature because of his contributions to folk writing. As a result, this is an attempt to understand how Meghani's writing has influenced Gujarati literature. Legend has it that Jhaverchand Meghani made a significant contribution to folklore. The quality of permanence is a defining element of Meghani, placing it in the prestigious category of literature. For more than 90 years, the number of people in general and scholars interpreting and transcribing them has risen tremendously. He collected and published non-professional sources' folktales, ballads, and hymns. Tales of Saurashtra folklore like Sorathi Baharvatiya (Saurashtra outlaws), Kankavati (Ceremonial Tales), Dadaji ni Vaato (Legendary Tales), Rang Chhe Barot (Wonder tales), and Folksongs like Radhiyali Raat (Folksongs) have earned respect in society. He discussed comparative folklore at Shanti Niketan. Folk songs were the topic of discussion at Mumbai's Thakkar Vasanji vyakhyanmala. Due to the big crowd, Meghani was forced to abandon the stage and talk from a table in the hallway. In recognition of his contributions to folklore, Meghani was awarded the first Ranjitram Suvarn Chandrak. Jhaverchand Meghani's contribution to Gujarati folklore, namely the literature of Saurashtra (a region of Gujarat), is the focus of this dissertation.

Keywords: Jhaverchand Meghani, folklorist, literature, folklore, Saurashtra

Meghani was born into a village named Chotila situated in the Saurashtra region. The effect of birthplace and region is visible in the works of Meghani. As he explored, collected, and edited the folklore of Saurashtra. But how he came across so much of people and folktales is interesting. As the son of the police official, his father was transferred from one place to another in the Saurashtra region of Gujarat. With the various posting of the father in the different parts of Saurashtra. That is one reason for his vast knowledge of the culture of Saurashtra and its folk tales.

He completed his graduation from Shamaldas College, Bhavnagar. At the time of his study, he was greatly influenced by the renowned Gujarati writers Nahanalal and Kalapi. Kalapi and Lord Byron were his favourite writers of Gujarati and English literature. In 1917 he went to Calcutta to take care of the family business. But then he realized he was not meant to be in the business. Then he started working as a manager in the aluminium factory, where he got exposure to the Bengali language and culture. At that time, he met the prominent Bengali writers Dwijendrnath and Tagore. He also read the works of Bankimchandra at that time. He learned a lot about Bengal's traditional and folk culture at that time. Folk literature's influence on Bengali intellectuals intrigued him and drew him into the possibility of investigating his native Saurashtra's rich folklore. He was not feeling at ease in Calcutta. The factory owner tried to stop him from leaving, but he had decided to leave for Saurashtra. He wrote a letter to his friend Gulabchand,…You won't understand this, I'll repeat. I could not have comprehended it two years ago. In the interim, there have been waves of fresh life. The ominous sound of life has been heard. I see an indication of one invisible hand in front of me, and I respond, "I'm coming... coming... coming." The night is falling. It is Godhuli season right now. The bells on the necks of the animals coming out of the woodland tinkle gravely in my ears. The bronze gongs began to ring (in the temple).

Additionally, I will return in a month or two and feel worn out. My herdsman is calling me during this Godhuli (evening time of cattle's returning, which raises dust) of life, during the conflict between light and darkness. I won't go off course. I can identify his call, 'You won't get it, so I'll say it again: Two years ago, I couldn't have grasped the concept. In the meantime, new waves of life have sprung up. The ominous sound of life has pierced the ear. I see a sign of a single invisible hand, and I respond, I am coming... coming... coming... coming... coming..." It's becoming darker out. It's Godhuli season. The bells on the cows' necks are tinkling loudly as they make their way back from the forest. Bronze gongs began to chime (in the temple). I'll return in a month or two, but I'm already fatigued. As my life enters its latter stages, my herdsman invites me to join him in the battle against light and dark. I will not miss the route. I know who's calling...' (Meghani et al. 95).

After returning to his motherland Saurashtra, he started to spend time with his friend and lord of a village, Vajsur Vala. They both pursued the literature together, sharing a common interest in folk culture and literature. During his time with Vajsur Vala, he came across many scholars and poets of the region. With this, he started to explore the folk literature of Saurashtra. That was the beginning of his quest for the literature of Saurashtra.

He became and served as editor of the weekly 'Saurashtra' on the recommendation of the editor Amrutlal Sheth. Later he worked as the editor of daily 'Fulchhaba' and 'Janmbhoomi,' which helped shape his career significantly. With fervour and determination, he explored the folklore of the land of legends and legendary lives, steep hills and vales, terrible cliffs and filling rivers, where lions roamed in majesty and folklores bloomed in plenty. He traveled for nearly two decades to collect folklore full of love, courage, honesty, and nobility from bards, street singers, storytellers, uneducated men, and women who were the only source of rote-learned tradition. All notable experts agree that Meghani had a soft and generous heart and could easily mix with laymen, unsophisticated countrymen, and even women. This skill earned him legends and folk songs.

He also contributed to the freedom fight in India. He wrote several poems to encourage the people to fight the British. For example, the British banned his poem 'Sindhudo' after the Dandi march. British also sentenced him the jail time for actively participating in the national freedom fight of India. When Gandhi was in dilemma whether to go to London or not to attend the Round Table conference, Meghani wrote a poem, 'The Last Chalice,' that exactly represented the confusion of Gandhi at that time. Upon reading the poem, Gandhi stated that the poet had successfully penetrated his psyche and accurately interpreted its predicament. He identified the author as Rashtriya Shayar, a nationalistic poet.

FOLKLORES OF MEGHANI

1. Doshima ni Vato (Granny's Tales)

Published in 1923, Granny's Tale contains 15 stories meant for teenagers. But many critics, including his son, argued against this perspective and suggested that it was not for teenagers, so he never published an extended or updated version of Granny's Tale. With this suggestion, Meghani published another version of this anthology, later publishing it under the 'Dadajini Vato.' The editor of this anthology Mahendra Meghani also included some stories from 'Granny's Tales.'

2. Saurashtra Ni Rasdhar

Saurashtra Ni Rashdhar belongs in the category of folk literature of Saurashtra, consisting five volumes. After examining Saurashtra Ni Rasdhar based on the definitions of folktales, it is obvious that it comprises all elements of folktales. Saurashtra Ni Rasdhar is a short narrative comprising components of myths and fairy tales enhanced with imagination and folk narrative of Saurashtra to make a single vivid effect on the mind of readers. These narratives have fascinating fluidity, and they are not products of any one author but are made by the folk and transmitted verbally. Another point regularly posed by readers and critics is questioning the ratio of history and imagination in Saurashtra Ni Rasdhar. Saurashtra Ni Rasdhar is a genre of literature; hence it can't be seen as historical record. So far as the topic of history is concerned, it was said by Meghani in the prologue of Saurashtra Ni Rasdhar that each hamlet stands as a unique historical character. Dantt Katha (Legend) is likewise a sort of history but unvalidated in the modern empirical sense. Another salient element of Saurashtra Ni Rasdhar is that they are adventure tales unattempted before Meghani in Gujarati.

During the Gandhian era, the stories profoundly affected the upbringing of an entire generation of Gujaratis. They were imbued with what the author considered eternal and universal principles. After eight decades since their initial publication, the volumes have been republished numerous times, have become an indispensable element of libraries and private collections, and can still be found on the front shelves of bookshops in the region. Vols.1-5 of Saurashtra Nee Rasdhar are comprised of Saurashtra's love legends in ballad style; some of the tales are based on the folk tradition of tale-telling, while others are based on the duha poems he discovered during his investigation. In this collection of short stories, the predominant emotions are love, anger, brotherhood, vengeance, betrayal, and kindness, among others.

3. Sorathi Baharvatiya

Three volumes of Sorathi Bahaarvatiyaa [outlaws of Saurashtra] were released between 1927 and 1928. These folktales contain tales about numerous outlaws, including Jogidas Khuman. Outlaws didn't only exist in India. Britain also has a history of outlaws. Encyclopedia Britannica defines 'outlawrey' as, "…act of putting a person beyond the protection of the law for his refusal to become amenable to the court having legal jurisdiction" ("Outlawry | Law"). The stories of Saurashtra's outlaws are not based on mythology but on the history of Saurashtra's outlaws. Information about outlaws has been gathered from Histories, families of outlaws, and the police agency to bolster the integrity of stories about outlaws. In addition to these components, Meghani has added a layer of imagination to each story.

4. Dadaji Ni Vato

published in 1927, It includes five short stories. The stories in the collection of Grandpa's Tales appeal not only to youngsters' curiosity but also to adults, who value the qualities of bravery and awe that predominate in the stories.

5. Rang Chhe Barot

The 1945 publication Raang Chhe Barot is a collection of twelve short stories. Rang Chhe Barot is rup katha/ adbhut katha (fairy tales). It captivates children by showing a series of astounding occurrences. At the same time, readers of all ages are captivated by all the tales because they depict the great acts of the historical hero King Vikram of Ujjain. It provides thorough descriptions of 14 abilities and four sorts of women, making it an enlightening and informative literary work.

CONCLUSION

Meghani was always trying to make people respect each other and be aware of history. Meghani's works are still important today, not just as literature but also as a record of Gujarati culture. To sum up, other writers of his time were searching for an Indian identity and trying to wake up India's sleeping masses by looking to the West for ideas. Meghani, on the other hand, said that there was no need to look outside of India for ideas because our own folklore has enough cultural vitality and inspirational power to wake up the masses. By getting to the heart of folklore, he could see that this was the spirit of truth.

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NANO LIPOSOMES: BEING GOOD APPROACH FOR TREATING ANAEMIA

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ABSTRACT

This review mainly focuses on the anaemia caused due to iron deficiency. Iron is essential in many physiological processes, including DNA metabolism, oxygen transport, formation of new RBCs and cellular energy generation. Deregulated iron metabolism, which results in iron overload or iron deficiency, is observed in many different diseases and in pregnant women, therefore it results into anaemia. Only dietary supplements are not sufficient. Liposomal iron is a technologically designed, innovative form of iron which ensures higher absorption and bioavailability, greater tolerability and least gastrointestinal side effects unlike conventional oral iron preparations due to its differential delivery system. This review provides a critical discussion on liposomal iron preparation, mechanism of its absorption, its advantages over conventional iron preparation and its usage in iron deficient states in pregnancy. We here summarize recent progress in the liposomal drug formulations overcoming the side effects of convectional dosage form and can resolve this major issue faced by patients worldwide and can provide better quality of life (QoL).

Keywords: Iron, Anaemia, Nanoliposomes, hepcidin, neutraceutical, transferrin, Vesicles.

INTRODUCTION

One of the challenges of nanotechnology in the nutraceutical and food field is to improve the bioavability of the nutritional components. Also many bioactive compounds are poorly absorbed or rapidly metabolized as soon as ingested and therefore are not able to be absorbed in their active form. Nanoscale delivery systems in those Nano liposomes can help to increase the bioavailability of active compounds also protecting them during the digestive process and at the same time improving their uptake in the gastro-intestinal tract. Due to their unique properties of biocompatibility, biodegradability, low intrinsic toxicity and also versatility. Liposomes use has been rapidly grown as new technology for food fortification and also for dietary supplements in form of (tablets/capsules) gives enrichment to increase active molecules shelf life. Among the several applications of liposomal vectors already commercially exploited the release of vitamins or micronutrients as well as in nutraceuticals dietary supplements also fortified foods constituents the largest part[1].

Anaemia is one of the most widespread nutritional deficiencies which affect globally two billon people. According to the World Health Organisation it is due to the iron deficiency as well as dependent on ethnic groups and geographic location. According to WHO Iron deficiency is highly prevalent in developing countries where it represents a major public health problem, and also common in Western countries, particularly in populations such as infants, young children, women with heavy menses, and pregnant and puerperal women. Women are at high risk of developing IDA during pregnancy because increase in iron requirements. Iron deficiency anaemia increases morbidity and mortality. In France a large epidemiological study has shown that approximately 90% of women have insufficient dietary iron intake leading to cause less iron absorption and 23% of women under reproductive age are iron deficient 4% of whom are anaemic[2].

The main risk factors for iron deficiency anaemia (IDA) are: Low iron intake also different levels of chronic blood loss, and mal absorption. In addition to that certain chronic diseases like chronic kidney diseases (CKD), chronic heart failure, cancer, and inflammatory bowel diseases (IBD) are frequently responsible for IDA. Iron deficiency anaemia is also being known to affect a large part of adult and elderly patients in internal medicine units[2].

Iron is essential for oxygen transport, cell growth as well as survival. A typical adult human body contains an average of 3.5g of iron (Almost 4g for males and 3g for females). Most of the iron inside the body is used in haemoglobin (2.1g). A small amount is devoted to cellular protein synthesis (myoglobin, cytochromes) and circulates through plasma bound to transferr in. Iron homeostasis is regulated by intestinal absorption and by recycling of iron already present in the body. This element is having the particularity that once absorbed; there is no physiologic mechanism for its excretion from the body. Only 1 mg of iron is lost per day by males and 2 mg by menstruating females (through blood and mucosal epithelial cell loss)[3].

To maintain adequate supplies of iron for heme synthesis, 20mg of iron is recycled daily and going from senescent red cells which are removed from the circulation to new cells in the bone marrow. Iron from older

cells is loaded onto transferrin by macrophages for delivery to the bone marrow. The diet provides 10-20 mg per day of iron requirement, that isheme (mainly in red meat) and nonheme (white meat, vegetables and cereals). Healthy adults absorb approximately 10 to 15 % of this iron in their diet, but absorption is influenced by the body's iron stores and types of iron in the diet (heme and nonheme) also other dietary factors that may increase or reduce the absorption of iron. Heme iron is absorbed very efficiently by the body but only 1to 7% of nonheme iron is absorbed. Because nonheme iron is present mainly as ferric iron in food, it must be reduced to the ferrous and divalent form (fe^{2+}) prior to uptake by intestinal enterocytes. Although 1-2mg/day of additional dietary is needed to balance losses in the urine, sweat, and stools. The hormone hepcidin regulates iron homeostasis by controlling ferroportin-medicated release of iron from enterocytes and macrophages[3].

Oral iron is usually prescribed as first-line therapy, as it is cost-effective strategy to restore iron balance. Both ferrous and ferric forms are available, mostly only the ferrous form is recommended due to superior absorption. Ferrous sulphate is used most frequently, but with that ferrous gulconate and fumarate can also be used.[1],[2],[7] Problems caused by oral iron supplementation are(1) Poor iron absorption (10-15%), (2) iron loss or iron requirements in excess of the absorbed dose, (3) low bioavailability, (4) poor tolerability,(5) leading to noncompliance causing further problems.. Iron absorption can be lowered by continuous intake of iron absorption inhibitors like phosphates, phytates, and also tanates in food and certain digestive disorders. Certain side effects like abdominal discomfort, nausea/ vomiting, diarrhoea, also constipation are directly related to the amount of elemental iron ingested.[1],[6],[8],[9]

Intravenous (IV) iron is recommended as second-line therapy for patients who do not respond to oral iron, who have intolerance to oral iron therapy and require rapid iron replacement to prevent frommalabsorption due to surgery, heavy bleeding, concomitant use of erythropoietin and anaemia secondary to cancer or chemotherapy.[1],[10] Some of the IV preparations available that are iron gluconate, iron hydroxide sucrose complex, and iron dextran.[7]In spite of their good safety profiles, IV iron preparations are painful, require patient monitoring also carry the risk of anaphylaxis and certain preparations can cause injection site discoloration.[7],[10]

Liposomes:
Liposomes are spherical vesicles characterised by a bilayer of lipids having an internal aqueous cavity. Liposome structural components have phospholipids or synthetic amphiphiles having sterols inside it. This phospholipids bilayer is suitable for fundamental cellular functions, like motility and shape change, and provides the ability to mimic the biophysical properties of living cells[4].

English haematologist Alec Bang ham in 1961 first described the liposomes and since then they have been recognized and extensively used as delivery vehicles for pharmaceuticals[4].

Liposomes are biphasic and having the property to act as carriers for both lipophilic and hydrophilic drugs. Encapsulation of drugs in liposomes enhanced the therapeutic properties of various agents, mainly through alterations in their pharmacokinetics and pharmacodynamics.
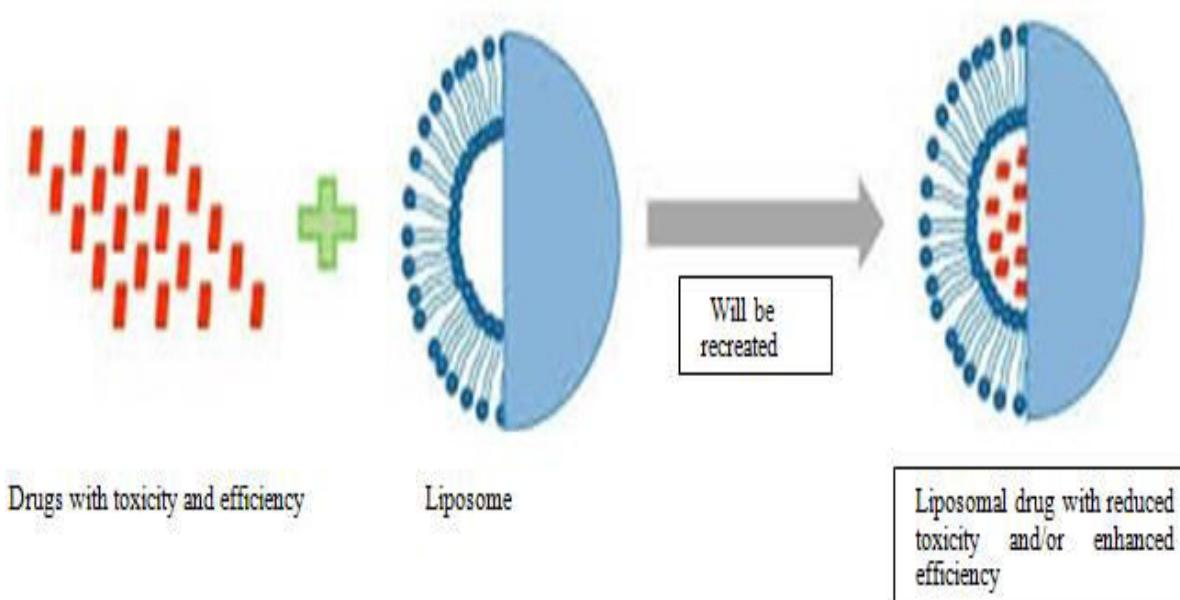
Fig 1: Formulation of drugs in liposomes
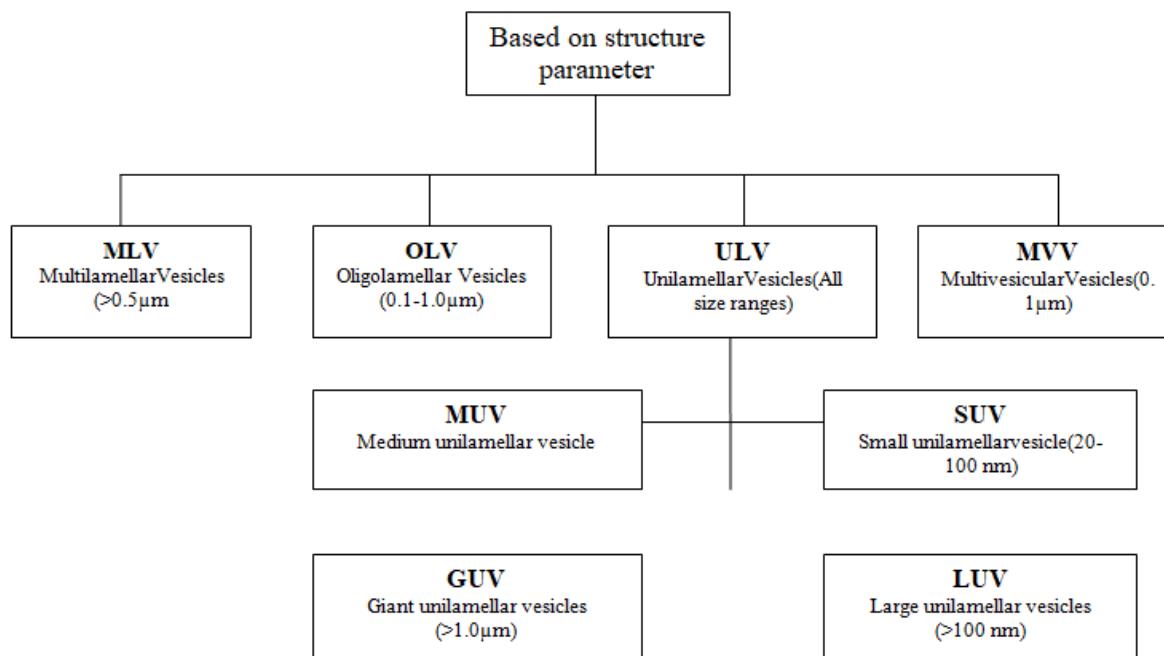
Fig 2: Classification of liposomes based on structural parameters

Liposomes as drug delivery systems are used due to their unique characteristics like biodegradability and non-toxicity, flexibility, and increasing efficiency and therapeutic index as well as increasing stability of entrapped drug via encapsulation protecting the entrapped drug against enzymatic degradation in circulation also reducing side effects of drugs.

The main instabilities of liposomes are related to their possibility of hydrolysis, peroxidation reactions also ability of aggregation. Chemical instability of liposomes is caused by hydrolysis of ester bond or peroxidation of unsaturated acyl chains of lipids and free radical reactions. These reactions can be avoided by selecting lipids with only saturated bonds and storage under inner environment and usage of additional antioxidants such as α-tocopherol, quercetin and coenzyme Q (CoQ) and chelating agents[5].

Iron Metabolism:

The human body contains 3-4 grams of iron. The most of it is utilized in erythrocytes to bind and provide oxygen for the body. Macrophages in the spleen, bone marrow, and liver these recycle iron by taking up erythrocytes and breaking them down to provide iron for many processes such as erythropoiesis [5]. The remaining iron is stored in hepatocytes, it serve as a regulatory unit to control the systemic iron level. An another regulatory measure to control body iron by adjusting its absorption realized by enterocytes in the duodenum. In enterocytes, iron is either stored to minimize the amount of circulating iron as ferritin or else transported to the basal side and released into the bloodstream by Fpn[6], [7]. After the release, iron is loaded to transferrin and distributed safely throughout the body [8]. Transferrin-bound iron is recognized by transferrin receptor (TfR), it is a membrane-bound protein that is widely expressed on cells with a high iron demand, that are intermediate stages in red blood cell formation like erythroblasts [9] The regulation of systemic iron homeostasis is primarily start that by hepcidin, a 25 amino acid peptide [10]. Hepcidin binds to Fpn, that initiating the iron exporter's internalization and degradation and also decreasing available iron in the circulation [11]. The expression of the HAMP gene, that encodes for hepcidin, is up regulated by many of factors, including bone morphogenetic protein (BMP), hemojuvelin (HJV), also human hemochromatosis protein (HFE), targeting either the BMP receptor (BMPR) or tTfR on hepatocytes [12]–[14]. Also in inflammatory cytokines such as interleukin 6 (IL-6) induce hepcidin biosynthesis that reduce plasma iron levels which is a preventive measure against bacterial growth [15]. To release iron from its storages that increase its availability for processes like erythropoiesis, erythropoietin (EPO) that stimulates erythroblasts to release the protein erythroferrone (ERFE), responsible for inhibiting hepcidin production by binding to BMPs [16].

At the cellular level, non-protein-bounded iron is presented as labile iron pool that consisting of ferrous iron bound by low-affinity iron chelators. Also the labile iron pool regulates the intracellular iron flux via iron-responsive proteins (IRP) interacting with iron-responsive elements (IRE) that controls the translation of mRNA encoding for ferritin, TfR1, Fpn, and divalent metal-ion transporter-1 (DMT1) [11]–[12]. Further More, the transcription of TfR, DMT1, and Fpn are also controlled by HIF via binding to hypoxia-responsive element

(HRE), which serving as a potent transcription factor [13]–[16]. Prolyl-4-hydroxylase (PHD), which regulates the degradation of HIF that is highly Fe^{2+}dependent making HIF and PHD suitable target for treatment of iron metabolism-related pathologies [7].
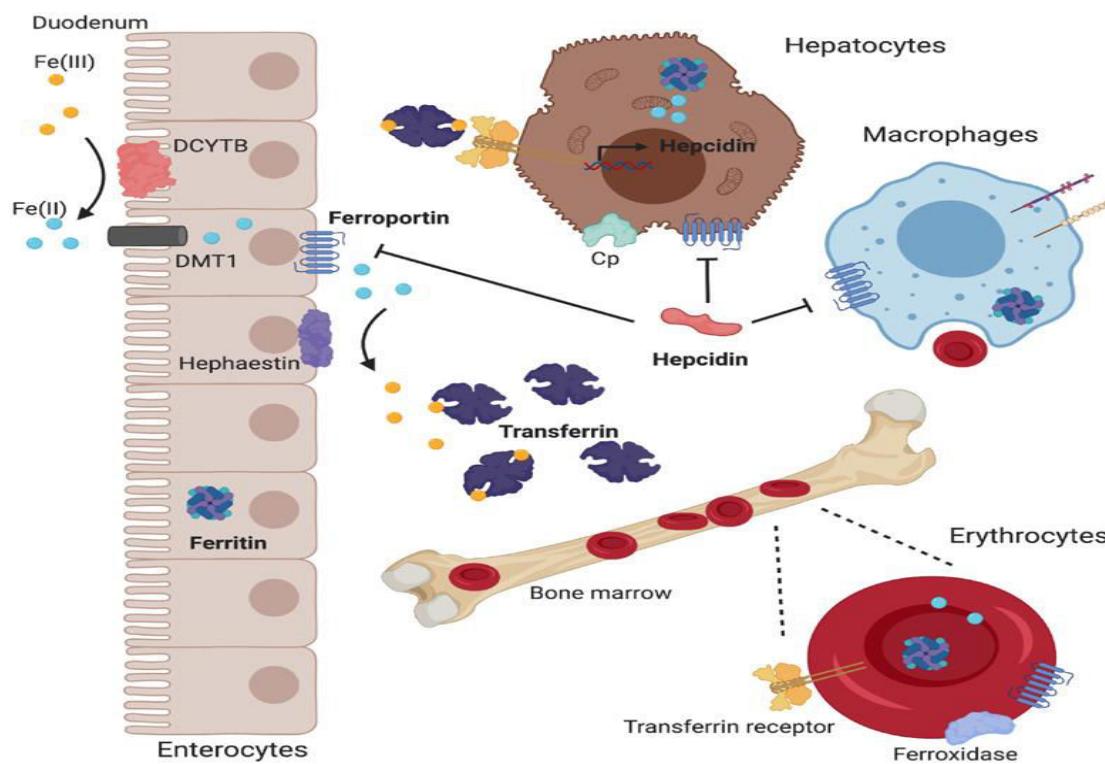
Fig 3: Iron metabolism and its Pharmacology

Under physiological conditions, iron occurs in different oxidative states. Ferric (III) Fe^{+3}iron is stable but poorly soluble in water. Also ferric iron bound to proteins serving as ligands, like transferrin, in order to overcome solubility issues and also ensure good bioavailability. This means that ferric iron can be transported safely in a redox-inactive state. On the other side, Ferrous (II) Fe^{+2}iron is water-soluble, but its high reactivity contributes to its destructive potential. When present in excess amount , ferrous iron leads to the generation of reactive oxygen species (ROS) so-called Fenton reaction, which usually results in cell damage, cell death, organ failure, primarily affecting the liver, heart, pancreas, thyroid, and central nervous system [3], [4].

Limitations of Conventional Iron Therapy:

Various iron salts like ferrous sulphate, ferrous fumarate, etc. are used for treatment of iron deficiency anaemia (IDA). Iron present from these salts is absorbed with help of various transporters like divalent metal transporter 1 (DMT-1) [4]. The major advantage of these oral iron salts is that their extensive availability and low cost. Conventional oral iron therapy is cheap but associated with alot variety of limitations. GI intolerance (nausea, flatulence, abdominal pain, diarrhoea, constipation, black or tarry stools) are the most common frequent adverse effect associated with oral iron.A meta-analysis from Tolkien et al involving 20 trials in that observed Iron Sulphate has significantly high risk of GI side effects compared to placebo. From different studies it has being identified prevalence of constipation, nausea and diarrhoea to be 15%, 12% and 9% respectively.[14] In a study of pregnant women, it reported that only half of the women (49.7%) used iron therapy during the whole pregnancy. It has estimated that non-compliance to oral iron may range from 28% to 76% [8]. Also food interactions with phytates, tannins, etc. present in food causes malabsorption[15]. While usage of conventional iron salts,it reported longer duration is necessary for the rise of 1gm of haemoglobin (Hb) concentration. In a study from North India it reported that after 60 days treatment there was rise of Hbalmost 1gm% with different iron salts available commercially which are ferrous sulphate (0.94 ± 0.27gm%), ferrous fumarate (1.06 ± 0.29gm%), ferrous ascorbate (1.14 ± 0.35gm%),ferrous bisglycinate (1.11 ± 0.29gm%), and sodium feredetate (1.09 ± 0.31gm%) [16].Also daily or twice supplementation of oral iron salts increases hepcidin expression for nearly 24 hours which results in lower absorption of iron in the next day. A study in iron-depleted young women which was conducted by Moretti et al. he observed that after 24 hours, intake of $\geq$ 60 mg of ferrous sulphate, serum hepcidin was increased and fractional iron absorption was decreased by 36% to 44% (p < 0.01 for both). This could be avoided by higher doses of iron but continuous intake is harmful to patients. Also in the same study it was noted that a six-fold increase in iron dose i.e. (40 to 240 mg) resulted only a threefold

increase in iron absorption (6.7 to 18.1 mg) [16]. In presence of such issues with these existing iron therapy, liposomal iron treatment seems to be more logical and affective way to improve iron deficiency state in pregnancy as well as non-pregnant women for reproductive age.

Nanoliposomal Iron:

Nanoliposomes are one of the most effective novel drug carrier systems which potentially deliver different therapeutic substances to the specific molecular target sites. There biocompatibility, biodegradability also low toxicity make them suitable for delivering such drugs. Iron delivery by liposomes is promising approach for the patients and their compliance[2].

Mechanism of Liposomal Iron:

The composition of outer membrane of liposomal iron is similar to that of biological membranes, different mechanisms may be useful in absorption. The mechanisms of absorption are multiple and mostly involve: 1) Simple adsorption increases local concentration of liposomal contents at site of intestinal membrane with resultant absorption by diffusion or transporters; 2) Endocytosis that is with subsequent breakdown of liposomal membrane by intracellular lysosomes; 3) There is fusion of lipid bilayer to plasma membrane with release of contents in to the cytoplasm; 4) Also exchange of lipids between liposomal bilayer and plasma cell membrane cause liposomal bilayer instability with subsequent release of contents intracellularly[10] . Thus, Nano liposomes iron delivery may also avoid any protein mediated carrier transport of iron. This ultimately result in better bioavailability of iron.

Additionally, it showed direct absorption by microfold cells (M cells) in Payer's patches bypassing the conventional routes of absorption is involved in liposomal iron absorption suggested in an in-vitro study [11]. However, it has remain unclear to what extent each mechanism contributes to the overall absorption of iron. In experimental studies, the administration of liposomal iron was reported to be associated with significant increase in red cell count, haematocrit, serum iron levels and also liver iron levels [12] [13] .
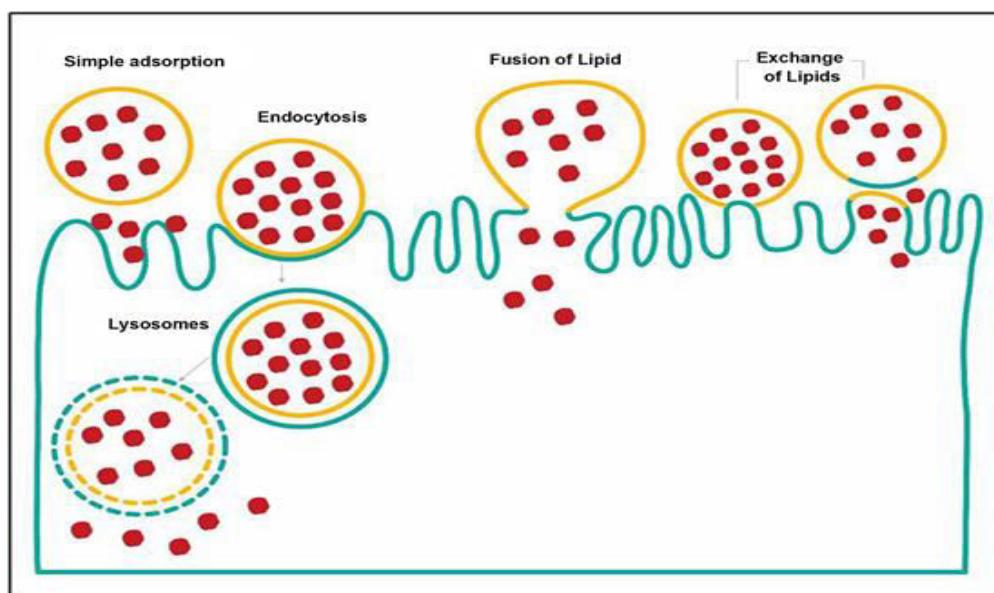
Fig 4: Liposomal Iron Absorption

ADVANTAGES OF LIPOSOMAL IRON :

1) It Has Quicker Absorption and Restoration of the Iron Content:

Experimental evidence suggests Nano liposomal iron recovers iron levels in liver quickly and faster than conventional oral iron [13]. Multiple studies suggest that nanoliposomal encapsulation of iron is associated with enhanced iron absorption as compared to non-capsulated conventional oral iron [14] [15] .

2) There is No Induction of Oxidative Damage:

Evidences has suggested that liposomal iron is associated with decreased malondialdehyde levels and there is increase in super-oxide dismutase levels. This will help in minimizing the oxidative damage that is possibly induced by conventional iron [13].

3) Absorption with Improved Capacity:

As compared to heme iron, it is better absorbed has lower adverse side effects mostlydue to lower oxidative damage [13].

4) Physical Stability and Gradual Release Property:
Nanoliposomes are unilamellar vesicles, also Nano-sized particles. Lipid bilayer provides them stability and may release the contents gradually. Gradual release may also help in better absorption of liposomal content.

CHARACTERSTIC	LIPOSOMAL IRON	CONVENTIONAL IRON
Phospholipid Bilayer	Present	Absent
Effect of gastric acidity	None	Present
Oxidation of iron	No	Yes
Targeted iron delivery	Yes	No
Absorption of iron	Enhanced	Regular
Absorption via intestinal M cells	Yes	No
Food effect	No	Yes
Oxidation damage to intestinal epithelium	No	Yes
Gastrointestinal side effects	Absorbed	Yes
Metallic taste	No	Yes
Chelation with other metals	No	Yes

Fig 5: Comparison of liposomal iron and convectional iron

CONCLUSION
Conventional iron therapy is associated with many gastrointestinal intolerance, constipation, black stools and food intolerance which effects compliance to therapy. Improving compliance of oral iron is one of the essential components due to these issues. Formulation of liposomal iron has provided newer opportunities for improving tolerance with conventional oral iron therapy. Liposomes have been used since long as carriers for many drugs. The ideal property of liposomal carriage of iron is associated with less exposure to gastric contents, lesser interaction with food contents and no exposure to different digestive juices. It is associated with targeted delivery of iron, requires lower doses to be administered because drug gets directly absorbed in to the blood stream without need of any protein carriers. The development of liposomal iron significantly increases hemoglobin, ferritin levels in pregnant women also in women with iron deficiency. Use of lower doses of liposomal iron was effective in comparison to the usual doses of ferrous sulphate. This is helpful in reducing the GI adverse effects associated with non-capsulated conventional oral iron.

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CREATIVITY AND IMAGINATION IN BLYTON'S FARAWAY TREE SERIES

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ABSTRACT

Imagination is the mother of creativity. Since the beginning of time, human beings have been using creativity to solve various problems. The development of human civilization depends of the basic fact that human beings do not like problems. The ability to solve problems requires the single most important component of creativity. Neuroscientists have defined creativity as the mixing and remixing of working memory. One of the strong barriers to creative thinking is the constraints of "reality". Any human being who cannot think and imagine beyond what he knows, sees and believes, will not be able to find ways to solve problems in a creative way. Many times, problems exist because the known way to doing things do not work and thinking has to be creative to find the solution. Any idea or notion that expands beyond the natural realm of reality helps in developing creativity. The development of creative ideas can be prompted by stories which may have a base in reality, but do not restrain the storyline with real world situations or occurrences. Development of creativity happens during a young age. Introduction of stories and ideas which are a shift from reality are one of the ways that the working memory can be kindled to new connections in the brain. As an adult, the pattern of thinking has been relatively fixed due to the inputs taken in during the childhood days when the brain is being developed. The creative thinking, if needed to be active in adulthood, has to be encouraged during childhood days when there are very less to no constraints on what is or is not possible. So, for the development of their mental ability, stories for children have been written by a number of writers.

There were a number of writers like Lewis Carroll, Roald Dahl, Dr. Seuss, J. R. R. Tolkien and Enid Blyton who wrote creative stories for children.

In this paper, we propose to explore how "The Faraway Tree" series of novels written by Enid Blyton has broken the constraints of reality and fuelled imagination and creativity of children.

Keywords: creativity, imagination, storytelling, children's literature, Enid Blyton.

INTRODUCTION

The Faraway Tree series is a series of 4 novels written by a great English writer of Children's Literature Enid Blyton. She forces the mind to stretch towards imagining limitless possibilities through her books.

There is a balance between the aesthetic and the efferent aspects of piece of literature which includes visuals as well as words in the case of children's literature. To explain the case in point, the example can be taken back to the 1800s. Inventor James Clark Maxwell is a great figure in Physics and Chemistry. He figured out that radio waves exist by playing around with magnets. He had these big boxes with magnets and iron filings in them. He would use the magnets to manipulate the filings in different ways. He would find that sometimes in the morning when he would come and look at the patterns, the magnet filings would move. He gathered his thoughts together and watched what was happening and discovered that there is a constant bombardment of waves hitting these magnetic filings that just exist in the universe so he discovered things that are invisible to see. This is clearly something that changed the face of the earth during the 20th century and even further in the 21st century with the discovery of invisible radio waves, other scientists also figured out how to manipulate that as well. This emphasizes that our great triumphs in science are the triumphs of the imagination.

CREATIVITY AND IMAGINATION

Creativity is defined by psychological scientists as the generation of ideas or products that are both original and valuable. Creativity relies on imagination, **the conscious representation of what is not immediately present to the senses**.

We tend to discount imagination at our great peril. Our great failings in science are also our great failings in imagination. Some of the worst things that we've done in the name of science have come from our failings to imagine what those uses might be. It's true for the social studies as well our great triumphs in government, the social justice. Understanding humanity has also come through triumphs of the imagination of people who could see things out there that weren't yet but could be and so on. The hypothesis here is that this approach of intertwining of the efferent and the aesthetic of knowledge and imagination of belief and science is our strength as humans. This is the progress that we experienced in the 21st century. There were difficult times but the strength of human development and growth is innovation and that comes from imagination.

A number of years ago, the literary theorist Northrop Frye talked about this aesthetics issue and the teaching of literature through imagination. It's easy to discount imagination in favor of something that's practical and it's also easy to teach imagination in a very fluffy and substantial way. That transaction is between us and the piece of art and there's not an attempt to find out what the author meant to say to us because we don't get to interact with the author. We do get to interact with the artifact that the author or the painter left behind and in rare cases we get to come back maybe at a conference or someplace sort of book signing and have a few words with the author. It's that transaction between the text and the reader and Louise Rosenblatt that also helps us that that transaction is at the heart of the aesthetic moment and the idea that there's the efferent moment as well. So, a fairly simplistic way of thinking about what art is, is to think about that moment when a toddler shows a drawing and the adult looks at it and gives them some sort of a feedback.

So, in educating the imagination the question is do we have equipment and knowledge like the visual features or understanding how a paragraph or text or the graphic design pieces of a book work that make us better appreciate the moment that we're actually looking at. For a kid looking inside a book, the imagination is the aesthetic moment that is engaging him, not the efferent stuff that's in there. It's neither the lessons nor the knowledge. It is the presentation that is put together in the book in the way things are written that makes the child to go back to these pages over and over again.

The compelling thing about aesthetic does not have to come from something being beautiful. It is compelling so we're compelled by things that are typical for us as humans to be compelled by, even though we may or may not want to talk about it afterwards. So, the aesthetic moment may or may not be where our discussions come from.

As adults, it's very easy for us to err towards the side of the efforts, towards the delivery of information, towards the discussion of what did you learn or what did you get out of this. It's not as natural for us as educators to think about our role in educating the imagination.

Enid Blyton as an Imaginative Writer

CS Lewis and E Nesbit come to mind when we think of as other 'imaginative' writers. Enid Blyton has proven herself to be able to peek into the mind of children in a way other author's didn't quite.

In her long and illustrious career, Blyton, whose birthday is celebrated on August 11, wrote around 800 books. She still sells millions of copies with translations into 90 languages. This is exclusive of the series authored for her newsletters and magazine articles. She averaged with an ability to write 50 books a year, which led to allegations that she hired ghost writers.

Even in India, bibliophiles who attended a school with well-stocked libraries, that is, between the 1950s and 1980s and well into the 1990s, will remember being guided by Enid Blyton's campaign, moving from mythology to school stories to mysteries. Every child has been down this path before entering the 'adult' of Hardy Boys / Nancy Drew.

In 'The Story of My Life' (1952), Enid Blyton states that, from a very young age, she "liked making up stories better than I liked doing anything else." At a very young age, she would go to bed at night and stories would automatically come into her mind "all mixed-up, rather like dreams are" But she states that every plot had its own definite path with the start, mid and finish. This is a unique and rare phenomenon that Enid was unaware of as unusual. She shared the same notion while she wrote on February of 1953 to psychologist Peter McKellar: "I thought all children had the same 'night stories' and was amazed when one day I found they hadn't." She described her "night stories" as "all kinds of imagination coming to her in the form of a story," saying: "Because of this imagining I wanted to write — to put down what I had seen and felt and heard in my imagination."

Enid Blyton from a very young age was eager to work on her writing and story-telling skills. She recalls telling stories to her brothers. She made up her own rhymes based on the rhythm and rhyme-scheme of the then-famous nursery-rhymes. She also had the regular habit of keeping a diary. She wrote letters to real and imaginary receivers, entered literary competitions and paid a lot of attention in English classes at school. She also read voraciously. Along with a good amount of fiction and poetry, she also loved reading biographies of famous authors. She herself admitted that she borrowed books to read on the 'Art of Writing'.

Enid Blyton gives a very sound advice in The Story of My Life. She says to children who are interested in writing to fill their mind with every type of interesting situations and things . The more that is put in, the better and varied the outcome will be. "Nothing ever comes out of your mind that hasn't already been put into it in some form or other… it was you who put it there … Your thoughts, your actions, your reading, your sense of humour, everything gets packed into your mind, and if you have an imagination, what a wonderful assortment it will have to choose from!"

Since Enid began writing at a very young age, she had begun to submit her work to publishers in her teenage year. At that point of time, all that she received was countless rejections. This rejection, however, only determined her more and filled her with perseverance to not stop her writing: "It is partly the struggle that helps you so much, that gives you determination, character, self-reliance — all things that help in any profession or trade, and most certainly in writing." Soon enough, Enid Blyton walked into unparalleled success with her twenties when her magazine articles and poetries were published.

Enid justified her success by saying in The Story of My Life that she never charted out a her work of fiction before writing it. She often said that she was never clear of the path that the story was going towards. She basically let plot unfurl in her imagination as she wrote. She trusted on her own imagination rather than trying to consciously trying to finish her story. She said that her methodology was like viewing a movie in her mind and writing down what she saw. She writes this in a letter to Peter McKellar in 1953.

Imagination, by Enid's own admission, comes from inputs of interesting proportions. Enid ignores that, presenting that most of the things have come up into her mind suddenly while she wrote the book and they have continued to surprise her as they have done for many more.

It is clear that in The Story of My Life, Enid Blyton gives us an imagination accounting of the writing of The Enchanted Wood. She simply makes everything more neat and simple than they actually are. Blyton, however, was an inspired and industrious storyteller.

Creativity and Imagination in "the Faraway tree Series"

"The Faraway Tree series" is a series of novels written by Enid Blyton and published for the first time between 1931 and 1951. The actual series consists of four novels - The Enchanted Woods (first published in 1939), The Magic Faraway Tree (first published in 1943), The Folk of the Faraway Tree (first published in 1946) and Up the Faraway Tree (first published in 1951).

The story begins with the characters of Jo, Bessie and Fanny. Then it she follows a long winding path through a forest in her mind, and suddenly we meet the "the strange Faraway Tree, a tree that reaches to the sky, and is the home to little creatures. Enid says that "never heard of it, or seen it till that moment — but there it is, complete in every detail." In actuality, Enid Blyton had already envisioned the Faraway Tree for around three years before writing The Enchanted Wood, as she had first mentioned the tree in The Yellow Fairy Book (1936.)

Enid Blyton goes on to describe the ascent of a tree in his mind and sees the door at the top: "... before I knocked, it opened, and there stood a round, red-faced, blinking-eyed little boy, at me. I know who he is, though I have never seen him in my life before. It is Moonface." Not surprisingly, we find once again that Enid Blyton had earlier Moonface in another form and in another writing. He too had appeared in the Yellow Book of Legends, mentioned as having a small round room and slippery slips.

Enid then writes: "I hear a strange sound - a piercing, piercing, pounding sound. What is it? He is a Saucepan Man, hanging from pots and pans. Again Enid Blyton had written about the Saucepan Man character nearly thirteen years ago, when she wrote the Enid Blyton Book of Brownies (1926.)

She talks about the Moonface and the Saucepan Man up at the top branch of the Faraway Tree to discover that "the little yellow staircase extends from the last branch, up into the purple hole in the cloud over the tree." "Surprisingly" may not be the right word, as the ladder and cloud are also featured in the Yellow Fairy Book.

"I closed my eyes for a few minutes, put my portable stylus in my knee - made my mind empty and waited - and then, as I saw the real kids, my characters stood in front of me imagining ... the first sentence comes straight to my mind, I don't have to think about it - I have nothing to think about," told psychologist Peter McKellar, who asked him about photography techniques for his research project.

But there was more to Blyton (1897-1968). Despite her good sense of humor, she was able to intelligently adapt to the realities of real life - moving trees outside one of her houses inspired the Enchanted Wood, Superintendent Jenks of Five Find-Outers was backed by her promoted city police officer. In reality, she was much wiser than she was praised for.

And then Blyton had a much larger share of the opposition - in her growing day, the BBC dismissed her work as "not worthy of literature" on the 1960s' allegations of simplicity, reprinted sites, and racism, racism, xenophobia, and the like. Then along came political correctness, a set of changes that raised additional doubts about the fact that its providers were constantly thinking about the impact on easily accessible minds.

Happily, millions of students continued to read it without any ill effects.

Not only are Jo, Bessie, Fanny and Dick renamed as Joe, Beth, Franny, and cousin Rick but Dame Slap is no longer Dame Slap. She never slaps; rather, scolds. This is true result of adults trying to focus more of facts and implications rather than the virtue of a creative imagination.

There might be other problems that a person without an appreciation of imagination, would have. One of them being the Saucepan Man. He may not even be everyone's favourite character in books as a child. His particular liking would especially be because of the smooth slide in his house. But, a child might find the Saucepan Man funning with his banging of pots and pans, throwing a tantrum and fit or his problem with hearing due to the loud banging of utensils. On the other hand, an adult would be shocked to discover his outburst of emotions, his not being magical like other characters and being just a angry man with pots and pans

What really feeds in to the imaginations is a variety of other things:

Eateries: Imagine having a tree that would grow not just fruits and vegetables but rather all the goodies like candies, bakery items, and lot of surprises. The creatures of the tree also present the child with a variety of pop cakes, shock toffees and Google buns. Basically, the children who read are encouraged to imagine what could be found next with the word "you could never know, what the tree would grow the next day"

Lands: There are a variety of lands that are visited by the children and also by the creatures residing in the Faraway Tree. Some are quite fun and good, some are plain pleasant, some not so pleasant and some are simply to be avoided at all costs. Some of the lands worth mentioning are The Land of Birthdays, The Land of Do-As-You-Please, The Land of Dame Snap, The Land of Take-What-You-Want, The Land of Goodies, The Land of Presents. There are not so good lands as well – The Lands of Giants, The Land of Tempers, The Land of Topsy Turvy, The Land of the Old Woman. Reading about the lands and the way the characters enjoy them makes them come alive in the pages.

Characters: The human characters have been kept plain and simple. They are either good or naughty. The naughty ones like Cousin Rick and Connie do eventually 'learn a lesson and turn good'. But the other characters in the Enchanted Woods and in the magical lands are all different and well, magical. There is Silky- the dainty little fairy, Moonface-a man with a face as round as a moon, a round room and a slippery slope for getting out of the house, the Saucepan Man who wears pots and pans all over himself, Dame Washalot who loves to wash a lot, the Angry pixie, Mr. Whatzhisname who has forgotten his name and many more. These characters make the story more interesting and make the child open to accept others no matter what they look like.

So, it may not translate out to make an impressive film, as this may cut down the process of imagination, but it still draws millions of children to read and imagine about the limitlessness of possibility that may exist in the world around.

CONCLUSION

One woman with a typewriter did more to shape the imaginations of many generations of young and little readers than anyone else — and still does.

It is a really strange feeling of discovering that as adults the books that we found as classics do not actually present to be the same when read now. But, The Faraway Tree series as the exhibition of creativity and imagination is really good. There's something there for all ages. On one hand, there are different land appears – one of roundabout made of sweets and cakes and another with imaginative creatures cruising past our minds on the speed of a sledge. As a open-minded and creative adult, one would love to go down the slippery-slip. At the end, there is something in there for everyone who is free to let go of the constraints that adulthood has put on our minds.

Even though, it belongs to another era and another century, it's the creativity and imagination in "The Faraway Tree" series of novels by Enid Blyton that will make it never go out of fashion.

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PRIME AVERAGE HARMONIOUS LABELING OF CYCLE RELATED GRAPHS

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ABSTRACT

A function L is called prime average harmonious labeling of graph G with n vertices and m edges if $L : V \rightarrow \{0,1,2,3\ldots\ldots,2m-1\}$ is injective and the induced function $L^* : E(G) \rightarrow \{0,1,2,\ldots.2m\}$ is defined by

$$L^*(uv) = \begin{cases} GCD\left(L(u), L(v)\right) = 1 \\ L(uv) = \dfrac{L(u) + L(v) + 1}{2} \ (mod \ m) \ if \ L(u) + L(v) \ is \ odd \\ L(uv) = \dfrac{L(u) + L(v)}{2} \ (mod \ m) \ if \ L(u) + L(v) \ is \ even \end{cases}$$

A graph that satisfies the conditions of prime labeling and harmonious labeling is called a prime average harmonious labeling. A graph that admits a prime average harmonious labeling is called a prime average harmonious graph .In this paper we proved that the cycle graph, The Quadrilateral snake graph, the graph $C_3 \odot P K_1$, the jewel graph ,Jelly fish graph ,*the Shadowgraph* are Prime Average Harmonious Labeling.

Keywords: Average Harmonious, Prime harmonious, injective function, Prime average, Bijective

AMS Subject Classification: 05C78

1. INTRODUCTION

Harmonious labeling were defined by Graham and Sloane [3].as part of their study of additive basis and are applicable to error – correcting codes. Since their introduction in 1980, harmonious labeling has piqued the interest of many researchers, and they are now among the most widely used labeling in the literature. Sarasija and Binthiya [1830] introduced an even harmonious labeling. Adalin Beatress and Sarasija [2] introduced average harmonious graph in 2015. The concept of prime harmonious labeling was introduced and studied by P.Deepa and K .Indirani in 2016. The concept of prime har monious labeling of Some Graphs was extended and inroduced by Dr. M. Tamilselvi, K. Akilandeswari , S. Mahalakshmi 2018.On the basis of this work we introduced a new concept Prime Average harmonious Graphs.

II PRELIMINARIES

Definition 2.1: Let G be a graph with p vertices and q edges. A bijection $f(v): V \rightarrow \{0,1,2,\ldots,|v|\}$ is called prime labeling if for each edge $e = \{u, v\}$ belongs to E, we have $GCD(f(u), f(v)) = 1$. A graph that admits prime labeling is called a prime graph.

Definition 2.2: Let G be a graph with p vertices and q edges. A function f is called harmonious labeling of graph G if bijection $f(v): V \rightarrow \{0,1,2,\ldots,q-1\}$ is injective and the induced function $f^*(e) = E(G) \rightarrow \{0,1,2,\ldots,q\}$ defined as $f^*(e = uv) = (f(u) + f(v))(mod \ q)$ is bijective. A graph which admits a harmonious labeling is called a harmonious graph.

Definition 2.3: Let G be a graph with p vertices and q edges . A function f is called prime harmonious labeling of graph G if, $f(v): V \rightarrow \{0,1,2,\ldots,2q-1\}$ is injective and the induced function $f^*(e) = E(G) \rightarrow \{0,1,2,\ldots,2q\}$ is defined by, $f^*(uv) = \begin{cases} GCD\left(L(u), L(v)\right) = 1 \\ f(u) + f(v)(mod \ q) \end{cases}$ A graph which admits a prime harmonious labeling is called a prime harmonious graph.

Definition 2.4: A connected graph G' s shadowgraph $D_2(G)$ is G' and G'' was created by duplicating G. Every vertex u' in G' should be connected to the neighbors of the corresponding vertex v' in G''.

Definition 2.5. Let G be the H -graph of path P_n, which is the graph that is secured by two copies of path P_n. Let the vertices $u_1, u_2, u_3, \ldots, u_n$, $v_1, v_2, v_3, \ldots, v_n$ by attaching the $u_{\frac{n+1}{2}} v_{\frac{n+1}{2}}$ if n is odd or $u_{\frac{n}{2}+1} v_{\frac{n}{2}}$ if n is even.

III. PRIME AVERAGE HARMONIOUS LABELING OF GRAPHS

Definition 3.1: A function L is called prime average harmonious labeling of graph G with n vertices and m edges if $L : V \to \{0,1,2,3 \ldots \ldots, 2n - 1\}$ is injective and the induced function $L^* : E(G) \to \{0,1,2, \ldots .2m\}$ is defined by

$$L^*(uv) = \begin{cases} GCD\left(L(u), L(v)\right) = 1 \\ L(uv) = \dfrac{L(u) + L(v) + 1}{2} \ (mod \ m) \ if \ L(u) + L(v) \ is \ odd \\ L(uv) = \dfrac{L(u) + L(v)}{2} \ (mod \ m) \ if \ L(u) + L(v) \ is \ even \end{cases}$$

A graph that satisfies the conditions of prime labeling and harmonious labeling is called a prime average harmonious labeling. A graph that admits a prime average harmonious labeling is called a prime average harmonious graph.

Theorem 3.2: The cycle C_n, $(n \geq 3)$ is a prime average harmonious graph, when the value of n is odd.

Proof: Let C_n be an n vertices, $m = n$ edged cycle.

Let $V(C_n) = \{ v_h, \ 1 \leq h \leq n\}$ and

$E(C_n) = \{ v_h \ v_{h+1}, \ 1 \leq h \leq n - 1\}, \quad v_n v_1 \}$

Define an bijective function $f : V(C_n) \to \{1, 3, 5, \ldots, 2n - 1\}$ by

$L(v_h) = 2h - 1, \quad 1 \leq h \leq n.$

After that, L induces a bijection $L^* : E(C_n) \to \{0, 1, 2, \ldots, m - 1\}$

The following are the edge labels:

$L^*(v_h v_{h+1}) = 2h, \quad 1 \leq h \leq \dfrac{n-1}{2} - 1$,

$$L^*(v_n \ v_1) = 0$$

$L^*(v_{\frac{n-1}{2} + h}, v_{\frac{n-1}{2} + h + 1}) = 2h - 1 \ mod \ (m), \quad 1 \leq h \leq \dfrac{1}{2}(n - 1)$

Hence both vertex labels and edge label are distinct.

Hence the cycle graph C_n, $(n \geq 3)$ is a prime average harmonious graph.

Example 3.3: The C_7 cycle is a prime average harmonious graph as illustrated fig 2
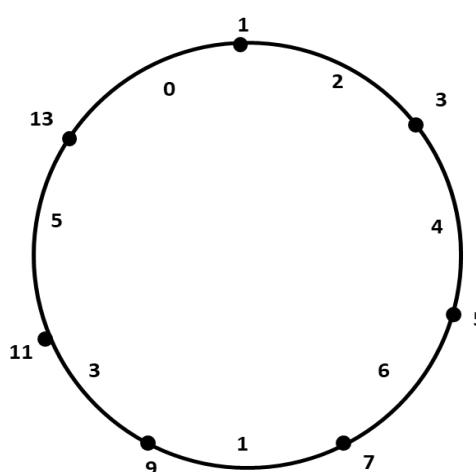
Fig. 1: The cycle C_7.

Theorem 3.4. $C_3 \ @ \ pK_1$ is a graph with a prime average harmonious graph.

Proof: The vertices of the cycle C_3 are denoted by u, v, w.

The vertices of the p pendant vertices are denoted by $w_1, w_2, \ldots, w_p$

$E\,[C_3\,@\,pK_1\,]\;=\;\{\,uw,\;wv,\;uv, ww_h\,,\qquad 1 \le h \le p\}$

There are $n\;=\;m\;=\;p\;+\;3$ vertices and edges in the graph $C_3\,@\,pK_1$

Define a bijection $L:\;V(C_3\,@\,pK_1\,)\;\rightarrow\{1,2,3,\dots,2(p+3\,)-1\}$ by

$L(u\,)=\,1,$

$L(v)=\,2$

$L(w)=\,2p\,+\,5\;\;and$

$$L(v_h)\;=\;2h\,+\,1\,,1\,\le h\le p$$

The induced function $L^{\,*}:\;E[C_3\,@\,pK_1\,]\;\rightarrow\;\{\,0,1,2,\dots,p\,+\,2\}$ is a bijection defined by

$L^{\,*}(uv)=\,2,$

$L^{\,*}(ww_h)=2h\,+\,1\,,\qquad 1\le h\le p$

$L^{\,*}(vw)=\,1\,,$

$L^{\,*}(uw)\;=\,0.$

Then L is a prime average harmonious graph and hence, $C_3\,@\,pK_1$ is a prime average harmonious graph.

Example 3.5 $C_3\,@\,pK_1$ is an a prime average harmonious graph as illustrated fig 2
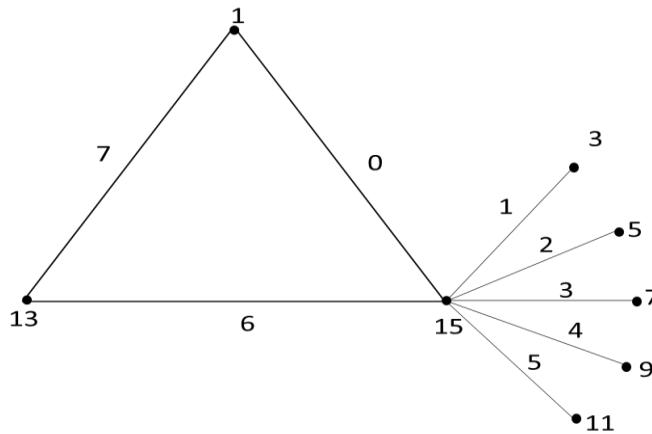
Fig. 2: $C_3\,@\,pK_1$ is a graph with an a prime average harmonious.

Theorem 3.6. The quadrilateral snake Q_n is a graph with a prime average harmonious graph.

Proof: $V\,[Q_n\,]\;=\;\{\,u_h,\;1\le h\le n\;and\;v_h\,,w_h\,,\;1\le h\le n-1\,\}$ be the vertices and

$E\,[Q_n\,]\;=\;\{\,u_hu_{h+1}\,,u_hv_h\,,u_{h+1}w_h,v_h\,,w_h\;1\le h\le n-1\}$ be the edges.

There are $n\;=\;m\;=\;p\;+\;3$ vertices and edges in the graph Q_n

Define a bijection $f:\;V(Q_n\,)\;\rightarrow\{1,2,3,\dots,2(p+3\,)-1\}$ by

$L(u_h\,)=\,4h-3,$

$L(v_h)=\,4h-1,$

$$L(w_h)=\,4h,1\,\le h\le p$$

The induced function $L^{\,*}:\;E[Q_n]\;\rightarrow\;\{\,0,1,2,\dots,p\,+\,2\}$ is a bijection defined by

$L^{\,*}(u_hu_{h+1})=\,4h-1,\;\;1\le h\le n-1$

$L^{*}(u_hv_{h})=\,4h-2,\;\;1\le h\le n-1$

$L^{\,*}(v_hw_{h+1})=\,4h,\;\;1\le h\le n-2$

$L^{\,*}(u_{h+1}w_{h})=\,4h+1,\;\;1\le h\le n-2$

$L^{\,*}(u_nv_n)=\,1\,,$

$L^*(u_n v_n) = 0$.

Then L is a prime average harmonious graph and hence, $C_3 @ pK_1$ is a prime average harmonious graph .

Example 3.7. The graph $P_3 + 3K_1$ is the quadrilateral snake Q_n is a graph with a prime average harmonious graph.
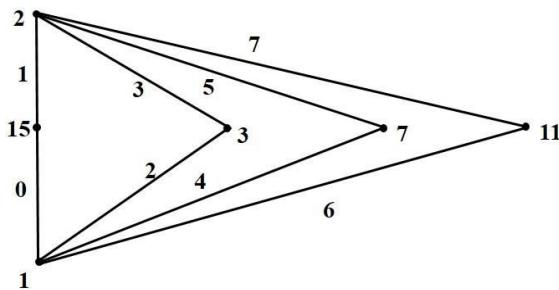
Fig.3: The graph $P_3 + 3K_1$.

Theorem 3.8: The Jewel graph J_r, $(r \geq 1)$ is a prime average harmonious graph.

Proof. Let $V(J_r) = \{ u_1, u_2, u_3, u_4, v_h, \quad 1 \leq i \leq r\}$ and

Let $E(J_r) = \{ u_1 u_2, u_2 u_3, u_3 u_4, u_4 u_1, u_4 u_2\} \cup \{u_1 v_i, u_3 v_h \quad 1 \leq i \leq r\}$

There are $r + 4 = n$ vertices and $2r + 5 = m$ edges.

Define a bijective function $f : V(J_r) \to \{ 1,2,3, \ldots ,2n - 1 \} by$

$L(u_1) = 1, f(u_2) = 5$

$L(u_3) = 2, f(u_4) = 9$ and

$L(v_h) = 4h + 11, 1 \leq h \leq r$

After that , L induces a bijection $L^* : E[J_r] \to \{ 0, 1, 2, \ldots, m - 1 \}$ as well as

$L^*(u_1 u_2) = 3$,

$L^*(u_1 u_4) = 5$,

$L^*(u_2 u_3) = 4$,

$L^*(u_3 u_4) = 6$,

$$L^*(u_2 u_4) = 7$$
$$L^*(u_1 v_h) = 2h + 6 (mod\, m), \quad 1 \leq h \leq r$$
$$L^*(u_3 v_h) = 2h + 7\ (mod\, m), \quad 1 \leq i \leq r$$

Hence both vertex labels and edge label are distinct.

Hence the Jewel graph J_r $(r \geq 1)$ is a prime average harmonious graph.

Example 3.9. The Jewel graph J_3 is a prime average harmonious graph as illustrated fig 2.
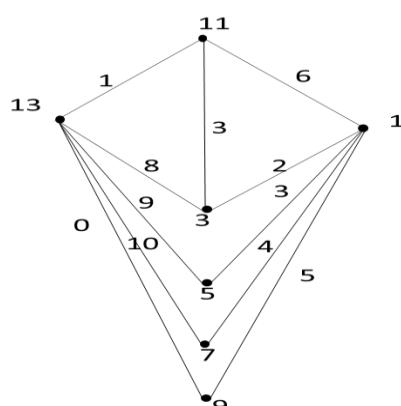
Fig.4: The Jewel graph J_3 is a prime average harmonious graph

Theorem 3.10. The Jelly fish graph $JF(p,q)$ is a prime average harmonious graph. When $(p,q \geq 1)$.

Proof: Let $\{u_1, u_2, u_3, u_4\}$ be the vertices of the cycle C_4.

Let $U[JF(p,q)] = \{v_h, 1 \leq h \leq p\}$ and $U[JF(p,q)] = \{w_h, 1 \leq h \leq q\}$.

Let $E[JF(p,q)] = \{u_1 u_2, u_2 u_3, u_3 u_4, u_4 u_1, u_4 u_2, u_1 v_h, 1 \leq a \leq p; u_3 w_h, 1 \leq b \leq q\}$ be the edges.

There are $n = p + q + 4$ vertices and $m = (p + q + 5)$ edges and the modulo $(p + q + 5)$ in the graph $[JF(p,q)]$

Define a bijection $L: V[JF(p,q)] \rightarrow \{1, 2, 3, \ldots, 2(p + q + 4) - 1\}$

$L(u_1) = 1, L(u_2) = 5$

$L(u_3) = 2, L(u_4) = 9$

$L(v_h) = 2q + 2h + 12, 1 \leq h \leq p$ and

$L(w_h) = 2h + 11, 1 \leq h \leq q$

and a bijective function $L^*: E[JF(p,q)] \rightarrow \{0, 1, 2, 3, \ldots, (p + q + 5)\}$ by

$L^*(u_1 u_2) = 3$,

$L^*(u_1 u_4) = 5$,

$L^*(u_2 u_3) = 4$,

$L^*(u_3 u_4) = 6$,

$$L^*(u_2 u_4) = 7$$

$$L^*(u_1 v_h) = h + 7, \quad 1 \leq h \leq r$$

$L^*(u_3 v_h) = q + h + 7 \ (mod \ m), \quad 1 \leq h \leq r$.

The edge labels and vertex labels are distinct.

The Jelly fish graph $JF(p,q)$ is a prime average harmonious graph. When $(p,q \geq 1)$

Example 3.11. The Jelly fish graph $JF(4,5)$ is a prime average harmonious graph as illustrated fig 3
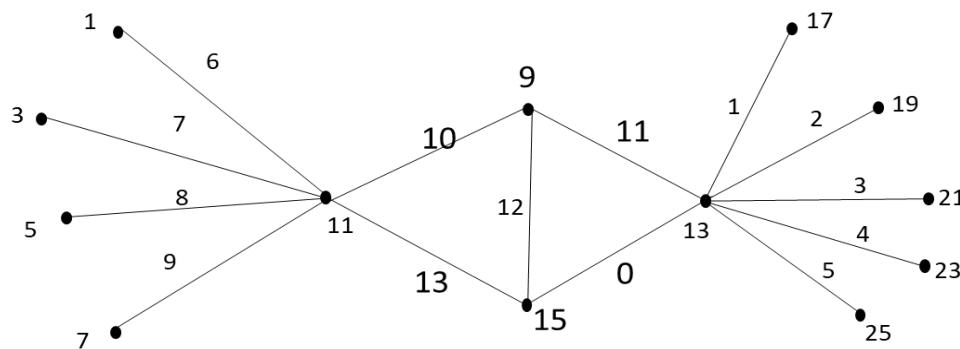
Fig.3 : The Jelly fish graph $JF(4,5)$ is a prime average harmonious graph.

Theorem.3.12. the shadow graph $D_2(K_{1,n})$ is a prime average harmonious graph.

Proof: Consider two copies of $K_{1,n}$. Let $v_1, v_2, v_3, \ldots, v_n$ and $v'_1, v'_2, v'_3, \ldots, v'_n$ be the pendent vertices of the first and second copy of $K_{1,n}$ With v and u respectively apex vertices.

Let G be the edges of the shadowgraph $D_2(K_{1,n})$ are $vv_1, vv_2, vv_3, \ldots, vv_n, vv'_1, vv'_2, vv'_3, \ldots, vv'_n, v'v_1, v'v_2, v'v_3, \ldots, v'v_n$ and $v'v'_1, v'v'_2, v'v'_3, \ldots, v'v'_n$

Then $p = 2n + 2$ and $q = 4n$.

To define $L: V(G) \rightarrow \{0, 1, 2, 3, 4, \ldots, (8n + 2) - 1\}$ by

$L(u) = 1$,

$$L(u_h) = 4(h) - 1 \text{ for } 1 \leq h \leq n,$$

$L(v) = 2$ and

$L(v_h) = 4h + 2n + 5$ for $1 \leq h \leq n$.

From the above construction pattern, L induces a bijection $L^* : E \to \{0,1,2, \ldots (4n-1)\}$ by

$L^*(uu_h) = 2h$ for $1 \leq h \leq n$,

$L^*(uv_h) = 2h+2n$ for $1 \leq h \leq n$,

$L^*(vu_h) = 2h + 1 \pmod{m}$ for $1 \leq h \leq n$,

$L^*(vv_h) = 2h + 2n + 1 \pmod{m}$ for $1 \leq h \leq n$,

Thus L admits a prime average harmonious graph for the shadowgraph $D_2(K_{1,n})$. Hence the shadowgraph $D_2(K_{1,n})$ is a prime average harmonious graph.

Example: 3.13 The shadowgraph $D_2(K_{1,3})$ is an OAHL graph is given in fig 3..
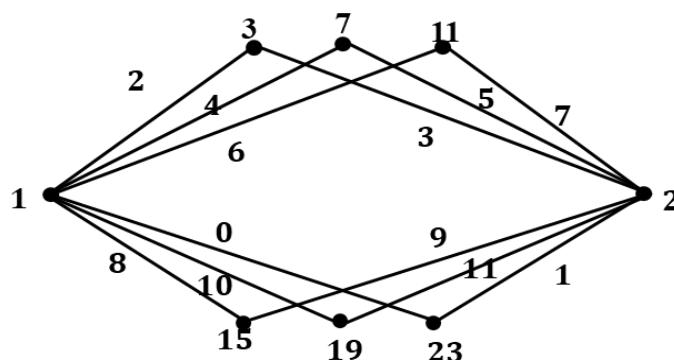
Fig.6: The shadow graph $D_2(K_{1,3})$ is an OAHL graph

IV CONCLUSION

This paper discusses about the Prime average Harmonious graphs. As all the graphs are not Prime average Harmonious graphs .We have proved that that the cycle graph, The Quadrilateral snake graph, the graph $C_3 \odot P K_1$, the jewel graph ,Jelly fish graph ,the Shadowgraph are Prime Average Harmonious Labeling.

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AN INVESTIGATION ON SYNTHESIS AND CHARACTERIZATION OF NANO CELLULOSE FROM SUGARCANE BAGASSE FOR BIODEGRADABLE PACKAGING APPLICATION

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ABSTRACT

Cellulose that has been structurally modified into nanoparticles is what is meant by the term "nanocellulose". Nanofibers also known as nano-fibrillated cellulose and nanocrystals, or bacteria-derived nanocellulose might be the source of these materials. Environmental contamination caused by synthetic polymers is becoming one of the world's most serious problems. Plant-based nanocellulose (NC), as established in multiple scientific studies, is a sustainable and harmless material with competitive rheological, mechanical, and gas barrier qualities when contrasted to oil-based polymers. The amorphous areas of cellulosic materials are quickly hydrolyzed, releasing unbroken crystalline regions. Chemical reactions using oxidative hydrolysis or acidic hydrolysis of cellulosic materials hydrolyse the unstructured areas, resulting in the release of unbroken crystallized sections of cellulose nanocrystals, which are very tiny and crystalline nanoparticles. In this study sugarcane bagasse has been utilized to extract the nanocellulose via the acid hydrolysis process. Further, the extracted nanocellulose is used in preparing the films which are then characterized. An FTIR spectrometer, a scanning electron microscope (SEM), and tensile tests are used to examine the films' properties.

Keywords: Nanocellulose, CNC (Cellulose nanocrystals), CNF (Cellulose nanofibrils), Crystalline regions, Amorphous regions.

INTRODUCTION

Biopolymers, such as cellulose, which is produced by a wide range of creatures, including plants, fungus, marine animals, and bacteria, are the most prevalent in nature and have long been considered a significant renewable resource. As a result, it is the world's most plentiful and renewable natural resource. Sugarcane bagasse, a by-product of the sugar and alcohol industries, is largely utilized as a fuel to operate the sugar mills in the sugar industry. Through different chemical methods, this bagasse may be utilized to generate nanocellulose. Approximately 40–50% of bagasse is composed of glucose polymeric cellulose, the majority of which has a crystalline structure. 25–35 percent more is hemicellulose, an unstructured polymer often made up of arabinose, galactose, and xylose. The remaining consists mostly of lignin (18–24 per cent) [1]. The stem of the sugar cane can indeed be cut into two distinct parts: the rind present on the outer side and the pith on the inner side. The larger and smaller bundle of fibres are located in the area of the rind that is located on the exterior, while the shorter fibres are located in the region that is located on the inside[2].

The majority of bagasse, anywhere from 60–70 percent, is burned in power plants to produce steam and electricity, while the remaining 40–30 percent is used in the production of paper goods and alcohol[3].There have been various studies done on the isolation of nanocellulose using sugarcane bagasse, which is considered an agro-waste product, in order to improve its exploitation for possible applications[4].Ping Lu et al. isolated nanocellulose using cotton cellulose and discovered nanocrystals in their investigation showed increased thermal conductivity and a much greater carbonaceous residue (almost 30%), It's possible that this is due to direct solid-to-gas breakdown[5]. Nanocellulose is a naturally occurring nanomaterial derived from plant cell walls. With a nanometer-sized dimension, nanocellulose has desirable features such as high strength, great rigidity, and a large surface area[6]. Nanocellulose is compostable, lightweight has a density of around 1.6 g/cc, and tensile strength of 10 GPa, which is similar to cast iron. Additionally, it has reactive hydroxyl groups, making it appropriate for surface functionalization in a wide range of applications.

Nanocellulose is basically of three types namely: Cellulose nanocrystals(CNC), Cellulose nanofibrils(CNF), and Bacterial nanocellulose(BC). CNC and CNF are derived from plant-based sources while bacterial nanocellulose is derived from acetobacter xylinum bacteria[7]. There are several different procedures that may be used to extract nanocellulose. Some of the writers acquired nanocellulose by an acid hydrolysis method, others obtained it through an enzymatic hydrolysis process, while yet others recovered nanocellulose through ball milling techniques. Acid hydrolysis is perhaps the most extensively used technique for producing nanocellulose because it is simple and quick to manufacture nanocellulose with improved characteristics. The crystallinity index of nanocellulose generated by acid hydrolysis was found to be greater than those of nanocellulose generated by other techniques, according to certain studies. The acid hydrolysed nanocellulose has a lower particle size as well. Thus, acid hydrolysis process was used to create nanocellulose for these reasons[8].

Enzymes are employed to break down or change cellulose fibres in an enzymatic hydrolysis process. While high forces are applied in order to cleave the cellulose fibres in case of mechanical processes like ball milling to generate the nanocellulose. All these processes are used to hydrolyse the amorphous part of the cellulose and leave back the crystalline form, thus yielding cellulose nanocrystals.

Today, the use of packing materials may be considered in order to keep drinks, food, healthcare, cosmetics and other basic commodities from deteriorating owing to biochemical, physical, and other factors, as well as microbiological variables[9].In their work, A. Nor Adilah et al employed mango peel extract (MPE) to test the mechanical, barrier, physical, and antioxidant characteristics of fish gelatin films for food packaging. In their study, they found out that films incorporated with MPE showed a decrease in the water vapour permeability and lesser film solubility[10].Nanocellulose-based composites containing active compounds, mostly antimicrobials and antioxidnts, have recently been successfully employed to improve food safety and quality. In answer to food industry needs, the produced composites demonstrated good functional capabilities for active food packaging[11].

Plastics have been utilised as packing material for a significant number of centuries, yet the amount of environmental harm they have caused has increased over time. Despite the fact that researchers have developed several recyclable polymers, the amount of time required to recycle such plastics is much longer. It has just come to light that nanocellulose can function as a biopolymer that is both biodegradable and sustainable. It is particularly useful in the packaging sector because to the exceptional mechanical and barrier capabilities it has, as well as the antibacterial and antioxidant qualities it possesses. When it comes to biopolymers, however, mixing and adding nanofillers are excellent ways to increase their characteristics and hence widen their application areas[12].

Compounds made of polymers and inorganic or organic additives are known as polymer composites, minimum one component of filler is required. Polymer nanocomposites may be made using nanoparticles in the nanometer range[13].A homogeneous dispersion of nanoparticles makes a massive matrix/filler interfacial area, altering molecular mobility, relaxing behaviour, and the material's thermo - mechanical characteristics. Because of its high surface areas, fillers with a high ratio of the biggest to smallest dimensions (i.e., aspect ratio) are especially remarkable because they provide higher reinforcing effects.

In their work, Fei Li et al. examined the performance of flexible food packaging sheets coated with cellulose nanocrystals (CNs). Initially, the morphological characteristics of CNs from cotton linters and the uniformity of their coating on various substrates were characterised. Next, the optical, mechanical, barrier, and antifog properties of 1.5 micrometres thick CNs coatings on oriented polypropylene (OPP), polyethene terephthalate (PET), and cellophane samples were characterized[14].

Research into the application of biodegradable polymer-based green nano - composites in certain areas, such as packaging and medicine, is being vigorously encouraged. Environmental health and safety (EHS) constitute two critical issues that nanotechnology can successfully address. Through a mechanical or chemical process, nanocellulose is produced from cellulose, alkali treatment, mechanical breakdown, delignification, and acid hydrolysis are all part of the chemical process that results in rod-like cellulose nanocrystals (CNCs) with diameters ranging from 3 to 50 nm and lengths ranging from 100 to 500 nm. Mechanical treatments including such grinding and high-pressure synthesis are commonly used to create cellulose nanofibrils (CNFs) with diameters ranging from 5 to 50 nm and lengths ranging from 500 to 2000 nm[5].

The goal of this research was to produce nanocellulose utilising sugarcane bagasse as a raw source. The created nanocellulose is then used to create the films. The films are then characterized with FTIR, SEM and Tensile testing.

MATERIALS AND METHODS

Without any more modification, sodium hydroxide, sulphuric acid (98%) of AR grade, and dimethyl sulfoxide of AR grade from SD Fine Chemicals were used; similarly, sodium chlorite from thomus Bakers was used, and polyacrylic acid with a relative molecular mass of 1800 g/mol from Sigma Aldrich, India, was used. As a starting point for the research, sugarcane bagasse from nearby sugarcane juice stores was used.

EXPERIMENTATION

Extraction of Nanocellulose:

In order to transform bagasse into nanocellulose, the bagasse must first go through a series of steps that involve being chemically treated in a number of different ways.

Bagasse, which is manufactured from sugarcane, is collected from the several juice shops located around the community. After giving the item a good washing with water and letting it air dry in the sun for around two to three days, any trace of moisture that may have been left behind is entirely removed. After that, the bagasse that has been dried is maintained in an oven at a temperature of 65 degrees Celsius throughout. After being removed from the oven as necessary, the bagasse is cut into smaller pieces before being crushed with a home mixer grinder. After going through the sieve, the result is a bagasse powder of an extremely fine consistency. The solution of 0.5 M NaOH has 20 gram of pulverised sugarcane bagasse added to it at a concentration of 20 grams per litre. This mixture is swirled continuously at a temperature of 60 degrees Celsius for a period of six hours while the temperature is maintained constant. After waiting for six hours, the mixture is rinsed with a substantial volume of di water till the pH reaches a state of neutrality.

During the acid chlorite treatment, sodium chlorite (NaOCl2) is diluted in 100 millilitres of deionized water and then added to the mixture. The substance is then subjected to continuous stirring and temperature maintenance at 60 degrees Celsius for a period of six hours. The mixture is considered to have been breached once it has been treated with NaOCl2 at regular intervals until it turns white. This signifies that all of the lignin and hemicellulose content has been removed from the combination. After the mixture has become white, it is rinsed with a significant quantity of dilute hydrochloric acid until the pH reaches a neutral state.

After the cellulose has been breached, it is subsequently acid hydrolyzed by adding 15 ml of H2So4 to 35 ml of di water to create a total volume of 50 ml of dilute acid concentration. Following the addition of the diluted acid, the bleached cellulose is heated to 60 degrees Celsius while being continuously stirred for the next eight to ten hours.

The acid content of the acid hydrolyzed cellulose is subsequently removed from it by the process of centrifugation. After that, it is submerged in copious amounts of water until the pH reaches a neutral state. Therefore, nano cellulose may now be extracted. And then it is filed away for later application.

Fig.1: Grinding   **Fig.2:** Sieving   **Fig.3:** Grounded sugarcane bagasse (GSB)

Fig.4: Extracted nanocellulose

Film preparation:

Initially, the CNC and a little amount of DMSO were well combined. Then, the known determined amount of PAA was added with DMSO and was kept for stirring for two hours separately. Later, just the CNC and DMSO mixture was sonicated for around 20 minutes. After that, the solution was cast onto Teflon-coated substrates and heated overnight to 60℃. Films may be peeled and dried-stored once they had fully dried. The terms utilised for these films are listed in Table 1 and were used to create films with different loadings of polyacrylic acid (PAA).

Table.1- Different loadings of PAA with CNC

Sl. no	Sample code	PAA (wt%)
1	CNC-0	0%
2	CNC-5	20%
3	Neat PAA Film	100%

Characterization:

FTIR Spectroscopy:

Recordings of spectral responses were made in transmittance mode as a factor of wave number. FTIR spectroscopy with a Bruker Tensor 2 was used to investigate the chemical stability of the polymer across a range of 400 cm–1 to 4000 cm–1 in wavelength. Before making any adjustments, direct testing was performed on samples of solid films. Using a spectrometer called the Lambda 35 from PerkinElmer, we were able to record the spectral transmittance on cellulose sheets.
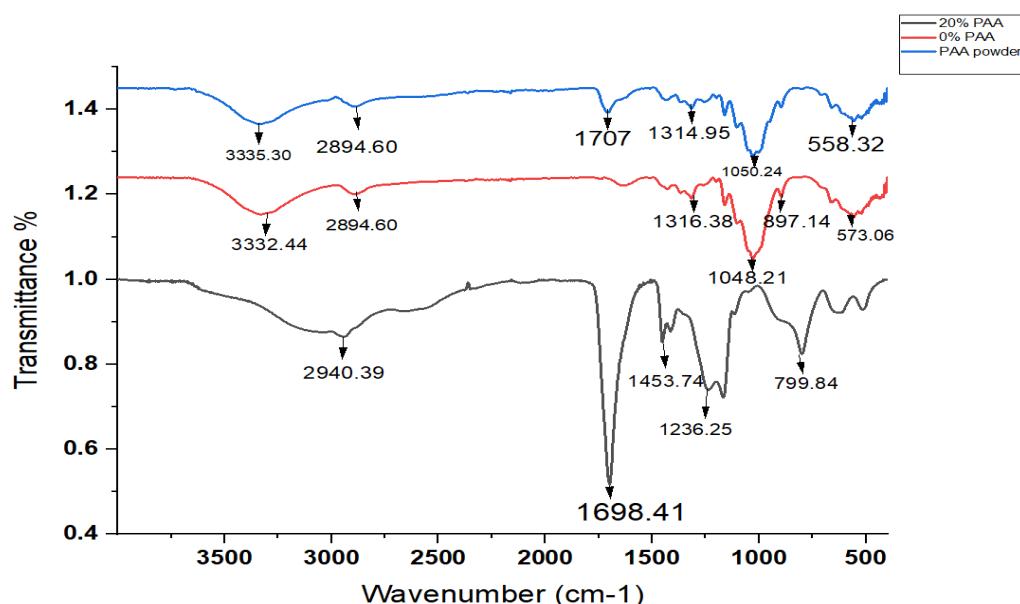
Fig.5: FTIR Spectroscopy of different loadings of PAA

SEM (Scanning Electron Microscopy):

Scanning electron microscopy (SEM) was utilised so that the surface of the films could be determined.
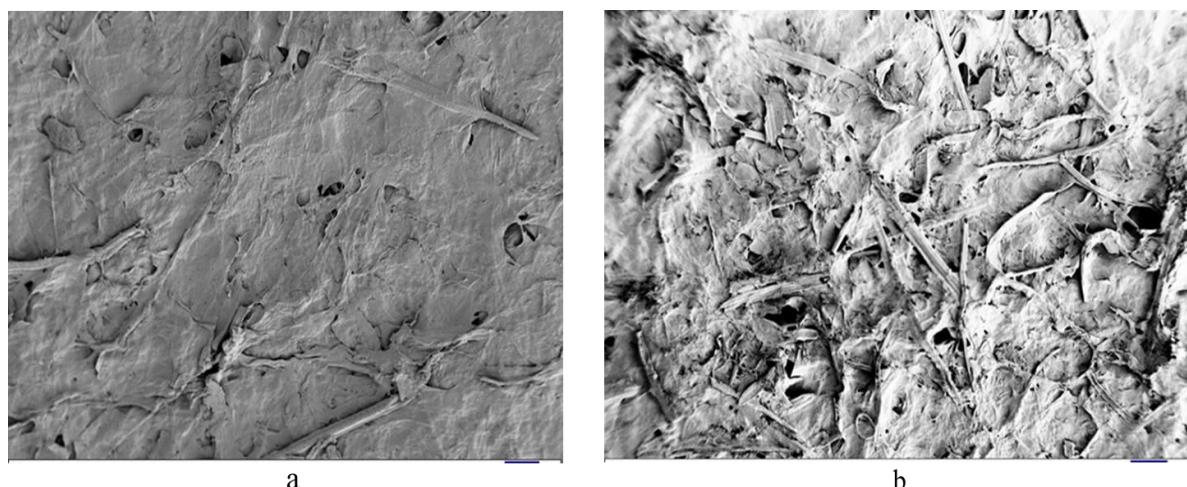
Fig.6: SEM image of Nanocellulose (b) SEM image of CNC+PAA

Tensile Test:

Using Micro UTM of Mecmesin with a 25 N unit cell, the stress-strain behaviour of the material under tension has been studied. Fims were cut according to ASTM standard D638 having overall length of 63mm , 4mm width, and 7mm gauge length.
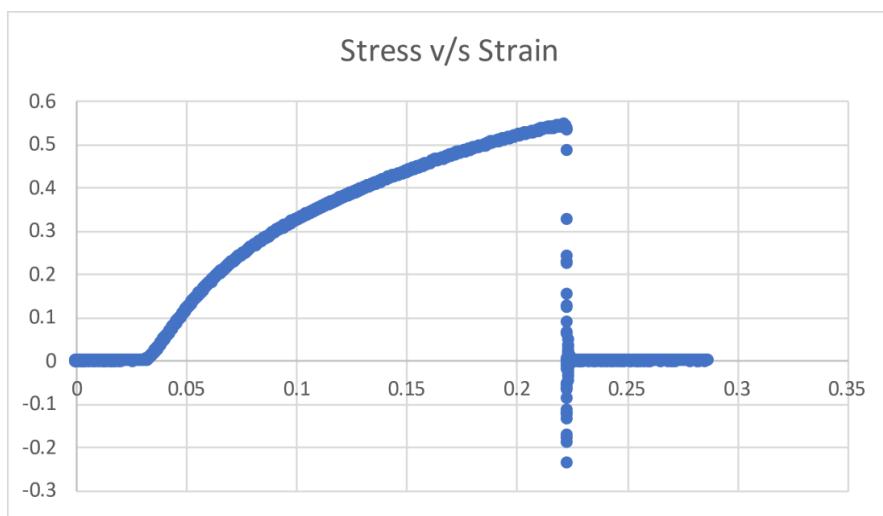
Fig 7: Stress vs Strain graph of CNC+PAA film
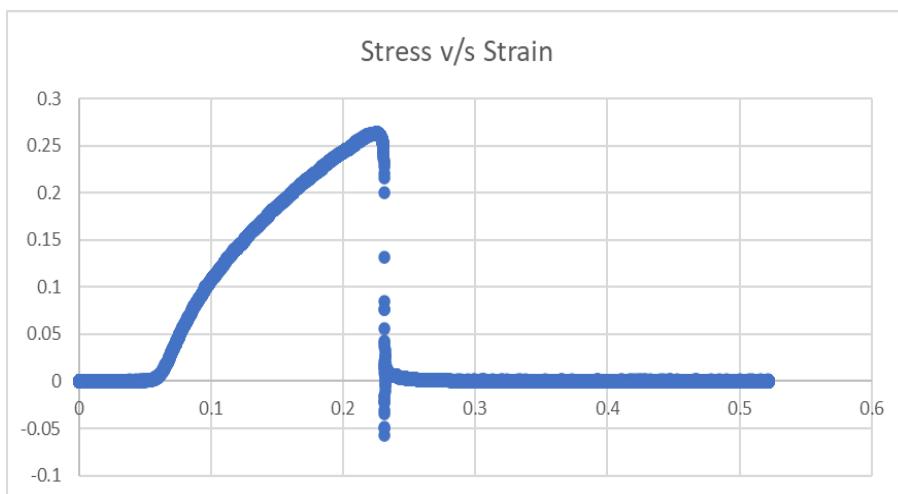
Fig 8: Stress vs Strain graph of Nanocellulose Film

RESULTS AND DISCUSSIONS:

FTIR

This analysis has been done to research the transformation in the chemical structure by finding the functional group in the cellulose nanocrystals. The figure 5. represents the FTIR spectra of neat PAA film, CNC film, and 20 percent PAA film. The main parts of natural fibres include cellulose , lignin and hemicellulose, which are made of aromatics, esters, ketones, alkanes and alkohols, with different o2 functional groups. From the graph we are able to The broad band centred at 3335 cm-1 is assigned to the stretching of –OH groups as well as inter - molecular hydrogen bonds. The spectrum at 1050 cm-1 could be connected to the C-O stretching oscillations of ether groups. The spectrum at 1314 and 1707 cm-1 can be thought to be due to the asymmetric and symmetric modes of stretching oscillations of carboxylic groups (C=O).

SEM

From SEM images we can infer that the nanocellulose film alone is smooth without any cracks or pores, which indicates a better homogeneous film. But the SEM image of CNC+PAA film not that smooth indicating the dispersion of PAA in CNC.

Tensile test

From the tensile test results it is evident that the addition of PAA into CNC has got a significant effect on the strength of nanocellulose film. The tensile strength of CNC+PAA film is found to be higher than that of CNC film alone. Also we can see there is decrease in the strain, which indicates there is not much deformation can be found in the films.

CONCLUSION

By using a solvent casting technique, different eco-friendly nanocomposite films based on cellulose nanocrystals (CNC) filled polyacrylic acid (PAA) were produced in this research. CNC has been isolated using sugarcane bagasse fibres, and the integration of this material into PAA has demonstrated a favourable influence on the tensile characteristics of the resultant nanocomposite films. In comparison to the nanocellulose film by itself, the tensile strength of the CNC+PAA film was much greater. The strong interfacial connections that were produced as a result of the hydrogen bonding that occurred between the hydroxyl groups in the CNC and the carboxyl groups with in PAA polymers were responsible for the increase of the characteristics of such nanocomposite films. As a result, it is anticipated that these environmentally friendly structured nanocomposite films, which have outstanding qualities, will be beneficial in a variety of applications related to packaging.

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CONSUMER PURCHASE INTENTIONS AND ENVIRONMENTAL CONSIDERATION- A STUDY OF SELECT AGE GROUP TOWARDS GREEN ELECTRIC VEHICLES IN GUJARAT

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ABSTRACT

The aim of the present study is to explore the barriers influencing consumers' intention to adopt sustainable electric vehicles (EVs) based on the modified theory of Planned Behavior (TPB) model. A total of 262 valid responses have been selected across the State Gujarat in India. The results of the current study explored how attitude, subjective norm, and perceived behavioral control significantly influenced users' sustainable consumption intentions. The measurements of vehicle performance, namely safety, reliability, range, purchasing price, charging facility, maintenance and battery cost influenced consumers' sustainable consumption intentions. The inferences of the current study could support government and policymakers in designing sustainable programs, which may improve consumers' sustainable consumption intentions to prevent further air pollution and reduce CO_2 emissions from the transportation sector.

Keywords: electric vehicle (EV); environmental concern; green consumption; sustainable EV adoption

1. INTRODUCTION

India is the second largest populated and third-largest road network country in the world. For increasing demand of transportation, Roadways seemed to be a preferred choice of Indians with over 60 % of the population used either personal or shared vehicles to travel. As we knew that conventional vehicles are generally found for the cause of environmental air pollution and global warming. Carbon dioxide (CO_2) is considering as one among the critical components of greenhouse gases (GHGs) that contribute to warming. Thus, reducing carbon emissions universally could be an immediate and considerable challenge, specifically within the emerging transportation sector, because the transportation sector is the largest end-use source of CO_2 emissions. As per the International Energy Agency's report, "the transportation sector contributes around one-fourth of the whole universal greenhouse gas, projected to extend from 23% to 50% by 2030." Therefore, switching to better and simpler vehicles is taken into account an efficient method for reducing CO_2 emissions by several countries.

Alternative fuel vehicles (AFVs) are usually classified as all styles of cars which will be fueled entirely or partially by alternative fuels, biofuels (Ethanol, Biogas), and electricity. Inline, EVs incorporate diverse technologically advanced vehicles, hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), extended-range battery electric vehicles (E-REVs), and battery electric vehicles (BEVs). Within the present study context, EV is taken into account electrified transport with onboard batteries that may be recharged from an electrical outlet. It can even diminish CO_2 emissions substantially, as electricity is generated from green energy sources. Nevertheless, biofuels and electric cars are sustainable solutions. For instance increasing use of biofuel burdened on the cultivated land use that adversely affects forestry. We cannot compromise the forestry so EVs found more suitable with green power generation support. However, the advantages mentioned above offered by EV haven't fully materialized, due to the lack of user adoption. Presently, EV shares a distinct segment market share of the transportation sector.

2. LITERATURE REVIEW

Yang et al (2019), based on the scenario of electric vehicles in China, makes an attempt to understand the Consumer's perception in terms of their Behavioral, Perceived, control, and behaviour attributes and analyses the key factors affecting consumers' purchase intention and actual purchasing behaviour. The literature stated that individuals won't have an interest in using a pro-environmental vehicle that intervenes in their conventional driving behavior. Thus, understanding the factors influencing individuals' intention to adopt a sustainable EV is one among the key elements in ensuring optimal integration.

Additionally, it ultimately measures benefits for both policymakers and therefore the industry regarding green consumption. Since the consumers' behavior could be a critical considers participation, consumption, and adoption, the theory of planned behavior (TPB) is taken into account an appropriate underpinning theory for the present study purpose. However, literature indicating the predictive power of the initial TPB regarding consumers' pro-environmental behavior can be improved using antecedent variables.

Inkpen et al (2015) scrutinizes the outcome of the massive adoption of electric vehicles with respect to the power market. The study concludes that in the presence of photo voltaic generation, the benefits will be significantly amplified by initiating a program for the replacement of Internal Combustion Engine (ICE)

Vehicles with Battery Electric Vehicles (BEV). Such a program would support the power demand and also help in increase the financial savings on the power production side.

Henry Lee and Alex Clark (2018) discusses about the challenges and opportunities for the adoption of electric vehicles. They examine the additional development and advancements needed to propagate the penetration of electric vehicles in the passenger vehicle fleet. The economics of commercial charging of electric is dependent on various factors and has the capacity of changing from location to location.

"The theory of planned behaviour is developed from the theory of reasoned action, which is based on the theory of expectancy value, explaining individual decision-making process from the perspective of psychology. It is basically a theory that provides a link to one's belief system and their behaviours. It examines an individual's behavioral intentions shaped by attitude, subject norms and perceived behavioral control.

Behaviour attitudes represent potential consumers' assessment of the positive or negative impact of buying Cars as electric vehicles (EVs). It depends essentially on whether respondents believe that electric cars are environmentally friendly or not, whether it is cost-effective or not, whether government policies support it or not, whether it will produce less noise than conventional car or not. If a respondent believes in all of these considerations, they may have a favorable attitude toward the car as green electric vehicle.

Referencing from the existing literature, it is thus hypothesized that:

"There are significant factors found to influence the consumers' attitudes, subjective norms, and perceived behavioral control to adopt a sustainable EV."

3. RESEARCH METHOD

3.1 Creation of Theoretical Structure and Hypotheses
This research is founded on the respondents' awareness and perception in Gujarat. The respondents' option to buy an electrical vehicle rather than conventional Petrol or Diesel cars within the near future would then be accustomed determine and analyze the long run impact of the intentional green consumerism. the subsequent theories are developed, in conjunction with this Theory of Planned Behaviour:

Hypothesis 1 (H_1): Subjective norm is positively related to intention to adopt a sustainable EV.

Hypothesis 2 (H_2): Attitude is positively associated with adopting a sustainable EV.

Hypothesis 3 (H_3): Perceived behavioral control has a positive relationship with consumers' intention to adopt a sustainable EV.

3.2 Sample and procedure
The objective population of the present study was Gujarati. Convenience sampling method was applied to attend the samples. There are 262 respondents were finalized to analyze their opinions.

3.3 Data analysis and interpretation
A structured close ended questionnaire with five point Likert's Scale has been preferred to obtain the information. A Pretest and a pilot study were performed to validate the instrument. The outcomes from the demographic survey revealed that around 72% of the respondents were male while 28% are females. The majority of the respondents have completed a Bachelor's Degree (72.5%) followed by Master's degree (23.5) and remaining (3.9) has attended School as their Qualifications. The survey found that the respondents were in the age group of 18 years to 60 years with the maximum number being in the 30 to 45 years of the age group.

The statistical analysis has been done with the SPSS. The Cronbach Alpha coefficients for behaviour were of the order 0.75, 0.7 and 0.71 respectively, which are higher than the acceptable value of 0.7.

The multiple correlation model was developed for measuring the correlation between the intention to shop for the electrical vehicle and therefore the behavioral attitude, subjective norm and perceived behavioral control. the result of the regression model is shown with the beta-coefficients, the quality error obtained, the t-values obtained and therefore the degree of significance.

Results from multiple regression analysis the average regression coefficient for the regression model was found to be important after rendering the regression analysis in R program ($R^2 = 0.81$, F (2.656) = 138.54, $p < 0.01$).

Through this the partial regression coefficients were discovered and the assumptions made above (H_1, H_2 and H_3) followed. In the H_1 hypothesis, it was stated that the more favorable the attitude of the customer towards the electric car is, the greater would be their intention to buy and an actual action of buying an electric car. This was shown by ($\beta = 0.61$, $t = 11.62$, $p < 0.01$).

While in the hypothesis H_2, "the subjective norms of consumers are positively related to the purchase intention of electric cars, that is, the stronger their subjective norms are, the stronger their willingness to purchase electric cars and actual purchasing behaviour." This has been shown by ($\beta = 0.26$, $t = 4.95$, $p < 0.01$). In the hypothesis H_3, "The consumers' perceived behavioral control is positively related to the purchase intention of electric cars, that is, the stronger the perceived behavioral control is, the stronger their willingness to purchase electric cars and actual purchasing behaviour." This proposition was supported ($\beta = 0.13$, $t = 3.27$, $p < 0.01$). From the analysis it was found that the demand for electric vehicles is estimated to grow in the near future.

4. FINDINGS

The current study's findings explored how subjective norm, attitude, and perceived behavioral control positively influence consumers' intentions to adopt EV.

- These findings are consistent with previous findings of Ajzen, I.'s Attitudes and the attitude behavior relation.

- Subjective norm is essential to the growth and development of positive intention that encourages consumers to self-regulate EV adoption.

- Consumers attempt to conform to the expectations of others under social pressure. If consumers perceive a positive attitude toward adopting EV, their intentions of adopting EV also improve. Thus, a positive attitude should be considered an active contributing factor where EV adoption is concerned.

- Promotion of consumer adoption of sustainable EV requires skills, opportunities, and resources related to finding and collecting precise information and preferential policies such as providing a certain degree of subsidies and tax benefits to consumers. Thus, easily available resources could boost consumers' perception of control by improving their skill levels.

- Policymakers must create the right kind of advertisements and publicity policies to reach the tech-savvy generation.

- The maintenance and battery replacement costs negatively influenced consumers' attitude and perceived behavioral control.

- The EV consumers in the survey agreed that environmentally-friendly vehicles such as EV are more expensive than traditional ICE vehicles. At the same time, the lower operative costs reinforced their intention to adopt EV

5. DISCUSSION AND IMPLICATIONS

Talking about the Indian context with regard to electric vehicles, the country is predicted to 1 of the fastest growing countries and encompasses a huge consumer base for the adoption and usage of electrical vehicles. this might attract the foreign players together with the domestic one like Tata Motors, Mahindra and Ashok Leyland to speculate within the production of electrical vehicles. the end result of high adoption of electrical vehicles, increase in demand of electrical power supply and thereby a rise within the demand of oil and gas would determine the impact on this industry and also the demand. The demand for other refined items, like hydrocarbons, petrochemical products, crude may not be impacted that very much like these don't seem to be directly employed in the propulsion of engines. These are mainly required within the ancillary functions of the vehicles like maintenance etc

Other factors are Policies that have a robust impact on EV adoption. The world's EV cities deliver initiatives like guidelines for fuel economy and discounts for cars with zero to low emissions, and emphasis on charging infrastructure. An ambitious EV strategy can help create trust among private suppliers and productive systems will boost demand for EVs. The incorporation of charging infrastructure within the framework is probably going to produce momentum to the development of public charging facilities throughout the country. it might see the introduction of charging stations in not just in Tier 1 cities but also in Tier 2 cities and highways. one amongst the foremost important issues for patrons is probably going to be resolved – the country's dearth of charging facilities. The incentives and subsidies are expected to offer a giant boost to the assembly of latest battery materials and chemicals. These policies will enable the manufacturers to manufacture electric vehicles at a lower cost. this is able to mean that the electrical vehicles might see a surge in demand and more buyers within the market.

6. LIMITATIONS AND SUGGESTION FOR FUTURE RESEARCH

While conducting this research, certain limitations were identified, with some suggestions for future studies. First, this study was limited to the consumers of Gujarat state only it has not cover all the states in India. In future studies, it would be ideal to consider all the states and major cities of India.

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FOOT NOTES

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UNIFIED PAYMENT INTERFACE, A REVOLUTIONARY METHOD OF FUND TRANSFER

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ABSTRACT

National Payment Corporation of India (NPCI) launched Unified Payment Interface (UPI), a mobile centric real time interbank payment system to shift Indian population from cash to online payments. The users also started preferring the same due to its 24*7 availability, flexibility and convenience. Demonetization announced in December 2016 promoted the usage and the pandemicinduced lockdown resulted in enhanced usage due to the fear of spread of infection through social contact and exchange of currency. Further the smart phones and its competitive, affordable prices help the consumers to adapt to different mobile applications and electronic banking. This study concentrates on the journey of UPI since inception and also the consumer perception towards the same.

Keywords: NPCI, UPI, Digital payment modes

INTRODUCTION

The acceptance of one touch payment is influenced by the availability of an internet connection, one touch access, and safe financial transactions. As a result, in order to maximize the benefits of smart phones and technology while also developing a forum for cashless and open financial transactions, the Indian government created one significant device, UPI. UPI is a simple payment tool developed by NPCI. It is based on the IMPS system. UPI can be used on a smartphone and acts as a money-related email address. It enables users to use a virtual Payment Address (VPA: A VPA is an ID that a user generates by linking their accounts to a bank's mobile application) as a payment identifier for sending and receiving money, and it works with just one click. UPI mode for person-to-person payments has been well accepted. It is giving tough fight to electronic wallets as wallets need more stringent KYC adherence. How UPI as a single solution for person-to- merchant transactions need to be studied as it aims at capturing the entire Indian business. PhonePe, Google Pay, and BHIM dominate as the most commonly used UPI options. UPI has become a favorite option among the users and hence, the study tries to understand the statistics of UPI market over the period and also the acceptance of the users.

Conceptual Framework:

The research revolves around UPI's growth over the period and also tries to understand the user comfort level for the same.

1. Unified Payment Interface (UPI) –

The Unified Payments Interface (UPI) is a framework that combines many banking functions, seamless fund routing, and merchant payments into a single mobile application (of any participating bank). It also manages "Peer to Peer" collection requests, which can be arranged and charged according to need and convenience. In light of the above, the National Payments Corporation of India (NPCI) conducted a pilot launch with 21 member banks. Dr. Raghuram G Rajan, RBI Governor, launched the pilot on April 11th, 2016 in Mumbai. Since August 25, 2016, banks have been uploading their UPI-enabled apps to the Google Play store. Various options under UPI include

2. Digital Payment Modes in India –

There are a variety of factors that are facilitating the growth of digital payments and the transition from a cash-based economy to one that is less cash-based. The penetration of internet access on smart phones, non-banking financial institutions enabling digital payment, one-touch payment, the growth of the financial technology industry, and government pushes, either by incentives or tax cuts, are examples of these facilitators. In India today, there is a favourable environment for the growth of digital payments. In India, there are currently a variety of digital payment options including UPI, electronic wallets, debit and credit cards, RuPay cards, NEFT, RTGS etc.

3. National Payments Corporation of India (NPCI) –

Under the provisions of the Payment and Settlement Systems Act, 2007 it is a joint initiative by Reserve Bank of India and Indian Banks' Association to establish digital payments and settlement system in India. It is a not-for-profit organization registered u/s 8 of the Companies Act, 2013. It aims to touch every Indian with one of the NPCI's products and services.

Need and Objectives of the study:

UPI has evolved as the most convenient, easy to use and fast mode of payment and catching its customers with a great pace. It is interesting to know public view and admiration for the same and also its journey from its inception. Hence, below broad objectives have been set for the study.

1. To analyze growth of UPI on year-on-year basis.

2. To understand the people awareness and their acceptance of UPI as a mode of payment.

RESEARCH METHODOLOGY:

The structured questionnaire was circulated to collect response from 100 respondents. Since the young generation is more aware about the digital means, handling various gazettes, and are very active on the social media as compared to the middle age group or the seniors, they were approached to understand their views about UPI. Convenient sampling method has been adopted for the purpose of this study. Lot of research material and details from various web sites and NPCI platform have been used for the purpose of the analysis.

ANALYSIS AND FINDINGS:

UPI growth Y-O-Y basis since inception –

Year	No. of Banks live on UPI	Volume (in Mn)	Value (in Cr.)
FY 2016-17	44	17.86	6,947.05
FY 2017-18	91	915.23	109,831.92
FY 2018-19	142	5,353.40	876,969.76
FY 2019-20	148	12,518.62	2,131,730.13
FY 2020-21	216	22,330.65	4,103,653.59
FY 2021-22	314	45,967.52	8,417,572.48

Source - https://www.npci.org.in/what-we-do/upi/product-statistics
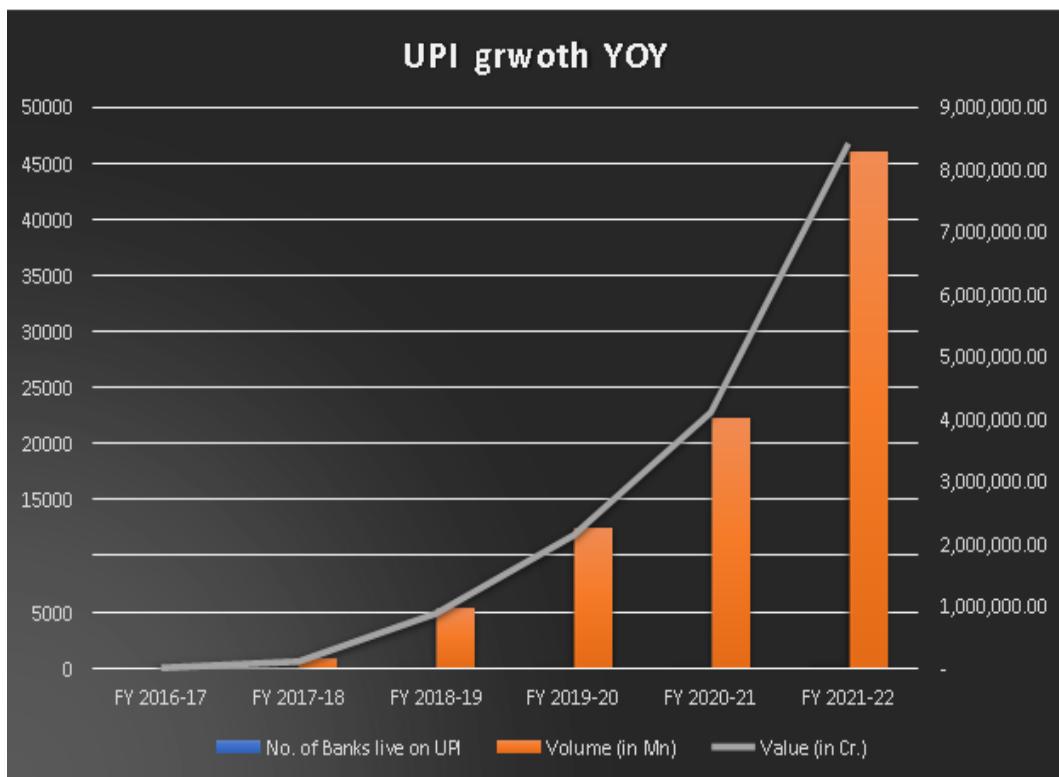
Above details evident that the number of banks which were linked to UPI in FY 2016-17 were just 44 and as at the end of March 2022 this number has increased to 314 banks. Similarly, the volume of transactions and the value has increased substantially.

It is further interesting to know the contribution of various applications which are mostly used for the transactions under UPI apps. The commonly used platforms are PhonePe, Google Pay, Paytm, BHIM, Amazon Pay. All together make UPI a strong performer in Indian market. The latest published data in Jun 2022 show below statistics –

Apps	Market Share
PhonePe	47%
Google Pay	34%
Paytm	15%
Others	4%

Source - https://www.npci.org.in/

The data shows that PhonePe is a dominant player followed by Google Pay and then Paytm. People have started choosing BHIM and Amazon Pay as well but, the usage is still low as compared to PhonePe and Google Pay.

It is important to know what the end user feels and what is his perception hence, below analysis.

1. **Are You Aware About UPI?**

Aware but not completely	27
Fully aware	56
Heard of it, but very less aware about it	7
Unaware	10
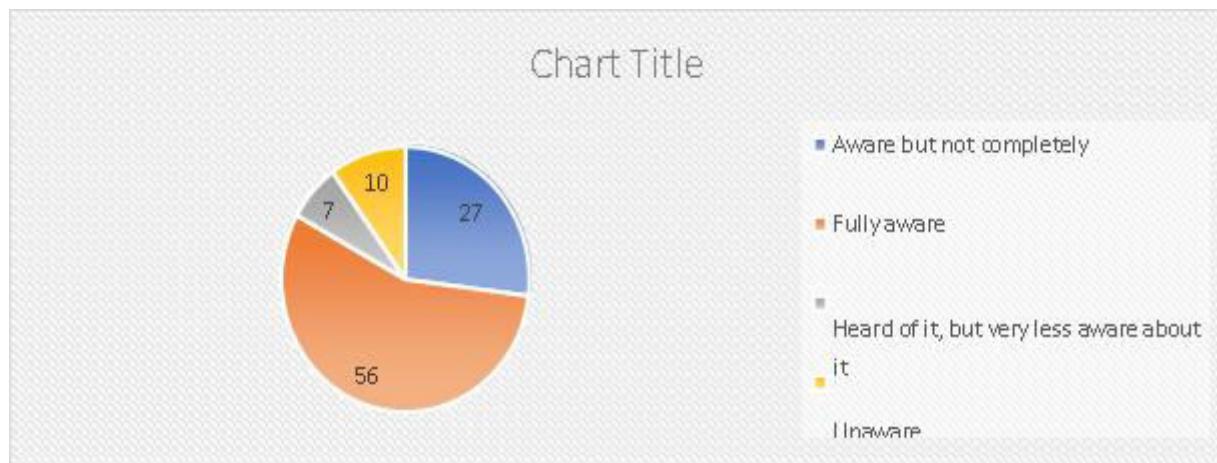
It shows that more than 50% people are aware about UPI.

2. **Which Mode of Payment/Fund Transfer Do You Prefer the Most?**

Cash	**26**
Debit/Credit Card	10
Digital wallet	6
NEFT/RTGS	4
NetBanking	4
UPI	50

UPI counts the maximum among all other digital modes.
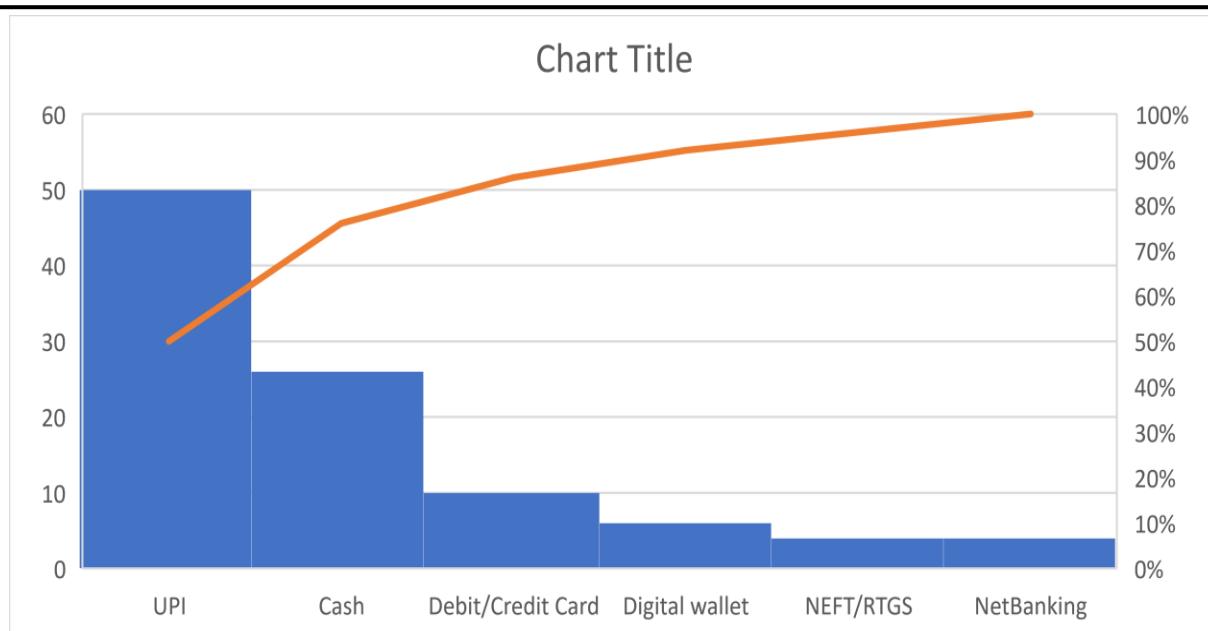
3. How Often Do You Need to Make Digital Payments?

	Below Rs. 1,000	Rs. 1,000-5,000	Rs. 5,000-20,000	Above Rs. 20,000
Very often	52	22	9	5
Often	24	33	15	10
Sometimes	13	29	33	18
rarely	5	10	32	31
Never	6	6	11	36
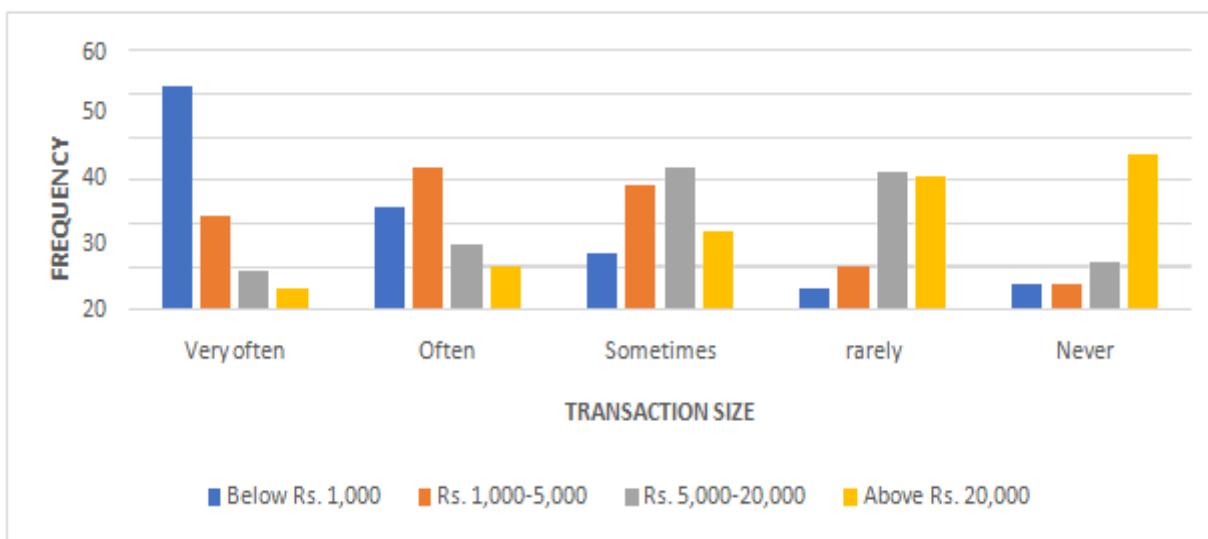
People are using digital methods for low value transactions as compared to high value transactions. The reason might be lack of awareness or security reasons which are holding back the respondents from using digital means of payments.

4. Which App Do You Prefer For Digital Payment?

BHIM App	25
Google Pay	69
PhonePe	32
PayTM	22
Amazon Pay	11
Bank App	16
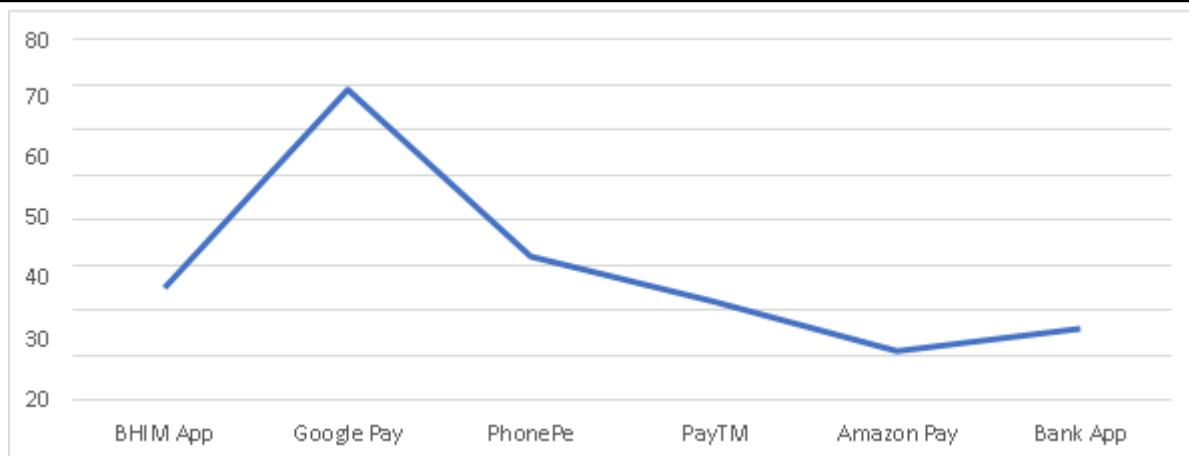
It clearly indicates people preference towards Google Pay followed by PhonePe and so on in UPIapplications.

5. **Please Rate The Following With Respect To UPI?**

	Registration mechanism for UPI	Using UPI payment mechanism	overall working of UPI
Non-user	8	7	8
Very easy	38	36	33
Easy	40	40	34
Moderate	11	13	19
Difficult	3	3	5
Very difficult	0	1	1
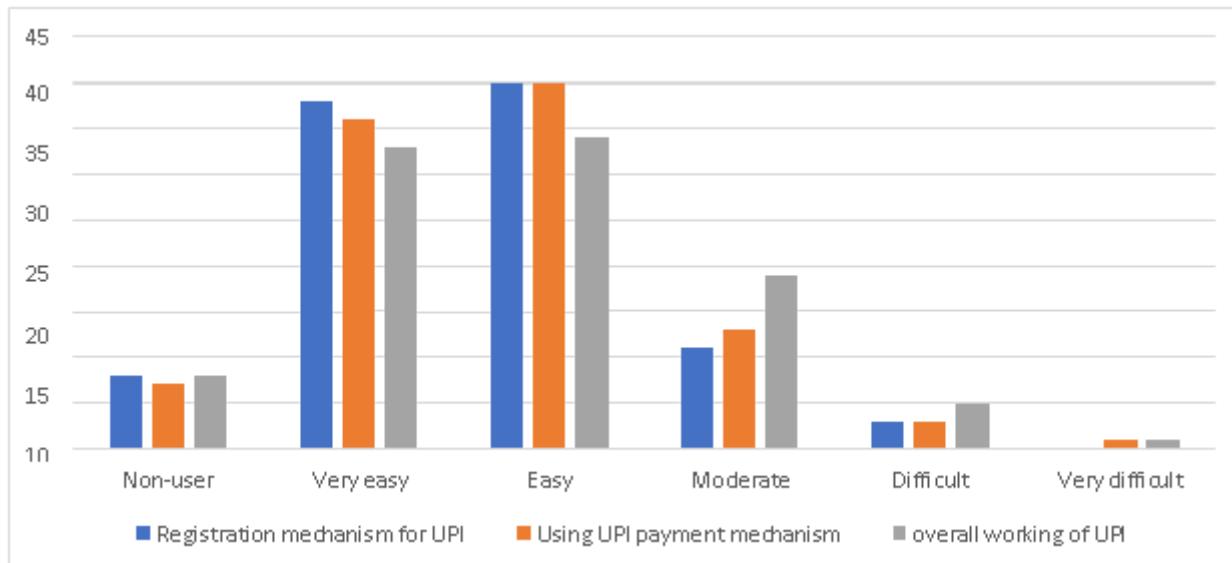
It looks like people are finding UPI as the most convenient option and hence opted for easy option among all other options.

LIMITATIONS AND FURTHER SCOPE FOR THE STUDY
This study has concentrated only on UPI which leads to the scope of studying other modes of digital transactions. Further, the respondents chosen were college students from Mumbai hence, responses from different age groups and residing at different places can be approached.

CONCLUSION
Analysis reveals that people are preferring UPI over other options and shifting to digital methods from the traditional modes like cash and cheques. Year on year analysis also indicated that the risein the volume and value of the transactions along with the partner banks are continuously rising which clearly indicates that this digital method has strong future and the acceptance. The focus group was of college students for the purpose of the primary study. The young generation is muchadaptable and is exposed to new methods hence, if they are aware and comfortable then it is easyto cater to other people as they can teach or spread the awareness among other age

group. Still fewstudents were found unaware about UPI and few students opined that UPI could be used for low value transactions. Indian government is making all the efforts to promote cash less economy and this study provides input to the government as well as other stakeholders to decide the future course of action in order to increase further usage of UPI. Other players will also get fair idea regarding public demand and if they would want to make changes and introduce better options to attract more users.

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IDENTIFICATION OF BARRIERS TO THE INCLUSION OF SUSTAINABLE DEVELOPMENT PRACTICES IN THE ROAD TRAFFIC INFRASTRUCTURE DEVELOPMENT INDUSTRY IN A DEVELOPING COUNTRY, MAURITIUS

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ABSTRACT

Adoption of sustainable development practices in all spheres of development is a crucial need for humanity at large. Developing countries are those which are lagging much behind in the change required towards sustainability. The construction industry while contributing, largely to the overall socio-economic development worldwide, is a major exploiter of natural non-renewable resources, a significant polluter of the environment and has a major impact on economic and social inequity. More attention has been devoted to sustainability research in building construction than in the road traffic infrastructure development industry, much scarcer in developing countries. The government in Mauritius is investing considerably on road projects but the infrastructure development processes and methods have remained traditional and are almost devoid of sustainable development practices. This research aimed at identifying barriers hindering the application of sustainable development practices in the road sector in Mauritius by industry professionals. A quantitative research methodology was used with a structured questionnaire as research tool whereby descriptive and inferential statistical analysis, namely; the Pearson Chi-square test and Kruskal-Wallis test were done using SPSS. It was found that even though the level of awareness and knowledge about sustainability principles was low, whereby sustainability concepts are more directed towards environmental protection and much lesser towards economic and social aspects, the importance of sustainable development was acknowledged. With reference to the relative importance index (RII) 'Resource conservation, innovation' and 'wellbeing and quality of life' was found to the most rated drivers for environment, economic and social sustainability. Also, 'lack of priority from the government', 'lack of regulations and planning guideline's' and 'lack of demand' were ranked as the most significant barriers.

Keywords: sustainable development barriers, road infrastructure, developing country, SDGs.

1.0 INTRODUCTION

Sustainable development is an ambitious developmental goal that has been established by the United Nations in order to promote comprehensive social, environmental, and economical sustainability which is crucial for humanity at large. The 17 Sustainable Development Goals (SDGs) and 169 targets constitute the core of the 2030 Agenda for Sustainable Development adopted by the international community in September 2015 that seeks to transform our world and guide all global, regional and national development strategies. Through Goal 9, the Member States of the United Nations call upon the international community to "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". This is the most direct call for increased sustainability in infrastructure in the SDGs. More specifically, the target 9.a point out for facilitation of sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States (SIDS). Infrastructure development is concerned with the activities involved in the creation of physical infrastructure and therefore comprises of all civil-engineering works for new projects as well as the maintenance and repair of existing structures. Thus, the aforementioned SDG target relates largely to the construction industry (CI) in developing countries.

The construction industry has been globally acknowledged as one of the main engines of economic growth and development. It provides the infrastructure required for other sectors of the economy to flourish, thus enhancing sustainable development. The construction industry while contributing, largely to the overall socio-economic development in every country, is a major exploiter of natural non-renewable resources and a significant polluter of the environment. The latter aspects include the extraction and beneficiation of raw materials, the manufacturing of construction materials and components, the construction project cycle from feasibility to deconstruction and the management and operation of the built environment (UNCHS, 1996). The impact of the CI on the environment rates as one of the highest among all the industries (Uher & Lawson, 1998) as this activity sector is responsible for a substantial amount of global resources use, waste generation and emissions. Hence, on one hand the CI with all its activities are key areas in the attainment of sustainable development (CIB, 1999a; Ganesan, 2000) and on the other hand the same industry impacts negatively on sustainability. Plessis (2002a) advocate for a holistic process aiming to restore and maintain harmony between the natural and

built environments. The Sustainable Development Task Force (SDTF, 2003) suggests incorporating, inter alia, the environmental effects into the criteria for awarding construction contracts and expressing their effects in monetary terms.

Broadly, the CI consists of two main sectors; the building construction sector which involves the design, construction and maintenance of residential and non-residential buildings, and the roads and civil construction sector, which includes the design, construction, maintenance and repair of roads, runways, bridges, tunnels and related structures including drainage and road services. It can be observed that remarkable progress has been made in the building sector regarding application of sustainable development principles for building construction projects. Life cycle assessment (LCA) systems and certification systems for buildings were developed more than three decades back by a number of developed nations (Uher & Lawson, 1998). Some of the most popular existing building projects rating/certification systems are as follows; BREEAM (UK), developed in the year1990, Home Energy Rating (UK), BRE Office Tool Kit (UK), BREDEM (UK), Waste/Environmental Data Sheet (Europe), European Eco-labelling (Europe). Some popular certification systems for green building in the world are the Leadership in Energy and Environmental Design (LEED) in the USA, Comprehensive Assessment System for Built Environment Efficiency (CASBEE) in Japan, Demarche Haute Qualité Environnementale (HQE) in France, EcoProfile in Denmark, Green Building Initiative (GBI) in Canada and German Sustainable Building Council (DGNB) in Germany (Grace, 2000).

However, the road traffic infrastructure sector has lagged behind regarding development of indicators and assessment tools for measuring the integration of sustainable development principles in project design, construction and operation. Nevertheless, there are two popular rating systems for highway projects, one for EU countries and the other developed in the USA. The first one is the "Transport and Environmental Reporting Mechanism" (TERM) series, whereby TERM 01 concerns the total energy consumption in transport; TERM 02 deals with GHG emissions in the transport sector; TERM 03 assesses the air pollutant emissions in the transport sector; TERM 04 is about air quality requirements; TERM05 concerns exposure to traffic noise and irritation caused; TERM 06 deals with the fragmentation of ecosystems and habitats by transport infrastructure; TERM09 is in relation to the number of fatal accidents and serious injuries; TERM 11a considers the generation of waste from end-of-life of vehicles and TERM 11b concerns oil waste and used tires from vehicles. The second one is the 'Greenroads' rating system which was developed by the University of Washington initially in 2007 and has further developed into several versions since its creation.

The aforementioned rating systems for road infrastructure projects have been developed within developed countries context whereby many parts of the content refer back to rules and regulations that are already present in those developed nations and which does not exist in developing countries. Thus, the latter rating systems may not be easily adapted to the developing world. Regarding the TERM assessment system, described above, it considers to a larger extent the operation phase of roads and to a lesser extent with the design and construction phases.

Sustainable development in road traffic infrastructure development can be understood as the effect of qualitative and quantitative transformation of processes in the planning, design, construction, operation and maintenance of traffic facilities relative to traditional methods. This would require change from existing methods within all stages of projects and also at different levels, namely; political, social, economic, institutional and technological. The change should enable and enhance contribution to poverty alleviation, creation of healthy and safe working environment, equitable distribution of social costs and benefits of construction, facilitation of employment creation, development of human resources, acquiring of financial benefits and uplift of the community. The present time calls for a heightened urgency for change from unsustainable practices as early and quickly as possible due to the alarming economic, social and environmental conditions worldwide but mostly in developing countries.

The challenge remains a whole regarding attainment of sustainable development practices in road traffic infrastructure project, mostly in developing countries. Despite, the term 'sustainable development' having reached quite deep into popular consciences in the latter countries and where institutions often recognise sustainability as a major policy goal, still no major change can be observed in the processes of road infrastructure development. As observed in Mauritius, sustainability concepts and aspects are not quite visible in the design, resource exploitation, technological innovation, performance measurement and accountability, and operational efficiency at different stages of infrastructure projects whereby processes have remained almost the same since decades. Thus, there is a pressing need to identify what are the barriers for application of sustainable development principles and methods in road transport development projects in a developing country such as Mauritius.

Presently, the government of Mauritius is investing considerably on road infrastructure projects. However, the infrastructure development processes and methods have remained quite traditional lacking in sustainable development principles despite some concerns expressed at policy level concerning environmental protection. Thus, it is crucial to increase awareness about the concept of sustainable development and the importance of integrating sustainability practices in projects in ways that enhance economic, social and environmental well-being in order to hasten progress in the achievement of the SDGs. The objective of this research is to highlight the pressing need for the adoption of sustainable development principles in physical infrastructure development and at the baseline the identification of barriers to the application of sustainable practices in the road traffic infrastructure development industry (RTIDI) in Mauritius.

2.0 RESEARCH METHOD

This research was conducted using primary data collected through a questionnaire survey whereby the literature review formed the basis for designing the questionnaire which was created using a web-based platform, Google forms. The latter enabled filling and submission of the questionnaire online. The questionnaire was structured around a Likert scale of five point to rate the level of importance/interests/awareness/knowledge of sustainability and designed into four sections, so as attain the research objectives.

The first section captured the demographic details of the respondents, which was then used to investigate influence of the latter parameters on the main findings. The second section gauged the perception and understanding among the local construction professionals in Mauritius on the subject of sustainability in land transport infrastructure construction projects. The third section consisted of the identification of the key drivers and barriers to sustainability in road and rail infrastructure as perceived in Mauritius. Finally, the last section investigated the level of knowledge and popularity of sustainable practices with regard to the design and implementation of land transport infrastructure project in the local context.

A pilot study was initially undertaken by requesting the opinion of 15 stakeholders involved in the land transport construction industry in Mauritius to detect any issues. The questionnaire was fine-tuned based on the results of the pilot study and the final list of questions was adopted for the study.

For the main survey, the respondents were chosen among a specific group of stakeholders which included Project Managers, Contract Managers, Site Engineers, Design Engineers, Quantity Surveyors and representatives of the Client who were all professionals from the government sector. To ensure that the sample is representative of the population and to ensure holistic views are obtained, the respondents were chosen to be from the private sector, parastatal bodies and government sectors. The questionnaire was distributed to 200 local professionals in the land transport infrastructure sector in Mauritius.

At the end of the 4-week period, a total of 96 questionnaires out of the total of the 200 sent was received back and were all answered correctly, eliminating the need for rejecting any filled questionnaire.

Responses downloaded from Google forms were transferred to a spreadsheet format prior to coding and input into the statistical analysis software, the Statistical Package for Social Science (SPSS).

The data collected were analysed using excel and the SPSS software. The analysis was carried out using descriptive and inferential statistics in order to extract useful knowledge from the data set.

The following computational statistics was used:

- Descriptive statistics
- Central tendency, mean, mode, median, ranking (RII method)
- Cross tabulations
- Inferential statistics
- Normality tests
- Chi square tests
- Kruskal-Wallis test

This Likert type question on a scale 1 to 5 the Relative Importance Index (RII) was calculated using the equation as below (Adnan et al, 2007).

$$RII = \frac{5n5 + 4n4 + 3n3 + 2n2 + n1}{5(n5 + n4 + n3 + n2 + n1)}$$

Where;

n1: number of respondents who strongly disagree

n2: number of respondents who disagree

n3: number of respondents who are neutral

n4: number of respondents who agree

n5: number of respondents who strongly agree

Cronbach alpha test was conducted for all Likert scale type questions in the questionnaire to determine if the scale is reliable whereby all Cronbach's alpha coefficients were found to be over 0.6 demonstrating that consistency/reliability was achieved.

3.0 ANALYSIS AND RESULTS

3.1 Demographic Profile of Respondents
The majority of the respondents were relatively young professional with 62.2% being in the age 26-35 age group followed by 18-25 (21.6%), 36-45 (8.1%), 46-60 (6.8) and above 60 years (1.4%). A large majority of the respondents were male with a percentage of 90.5 as compared to 9.5 for females.

Concerning the education level 60.8% held a Bachelor degree, 23.0% studied up to Masters level. Those having a Diploma represented 9.9% and 1.4% had a PhD degree.

This survey targeted professionals from different background within the road traffic infrastructure development industry (RTIDI) and who had decision-taking roles. A well-diversified range of professionals were involved whereby 35.1% were design engineers, 29.7% were site engineers, 14.9% were project managers, 9.5% were quantity surveyors, 8.1 were technical officers and 2.7 % were contract managers.

Most of the professionals participating in the survey has work experience in the range of 1-5 years (50.0%), those having work in this field for the range 6-10 years represented 25.6% of respondents. Those with more than 15 years of experience consisted of 14.2% and 10.2% had been in the industry for a period in the range of 10-15 years. Thus, the respondent sample had relatively good work experience in the RTIDI field.

Respondents were distributed under various types of organisation, namely the private sector and public sector including parastatal bodies, and according to the type of activity within the RTIDI. The results reveal that 23.6% of the respondents were from the public sector and parastatal bodies whereby this proportion represent Developer/Client of road infrastructure projects. From the private sector 34.3 % of the respondents were from Contractors' firm, 24.8% were from Consultancy firms, 12.6% were from Project Management firms and 4.7% were from Quantity Surveying firms.

Responses were obtained from respondents working in organisations of different size. Thus, 28.4% were employed in organizations with less than 50 employees, 47.3% belonged to firms in the range of 51-200 employees, 14.9% worked in relatively large firms with 201-500 employees. A lesser proportion of respondents were from firms with 501-1000 employees (4.1%) and those working in firms with over 1000 employees represented 5.1% of the responders.

3.2 Awareness, Knowledge and Understanding of sustainable development (SD) principles in the Road Traffic Infrastructure Development Industry (RTIDI) in Mauritius
Among all the respondents, it was found that a large majority (73%) were aware about the existence of sustainable development (SD) principles for the RTIDI whereby 23% were not cognizant about the latter concepts at all. Concerning the respondent's source of knowledge about sustainable development in RTIDI, a higher proportion (34%) of the respondents revealed that internet was their primary source of information. For 21.6% of the responders, they had acquired knowledge about sustainability at their workplace and 19.4% among the professionals has had some sustainable development knowledge through their programme of studies, either undergraduate or postgraduate, at the university. It was quite interesting to note that 13.4% among the answerers had received formal training/workshops on the subject of sustainable development and 11.3% of the respondents received knowledge about sustainability concepts through government programmes.

Regarding the degree of importance about applying sustainable development principles in the RTIDI, a high proportion of respondents acknowledge it as very important (50.7%) and 33.3% agree that it is fairly important. For 13.0% of responders it is just important and 2.9% believed that it is slightly important. What is quite positive is that none have rated application of sustainable development principles in RTIDI as being not

important. Thus, all the respondents recognize to different level of importance the relevance of sustainable development in the context of road infrastructure provision, operation and maintenance.

About their level of knowledge about sustainable development applicable to the RTIDI, the majority of the respondents claimed to be somewhat knowledgeable (43.5%) on the concept of SD in road infrastructure projects. Those assessing themselves as slightly knowledgeable represented 26.1% of responders, 20.3% were moderately knowledgeable, 5.8% did not have any knowledge about the subject and 4.3% among them believed they were extremely knowledgeable.

3.3 Chi-square test of association between demographic factors and importance, interest, awareness and knowledge about sustainable development (SD) principles in the RTIDI

The Chi-square test of independence was used to evaluate the existence of statistically significant relationship between the demographic factors of age, profession and level of education, and the categorical variables of importance, interest, awareness and knowledge of respondents about the principles of sustainable development in the road traffic infrastructure development industry.

The Pearson chi-square value, the p-value and the degree of freedom at a significance level of 5% are tabulated in Table 3.1 below.

The Null hypothesis being that for each pair between each of the three demographic factors and each of the four variables; importance, interest, awareness and knowledge there is no significant statistical relationship.

The result of the chi-square test of independence show that only regarding awareness and knowledge about sustainable development, whereby the p-values were respectively 0.036 and 0.021 (both < 5%), the latter two parameters depend on the level of education of the respondents.

Apart from the aforementioned association no other association was found. Thus, importance, interest, awareness and knowledge about SD was found to be independent on the age and profession of the respondents. Also, importance and interest about SD did not depend on level of education, except for awareness and knowledge as stipulated above.

Table 3.1 - Chi-square test results for relationship between demographic factors and motivation variables of sustainable development

	Pearson Chi-square	p-value	df
Importance of SD			
Age	6.472	0.890	12
Level of education	9.814	0.632	12
Profession	10.543	0.784	15
Interest in SD			
Age	8.115	0.776	12
Level of education	12.163	0.433	12
Profession	10.092	0.814	15
Awareness about SD			
Age	20.655	0.192	16
Level of education	27.476	0.036	16
Profession	13.376	0.861	20
Knowledge about SD			
Age	14.062	0.594	16
Level of education	19.988	0.021	16
Profession	18.379	0.562	20

3.4 Drivers for sustainable development in road traffic infrastructure development industry (RTIDI) in Mauritius

The results of the ranking of the calculated values of the Relative Importance Index for the three categories of drivers, namely; environmental, economic and social drivers of sustainable development in the RTIDI in Mauritius was determined separately. The results are tabulated in Tables 3.4.1, 3.4.2 and 3.4.3 below.

Table 3.4.1 - Environmental Drivers of sustainable development in the RTIDI in Mauritius

Environmental Drivers for sustainable development in the RTIDI in Mauritius	Relative Importance Index(RII)	Rank
Resource conservation	0.769	1st
Environmental friendly technologies	0.768	2nd
Protection natural environment	0.765	3rd
Energy efficiency	0.764	4th
Reduction in GHG emissions	0.759	5th

Table 3.4.2 - Economic Drivers of sustainable development in the RTIDI in Mauritius

Economic Drivers of sustainable development in the LTIDI in Mauritius	Relative Importance Index(RII)	Rank
Innovation	0.771	1st
Regulations, legislations and planning guidelines	0.770	2nd
Lifecycle cost assessment (LCA)	0.759	3rd
Quality management for durability	0.743	4th
Image & reputation	0.681	5th
Enhanced marketability	0.680	6th

Table 3.4.3 - Social Drivers of sustainable development in the RTIDI in Mauritius

Social Drivers of sustainable development in the RTIDI in Mauritius	Relative Importance Index(RII)	Rank
Well-being and quality of life	0.768	1st
Health and safety(occupational & public)	0.738	2nd
stakeholder and community engagement	0.700	3rd
Preserving cultural heritage	0.670	4th

3.5. Barriers for sustainable development in road traffic infrastructure development industry (RTIDI) in Mauritius

The ranking of the calculated values of the Relative Importance Index for barriers to sustainable development in the RTIDI in Mauritius was determined. The results are tabulated in Table 3.5.1 below.

Table 3.5.1 Barriers to the application of sustainable development principles in the RTIDI in Mauritius

Barriers to sustainable development in the RTIDI in Mauritius	Relative Importance Index(RII)	Rank
Lack of priority/support/incentive from government	0.769	1st
Lack of regulation & planning guidelines	0.762	2nd
Lack of demand from promoters/developers/clients	0.746	3rd
Resistance to change from traditional practices	0.745	4th
High investment costs versus low perceived benefits	0.705	5th
No appropriate technology/expertise	0.703	6th
Lack of awareness, education, knowledge to promote sustainable development	0.697	7th
Lack of measurement tool	0.692	8th
Risk of investment/skepticism about long term performance	0.690	9th
Lack of technical skills among professionals	0.598	10th
Unfamiliarity with maintenance and associated costs	0.597	11th

4.0 DISCUSSION

The results of this study show that resource conservation was perceived to be the most important environmental driver in order to promote sustainability on road construction projects in Mauritius. This is in line with the findings of previous research (Durdyev et al., 2018) whereby the construction industry is acknowledged as a heavy consumer of natural resources worldwide. A significant difference from previous research is the use of environmentally friendly technologies which was ranked 2nd in this study with an RII of 0.768 whereas the latter parameter has been ranked lower by Durdyev et al. (2018) and Chan et al, (2018). Moreover, with reference to Darko et al. (2017) and Manoliadis et al. (2006) who found energy efficiency as the most influencing driver in sustainable construction practices has been ranked forth in this study.

As highlighted by previous research (Durdyev et al., 2018), the economic drivers of sustainable development have not received adequate attention as sustainability is more often understood to relate to solely environmental issues. In this research, according to respondent's opinion, Innovation received the most important rating for economic drivers of sustainable development, which implies that the stakeholders are conscious that the traditional road construction practices do not comply with sustainable processes. As per Oad, (2016), it is possible to achieve considerable profits in the long term, as the use of innovation will help to reduce maintenance costs of roads.

Regulations, legislations and planning guidelines was also highly rated. This is consistent with the findings of by AlSanad (2015) where rules and regulations was perceived as one of the most important driving factor towards sustainability whereby enforcement of new rules and planning policy guidelines encourage stakeholders to implement the new construction practices and hence promote sustainability. Life cycle assessment and quality management for durability was also considered as important whereby a more holistic approach to sustainability should be envisaged. The economic driver of "Image and Reputation" was given lower importance as stakeholders often prioritize on short-term/quick profit rather than capturing the economic advantages of long-term image and reputation building.

Regarding social drivers of sustainable development, well-being and quality of life, health and safety and stakeholder and community engagement was perceived to be the most important social driver of sustainability in road construction projects in Mauritius (Akadiri et al., 2012). Regarding the 'stakeholder and community engagement' driver, it can be explained by the logic that properly managed stakeholder engagement encourages all stakeholders to work together for the benefit of the project. This in turn increases the quality of life and well-being while reducing the adverse impacts and increasing the economic benefits of the project. Therefore, it can be deduced that the driver of well-being and quality of life cannot be fully achieved without stakeholder and community engagement.

Lack of technical skills being identified as an important barrier is highly justified as in developing countries the latter aspect is quite relevant. Regarding lack of demand, this is due to the fact that stakeholders perceive that sustainability should be enforced rather than a free choice.

5.0 CONCLUSION

The main findings showed that there is lack of education in sustainability among the construction professionals whereby they derive their information mostly from the internet. Only 11% said that their source of information about sustainability was from governmental programmes.

Government being a key player in the uptake/promotion of sustainability in the road construction industry needs to provide full support and incentives to the construction professionals. Rules, regulations, guidelines and planning policies needs to be amended in such ways that key players are encouraged to promote sustainability in the road construction industry. Stakeholders who hold decision making roles should be trained and provided with the necessary skills and expertise to consider opportunities for sustainable practices in the road construction industry. There is a need to increase awareness and knowledge about sustainability in road construction industry. These can be achieved by trainings, seminars, workshops and incorporating sustainability in the academic studies to create a sustainability culture in the industry. This study can be extended to consider far more drivers and barriers to the uptake/promotion of sustainability in the road construction industry.

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A REVIEW ON: NANOCOCHLEATES NOVEL APPROACH FOR LIPID-BASED DRUG DELIVERY SYSTEM

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ABSTRACT
The main objective of this review article is to study Nanocochleate drug delivery system including its composition, method of preparation, route of administration, mechanism of permeation, various advantages, disadvantages and application.Nanocochleates are novel lipid-based drug delivery systems in which lipid vesicles or liposomes are converted into nanocochleates by the addition of cation. Nanocochleates drug delivery system based upon entrapment of desired drug molecule into Solid-lipid bilayer in the form of sheet rolled up in spiral shape. This technology involves encochleation of the drug for overcoming problems such as poor solubility, poor permeability and poor oral bioavailability. It is a multilayered structure used for oral and systemic delivery of a wide variety of molecules including genes, proteins, and vaccines.Nanocochleate drug delivery has the potential to carry both hydrophilic, lipophilic, positively and negatively charged drug molecule and their structure provide protection from the harsh environment. Nanocochleates can be prepared by many methods and is having fewer limitations than other dosage forms hence it becomes a potential drug delivery system.

Keywords: Liposomes, Phospholipids, Nanocochleates, Encochleate, etc.

1. INTRODUCTION

The use of large size materials in drug delivery systems is challenging due to its poor bioavailability, solubility, targeted delivery to the site of action, side effects and plasma fluctuation. Several types of research in Nano drug delivery have been designed to overcome these challenges and it has been proved that nanostructures have the ability to overcome these challenges. The oral bioavailability of the drug is increased by nanotechnology due to absorptive endocytosis and the drug is able to remain in blood circulation for a long time leading to less plasma fluctuation and minimizing the side effects.Nanostructure uptake is 15-250 times greater than that of microparticles in the range of 1-10μm. Different nanostructures such as liposomes, polymers, dendrimers,magnetic materials, silicon or carbon tubes have been reported as a carrier in drug delivery systems. Lipid-based drug delivery systems have got huge attention as their resemblance with the cell membrane. Liposomes are biocompatible, completely biodegradable, non-toxic, and non-immunogenic for non-systemic and systemic administration. Liposomes are phospholipid vesicles consisting of one or more phospholipidsmainly composed of natural as well as synthetic phospholipids. Hydrophilic and lipophilic drugs are encapsulated by liposomes.[1]
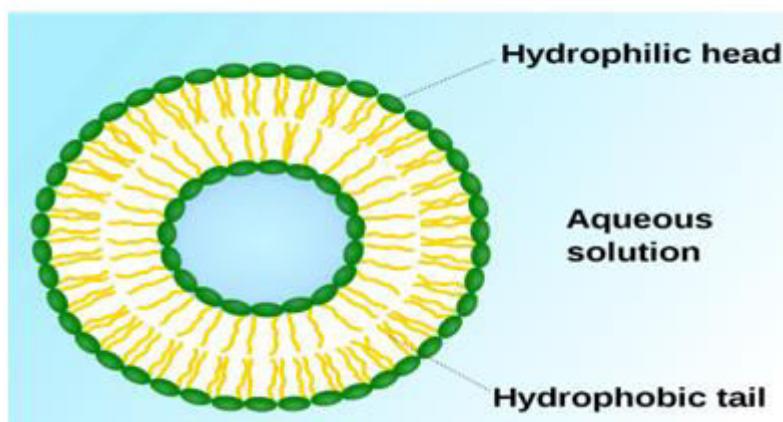
Fig. 1. The basic structure of the liposome

Liposomes undergo oxidation and hydrolysis as their outer membrane is exposed to a harsh environment.To overcome this problem and to increase efficiency various modifications were made with liposome formulation which develop a new class of drug vehicles called Cochleates.Cochleates are solid particles made up of enormous continuous lipid bilayer sheets coiled into a cigar-like shape with no watery interior phase. Cochleates are lipid-based particles composed of both natural and synthetic lipids. Cochleates differ from liposomes in having rod-shaped, water-free interior and rigid stable structure. Nanocochleates are a novel lipid-

baseddrug delivery system that represents a new approach suitable for the administration of a wide range of therapeutics including drugs, vaccines, antigens and genes. Liposomes are failed to improve the oral absorption of the drugs because of their low mechanical stability, poor drug loading capacity, and production cost is high. These challenges are overcome by nanocochleate nano technologywhich gives answers to all the problems related to oral administration.[2]

1.1 Basics of Nanocochleates:

Nanocochleates are cigar or cylindrical structures made up of a series of lipid bilayers. Nanocochleates are stable phospholipid-cation precipitates. The unique structure of nanocochleate is consist of a solid, lipid bilayer stacked or rolled into a spiral-like structure. This unique structure of cochleate minimizes interaction with water. The entire nanocochleate structure is a solid layer so when it comes tothe harsh environment the encapsulated drug molecule remains intact within the interior. The interior structure of nanocochleate is oxygen resistant and water-free which increases the shelf life of nanocochleates. The nanocochleates can be stored at room temperature or 4℃ and may be in lyophilized form. Before being used in vitro or in vivo, lyophilized nanocochleates can be reconstituted with liquid. Because nanocochleates have a hydrophilic and hydrophobic surface, they can encapsulate both hydrophobic and amphipathic medicinal molecules. It is the most versatile and stable technology for the encapsulation of drug molecules.[2,3]
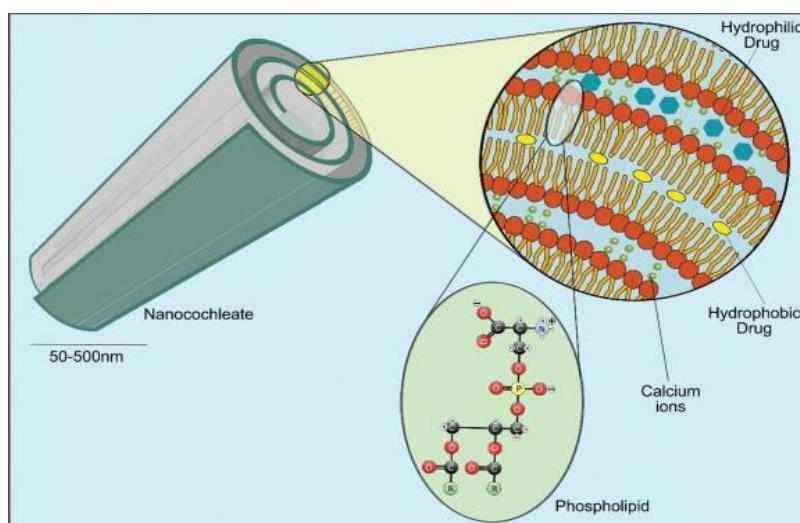
Fig. 2. Structure of Nanocochleate

1.2 History

Dr. Papahadjopoulos and his co-workers in 1975 discovered the structure of cochleate from the interaction of liposomes and cations.The term Cochleate was given due to its structure same as to snail with a spiral shell. Initially the cochleatewas prepared in micrometres' size. In 1999, Nanocochleates were introduced to establish smaller particle sizes between 50 to 100 nm. It was reported that by using the hydrogel method more uniform cochleatewas prepared. Amphotericin B is the first product encapsulated with a diameter of 50 nm and it consists of a crystalline structure having an anhydrous interior that encapsulatesthe drug molecule and protects it from degradation in GIT.[4]

1.3 Composition of Nanocochleate Drug Delivery System:

The major components used in the preparation of nanocochleates are cations and lipids.[5]

1.3.1 Lipid

e.g.,Phosphatidyl serine (PS), Phosphatidic acid (PA), di-oleoyl PS, Phosphatidylinositol (PI), Phosphatidyl glycerol (PG), Phosphatidyl choline (PC), di-myristoyl PS, Phosphatidyl ethanolamine (PE), di-phosphatidyl glycerol (DPG), dioleoyl phosphatidic acid, di-stearoyl phosphatidyl serine, di-palmitoyl PG.

1.3.2 Cations

e.g., Mg^{+2} or Ba^{+2} or Zn^{+2} or Ca^{+2}

1.4 Routes of Administration

Nanocochleate drug delivery allows efficient oral delivery of drugs. An alternative route of administration can be parenteral, rectal, topical, sublingual, mucosal, nasal, ophthalmic, subcutaneous, intramuscular, intravenous, transdermal, spinal, intra-articular, intra-arterial, sub-arachnoid, bronchial, lymphatic, and intrauterine administration, intrathecal, intravaginal or any other mucosal surface.[6]

1.5 Dosage Forms Available for Nanocochleate Drug Delivery:

1. Oral administration: Capsules, cachets, pills, tablets, lozenges, powders, granules, or as a solution or a suspension or an emulsion

2. Topical or transdermal administration: Powders, sprays, ointments, pastes, creams, lotions, gels, solutions, patches, and inhalants

3. Parenteral administration: Sterile isotonic aqueoussolutions, dispersions, suspensions or emulsions, or sterile powders which may be reconstituted into sterile injectable solutions or dispersions just before use.[6]

1.6 Advantages

1. They are more stable than liposomes because of less oxidation of lipids.

2. They maintain their structure even after lyophilization.

3. They exhibit efficient incorporation of biological molecules particularly with hydrophobic moieties.

4. The lipids used are found in plant and animal cell membranes hence they are non-toxic, non-immunogenic and non-inflammatory

5. They are produced easily and safely.

6. They improve the oral bioavailability of drugs having poor water solubility, protein and peptides which are difficult to administer.

7. They reduce stomach irritation and other side effects; they are produced as defined formulations composed of a predetermined amount of drugs.

8. Permeability of drug through the intestinal lumen is increased in this formulation.

9. Encochleated drugs can be protected from degradation caused due to environmental factors.

10. In comparison to liposomes cochleates are more stable.[7]

1.7 Disadvantages:

1. Aggregation may occur during storage

2. Cost of production is high.

3. They require specific storage conditions.[7]

1.8 Mechanism of Nanocochleate Drug Delivery

After oral administration absorption of cochleate takes place from the intestine Cochleate crosses the digestive epithelium and deliversits molecule to blood vessels. Inthe case of other routes, they cross theassociated cell and reach circulation and are delivered to the target.[8]

2. Method of Preparation

The nanocochleates are usually prepared by the following methods:[8,9,10,11]

1. Hydrogel Method

2. Trapping Method

3. Liposomes before cochleate dialysis method

4. Direct calcium dialysis method

5. Binary aqueous-aqueous emulsion method

2.1 Hydrogel Method

Different steps involved in the hydrogel method are as follows:

Step 1: The drug-loaded small unilamellar liposomes are prepared by the standard method.

Step 2: The drug-loaded liposomes are added to polymer A such as Dextran (MW 200,000-500,000), and Polyethylene glycol (MW 3400-8000).

Step 3: Polymer B solution is prepared with Polyvinylpyrrolidone, Polyvinyl alcohol and Polyvinyl methyl ether.

Step 4: The liposome Polymer A suspension is mixed with Polymer B solution using injection. Two polymers being immiscible with each other form an aqueous two-phase system of polymer this can be attained mechanically through a syringe pump at a rate of 1 to 10 ml/min.

Step 5: The divalent cation is added to obtain the cross-linkage of polymers.

Step 6: The formed cochleates are bathed in a buffer containing positively charged molecules, which helps to eliminate polymer and maintain their structure.

The drug molecule named Amphotericin B and Nelfinavir is made by this method.

2.2 Trapping Method
This method involves the formation of liposomes followed by drop wise addition of calcium chloride solution. The liposomes can be prepared by the addition of water to phospholipid powder or by adding water phase to phospholipid film. The cochleate made by this method shows higher aggregation compared with other methods. The following are the several phases involved in cochleate creation:

Step 1: Liposomes are prepared from phospholipid by vortexing for 15 min.

Step 2: Prepared liposomes are then separated from the above solution by filtration.

Step 3: Trapping solvent and the drug is added to separate liposomes. Trapping solvent e.g. Ethanol, DMSO.

Step 4: Calcium chloride solution is added to step 3 solution and crystalline nanocochleates are precipitated.

Step 5: The cochleate prepared are washed with buffer to remove residual solvent.

The drug namely Paclitaxel, Fisetin, Quercetin are prepared by this method.

2.3 Liposomes Before Cochleate Dialysis Method
This method is used for the formation of cochleates by using phospholipids, detergent biologically relevant molecule and cation The objective of adding detergent is to disrupt liposomes. Different steps involved in this method are as follows:

Step 1: Lipid anddetergent mixture is used to prepare an aqueous suspension.

Step 2: Polymer A is mixed with step 1 suspension (Polyethylene glycol, dextran).

Step 3: Polymer B is added to a suspension of step 2 (Polyvinylpyrrilodone, Polyvinyl alcohol, Polyvinyl methyl ether).

Step 4: Solution of the cationic moiety is added to two-phase polymer system and two-phase polymer system is washed to remove the polymer.

The drugs namely griseofulvin and cyclosporine are prepared by this method.

2.4 Direct Calciumdialysis Method
Unlike liposomes before the cochleate dialysis method, this method does not involve intermediate liposomes formation. Large size cochleates are prepared by this method. Different steps involved in this method are as follows:

Step 1: Phospholipids and cholesterolare mixed in the extraction buffer.

Step 2: Non-ionic detergent is added with a selected concentration of API and vortexed for 5 min.

Step 3: Clear solution prepared in step 2 is dialyzed against buffer at room temperature.

Step 4: Final dialysis is performed

The resultant white calcium phospholipids are cochleate by DC.

2.5 Binary Aqueous-Aqueous Emulsionmethod
This method is based on the incompatibility between the two-phase system of polymer solution both of which are aqueous and immiscible with each other. Different steps involved in this method are as follows:

Step 1: High pH or film methods are used for liposome formation.

Step 2: Formed liposomes are mixed with Polymer A (e.g. Dextran)

Step 3: The dextran/liposomes are added into the second immiscible polymer. (e.g. PEG)

Step 4: Calcium is added in step 3 solution which gently diffuses from one phase to another forming Nanocochleates.

Later the gel is washed with buffer.

3. Characterization of nanocochleates   Formulation

1. **Particle size Determination:** The mean particle size of liposomal dispersion and cochleates dispersions can be determined by laser diffraction technique using the Malvern analyser. The analysis is to be carried out at $30\pm2°C$ temperature with the angle of detection 90 °.[11]

2. **Entrapment Efficiency:** One hundred microliters of cochleates is aliquoted into a centrifugation tube. In each tube, 60 µl pH 9.5 EDTA and 1 ml of ethanol are added while vortexing. The absorbance of resulting determined using spectroscopic technique and entrapment efficiency is calculated by the following formula,[12]

$$\text{Entrapment efficiency} = \frac{\text{Amount of drug present in nanocochleates}}{\text{Total amount present}} \times 100$$

3. **Density:** A pycnometer is used to determine the density of nanocochleates.[13]

4. **Drug Content:** Dispersed nanocochleates suspension is centrifuged at 15,000 rpm for 40 min at25 °C after centrifugation separate drugs in the supernatant. The free drug concentration in the supernatant can be determined by using UV-Vis spectroscopic after suitable dilution.[14]

5. **Specific Surface Area:** The sorptometer is used to determine the specific surface area of freeze-driedcochleate. The following equation is used to calculate specific surfaces are,[14]

$A=6/\rho d$

Here,

A = Specific surface area,

ρ =Density

d=Diameter of cochleates

6. **Surface Charge:** The stability of nanocochleates depends upon the surface charged on the nanocochleates when the surface charge is the same on one or more molecules there is strong repulsion between molecules that occurs and there is no aggregation. When oppositely charged on molecules of nanocochleates then there is strong attraction and which causes aggregation. The laser light scattering techniques such as Laser Doppler Anemometry (LDA) and Laser Doppler Velocimetry (LDV) are used to determine the velocities of nanocochleates.[15]

7. **In Vitrostudy:** The standard dialysis, Diffusion cell membrane or modified ultrafiltration methods are used to study the in –vitro release profile of nanocochleates which uses phosphate buffer double chamber diffusion cell on shake stand.Low protein binding membrane is placed between two chambers,Donor chamber is filled with nanocochleates and the receptor chamber is assayed at a different time for the release of a drug.[16,17]

4. APPLICATION

1. Delivery of volatile oil – Oils are sensitive to oxidation and Nanocochleate technology provides stabilization to these oils. Physical and chemical stability can be achieved by encapsulation of oils and flavour in nanocochleates

2. Delivery of vaccines –Vaccines made with nanocochleate protect antigens and deliver them to lymphocytes for generating a strong, fast and long-lasting immune response

3. Delivery of antifungal agent – The limited use of potent antifungal drug Amphotericin B is due to its narrow therapeutic index, and adverse drug effects. Santangelo et al showed that AmB nanocochleates are effective for oral delivery and show efficacy at low doses. Ketoconazole entrapped nanocochleates are used for dermal and transdermal delivery of drugs.

4. Delivery of antibacterial agent – Antibiotics prescribed for long-term produce toxicity and drug resistance. It was reported that free clofazimine is 500 times more toxic than clofazimine nanocochleates and Rifampicin Nanocochleatesshowa significant increase in permeability of drug

5. Delivery of insulin – It was reported that insulin is encapsulated in magnetocochleate by changing lipid phase transition and it is a potential method for delivery of molecules through subcutaneous injection

6. Delivery of anticancer drugs – The challenges in anticancer drugs such as poor solubility,metabolism and side effects due to high doses are overcome byloaded nanocochleates.Bothiraja et al reported that Fisetin nanocochleate exhibit high drug loading and improve in-vitro cancer potency

7. Delivery of nutrients, proteins and peptides

8. Delivery of ApoA1 nanocochleates for treatment of Atherosclerosis and another coronary heart disease.[18,19]

5. CONCLUSION

Nanocochleates are lipid-based drug delivery which is more potential than liposomes. They are suitable for systemic and oral administration of drugs, genes, vaccine antigens. Nanocochleates are formed by the interaction between liposomes and cations. Nanocochleate formation results in a decrease in toxicity,increased bioavailability and improving therapeutic efficiency.Nanocochleates encapsulate the drug molecule and protect it from an environmental harsh conditions which improve stability and increases shelf life of drug. Nanocochleate drug delivery system is important in pharmaceuticals to transfer suitable and desired drug in body.

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FROM BULWARK TO WILL OF THE SOVEREIGN: THE MAKING OF LAW IN PRE-COLONIAL KASHMIR

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ABSTRACT

From the time of Herodotus, history has been recognised as an important branch of knowledge. Hammurabi, Manu, Aurangzeb, Thomas Babington Macaulay and many others produced or under their patronage produced finest documents in the legal perspective. The present paper deals with the history of 'law' in the Valley on the basis of both primary and secondary sources. It on the one hand tries to unearth law in the Rankean tradition there by showing 'how it really was', while on the other uses post-modern 'episteme' to reveal the multiplicities and complexities of the legal system in pre-colonial Kashmir. The paper concludes by showing that how law works in tandem with the 'power' in different historical periods.

Keywords: Indigenous, Kashmir, Legal-pluralism, Power, Pre-colonial, Protection.

INTRODUCTION

The Kashmir Valley is located in the northern most extremes of the India. Locally known as Kashir, it has diversified geography but mostly a mountainous region nested in the lap of the Himalayas. Though seems isolated, the Valley from earlier times closely connected to the outer world. From the earlier periods to the present, it has witnessed extensive in and outflows of people, an admixture of influences that gives region a distinctive history, culture, administration and character. However, there seems hardly any doubt that all through history, the Valley witnessed different mechanisms for the declaration, alteration, administration and enforcement of rules by which people live. Also not all societies feature a formal or single law as the most of these rely on a pluriversal system of 'law'. Though this type of law cannot make all people equal yet it performs the paramount function to settle issues and constrain the behaviour of the individuals in their relationship with one another.

With regard to the question whether the Brahmanical criminal law was ever applied in practice, there seems to be hardly any reason to doubt that it was not. In this connection the regional texts like Nilamata Purana, Rajatarangini of Kalhana, and works of Ksemendra, Somadeva and even earlier works like Kuttanimata-Kanya of Damodaragupta, clearly indicates that Brahmanical law was applied and honoured by the kings of Kashmir. Kalhana's Rajatarangini contains ample references to crime and punishment which gives an insight in to the social degeneration in early Kashmir.

The Nilamata Purana explicitly provides valuable insights about the legal system of early Kashmir. It states that 'all people should be penalised in accordance with their crimes; the king should neither be very hard in giving punishments nor should forgive anyone and he must carry on administration in accordance with the instructions of the treatise on polity'. In the same tune Kalhana advocates the punishments on the basis of specifications of a particular situation as well as at appropriate scale. Further evidence shows the intellect of the author ahead of the times when he advices the king that he in no case should harm the sons, wives, friends and relatives of the guilty person whom he punishes for the crime. There is no exaggeration in saying that the concept of separation of the crime from the criminal was wholly in tune with the Hindu philosophy and appears to have been well prevalent in ancient Kashmir. Having fully considered the time and the place (of the crime), the strength and the knowledge (of the offender), the king had to justly inflict the punishment on those who acted unjustly. Quite often the death penalty was used in number of the cases like treason, embezzlement of State funds and theft as well.

While it seems that the legal system appears to be quite enlightened but it is also true that there was no rule of law because the punishment was awarded as per the considerations of status of the accused. Caste status essentially contributed to determine the seriousness of the crime. In other words, the general principles adopted were that rights, duties and liabilities varied with caste or sex and thus punishments and damages were determined by the [status] of the accused or defendant and that of the complaint and plaintiff. Naturally Brahmans were the most privileged class and came to occupy the key positions within the society in general and the criminal justice system in particular. The law givers prescribe that a Brahman was not to be sentenced to death or corporal punishment for any offence whatsoever, but if they were guilty of an offence deserving the death penalty, Brahman was to be punished by his entire head shaved; he also might be banished from the country, a mark appropriate to the grave sin committed by him might be branded on his forehead and he might be paraded on an ass.

It is true that in ancient Kashmir though the caste system had not attained full rigidity but still Brahmans were the most privileged class. The Kalhana's Rajatarangini refers to a case in the reign of king Chandrapida of Kashmir (A.D.713-721) when a Brahman guilty of murder of a Brahman was exempted from death sentence because of the prevalence of a Smriti rule. Kalhana expresses the view that 'none is to be punished till the charge is established and that a Brahman even if prove guilty is exempted from capital punishment'. It is in tune with the social norm the penal code of Manusmriti prescribes the punishment to be proportionate to the pollution incurred. An interesting feature of the punishment was that a Brahman could either be banished, or humiliated, and sometimes branded with a dog's feet on his forehead or even could be fined but never given capital punishment. Trials were mainly based on the dispositions of witnesses. Normally one single witness with pure and righteousness was regarded as sufficient by the smriti. The qualities of a witness includes devout, charitable, born of a respectable family, truthful, righteous, straight-forward and should have sons and riches.

In the absence of any codified law, there are certain instances where the kings of Kashmir during ancient time punished the guilty at their own will. It was contradictory to the law or rule that Brahmans enjoyed the privilege of not being killed. In Rajatarangini we have several references where the Brahmans were executed by the [so] called naughty tyrants and rebels. Besides, kings at times allowed them to die through Prayopavesa. It is interesting to note that during the reign of Jayapida (A.D.753-782) because of the Brahmans in order to stop fiscal oppression, most of them preferred to leave the country. And those who resisted were either imprisoned or executed and even left to bear numerous hardships. Their lands were confiscated and the king himself proclaimed that 'let it to be reported to me if a hundred Brahmans less than one die in a single day.' In a similar vein, during the reign of king Harsha (A.D.1089-1101), Kalhana narrates that when furious Damaras fully exploited the anarchical condition and became ever powerful, he took many serious steps to suppress or crush them. Further it is worthwhile to note, says Kalhana while he (king) was killing the Lavanyas, he left in Madavarajya (South East of the Valley) not even a single Brahman alive if he wore his hair dressed high and was of prominent appearance.

Nothing like modern legislation or a written code of laws existed during ancient Kashmir. The king himself constituted the law-making agency. The Rajatarangini refers to the king's seat of judgement as dharmasana, surrounded by the learned sabhyas. Similarly, the Court building is mentioned as adhikaranamandapa or asthanamandapa. True king's Court was the highest court and the highest officer after king was the Rajasthana or Dharmadikara (chief-justice). Below him, there were other judges are denoted by the terms like Tantapati, Rajagrhyas etc.

There was no distinction between civil and criminal Court and the same Court tried both civil and criminal cases. The laws and the judicial system were not much caste bound, though Brahmans enjoyed many privileges including the exemption from taxation and capital punishments. The Nilamata Purana makes it clear that a king should neither be very harsh in awarding punishments nor should be condone the offence of the culprit. The king as an epitome of legal system should execute the sentence in accordance with the principles laid down in the rajasastras (treatise on polity). Not only this, the king as a protector of people once having gone to the court, should deal with the legal affairs impartially.

The punishments included death sentence, confiscation of property or wealth, deportation to unknown places and amputation of different body parts. Various forms of shaming were main form of punishment. The concluding Tarangas of the Rajatarangini contains many references of the culprits and suspected criminals being executed on the pale or by rope down round the neck during night. Famous author and philosopher Ksemendra also refers to the hanging of criminals fixed on the stake. All this suggests that the penal code was quite severe in ancient Kashmir. Like other parts of India, Kashmir too had a well-developed and elaborate criminal justice system.

The year 1339 marks an important landmark in the history of Kashmir when Sultan Shams-ud-Din Shahmir (1339-1342) laid the foundation of Sultanate which lasted for more than two centuries. The establishment of the Sultanate led to the application of the Muslim law in Kashmir and the emergence of new and distinct forms of law and judicial institutions were the result of this political change. It was Sultan Shahmir who first introduced Muslim law in Kashmir and made it the law of the land. The Hindu laws, customs and usages, which were applicable before his reign, were repealed by the traditional Muslim law. The Syeds who migrated to the valley played an important role for the implementation of the Muslim laws during Sultanate period. It is pertinent to mention that the establishment of the Muslim rule had practically paved the way for the introduction of Islamic institutions like Shaikh-ul-Islam, Qazi, Mufti, Mir adl, Mohtasib and the like.

The government under Sultans of Kashmir, as elsewhere in rest of India, was symbolically a monarchy in both legal and political terms. As noted, in the Sultanate administration, the king was the highest judicial authority and the fountain head of justice. As such the king's court was the highest court of appeal which tried cases of rebellion and civil and criminal suits. It was both the court of first instance and a court of appeal. The justice was dispensed with by the Sultan sitting in the Diwan-Khana in the open durbar every day. Unlike the Ottoman king, the Sultan was an "absolute monarch" in whose person "were fused the threefold functions of government, legislative executive and judicial, he was the pivot upon which turned the entire machinery of public life." Compared to Ottomans, where the Shaikh ul-Islam could theoretically remove the Sultan for violating the Holy Law, the Sultan faced no immediate institutional checks to his authority in Kashmir. In practice, however, the work of the Sultan, the Sadr, the Mufti and the Qazi were all interconnected. The Sultanate rulers used punishments that ranged from harsh to milder including flogging, qisas, tashir, amputation of body parts and gouging out the eyes by needle. It seems true that the purpose of those punishments was ibrat (example). However, we found the significant contrast to the contemporary practices of punishments during the Sultan Zain-ul- Abidin's (1420-1470) reign. The Sultan was opposed to the infliction of harsh and brutal punishments upon the offenders. For ordinary offences he professed to give milder punishments. Thus, he decreed that the thieves and robbers should not be executed, nor even be flogged, but were to be arrested and put in chains to work on land and public buildings to earn their livelihood by hard work. It was in this context the Sultan was ahead of his times and was definitely one of glaring example of the reformation of the offenders. Consequently there was the absence of uniformity and unanimity in the judicial administration. Nevertheless, the development of the Sultanate legal system in Kashmir presents a key example of how Islamic legal thought could function in a situation of religious and ethnic plurality and when their rulers were new to the faith.

The Mughal period that lasted from 1586-1753, marks one of the significant phases in the history of Kashmir, the status of Kashmir as a sovereign country came to an end on 6th October, 1586, when after the third attempt, the Mughals entered Srinagar in winner and Kashmir was made part of the province of Kabul. For the administrative convenience the Subah of the Kabul was subdivided into seven Sarkars: Kashmir, Pakli, Bimbar, Swat, Bajaur, Kandahar and Zubulistan. Acting on the advice of Akbar, Qasim Khan, after conquering Kashmir, embarked on the project of manufacturing consent and consolidating the imperial control. Abu Fazl makes causal reference in the following words; the ignorant [wild] people of Kashmir were pacified by the administration of justice and by the increase of love. Throughout the whole period the internal affairs of the Subah of Kashmir were administered by a Subadar whom the imperial authority appointed. In the same tune the administration of justice was wholly in the hands of Subadar (governor) who worked on the behalf of the emperor as the supreme judicial authority in his respective Subah. The people were, however, fortunate in the sense they were able to present their disputes and complaints to the Emperors personally when they visited valley on holiday. This proved an effective check on the authority of the governor and the subordinate staff as well. Criminal as well as civil cases of complicated nature were essentially lodged in his court.

Evidently Mughals applied Muslim Law in the Subah of Kashmir in the same way as being applied in rest of the country and for that purpose the officials were appointed. In Islamic Jurisprudence, the central aim of upholding the law was to maintain justice (adala). In the political or administrative realm, it was meant applying the holy law and achieving a balance (al-mizan) between the rights and obligations of the rulers and the ruled. There was no uniformity in the punishments during the Mughal period and these would range from harsher to milder. Death penalty could be inflicted by hanging, beheading and impaling, also various forms of execution were prevalent. The other common forms of punishment were mutilation, flogging, banishment, imprisonment, fines and confiscations, forfeiture of rank and title, forbidding the court and dismissals. In sum the ruler, the judicial officials, the Subedars, the Kotwals and others evaluated the gravity of the offences and penalized the offender accordingly. Evidently, the Mughal period in Kashmir too was characterised by the legal pluralism and diversity in the strict sense of the term.

About the middle of the eighteenth-century Kashmir passed into the hands of the rulers of Kabul and For 67 years (1753-1819) Kashmir remained under the rule of five Afghan kings and like Mughals they also sent their governors to Kashmir to rule for them. It is fact that in total twenty eight (28) Afghan governors and deputy-governors, directly or indirectly ruled over Kashmir. Almost all Governors deputed from Kabul once reaching Kashmir would try to become independent as soon as possible. The distance factor emboldened different governors on reaching Kashmir, and gradually they stood against their own masters. Deserting of Durrani masters and perpetual efforts to declare their independence was the predominant feature of Afghan rule. Consequently, on every occasion, the newly deputed governor was assigned with the duty to depose rebelled one to keep continue to the era of perpetual political instability, persecution and painful antidotes. When the

factious war began at Kabul and Mohammad Shah captured Zaman Shah, the conditions worsened at home. Naturally, the royal hold on Kashmir was relaxed and even the outward show of peace vanished quickly.

The Afghan were seldom known for their sense of justice. They only knew how to torture and fleece people. The question of dispensing any justice by some judicial authority under no circumstances arouse during the Afghan time. So, there was nothing commendable about the law and order in Kashmir during the Pathan rule. There was no special court to administer justice. Neither there was any code of procedure, nor any trained person to administer justice impartially. This aphorism speaks the sorry state of criminal justice system of the Pathans in Kashmir:

Tetis Laras Zan Tulnas Kalah

[He was beheaded like the bitter end of a cucumber].

The Pathan rulers attained fame for their quick justice (very often injustice). No sooner was the order given 'Behead the man,' or 'Take out his eyes,' or 'Cut off his nose,' then the executioner left and did this cruel deed. With this ended one of the be-boj waqt (lawless and order less period) in the history of Kashmir.

After more than sixty years the Afghan rule in Kashmir finally came to an end. It became part of the Sikh empire (1819-1846) of the Maharaja Ranjit Singh of Punjab. It is interesting to note that the judicial system of the Ranjit Singh is said to be a fusion of the Mughal and Misaldari systems with some elements of the British Indian system. In the Sikh administration, the Maharaja was the highest judicial authority and the fountain-head of justice. The Maharaja decided all types of cases--civil and criminal, original and appellate. No matter was too small or too great to be brought before the personal attention of the Maharaja; sometimes even conjugal conflicts were decided by him. In addition to this if the aggrieved person wanted to seek justice from the Maharaja that he would appear in the public Darbar and shouted 'dohai, Maharaja 'dohai, (mercy Maharaja mercy). The Maharaja after listening to his complaint took instant action to redress his grievance.

Nothing like modern legislation or a written code of laws existed during the Ranjit Singh's reign. According to Steinbach 'custom and caprice are substituted for the lex scripta'. However, Muslim law (sharia) was applied by the Qazis in deciding cases of the Muslims and Shastras for the Hindus. There was non-existence of capital punishment for any crime whatsoever. Ranjit Singh never inflicted death sentence even when an attempt was made to assassinate him. Fine and mutilation were the most important forms of punishments. Mutilation was reserved for such offences as violent theft, robbery, adultery and seduction. Culprits were deprived of their arms, noses, ears or legs according to the degree of offence. Fine was another important form of punishment awarded to both civil and criminal offences? True in number of cases it was imposed in place of corporal punishment. Impunity of all crimes from larceny to murder could be purchased by the payment of fine. 'A tolerable bag full of rupees is often accepted as compensation in full for the retention of a limb or feature.' Thus, it seems that the administration of justice was a source of considerable income to the state. The other forms of punishment includes imprisonment and confiscation of property, flogging, reprimand or rebuke by the Maharaja , inflicting wound on the forehead by a piece of hot iron, fancy punishment, ordeal of hot water for judging innocence or guilt of suspected offender, etc. The form of punishment was imprisonment; mutilation, so frequently practised by the Afghans being rarely resorted to. 'On the branches of it (a Chinar tree), writes Hugel, 'criminals are hanged, a punishment of constant occurrence under the Pathan sway, when the smallest offence was visited by death, but now inflicted only in cases of murder. Men are too valuable to the present ruler to be lightly spared; penalties and stripes are, therefore, the usual punishment. The people seem contented with the justice dealt out to them, and confessed to me that not more than one guilty person in every [twenty] is ever visited with the reward due to his crimes.' On the other hand , 'the dreadful cruelties perpetrated by their earlier rulers (Afghans) who, for smallest offence, punished them with the loss of their body parts including noses or ears, make the poor Kashmiris well satisfied with their present comparatively mild government; and, in actuality, there is very little oppression on the part of the governors or Thanedars'. Moorcraft, a British national, 'the Sikhs seem to look upon the Kashmiris as little better than cattle. The murder of a native by a Sikh is punished by a fine to the Government of Sixteen to Twenty rupees of which four rupees are paid to the family of the deceased if a Hindu and two rupees if he was a Mohammedan'. To sum up judicial system of the Sikhs (1819-1846) there was little change or rather no change in judicial system as the Maharaja's policy was to temper as little as possible. True some of the Sikh governors noted for their justice. One such governor was Colonel Main Singh (popularly Colonel Nausherwan) who used to hold summary trails and administer justice and it was for his quick justice, his period was considered as golden period—famously known as 'Sikh-Shahi'.

CONCLUSION

The valley effectively relied and functions on a dynamic legal system that allows different authorities in different historical periods to incorporate the legal system according to the political exigencies and circumstances. The valley witnessed a legal pluralism in the pre-colonial era which is no way considered as inferior to the centralised or codified legal system of the colonial powers. Just as the rulers or dynasties changes from period to period, the law also altered over a time. Like the colonial legal system, the roots of different legal systems in the pre-colonial period could be traced in the process of negotiation between the rulers and subjects in achieving their ends.

REFERENCES/ FOOT NOTES

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2. Ved Kumari, tr., The Nilamata Purana: A Cultural & Literary Study of a Kashmiri Purana, vol.II, Srinagar: J&K Academy of Art, Culture and Languages, 1973, p. 221

3. Kalhana states that the wise-men valued highly the quick punishments which the king named Uccala of mighty glory meted out to the cruel Kayasthas (official class). Because those who know the wise use of punishment for low bred horses, Kayasthas, persons possessed by goblins and enemies. For if they are not punished at the proper time they can pose a great threat to the king. See M. A. Stein, Kalhana's Rajatarangini, Vol. II, Delhi: Motilal Banarsidass, (3rd Reprint), 1979, VIII. 81

4. N. Drabu, Kashmir Polity (C 600-1200 A.D), New Delhi: Bahri Publications Private Limited, 1986, pp. 186-187

5. Gout. Xll, 43; see also Manu, Vlll, 123, 380-81; one of the indigenous punishments that both Indian Penal Code and Ranbir Penal Code did away with was the public display of a criminal on the back of an ass. Lord Macaulay perceived this as a parallel to the English pillory.

6. M. A. Stein, Kalhana's Rajatarangini, Vol. I, IV. 96-106.

7. M. A. Stein, Kalhana's Rajatarangini, Vol. I, VI. 109.

8. In context of ancient Kashmir, it means solemn fasts or voluntary starvation. It was used by Brahmans as a potent weapon against royal atrocities as well as for meeting their personal and communal grievances.

9. M. A. Stein, Kalhana's Rajatarangini, Vol. I, IV, 633

10. Damaras were a class of hereditary and feudal landholders that played a crucial role in the politics of Kashmir during eleventh and twelfth centuries.

11. It is name of the one of the ruling tribes in ancient Kashmir who had been the constant source of menace to both people and the king.

12. M. A. Stein, Kalhana's Rajatarangini, Vol. I, VII, 1229

13. The sources of the judicial system seem to have been sacred books as well as tradition.

14. N. Drabu, Kashmir Polity (C 600-1200 A.D), New Delhi: Bahri Publications Private Limited, 1986, p. 179.

15. Judges, Councillors or jurors

16. N. Drabu, Kashmir Polity (C 600-1200 A.D), p. 179

17. Ved Kumari, The Nilamata Purana, p. 221

18. Ved Kumari, The Nilamata Purana, p. 220

19. Treason, embezzlement of the State funds and kidnaping of women were the crimes in which the death sentence was mostly followed.

20. Mostly followed in cases of the Adultery

21. It was commonly followed in crimes relating to forging of the State documents

22. Hakim Imtiyaz Hussain, Muslim Law and Customs, Kashmir: Srinagar Law Journal Publication, 1989, p. 95

23. It was on the advice of a great missionary, Mir Syed Ali Hamadani, Sultan Qutb-ud-Din divorced one of his wives, who were real sisters to each other; marriage with two women who are real sisters to each other is not permitted by Islam.

24. Mohibbul Hasan, Kashmir Under the Sultans, Calcutta: Iran Society, 1959, p. 200

25. N.K. Zutshi, Sultan Zain-ul-Abidin of Kashmir, Srinagar: Gulshan Books, 2012, p. 95

26. In one of the cases of murder Sultan Zain ul Abidin prescribed the punishment of tashir (public humiliation). Along with the Sadaula, a learned and holy man from Mecca, the sultan held also held a yogi in a very high esteem, believing him to have blessed him with his first son. Driven by jealously, he killed the yogi in a state of intoxication. The legal experts including Shaikh-ul-islam recommended capital punishment but the sultan favoured public humiliation. Sadaula was seated on an ass with his face towards its tail, his head clean-shaved, his beard soaked with urine and his hands tied up with the entrails of a dead man. He was paraded in same condition through market place and the people who gathered for fun spat on him. Jogesh Chunder Dutt, The Kings of Kashmira, Translation of Sanskrit works of Jonaraja, Srivara, Prajyabhatta and Sukka, (First reprint), Delhi: Gian Publishing House, 1986, pp. 85-85

27. Mohibbul Hasan, Kashmir Under the Sultans, p. 84

28. Abul Fazl, The Ain I Akbari, tr. C. H. S. Jarrett, vol.II, Calcutta: Asiatic Society of Bengal, 1891, p. 347

29. Abul Fazl, The Akbar Nama, tr. H. Beveridge, vol. III, Delhi: Rare Books, 1939

30. James P. Ferguson, Kashmir: An Historical Introduction, London: Centaur Press, 1961, p. 135

31. Akbar visited Kashmir three times, Jahangir five times, Shahjahan four times and Aurangzeb once.

32. P N K Bamzai, Culture and Political History of Kashmir, vol.II, Srinagar: Gulshan Publications, 2015, p.202

33. Imtiyaz Hussain, Muslim Law and Customs, p. 98

34. The various executions are throwing a man down from the roof, to get criminals trampled under the feet of elephant, stung to death by snakes, torn to pieces by dogs.

35. The terms Afghan, Pathan and Durrani are used interchangeably.

36. Mohammad Saleem Khan, The History of Medieval Kashmir, Srinagar: Gulshan Books, 2006, p. 160

37. M. Aslam Khan, Martial Spirit of Kashmiris, Srinagar: A.S. College Research Publication, 1981, p. 47

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43. Henry Steinbach, The Punjab: Being a Brief Account of the Country of the Sikhs, London: Smith, Elder and Co. 1845, p. 71.

44. W. G. Osborne, The Court and Camp of Runjeet Sing, London: Henry Colburn Publisher, 1840, p.36

45. Punjab Administrative Report, 1849-50 and 1850-51, pp 10-11.

46. W. G. Osborne, The Court and Camp of Runjeet Sing, p.55

47. Henry Steinbach, The Punjab: Being a Brief Account of the Country of the Sikhs, P. 72.

48. These were awarded to those officials who were found guilty of embezzlement of revenue or any form of bribery.

49. The face of culprit was blackened and he was made to sit on a donkey with a face towards the back of the animal and was paraded in the streets of town or village.

50. Charles Baron Hugel Travels in Kashmir and the Punjab, London: John Petheran, 1845, pp 128-29

51. Charles Baron Hugel, Travels in Kashmir and the Punjab, p. 156

52. Charles Baron Hugel, Travels in Kashmir and the Punjab, p.156

53. William Moorcraft and George Trebeck, Travels in the Himalayan Provinces from 1819-1825, vol. II London: John Murray, pp.293-94

THE SIGNIFICANT ROLE OF TEACHERS IN FACILITATING SELF-DIRECTED APPROACHES TO LEARNING ENHANCE ACADEMIC PERFORMANCE FOR STUDENTS WITH LEARNING DISABILITIES IN INCLUSIVE CLASSROOM SETTINGS

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ABSTRACT

The present study explores the significant role of teachers in facilitating self-directed approaches to learning (SDAL) to enhance academic performance for students with learning disabilities (SwLDs) in inclusive classroom settings. The concept of SDAL has been around for some time. SDLA involves teaching students to modify and regulate their behaviour. Teaching students to self-regulate behaviour has been identified as one means of promoting self-determination, and advertising and enhancing self-determination has become a valued outcome internationally. Most teachers are concerned about SDAL, which has long been a concern. With its roots in educational reform, SDAL may be used with elementary and high school students. Different teachers may have somewhat different ideas on SDAL, but an in-depth look shows a slew of fundamental principles. For students with LDs, various educational alternatives and resources are available to help them achieve their academic goals. Students with LDs should have their educational experiences at school evaluated by institutions of higher learning in inclusive classroom settings. This study of SDAL will provide new expert perspectives on using SDAL in inclusive classroom settings. If students with LDs don't care for their education, we won't know how vital it is. It's about taking charge of your education and making your own decisions. It's not unusual for them to use practical learning approaches and tactics. Many students with LDs depend on text messaging to communicate with their mentors, teachers, and peers. Students who reside in rural areas have benefitted from this kind of teaching. It's common for people to report feeling happy and ecstatic when they engage in this kind of learning. Therefore, a wide variety of duties may be completed by a person alone. If individuals put in the effort and are creative in their job, they have the potential to make significant advances. Teachers' roles in encouraging SDAL are the subject of this investigation, which explores its origins, influences, and advantages. SDAL promotes students with LDs to actively participate in their education and development, which is beneficial to them. Students with LDs who better understand SDAL's underlying theory will have an advantage in their educational endeavours. An educator's role is to guide and correct students throughout their learning process and provide assessments and evaluations at the end. This is known as "assisted learning" and SDAL. An assisted learning environment includes e-books, audio-visual lectures, small groups, and flipped classes. Various SDAL styles are available, each with its characteristics, advantages and disadvantages, and assessment practices. In addition, SDAL could prove crucial for including students with LDs in inclusive classrooms by reducing the student's dependency upon others in the inclusive classroom setting.

Keywords: Self-Directed Approaches to Learning, Students with Learning Disabilities, Academic Performance, Enhancement, and Inclusive Classroom Settings.

INTRODUCTION

Education quality and efficacy are critical to any civilization's long-term sustainability. Teacher enthusiasm and high-quality performance are essential to the success of any educational institution (Emadzadeh, 2001). Motivation and a will to succeed are the keys to keeping pupils engaged in school; according to the SDAL, Volition, on the other hand, is the ability to do an activity to achieve a goal (Corno, 1992; Garrison, 1997). There is a severe shortage of qualified educators with both the education and practical experience to be good educators. Experimental efforts to enhance educational systems before schooling have been fruitless (Fathi Vajargah, 1997). As a result, instructors cannot improve their teaching methods unless they can commit all their time and energy to the process (Salsabili, 1992). SDAL is dedicated to the principle that students should be in charge of their education, as its name indicates. SDLA has a self-monitoring component that includes contextual management and self-monitoring. SDAL is a comprehensive plan that incorporates managing and monitoring (Bolhuis, 1996; Garrison, 1997). This means that new and inventive methods of teaching teachers are needed so that students and employers may take responsibility for their learning and success (Abdollahi, 2009). SDAL teachers gradually give over control of the classroom to students. How many alternatives kids have for learning what they're studying and doing it in the best way possible within a particular framework is astounding (Lyman, 1997; Morrow, Sharkey, & Firestone, 1993). Students with LDs may also benefit from one-on-one training. The new generation is more self-conscious and aware of their duties. For this reason, students with LDs must be able to plan and direct their outstanding education. Teachers nowadays believe pupils need to master SDAL to

compete in today's employment economy (Tekkol & Demirel, 2018). For this reason, SDAL should be permanently included in school curricula (Douglass & Morris, 2014; Guglielmino, 2013; Kidane, Robertson & van der Vleuten, 2020). Teachers must make learning "visible" if they want pupils to benefit from it. The students developing their self-directed learning approaches are valuable as role models and mentors (Bolhuis, 1996; Corno, 1992; Leal, 1993). To what extent should educators regard the rise in the popularity of SDAL as a teaching tool rather than a way to help students find and develop their unique learning styles? (Guglielmino, 2013). It's a lot of joy to work with SDAL. Students and instructors work together to broaden and deepen each other's knowledge and skills (Guthrie, Alao & Rinehart; 1997; Temple & Rodero, 1995). SDAL helps students learn about the topic matter and improve their communication abilities. You may need to discover how people know in the real world to bridge the knowledge gap between what you learn in the classroom and what you face in the workplace (Bolhuis, 1996; Temple & Rodero, 1995). This study will explore SDAL and psychological components to maximize its potential.

The Concept of Self-Directed Learning Approach

Students with LDs may use SDAL, sometimes referred to as SDAL at home, to learn on their own without the help of an instructor. The process of self-governance involves making decisions about what and how students learn. Learning new things and enhancing one's skills in a particular subject area is the goal of this practice. It is the first stage in SDAL's four-step procedure, which includes creating learning objectives, engaging in the learning process, and assessing progress. More and more students are describing outstanding outcomes with SDAL, although no formal study has been conducted (Douglass & Morris, 2014; Guglielmino, 2013). Since students are in charge of their education, they have complete discretion over what they study and how much time they dedicate to it. Involvement by a teacher in SDAL initiatives is, at best, limited. According to an SDAL review, students' learning grew significantly when they were allowed to choose their study resources (Murad, M.H.; Coto-Yglesia; F.; Varkey; P; Prokop; LJ; and Murad, AH; 2010). Students with higher merit levels benefited more from SDAL, as per various studies, rather than the lecture method (Bhat PP, Rajashekar B, Kamath U. P, 2007). Teachers must figure out how to make use of SDAL in a manner that is beneficial to their students. Without trained and competitive staff, this company's long-term viability is in jeopardy" (Morrison & Navarro, 2014). SDAL breaks down the course material into digestible chunks to accommodate students with LDs. Students with LDs need to know what they need to know, how to get it, and what evidence backs it up. Just "Read all pages" may be found on a package. Please complete the test by providing any missing information. Your instructor could know the solution. Students with LDs should be given teachers who go above and beyond the call of duty in their service. If the receivers need specific educational or community services, the packages may contain media or lead them in the right way. For students with LDs, bundle-completion lesson preparation may be more straightforward since teachers already know the skills they need to teach. Students with LDs would benefit significantly from increased emphasis on effective SDAL procedures in educational establishments. SDAL provides students with LDs the chance to build on this momentum, develop it, and enhance it. This strategy has been improved by new knowledge about the human brain. There are a lot of inconsistencies, and the brain is more prone to hunt for patterns and depend on its own experiences to make sense of the situation. The brain's structure and function differ significantly from person to person. Since the most current results in intelligence, learning style, and strength, people learn in various ways. The core of the educational approach is to teach students with LDs how to study and build transferrable abilities. Students with LDs who possess these features may find it challenging to commit to lifelong learning in inclusive classroom settings.

Historical Foundation of Self-Directed Learning Approach

The SDLA has been around for a long time and is a well-known entity. Studies claim the SDAL offers a framework for studying how adult education has evolved. Based on its widespread and good effect, one might make conclusions about education and possibly even life. SDAL empowers students with LDs by allowing them to take control of their education. For the SDAL to succeed, students must be able to explain how they found something. SDAL has been available to students for generations. All three great thinkers highlighted the need for self-study to succeed in their respective fields. It was a characteristic of great geniuses like Alexander the Great, Caesar, Erasmus, and Descartes that they could take charge of their destiny. Due to a lack of educational institutions, colonial Americans had no alternative but to educate themselves. A little over 150 years ago, American academics began investigating how people learn independently. In recent years, however, the SDAL has grown in importance and has been the focus of several inquiries. Academic, social, or personal interests are the most common reasons students attend school. There are three types of participants: those who have a specific aim in mind, those who like taking part in various activities, and those who believe that learning is the most important aspect of improving one's life in any way possible (Self-Directed Learning, 2006). Authors such

as Brockt & Hiemstra and Candy have made substantial contributions to the area of SDAL (Brockt & Hiemstra, 1991). Additionally, Merriam and Caffarella (1999). Considering Confessor and Confessor's SDAL literature, serious research is required (as cited in Long and Associates, 1992). All these discoveries are in order of priority: Caffarella & O'Donnell (1997), Tough (1979), Houle (1961), Brookfield (1985) Caffarella and O'Donnell (1997), Spear (1984), Tough (1978), Long and Associates (1996), and Brookfield. (1986) (1988). Tough to put into words (as cited in Caffarella & Caffarella, 1992). In recent years, SDAL has grown in popularity as a method of instruction. As per this concept, giving people greater support and resources might help them become more self-directed. Overall health and well-being are of primary importance while undergoing SDAL treatment. Students will be better prepared for lifetime learning as a result of SDAL. As a consequence, students' interpersonal and critical thinking skills enhance. With the SDAL, individuals may develop innovative solutions to overcome hurdles and problems. As people grow more self-confidence and competence, they may be able to take on more challenging roles in the future (Taylor, 2001). It seems that Candy's (1991) study links SDAL studies work in the 1980s with the need for new methods in the future (1991). A healthy society must promote the growth of SDAL, as this in-depth study has shown. The term "independent thinker" refers to someone who chooses to learn from others rather than go to school. The term has been around for quite some time. A free education might help eliminate societal inequities, as per Candy. Like Brockett and Hiemstra (1991), Candy (1991) examines SDAL myths. The assumption that software development lifecycle management takes place in a vacuum is still prevalent in many ways. Both students and teachers laud SDAL's innovative approach to teaching. Followers of SDLA think that individuals have the authority and competence to teach others about their education. In the next section, we'll discuss SDLA's conceptual foundations and some of its more recent advances. Since SDLA's inception, academics have used its concepts and approaches as a platform for their research. Learning, it is often held, necessitates independence. Teachers rely heavily on what their pupils have to say to learn. 'As a person's duties expand, they will need new skills. A common definition of how individuals naturally learn is via "tasks" or "issues" that they must solve. Many individuals are motivated to attain their objectives by feelings of self-worth, achievement, and enjoyment (Self-Directed Learning, 2006). Prepare first, create a learning environment, use teaching activities, and assess progress according to the SDAL's four most important learning components. To fully understand SDAL, students with LDs need to be part of inclusive classroom settings.

Factors Affecting the Self-Directed Approaches to Learning

SDAL involvement requires both a desire to learn and a desire to engage. An engaged and well-equipped workforce may provide better and more productive results. SDAL student success can only be accomplished if the following factors are considered. To be a successful student, you need to be motivated, self-assured, surrounded by others who share your optimism, and able to carry out your responsibilities excellently (Boyer, Edmondson, Artis, & Fleming, 2014). SDAL is being pushed into the curriculum and training techniques of many professions today, including architecture, engineering, medicine, nursing, and social work. Individuals in a wide range of fields will be able to define their own learning needs and stay current when new knowledge and easier access to information become accessible. Since then, the focus on formal development has shifted. Integrating problem-based, project-based, and team-based learning strategies into undergraduate and graduate courses is rising. Through problem-based learning, children develop SDALs, which are connected to lifelong learning (Blumberg, 2000). However, no studies have been done on the personality trait SDAL among students with LDs who are entirely self-directed digitally. SDAL and the resources needed to help struggling secondary school students with LDs may be better understood by secondary school students with LDs as a consequence of the findings of this research. Sure, students with LDs might benefit from this type of support.

Self-Motivation

One of the vital emotional ideas in modern education is motivation (Vallerand et al. 1992). The well-established link between academic motivation, learning, and performance outcomes has drawn scholarly attention (Vallerand et al. 1992). Motivation is the degree to which people will make decisions and put out effort (Keller, 1983). Studies demonstrate that motivation is influenced by emotional, social, and cognitive factors (Relan, 1992). People were allowed to employ the SDAL procedures at their discretion. Before putting learning methods into practice, students ensure they are appropriate for their academic objectives, grade levels, and courses. The desire to use SDAL should outweigh the other factors (Boyer, Edmondson, Artis, & Fleming, 2014). Numerous factors affect how much control students want over their education. But the one that stood out the most was the motivating power of a "great lecture." Giving students with LDs clear instructions on enhancing their learning in connection to the shared session is equally important. If the philosophical challenge around self-motivation is impeding this, the phrase must be changed to convey the expected learning more accurately. Because students with LDs are pretty precise in stating that they require additional feedback and

support if they are to maintain their love for SDAL, academic staff will need to address this and come to a resolution. The main element influencing how effectively they work toward their goals is motivation. When someone is ready and willing to perform their obligations and engage in actions that will achieve goals and objectives, they are motivated. People must be motivated to work in academic and prospective future career settings. In some situations, the motivating factors necessary to obtain the intended outcomes are used by both students and teachers. The primary sources of incentive for human conduct are reward systems. Schools may encourage students to pursue activities that will make them happy. One central tenet of the transformative approach to teaching is that people must be committed to learning. This is particularly true if they are in charge of the teaching methods and highly value continuing education (Boyer, Edmondson, Artis, & Fleming, 2014). To motivate SDAL, it's also essential to make use of the fact that students with LDs are encouraged by various variables. Teachers must keep a highly open mind on the nature of self-motivation to inspire and motivate diverse learners to become independent learners. Keller identified four motivational qualities: attention, relevance, confidence, and fulfilment. He also discovered techniques for creating engaging education (Clark (1997; 1998), developed the Commitment and Necessary Effort model to distinguish between two motivational processes: commitment and necessary effort. Wlodkowski (1993) identified six essential elements that have a long-term effect on the motivation of adult learners. These motivational models have been applied in earlier research studies to identify student motivational gaps and create motivating instruction. When people have a goal or want to fulfil it, they are typically inspired to engage in SDAL. For instance, when attempting to spread awareness about diet and nutrition, they could look for information from various sources to improve their understanding. SDAL is something that motivated people may invest time and resources towards. People won't complete their tasks and activities on time without solid motivation. They would then be able to achieve the necessary goals and outcomes in inclusive classroom settings.

Self-Efficacy

Self-efficacy is the conviction that one has the abilities and skills to succeed in various careers and pursuits. People need to feel self-assured and independent when it comes to work and other pastimes. Any reluctance or feelings of vulnerability must be overcome. To improve self-efficacy, people must become more aware of the tasks and roles they are willing to take on. People can achieve this by enrolling in training programs or using resources to expand their knowledge. These will enable them to be adequately prepared for the obligations and jobs they must carry out to achieve the appropriate objectives. The degree of one's self-efficacy has a significant impact on their capacity to solve problems and set goals. This definition is based on the social learning hypothesis, which claims that people alter their behaviour due to witnessing how others behave. Although little is known about the practice, academic research has been done on the underlying concepts of SDAL. The only factors researched about self-efficacy are information on teacher characteristics, student achievement in course content, and college readiness (Mahinay Jr DG., 2019, Galang AJ, 2009). The nation's tertiary education system and institutional underpinnings have also been the central area of attention in the nation's quest for academic excellence [Refugio C., 2018]. Lifelong learning is the ultimate goal of the existing educational systems worldwide, and academics have recognized the usefulness of SDAL for it (Dynan L, Cate T, Rhee K, 2008). These observations build cognitive processes and confidence in one's abilities by comparing one's abilities to those of others. If a person has high levels of self-efficacy in one particular area, they could start to think they can succeed at other things. The following activities can be finished if it is believed to lead to the intended outcome. Higher degrees of self-efficacy are required for educational institutions and individuals who must deal with challenges and hurdles from other people and the environment. When the environment is demanding and challenging, people must increase their knowledge of various professions and activities, continuously enhance their skills and abilities, and establish qualities like commitment, resourcefulness, and conscientiousness. These components will actively improve self-efficacy. There hasn't been any investigation into the empirical relationship between these aspects and SDAL, even though SDAL and academic motivation have been empirically linked in the local context (Ilagan JR, Hechanova MR, Co T, and Pleyto V. Bakit ka kumakayod, 2014). The nation's foundations and higher education have received the majority of attention in studies on academic motivation in the country (Refugio C., 2018). They realize that academics observe SDAL as vital for lifelong learning. It's significant to remember that academics have determined that SDAL is essential to lifetime learning (Dynan L, Cate T, Rhee K, 2008), where lifelong learning is the ultimate goal of the current education system in place throughout the world (UNESCO., 2017). SDAL must guarantee that students receive results they are happy with. Everything must be viewed as a lesson that inspires a sense of personal accountability in children. Effective classroom management is required for teachers to entice pupils to engage in the individual study (Suknaisith, 2014). The term "SDAL" defines instruction as giving students with LDs the freedom to decide for themselves what they need and want to learn and how they want to be evaluated in inclusive classroom settings.

Social Support

The adaptive learning concept emphasizes the value of social support. Fulfilling commitments and responsibilities is necessary to pursue academic programs, take advantage of employment chances, and achieve particular goals. People must form strong relationships with others, especially their teachers, managers, fellow students, and co-workers. On the other hand, people interested in SDAL must also value forming close bonds with others. They need the appropriate teaching resources. How teachers and others are perceived as helping students with LDs affects their attitudes, behaviour, and emotions. The idea of social support is the idea that other people in educational institutions, such as teachers, regard the students. When teachers compliment them for carrying out their responsibilities and support them by giving them more opportunities, students with LDs feel appreciated. Lack of parental support among students may result in problems at school, such as peer pressure and poor well-being or health development (Blaevi, 2016). Each student's action is considered on all fronts—physical, emotional, mental, and social—. From childhood until puberty, they develop attitudes, routines, and skills. People go through a period of major socio-emotional transformation early in life that supports their future development. Since numerous studies have demonstrated the importance of the early years for student learning and wellness, it is necessary to understand how developmental experience may further influence development. Additionally, studies have shown that children who experience abuse or neglect are more likely to experience various negative behavioural, academic, and health consequences (Schonert-Reichl, 2011). This study aims to determine whether social support affects the growth and learning of neighbourhood students. As per the report, there will not be a study in this field that is exactly like the one undertaken right now. Numerous studies on student learning and development were conducted, but none were targeted. Considering the inherent conditions, the study's main objective was to investigate how social support for children influences SDAL, which may be necessary for today's culture. Learning is not an easy task. The learners must receive support and guidance to increase their learning and successfully complete their goals and objectives. The learning environment inside the organization or the level of social support for learning directly affects the learners' readiness to use SDAL. When learners choose self-directed learning, their chances of becoming independent rise. Students with LDs who engage in SDAL receive social support to increase their understanding of how to do tasks and activities, but they are still required to put the skills into practice independently. As per a study, how students with LDs feel about their teachers' social support for the method influences how SDAL initiatives are employed. The conceptual paradigm views learning disabled students as the only mediators because of their excitement and motivation to implement SDAL. The considerable contribution of increased social support to SDAL preparations in inclusive classroom settings is another crucial factor to consider.

Academic Performance of Students with Learning Disability

Usually, a person's academic standing can be used to characterize their demeanour and behaviour. This expression is regularly used in conversations both within and outside the home. For instance, it's essential for everyone in the family to be aware of their responsibilities and to have open channels of communication. They ought to treat one another with consideration and respect. On the other hand, individuals must have access to the techniques and strategies required to carry out one's work activities proficiently in both academic and professional life. A degree, commonly displayed as an average in the form of a number, letter, or percentage for a program or set of programs, often represents academic performance. Lavin (1965) defined academic performance as "any means of measuring a student's educational position." There have been many studies on academic performance. Still, very few of them have been continuous, making it impossible to ascertain whether a specific set of factors consistently influences academic performance. The sex of the student with LDs, socioeconomic status, family dynamics, study habits, attitudes, interest in a subject, motivation, impulsivity, anxiety, sociability, learning style, and student-teacher relationships are just a few of the many other factors that need to be considered. Intelligence tests are frequently used to predict academic performance. Moreover, they must learn how to engage with others, communicate effectively, solve problems, and exercise the ability to think critically. The development of these abilities will assist the students with LDs in functioning at a level suitable for accomplishing personal and career goals. If people wish to improve their academic performance, they must put the techniques into practice. The people ought to focus on steadily raising their academic performance. Even while academic success cannot be directly linked to a particular trait or combination of circumstances, high school grades are an excellent indicator of how kids will behave in a more advanced environment. Students seem to gain from developing the skills connected to SDAL to be more academically successful since most of these institutions and learning environments need students to have self-directed capabilities. The changes the government is advocating would enable a more flexible, SDAL model of education. Modern and innovative strategies and procedures are becoming more commonplace throughout the entire educational system in terms of modernity. The teachers use both teaching activities and original teaching-

learning techniques. The students with LDs also use modern methods to aid their comprehension of SDAL. Utilizing technology is the invention that is most commonly used. People create information on a wide range of topics and perform a wide range of actions and functions using technology. As when they are forced to do a task. In these situations, professors, administrators, or other students could also advise the students to use the Internet to increase their knowledge. They would ask their managers for advice on how to start the task. As a result, many people believe that the Internet is the best tool for enhancing learning and comprehension. A lot of technology is being used to promote SDAL and improve the academic performance of students with LDs in inclusive classroom settings.

CONCLUSION

Lifelong learning is an activity. Every day of a person's life, they learn new information. The majority of individuals are aware of the importance of formal education. People of all ages and professions cherish education and work hard to enroll in school. Students with LDs can learn academic concepts and hone their skills in various fields in the educational system, which is essential to raising people's quality of life in general. The SDAL learning approach enables individuals to practice the study techniques that will aid in their thorough comprehension of the topics. Students with LDs get interested in SDAL when they believe they need to enhance their knowledge and abilities in particular fields. SDAL is determined by self-motivation, self-efficacy, social support, and academic performance. Personalized learning has been encouraged in schools because SDAL gives children with LDs several noticeable benefits. However, this tactic won't be as effective as it might be unless our present models and mindsets change from teacher-centered to student-centered classrooms. Active learning, competency-based formative assessments, and practical support for teachers, students, and technology must replace fixed learning hours, numerous stated outcomes, skills assessed for learning with adequate technology, and sufficient teacher and student preparation. These factors will impact the success of SDAL. Still, in the end, our approach to incorporating these changes into our learning environments will determine how well our kids do both academically and otherwise. Teachers at all levels of educational institutions must actively promote SDAL. The teachers must use several methods. One of these is giving students with LDs the opportunity and freedom to participate in decision-making procedures. They should be allowed to openly express their opinions on various tasks and activities, especially those related to their education. The teachers should let them participate in planning seminars and conferences. The encouragement offered to children with LDs to exhibit their work is one of the essential components. The teachers must also permit the children with LDs to participate in other programs and events, such as career opportunities. Therefore, when SDAL is utilized, students with LDs receive assistance and direction from others, particularly their teachers, peers, or family. To enhance their knowledge and skills in inclusive classroom settings, each person must decide and implement learning strategies.

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THE VARIABLES THAT AFFECT CORPORATE SUSTAINABILITY: MANAGEMENT'S EFFECTIVENESS

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ABSTRACT

Corporate Sustainability Management (CSM) practice is highly thought to be correlated with management views regarding the link between corporate social responsibility and corporate sustainability management. The literature study offers thorough evidence that the CSM is a crucial management problem of a complex and international character. The ability of the corporation to affect and be influenced by social, environmental, and managerial dilemmas in order to fulfill its profit and social obligations is not independent of the firm's status as a corporate body. According to CSM, to endure over time, a balance between the management's monetary, ethical, and environmental concerns is necessary. The paradoxical stance shows that CSM's attitudes and policies are still mostly influenced by economic concerns. The success of a CSR programme, or corporate sustainability management, is analyzed in depth. This article argues, obtained from research evaluations, that CSM practice should be efficient if at least five requirements are satisfied, including: (a) the extent of stockholder pledges to support management's efforts to address environmental and social problems, (b) the management's ability to achieve higher levels of sustainability performance, (c) the management's ability to establish and maintain a strong sustainability culture that accurately reflects the principles of sustainability, and (d) the management's ability to foster mutually beneficial collaborative effort.

Keywords: Business Sustainability Administration, accountability for profits, social duty, and economic stakeholders

INTRODUCTION

Today's management faces a critical challenge with corporate sustainability management (CSM). CSM is a management philosophy that asserts that a company's capacity to generate the highest possible profit while minimizing harm to the environment and community concerns is crucial to the success of the business (Ameer & Othman, 2012). In its early stages, CSM was closely tied to the ideas of CSR initiatives, corporate social awareness, corporate citizenship, ethical behavior, the triple bottom line idea, and the argument over the applicability of the management's economics and humanistic paradigms (Lawrence and Pirson, 2010). Because a firm is a profit-oriented organization, CSM is now a crucial problem since it is linked towards the corporate greed responsibility, which is the primary management obligation. The results of different studies and polls show that CSM is a concept that is simple to understand but challenging to put into practice (Ameer & Othman, 2012; Kiron 2012; Robinson & Boulle, 2012). From a managerial standpoint, it is commonly acknowledged that environmental and social concerns are significant and can have an impact on a business's ability to survive, yet management does not pay these concerns enough consideration. Even if the company has adopted the CSM, other studies have revealed that it does not always result in an improvement in the company's finances (Kiron et al., 2012). Therefore, there are still a lot of unanswered concerns before we can say that managing the CSM is in line with the requirements of company profits responsibilities. More important issues are raised by the multicultural research findings about CSM and the company's financial success. Why an enterprise succeeds or fails in making use of CSM? What inner and outside elements ought to be met as a success requirement of CSM practice? The solutions to those questions are very critical to bolster the argument that CSM is a really perfect concept? The solutions to those questions are very essential to bolster the argument that CSM is a perfect concept. This article discusses the numerous reasserts to reply those questions with the goal of producing new propositions for in addition research.

REVIEW OF LITERATURE

Corporate Social Responsibility (CSR) and Corporate Sustainability Management (CSM): Understanding the interconnectedness between a firm, the community, and the nature is a key component of the CSM idea. Because of, to the far more periodic global financial crises brought on by commercial practices that disregard morality, the equilibrium of economic motive, the preservation of societal interests, and environmental quality, this idea is becoming more widely accepted as fact. The business enjoys people's rights since it belongs to the general public. It is impossible to distinguish the corporation from the environment and the community since the firm has the power to affect and is influenced by both.

The CSM was directly influenced by company profits accountability during its creation (Kiron, 2012; Staton, 2011; Laszlo & Zhexembayeva, 2011; Raynor, 2009A corporation must preserve its existence even while

exhibiting integrity to uphold the standard of the environment, social equality, and duty to humanity either now or in the coming. It must also adhere to the economic growth of the community. The CSM idea views the firm as a member of the public with the duty and obligation to uphold the rights of the public. CSM and the idea of corporate social responsibility are closely related in the context of the profitability of the company (CSR). CSR refers to an organization's commitment to taking responsibility for any unfavorable consequences of its business operations (Carroll, 1991; Jones et al., 2009). Both the social and economic players are expected to shoulder the obligation. While CSR comprises 4 facets, including economic, legal, ethical, and philanthropic, it is sometimes only partially understood and limited to community development and environmental protection initiatives during its growth (philanthropic activities). CSR derives from a business's implementation of the CSM principle.

FINDINGS FROM CSM'S EMPIRICAL RESEARCH:

The fundamental idea behind CSM will be how to sustain a company's profitability while being accountable for striking a equilibrium between monetary gain and socially responsible. Such idea is one that is intellectually simple to grasp yet challenging to put into reality. The summation of many study findings is as follows. According to the CSM ideal, a business that can apply the CSM would capable of safeguard its extended business achievement. However, Peters and Mullen (2009) note business diverse research is connection between CSM and company's economic success produce a range of findings (See chart 1). The findings of several studies indicate because not all businesses that practice sustainability initiatives outperform their competitors financially. According to a survey, company is concerned that perhaps the population and the ecosystem have the potential to have an impact on the monetary efficiency and growth of the firm, but will not view them as one of the most significant stakeholders (Verschoor, 2008). The community as well as the ecosystem is ranked last in the studies of Jamali (2008) and Papasolomou et al. (2005). These findings show that the company's approach toward fulfilling its social and environmental obligations is contradictory.

Chart 1: Results from Various Research investigating the Relationship between Corporate Sustainability Management (CSM) and Corporate Financial Performance (CFP)
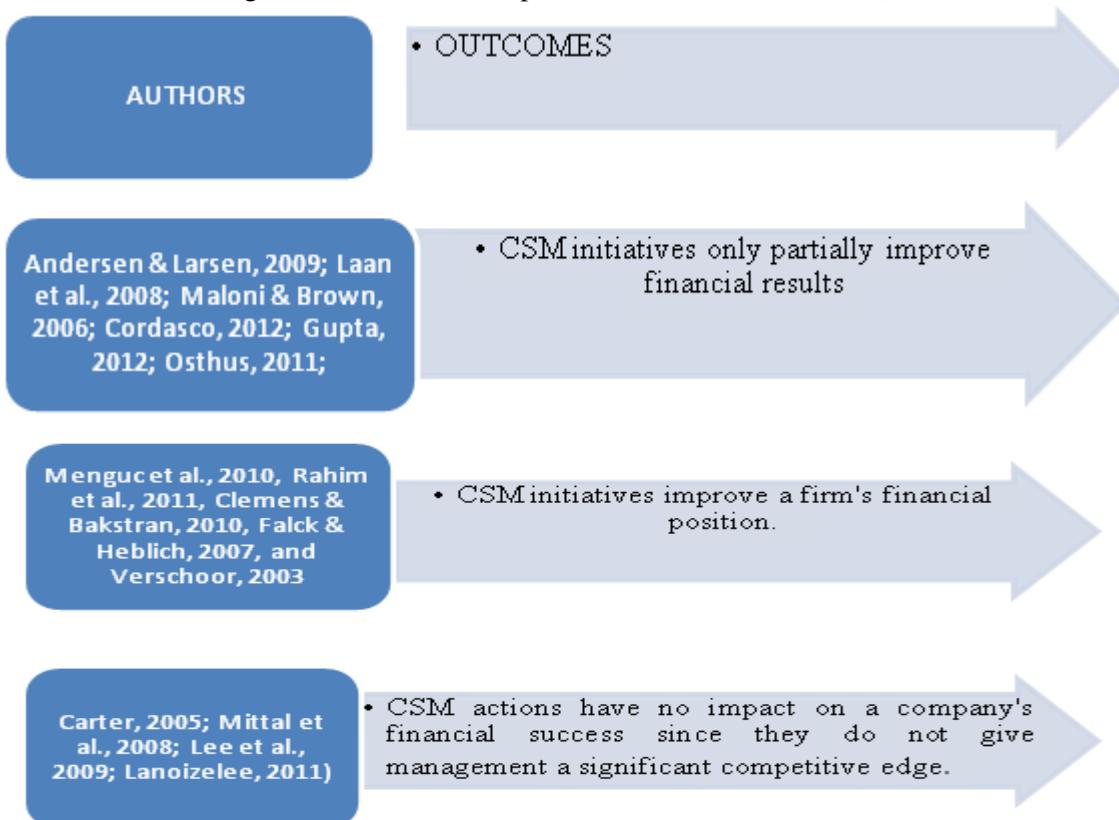
There are many discrepancies in how the people and the firm see the importance of topics including the environment, human dignity, community empowerment, economic security, and the wealth inequality. The community wants the business to play a bigger role, but management believes that handling these concerns is not their main duty (Verschoor, 2008). Upper executives believes that social and environmental issues are significant, even though it is unclear how to tackle these challenges, administration is not primarily motivated to do so (Robins, 2008; Crook, 2005). Because the desire for further consideration to social and environmental

concerns somehow doesn't reflect the reality that management faces each day, management lacks credibility and a strong commitment to these issues (Gioia, 1999). It's not like all businesses can operate in a way that balances economic sustainability with ecological sustainability. According to Ameer and Othman's (2012) research, businesses that regularly use the CSM will have improved long run financial success. Regardless of the fact that this research only considers worldwide major firms, it demonstrates how effects differ by nation. Additionally, Kiron (2012) note because not all businesses may benefit from improved financial performance and CSM accomplishment, such as improved teamwork and reciprocal societal engagement.

CRITICAL ANALYSIS

Because study findings are diverse and management ideas and mindsets vary, it is unclear why some organizations effectively use CSM while others do not experience increased profitability while doing so. These inquiries bring up five considerations for successful CSM application: (1) the principal-agent association, (2) the management's adoption of the humanism paradigm, (3) work structure, (4) the management's capacity to forge positive relationships with key stakeholders, and (5) internal circumstances that are in line with the requirements of putting the CSM concept into practice. The following sections try to address some of these questions based on the review of existing literature.

- **INVESTORS' PERSPECTIVES ON ENVIRONMENTAL & SOCIAL CHALLENGES**.

According to principal agency theory, management agreed to a principal agent arrangement in which it acts as the shareholders' agent (principal). Because the shareholders are the actual owners of the money, the management is legally obligated to the shareholders. The management's capacity to create maximum revenue in the interest of shareholders is what determines the sustainability of shareholders' wealth. The firm is an independent entity that exists exclusively to further the objectives of management. The sole social obligation is to create revenue while abiding by moral principles and regulatory standards (Kolstad, 2007). In light of different operational restrictions, such as social and environmental issues that may jeopardize the company's life, this prerequisite enables management to ensure the business's sustainability (corporate sustainability). According to the summary, agency theory places a high priority on corporate assessing the sustainability of principal-agent relationships. Agency theory also acknowledges that even if management disregarded ethical issues and legal requirements, business sustainability could not be attained. Irrespective of whether company is compelled to operate the CSR or not, ethics and adherence to rules are two critical parts of ethical behavior that indicate management understanding of the concerns of environmental protection. In reality, the company's capacity to satisfy the requirements of maximizing profits was significantly impacted by the connection between management and investors. Although the stakeholders are still the greatest authorities, they lack sufficient knowledge of such company's activities (Bonazzi & Islam, 2007). However, during day practice, the organization must contend with fierce corporate rivalry, which makes it challenging therefore for company to fulfill its environmental and social obligations. The management is unwilling to forego its financial desire in order to provide its social and environmental obligations. Evidence for this mentality may be found in the study report that demonstrates the company's paradoxical perspective toward its human and ecological duties. The dilemma approach is a sort of accountability towards the stakeholders since, in order to uphold its human and ecological obligations, company has reduced investors' interests that has an impact on the investors' perception of the organization. Consequently, the degree of continuous improvement to upholding sustainability initiatives is greatly influenced by stakeholder involvement (Barnea & Rubin, 2010). The Berkshire Hathaway investor's defiance of the requirement to follow environmental regulations issued by the United States government (www.huftingtonpost.com, 2011). The increased proportion of "socially responsible investors" in the stakeholder structure, although, has an impact on the management must be committed to working on environmental and social issues, claims Barrett (2001). Barrett (2001) asserts that the increased proportion of "socially conscious shareholders" in the stakeholder structure has an impact on the employees who contribute to working on environmental problems. The first proposition is as follows: "The level of investors' engagement to overcoming social and environmental considerations influences the success of continuous improvement to adopting organizational sustainable growth," according to the description.

SUSTAINABILITY PERFORMANCE GOVERNANCE AND THE HUMANISTIC PSYCHOLOGY PERSPECTIVE

According to Pirson and Lawrence (2010) and Harris and Towmey (2008), the globe is currently dealing with the difficulty of weight management sepsent due to increasingly periodic financial turmoil across many nations, which make it difficult to preserve the firm's sustainability. According to Pirson and Lawrence (2010), the management of the firm must be willing to be somewhat more humane, forge transformative partnerships, and forge profitable commercial ties with all of the organization and its stakeholders. If a corporation can secure the life of its stakeholders, including its rivals, it can guarantee its own existence. A significant humanitarian

outlook will influence management's approach to handling social and environmental aspects connected to the firm's commercial activity. Powerful social views will successful leadership from being hypocritical, faking, or acting untruthfully when fulfilling its social obligation. A more humanitarian mindset will urge managers to pursue excellent business behavior and refrain from doing anything "dumb and wicked" that goes against the interest of the employer and the community (Banerjee, 2009). Pirson and Lawrence (2010) specifically refer to this idea as Renewed Darwinian Theory (RD Theory). The overview of the fundamental CSR as a tool aims of generating wealth for all stakeholders and works for the mutual satisfaction of all involved. Using RD theory of management in a way that balances stakeholder expectations is the major challenge. The humanitarian approach is demonstrated by company activities that consistently prioritize social responsibility and always take the matter and morals into account as important factors while performing company. Pirson and Lawrence (2010) contend that business can increase the likelihood of the sustainable enterprise by embracing humanistic. The hypothesis 2 which can be developed from this study seems to be that "the firm's survival ability will be stronger the far more rigorous governance employing humanistic psychology perspective."

CORPORATE SUSTAINABILITY AS WELL AS THE REQUIREMENTS MANAGEMENT STRUCTURE

For something like the organization, CSM is a strategic and dynamic concern. According to Barrett (2001), the most basic necessity is to increase economic health and staff satisfaction, Maslow's Theory of Motivation. Moreover, it is really important to generate strong connections with clients, partners, and staff (associations), as well as enhanced business practices (ego), ongoing innovative products (conversion), internal coherence inside the organization, and relationship-building. Its greatest requirement is the need to create a solid bond of mutual dependency among employees and customers (unity), involvement between workers (involvement), and the need to be "good citizens" (Falck & Heblich, 2007). Additionally, according to Rice (2009), the demands of the organization may be broken down into eight categories, including (a) the need to feel secure against the danger of cost of doing business (security), (b) the desire to establish connections with others (connection), (c) the need to manage the surroundings, and autonomy (control), (d) The necessity of getting the investors' commitment (esteem), (e) the necessity to depict individual viewpoints (aesthetics), (f) the constant assistance needed to enhance and understand (cognitive), (g) the requirement for assistance in contacting the organization, (h) Organizations recognize that it's important to be considerate of others and uphold moral principles (transcendence). Moreover, Campbell (2009) divided the business in line well with sequence of demands. According to Maslow, the importance of the bodily (lowest), feeling secure, appreciated, and loved, and lastly, self-actualization for businesses, managing cash inflows is dependent on meeting their physical demands, which leads to the development of goods and services in response to the market. The greatest necessity is to act morally and with consideration for other people. According to the opinions of Rice (2009), Campbell (2009), and Barrett (2001), each firm may experience a range of demands, which has an impact on how conscious the company is of its social and environmental obligations. Additionally, Pre-CS (lowest) Compliance-driven CS, Profit-driven CS, CS, and CS are the six degrees of CSM practise, according to Marrewijk and Werre (2003). Integrative and caring-synergistic CS (highest). Marrewijk and Werre (2003) divided the classification into four categories depending on the amount of (1) company's outlook to satisfy the interests of other stakeholders and its own, (2) authorities to take action timeframe, (3) the stability of recognition to the importance of financial performance, social and environmental, and (4) company's abilities to develop a balanced and sustainable connection among all parties involved. The level of holistically CS was attained by even more effective business acumen then the more power of managing generates economic sustainability. According to the theorization, a corporation that consistently experiences working capital concerns is one that only considers brief solutions while ignoring long-term environmental and social responsibility challenges. Every business usually views environmental and social concerns as burdensome and frequently avoided challenges. (Lee & Ball, 2003) In contrast, a firm will be even more aware of and aggressive about social and environmental problems as its capacity to service its requirements of the business rises. Economic incentive is by far the most pressing necessity, according to Campbell (2009), Rice (2009), Marrewijk and Werre (2003), Lee and Ball (2003), and Barrett (2001). It may be used as an explanation for the scientific studies by Ameer and Othman (2012), who found that by using the CSM idea and Macdonalds capacity to "compel" its rivals to operate a protection of the environment programme together, typical worldwide companies can experience higher return on investment (Kiron et al., 2012). However, not all businesses can benefit from improved business performance after using CSM. In conclusion, if management can ensure a firm's long-term capital structure, a corporation will have a better balanced knowledge of its economic, societal, and ecological responsibilities. The next premise that may be proven from the explanation is: "The management will be more concerned with the concerns of social and environmental sustainability the more robust management skills to satisfy its long term financial performance."

BUSINESS RESPONSIBILITY AND MANAGEMENT EFFICIENCY

There are three levels of sustainability, according to Robinson and Boule (2012): quasi, weaker sustainable development, and powerful sustainability. A corporation that lacks or has inadequate sustainability likely to be protective (defensive) and it has a low level of awareness to social and environmental concerns (Lee & Ball, 2003A corporation that already has a supportive work environment that consistently views social and environmental challenges as commercial possibilities is said to have high sustainable and anticipatory engagement. A corporation that is unable to create a strong corporate environment, sees social and environmental challenges as a burden, and doesn't demonstrate a strong dedication to resolving these issues is considered non-sustainable or barely sustainable. According to the statement, it could be inferred that the company's capacity to create a potent organisational sustainable environment would affect the stability of the firm (Abbett et al., 2010). A culture that is effective inside an organisation is one that adheres to the rules and specifications of both partners and stakeholders. A healthy corporate change inside the CSM depends entirely on managerial skill (Caprar & Neville, 2012 ;). Nevertheless, there still are four types of organisational culture groups, according to Linnenluecke and Griffiths (2010): One internal organizational model, two human resources models, three models of rational goals, and four models of open systems. Internal process model is a corporate structure which, in the long term, is unable to achieve environmental governance since it is exclusively focused on economic stability. The human resource management framework is a cultural paradigm that places an excessive amount of focus on social beliefs that are harmful to long-term financial success. Since logical objective paradigm seems to be a corporate structure which prioritises economic viability as well as streamlining overall manufacturing operations, it cannot ensure the maximum corporate viability. Another institutional context paradigm known as that of the "open software approach" places a strong emphasis here on value for creativity towards achieving sustainability initiatives. This capacity csr forge positive connections well with business's financial and cultural customers is essential to its existence. As a result, administration ought to be adaptable in managing company's operations. Organization needs to be able to develop some of the following in ways that strengthen csr programs (Caprar & Neville, 2012; Robinson & Boulle, 2012Crews, D., 2011; Jorge et al., 2010; Linnenluecke & Griffiths, 2010; Abbett et al., 2010;; Grayson et al., 2008; Szekely & Knirsch, 2005).

• Essential aptitude that incorporate the company's long term strategy further into CSM structure's execution.• This same capacity to guarantee that every organization member has accepted that concept for what it is. • Having capacity that guarantees here that concept was already achieved in each and every choice, move, and regular activity made by everyone working for the organization. • The capacity to establish a culture of learning which permits ongoing progress. Environmental policies must serve as a catalyst for establishing novel, superior, and morally superior strategies for boosting performance. • Monitoring the successful execution of the aim, objective, beliefs, strategies, and projects • This same capability that cultivate the inspirational approach and constructive leading to be an encouragement as well as a provider of motivation across all individuals in the company. • Having competence for minimize discrepancies between organizational character and moral beliefs. • this same potential that create evaluation process and data management which can deliver reliable data depending on the balance of monetary, ethical, and performance measures. These capacities needs demonstrate the company's and investors' huge backing.

When assumptions aren't really combined only with capacity to integrate overall company structure through accordance with the standards that CSM in the day-to-day organizational processes, executives will never be capable of executing CSM effectively Moreover, even as company is made up of a variety of individuals with various perspectives or motives, overall effectiveness of CSM rests just on company's capacity to foster parity of viewpoint, objective, thinking, expression, and behavior among company members. Its fourth premise seems to be as follows: "its Company's capacity to build and execute a set of feasible may impact the company's tendency to preserve this same business's sustainable development."

- **ORGANIZATIONAL SUSTAINABLE DEVELOPMENT BUT ALSO SHAREHOLDER COMPETENCE**

This requirement must consider a concern of sustainability adds to company's pressure for meeting their financial responsibilities. Any need to consider human and ecological concerns places additional pressure on companies must fulfill its economic responsibilities. Throughout addition, its shareholder model suggests that a corporation must vary based also on assistance of its shareholders to ensure for exists. To do this, management should be able to accommodate the varied groups of many shareholders. As secure overall longevity of such corporation, proper calibre for cooperating connections becomes essential (Grayson ET al.2008; Jorge et al., 2011; Kiron et al., 2012). Overall depth of such negotiation position here between businesses with interested

parties enhances the type of coordinated efforts. Ultimately, administration must ascertain which parties have the most negotiating leverage which is what these individuals' priorities are. According to the findings from study by Jamali (2008) and Papasolomou et al. (2005), financial investors are far more significant over calling attention. Workers, clients, stockholders, plus vendors comprise financial constituents. Both environmental as well as the communities constitute societal contributors. Their findings demonstrated how identifying one of most significant parties and fostering engagement for them are nevertheless driven mostly by commercial importance. Financial investors are still particularly focused also on financial gains as the major factor in supporting the firm's existence. Customers need not accept of offering rising prices whether they are brought together by the extra cost of more intense form of donation, studies have shown that consumers progressively enjoy humanitarian action. (Oppewal et al., 2006; Staton, 2010; Schwartz, 2008; Rahim et al., 2011; Oberseder et al., 2011). Customers demand additional knowledge on business ethical behavior; however this does not ensure they would acquire so much from businesses who engage in significant charitable endeavors. Furthermore, study findings indicate that company is open to becoming engaged in addressing social and environmental impact so far like the vendors can develop a unique market value. Given that not all vendors were capable of making items that are rid of social matters and the environment, companies would face all higher costs associated with such requirements. As a result, a business will take into account the social and environmental impacts of its customers if doing so improves its business performance (Andersen & Larsen, 2009; Maloni & Brown, 2006; Carter, 2005). controversial behavior Investors of Berkshire Hathaway also claim stated they would not choose its financial gains to be hampered by the management's excessive humanitarian endeavours.Government assistance in the form of unambiguous established rules and fair but stringent judicial process has such an impact on a company's capacity to involve processes. Additionally, rivals have the power to affect managerial attributes that foster cooperation. Moreover, according to Michael Porter's notion from 1985, the degree of participation of vendors, consumers, challengers, and possible new competition determines the amount of competence and price offered. Therefore, it has been said that a firm's capacity to influence and command overall interests of financial consumers greatly affects their capacity to negotiate including its investors. That effectiveness in order to develop a beneficial trade partnership only with business's financial investors has an impact on their capacity to preserve the existence of the company, according to the fifth argument based on the aforementioned debate.

- **CONCLUSIONS AND SUGGESTIONS**

Although CSM is a simple idea to grasp, not because all businesses can take use of it. Company is well aware it is now impossible to fulfill its financial obligations while ignoring the needs of the people and the environment. The objectives of the firm might be impacted by social and environmental factors. As a pillar of the community, the firm seeks to preserve the welfare of stakeholders as part of a strategy to uphold the success of the corporation. It is considered that doing commercial activities while keeping the equilibrium between the monetary, societal, and ecologic outcomes will increase a firm's sustainable development over time. However, a number of research and survey findings demonstrate that not all businesses are successful and achieve greater profitability due to conflicts of desire within investors and among executives as well as the shareholders. Research demonstrates however not all businesses are equally capable of managing their CSM. Several actual pieces of research on CSM organizational performance indicate that at least five requirements must be fulfilled in addition to the importance of CSM, including: (1) the degree to which investors are committed to addressing environmental and social concerns, (2) the degree to which business has incorporated the humanism perspective into daily operations, (3) this same company's capacity to carry out charitable Endeavour's rather than being concerned about the possibility of declining revenues and loss of attractiveness, (4) its business team's capacity to develop and implement an integrated and holistic philosophy and (5) its executive team's capacity to foster relationships between the business and its financial constituents that are greatly agreeable.

SUGGESTION TOWARDS ADDITIONAL STUDY

Its goal of this report is really to gather opinions regarding the causes of either the application of CSM's victory and defeat. As per the research, the CSM integration must take into account at least 5 different elements. However, since CSM is a sophisticated business issue and a worldwide phenomenon, the thesis in this work cannot fully address all of its occurrences. Such circumstances have evolved in the necessity for considerable study about use of CSM across (1) various sectors, (2) various financial competitions, and (3) various nations.

BUSINESS GOVERNANCE SUGGESTION

Practically speaking, the aforementioned article advises businesses that if anything does not signify at least five criteria, implementing the CSM principle is inadequate. Therefore, to be competent to establish management practices and effective advance to lower the vulnerability of CSM implementation rejection, business must

conduct an evaluation of the circumstances including demands of various stakeholder groups prior to implementing the CSM.

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QUANTITATIVE ESTIMATION OF MICROFIBERS RELEASE IN WATERWAYS UNDER REAL-LIFE DOMESTIC LAUNDRY CONDITIONS

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ABSTRACT

Microplastics and microfibers are prevalent in different environmental conditions and different ecosystems around the world. One of the main reasons identified appeared to be the laundry of textiles and apparel. It was estimated that during the domestic laundry several microfibers are being released (mainly synthetic) into our waterways due to mechanical agitation, and chemical stress, which during long exposures lead to deterioration or degradation. Several laundry parameters like water level, laundry water temperature, type and quantity of detergent, wash timing, and additives such as bleaches and fabric softeners have been identified to affect the quantitative measures of the microfibers release. In the present study, microfibers release was estimated under real-life domestic laundry conditions without any external influences. It was found that laundry time plays a key role in the number of microfibers released. Correlative analysis showed that the number of microfibers released from the extended wash cycles was similar to that of a quick wash cycle. Moreover, it was observed that the lower the wash time the higher the mechanical agitation which only aims at the removal of dust or stains from the clothing with heightened agitation rather than focusing on the abrasion rates. This breaks out the inappropriate notion of washing clothes in the quick wash cycle can reduce the microfiber emission rates.

Keywords: domestic laundry, microfibers emission, washes cycle, laundry time, apparel and textiles

INTRODUCTION

Environmental pollution is increasing nowadays due to several factors and one of the main factors responsible is microfiber pollution is domestic laundry (Volgare et al., 2021). During the year 2017, microparticles released from the domestic laundry of textiles and apparel items were estimated about 35 percent of the global oceanic pollution (Boucher & Friot, n.d.). During the release, not all the fibers were blocked in the wastewater treatment plant, some of them escape and enter the seas, and oceans contributing to the whole eco-toxicological effect. Estimates of domestic laundry showed that for every one kg of fabrics/ apparels washed about 124 to 308 mg of microfibers were released into the environment (De Falco et al., 2019), which can correspond to about 640,000 to 1,500,000 microfibers in number. Studies conducted by Napper & Thompson, (2016), on acrylic fabrics exposed that for a reference load of 6Kg weight a preponderance amount of 700,000 microfibers were emitted from each washing process.

Laundry can be considered as one such household process which is done on a regular basis in almost each and every household (Stamminger & Schmitz, 2017), and this act of washing was highly influenced by consumer's social, cultural, economic, and moral norms (Das & Norum, 2013). Laitala et al., (2011), discussed that laundry is mostly habitual with consumers taking subconscious actions rather than examining the laundry requirements of clothing (soil level, stains, etc.). The general notion observed among the consumers is that as the clothing items were in close contact with the skin it was thought that they should wash a clothing item typically after each and every wear. While there were several methods through which quantification was carried out, there were very few works that worked under real-life domestic laundry conditions. The present research work was carried out to find out if there is any significant relationship between the washing time and the number of microfibers released. It was hypothesized that washing time has a significant effect on the abundance of microfibers released.

METHODOLOGY

Real-life domestic laundry conditions were considered for the study. The wash load was not optimized, which shows that majority of the households were using a mixed load of laundry. Difference wash cycles were noted with their corresponding time taken for completing one full cycle. Laundry effluents were collected using the aliquots method for easy quantification, and for qualitative analysis, FTIR analysis was conducted. Glass microfiber filters with a pore size of 5μm and 0.7μm were used for the filtration process.

Optimal laundry detergent (all-purpose) was used during the laundry process. No changes were made to the water level, the only changes made were to the timings, and as fully automated washing machines were selected the water level was adjusted according to the wash timing. Empty cycles were run before the experimentation

and filtered to see that fibers from the previous washes do not interfere with the study thus prone to errors. During the course of experimental washes, no empty cycles were run to replicate domestic laundry conditions.

RESULTS AND DISCUSSION

To find out the effect of wash timing on the number of microfibers released, several wash trials were performed in a real domestic household washing machine. Fifteen replicates of each wash cycle were carried out to find out if there were any discrepancies during the trials. The filtration method was carried out carefully to reduce contamination and the fibers were counted manually. It was interesting to note that about 0.7 percent of fibers found were significantly longer than the remaining obtained fibers. While the type of fabric and weave structure plays a major role in the average length of the fibers, a few characteristics which seem aberrant were the wear and tear of the clothing item. From figure 1 we can see the number of microfibers released from each wash cycle concerning the wash duration and the difference in the sheddability based on the type of load. General observations showed that 53 minutes cycles have released a significant amount of microfibers with a mean score of 1927.46 (Figure 3). Whereas, the second-highest emitters means calculated were 120 minutes cycle (cotton wash) and 15 minutes cycle (quick wash) with 1652.66 and 1614.80 respectively.
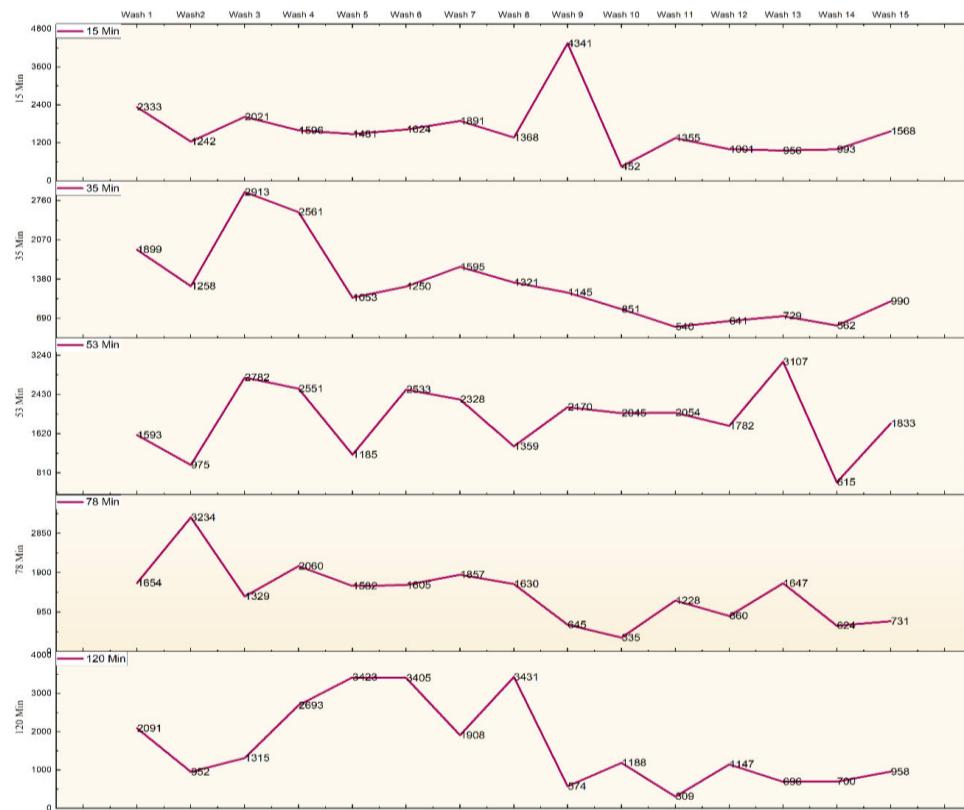
Figure 1: Depicts the different wash timing replicates and the number of microfibers released in each cycle

All the wash loads were almost even with a mixed load of clothing, which consisted of cotton, polyester, polyamide, rayon, and several blends depending on the wearer's choice. The statistical box plot (figure 2) depicts that the upper and lower limits of the 120-minutes and 15 minutes wash cycles were the same. This can be clarified as the 15 minutes cycle was the most agitating cycle, and during the 120 minutes cycle where the alteration between the soak and spin cycles the water-sensitive fibers such as cotton and rayon swell after an extended exposure which when abraded against the hydrophobic rigid fibers thus leading to rupture in the fiber structures. In the long run, these ruptures emit in the form of micro and nanofibers from the laundry effluents.
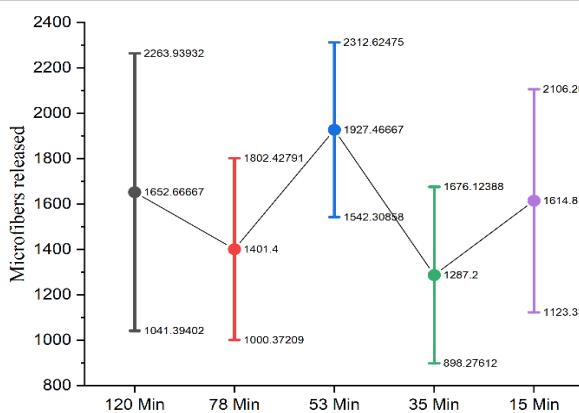
Figure 2: Depicts the statistical box plot of the Microfibers released under different wash durations

Correlative analysis depicted that 120 minutes and 53 minutes cycles have a negative correlation with values of -0.04. The effluent fibers were analyzed to identify the fiber content, and it was surprising to note that about 63 percent of the emitted fibers are of natural (cellulosic) origin. The results obtained were in accordance with a similar study conducted by Galvão et al., (2020), who found an abundance of natural fibers in the laundry effluents under domestic laundry conditions. This shows a strong relationship between the mixed load washing and the effluents rate. It can also be thought that as natural fibers are staples there were more chances of shedding rather than the filamentous synthetic fibers. Fabric structure and weave patterns highly affect the sheddability rates, thus while choosing clothing items it was recommended to choose a tightly woven fabric rather than fuzzy fabrics and loosely woven only to wash out the fibers in the form of laundry even without realizing the potential environmental risks.

CONCLUSION: The present study strongly suggests that changes in the laundry behavior should be analyzed and changes should be brought out with proper education and sensitization which paves a path to the reduction in microfiber pollution. Results showed that the majority of the fibers emitted were natural fibers, this might be due to several reasons. But it was recommended to the users that it is better to segregate the laundry load depending on the fiber content and wash according to the fiber's need rather than just tossing all the available laundry and running at just any wash cycle of choice. However, further research is recommended which are the influence of sustainable practices, and the effect of other parameters such as family size, demographic variables, water type, occupation, and conscious behavior.

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WOMEN'S STUDIES

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ABSTRACT
Women's Studies, also referred to the study of gender in general and feminist studies in particular . The research scrutinized the social and political consequences which gave birth to Womenist or Feminist Studies. The research studied the sociopolitical environment that further initiated the development of Women's Studies. The ideologies of social and political cultural are adequate to put forth, how women being the subordinate group developed their social and political existence in society. Not, only they developed their sociopolitical existence but their identity as an individual. The research also examined the possession of male strata. How they treated her merely a sexual object, her primary concern is to cater the domestic needs and since childhood she is being inculcate for the same. This piece of writing explored the need of Women Studies and deterioation of chauvnistic dogma. The study expounds the nature and domination through consent and force which further exemplified the tussle for existence and identity.

Keywords: Women, Possession, Hegemony, Identity, Chauvnisim

INTRODUCTION
Women's Studies is one of the extremely crucial and controversial topics of literature in particular and society in general. Woman is supposed to be wooed by a man since beginning. If the prefix Wo and Fe is separated from woman and Female then what all left is a man or male . And the interpretation of this very word is being defined majorly by patriarchy. Though her biology is as natural as her male counterpart still, she is treated differently on the basis of her physic . She is always being subjugated and this domination is done to her in numerous forms. Women and her Body is always defined by male authors in several works of literature. She is neither allowed nor supposed to illustrate herself according to her will, as she is considered what Simon de Beauvoir called her ' The Other' . This otherness is further illustrated by De Beauvoir with the instance of Master and Slave. The characterization of her being woman can be studied in the following words :

"One is not born , but rather becomes , a woman." (Beauvoir,1949 , p. 283)

The above statement better clarifies the norms which makes an infant what we call a Woman . Woman is the Other because man defines himself as essential to the world, and considers himself as the subject by which woman is defined. Further de Beauvoir uses Home, a metaphor for woman's limited position in society. Willingly or unwillingly by throwing themselves into domestic chores women are actually narrowing their path of equality. Therefore, home can be a parallel to a prison.

There are various blueprints in literature which divulged Male hegemony. Vijay Tendulkar's Slience! The Court is in Session is one such fine illustration. Professor Damle though, he is equally responsible does not need to face any trial as Miss Benare is facing. On the name of court's proceddings Benare's personal life is questioned and moreover desicated publically . Miss. Benare, the moment she is being charged with a crime ,there comes a threat on her profession as well but on the contrary Professor Damle is a free soul, no-one put forth a question to him. While Miss. Benare replicates her idea of biased society. she put forth her point by saying, for men the women was only about Body. Miss. Benare also represents the contrast between the Thinking of Man and Woman. The following words describes the difference of thoughts.

"She worshiped that man's intellect. But all he understood was her body."(Tendulkar,1963,p.108)

Miss. Benare is always under a question but nobody bothers about Professor Damle. The troupe members deliberately plan the mock trail to disturb Miss. Benare's piece of mind. Knowingly they target her time and again but they didn't pay any heed to Professor Damle's arrival.

Anita Desai's Voices in The City depicts the plight of woman through the character of Monisha . she is married to Jiban (officer in government department) and has a large joint family .Monisha's sufferings begin with the very first day of her marriage . Jiban believes in the orthodox roles of woman like,

"Cutting vegetables ,serving food ,brushing the children hair."

On the other hand Monisha likes to read books , she has many in her cupboard but unfortunately she doesn't get a chance to read . Because she is always busy in Domestic Chores. This is how women are kept aloof, for what they desire. Monisha is being dominated by her in-laws with each passing day after her marriage. She is being prevented to meet her younger sister Amla. There's no way out for Monisha to reveal her sufferings, unable to bear this trauma she commits suicide at the end by burning herself.

The possession over women is very common. Henrik Ibsen's A Doll's House represents such domination. Nora's husband Torvald calls her by names like "little songbird", "little skylark", "little person", "little woman." Moreover he uses "MY" which again shows his possiveness that Nora is his. By addressing Nora as "My" Torvald is treating her as an object which belongs to him only. Towards the end of the play Nora gets frustrated while declaring that despite their eight years of marriage, they do not understand one another. She realizes it's not love but the consented domination on the name of bonding, Torvald treated her like a doll to be played with and can humiliate her the way he likes.

Sashi Deshpande's That Long Silence also reflects this domination. The protagonist Jaya suffered a lot at the hands of her husband. Undoubtedly she was literate but she is neither ways allowed to use her wits moreover, she has to be a dutiful wife by remaining silent at her husband's illegal ways of making money . These words haunt her like anything on this planet, and in great pain she remembered how she is being chided by her grandmother:

"Look at you- for everything a question, for everything a retort. What husband can be comfortable with that?"(Deshpande, 1988, p.27)

These words adequately put that women are being trained since childhood to be silent. Jaya is intelligent, curious and bright, these qualities are being described as 'Devil in the House.' Being a woman she has to shun these vital qualities. Jaya's grandmother encourages her to act more conventionally so that she can get a husband when she grows up. Her grandmother often explained that civilized and cultured girls are skilled at cooking, cleaning and in domestic chores. In addition she tells Jaya to be more accommodating and to be quite when she disagrees. That means she doesn't need to show her disagreement at any point of time.

Alice Walker's The Color Purple is again a fine text to understand the pain and sufferings of women. Celie, the narrator; suffered a lot. Being raped by her father she is threaten to be silent. She is not even allowed to communicate with anyone that is the reason she writes to God.

"You better not never tell nobody but God. It'd kill your mammy."(Walker, 1982, letter1-90)

This is how Celie writes her very 1st letter to God explaining her sufferings and trauma. Celie's search for identity is one of the prime themes of the novel. Alphonso, her brutal father forced her to marry Mr.__ (also addressed as Albert) thrice of her age.

The mental and physical trauma through which woman undergoes is very much equal to the sufferings of colonized. Rather their plight is thrice to the colonized. As they are women 1st , poor and black. Because of this consistent treatment they started interpreting themselves through male gazes. This male gaze is what Coventry Patmore explained as 'Angel in the House', trying their best to be fit in the phenomena of Angel in the house some of them, putting their identity and passions at the stake, which is again set by male chauvinistic society, many lost their real self. They are being trained to be idealized woman by abandoning their intellect, passion and desire for freedom.

Women are not blessed with any sort of opportunity, more specifically the freedom to express. Woman and her body always defined by male authors in several works of literature. But it's time for woman writers to define their body in their own ways. As Helen Cixous said in The Laugh of the Medusa.

"And why don't you write? Write! Writing is for you, you are for you; your body is yours, take it…"(Cixous,1976,p.876)

It's essential for woman to write about themselves and they possess the talent as well. Virginia Woolf better draw the reader's attention through the creation of Judith Shakespeare in her essay A Room of Once Own. Woolf created this character just to make people realize, how a woman with talent equal to Shakespeare not able to achieve the same success because of the biased structure of the society. Judith's life is fraught with tragedy. Forced by her family into an early marriage, she is not able to pursue her art. She becomes pregnant, which makes a life of writing impossible to her. Later she kills herself. This is how subjugation repressed their lives to the extend. Equality is must for good production. That is why Woolf is of the view,

"A woman, must have money and a room of her own if she is to write fiction"(Woolf,1929,chapter one)

Woolf also expresses the plight of William Wordsworth's sister Dorothy Wordsworth. Being a woman she is unable to express her ideas as freely as Wordsworth. She has certain curbs. And Woolf questions such restrictions on female writing in her essay. Mark following words from her essay:

"…who shall measure the heat and violence of a poet's heart when caught and tangled in a woman's body?"(Woolf,1929, A Room of Once Own)

These words express that woman quest for writing is much more than anyone. Let them disclose the heat and violence, but for that must be free from chauvinistic impression.

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THERMAL COMFORT ANALYSIS OF VERNACULAR AND MODERN HOUSES OF KALABURAGI BY QUESTIONNAIRE SURVEY

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ABSTRACT

In vernacular residences passive techniques had been practised to attain thermal comfort environment. But present-day contemporary houses totally forget and ignore the architectural traditions. Infact contemporary buildings are opting for mechanically controlled built environment in order to achieve thermal comfort which increases the demand for energy.

Study of traditional buildings is carried out world-wide to create a sustainable solution for design of new buildings. To compare the thermal comfort in vernacular and modern houses a detailed questionnaire survey is being conducted in the present study. Vernacular house of more than 70 years and modern houses of less than 20 years have been selected for the survey. Survey results show that about 82% of the occupants feel comfortable in vernacular houses as compared to 50% of the occupants in modern residences. Similarly, subjective responses of other parameters like humidity, air flow and over all thermal comfort are also found to be much better in vernacular houses compared to modern residences. This mainly attributes that solar passive designs incorporated in vernacular houses plays a major role to achieve thermal comfort. Hence from the present study it can be concluded that comfortable living environment can be created by incorporating vernacular passive cooling techniques in modern residences.

Keywords: Vernacular houses, Modern houses, Questionnaire survey, Vernacular passive cooling techniques, Thermal comfort.

1. INTRODUCTION

The question of comfort has always been approached by tests with people in order to include subjective votes and correlate them with measured climate parameters. While standards on thermal comfort were exclusively based on laboratory tests for a long time, the demand for field studies gradually arose, for example, building monitoring and surveys were meant to improve the dialogue between all partners of the design and building process and enhance their responsibility for the performance of the building (Bordass and Leaman, 2005).

Building occupancy evaluation for a thermal performance are at a degree at which buildings modify the prevailing outdoor climate to create a comfortable indoor environment.

Contemporary architecture often forgets and ignore the vernacular architectural traditions. Achieving thermal comfort is important for general wellbeing of the occupants. Many solar passive techniques like building orientation, form, fenestration, window to wall ratio and materials contribute comfortable environment in vernacular houses which are lagging in the modern houses. Modern houses depend on the mechanical devices to achieve the comfortable built environment where as vernacular houses are more comfortable with their passive cooling techniques thereby minimising the energy need. (Ref.1)

The solar passive techniques to achieve thermal comfort have been studied worldwide to arrive at sustainable solutions for the design of contemporary buildings (Ref 2-4).

To validate the quantitative results questionnaire-based field survey has been conducted in Kerala-India and Accra- Ghana among the residents of vernacular and modern residences. (Ref 5-6). Survey on building occupancy evaluation for thermal comfort in Kalaburagi region Karnataka has so far not been reported.

Karnataka state is situated in south India and Kalaburagi region which is in northern part of Karnataka has hot and dry climate as per the classification of NBC-16. Due to the presence of high temperature, it causes thermal discomfort inside the buildings designed improperly without considering the climate.

Hence, in the present work, to understand the effect of various thermal comfort parameters like temperature, humidity and air movement a questionnaire survey is conducted among the occupants of both vernacular and modern houses of Kalaburagi region. Occupants of age group of 20-70 with equal representation of both male and female were chosen and subjected to a questionnaire survey to assess their subjective response for thermal comfort. A comparative analysis of the survey results is carried to bring out how well the solar passive cooling techniques incorporated in vernacular residences contribute for thermal comfort.

2. METHODOLOGY

2.1. Selection of Building Occupants:

The questionnaire was conducted among the building occupants of both vernacular and Modern residences of Kalaburagi region. 170 people of vernacular houses and 150 people of modern houses. All 320 houses selected were in the habitable condition where people were living in them. Before conducting the survey, the people were given full time to respond and were properly explained about the purpose of survey and how they have to respond.

The Vernacular houses selected were 100 and more than 100 years old. Vernacular houses were constructed with the passive cooling techniques like courtyard, small opening, roofs with Shahabad stones and thick walls thus cutting down the harsh solar radiations. The Modern houses selected were from 5 to 20 years old. The Modern building lack conscious effort of passive cooling techniques, they were constructed with thin walls cement plaster and RCC roof. Glass was also extensively used in most of the modern houses. Micro level variations were not considered in the above selected houses.

2.2. Questionnaire Preparation:

The questionnaire consists of three parts: Firstly, the basic information of the occupant and about the thermal comfort responses on thermal sensational parameters and the methods adopted to control with respect to the characteristics of building elements. Enquire of subjective responses include temperature, humidity, air movement, overall comfort, measures to retain the thermal comfort and characteristics elements of building. The questionnaire format for both Vernacular and modern buildings are given at the end.

Indoor temperature assessment was carried out using the subjective scale of cold (-3), cool (-2), light cool (-1), neutral (0), slightly warm (+1) and hot (+3). Humidity assessment was done using the subjective scale of very dry (-3) , Moderately dry (-2), slightly dry (-1), neutral (0), slightly humid (+1), moderately humid (+2) and very humid (+3). Air movement inside the building was assessed using the subjective scale of very still (-3), moderately still (-2), slightly still (-1), Acceptable (0), slightly draughty (1), moderately draughty (2) and very draughty (3), The subjective scale used for assessment of overall thermal comfort is very uncomfortable, uncomfortable, slightly uncomfortable and very comfortable. The questionnaire was prepared based on the analysis of the literature based on the thermal comfort (5-7).

The questionnaire was prepared for both vernacular (Appendix-1) and modern houses (Appendix-2). The questionnaire was given in English and for the people who dint know English it was translated in Kannada and it was made available for reference during the survey.

3. RESULTS AND DISCUSSIONS

The results of votes are analysed based on the subjective votes collected by the various inhabitants of the building. For any comfortable condition of a indoor space 80% of the occupants should feel comfortable with the prevailing thermal conditions.(ASHRAE)

Among the subjective votes for the indoor temperature, The ASHRAE standard 55 (18) states that the acceptable thermal conditions should have 80% of occupant's subjective votes for the central three categories cool (-1), neutral (0) and slightly warm (1). Fig.1 shows the subjective response of indoor temperature in summer season.
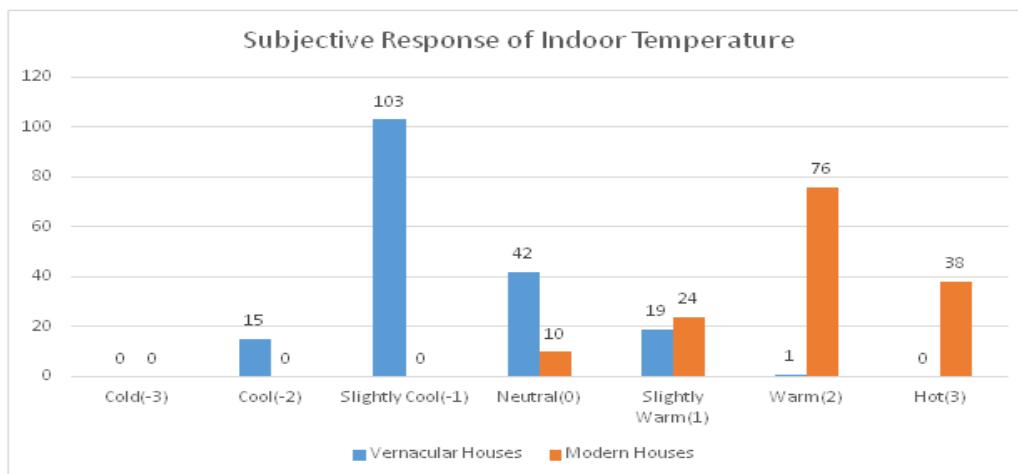
Figure-1. Subjective Response of Indoor Temperature in Summer Season

Air temperature is often considered as a main design parameter. Fig.1 shows that 80 to 100% of occupants voted for the central three categories for vernacular buildings and only 60% of occupants voted for the same in modern buildings. The distribution of votes is 15 for cool (-2) 103 for slightly cool (-1), 42 for Neutral (0) and 19 for slightly warm (1) in Traditional Residences. In modern residences the distribution of votes is neutral (10), Slightly Warm (24), Warm (76) and Hot (38). None of the occupants opted for cold in both Vernacular and Modern residences. Occupants of modern residences opted for hot but none of the vernacular residences for the same. From the above table it is evident that the occupants of the vernacular residences have more comfortable temperature than the occupants of modern residences.

Subjective responses of Humidity are shown in Fig.2.which shows that 85% of the respondents in vernacular residences and around 74% of respondents in modern residences are comfortable. The distribution of votes is 3 for slightly dry, 174 for neutral, 4 for slightly humid and 1 for moderately humid in vernacular residences. In modern residences it is 2 for moderately dry, 6 for slightly dry, 19 for Neutral, 77 for slightly humid and 44 for moderately humid. None of the occupants have opted for very dry and very humid in both vernacular and modern residences. For moderately dry also vernacular occupants have not responded comparatively its 2 for modern residences.
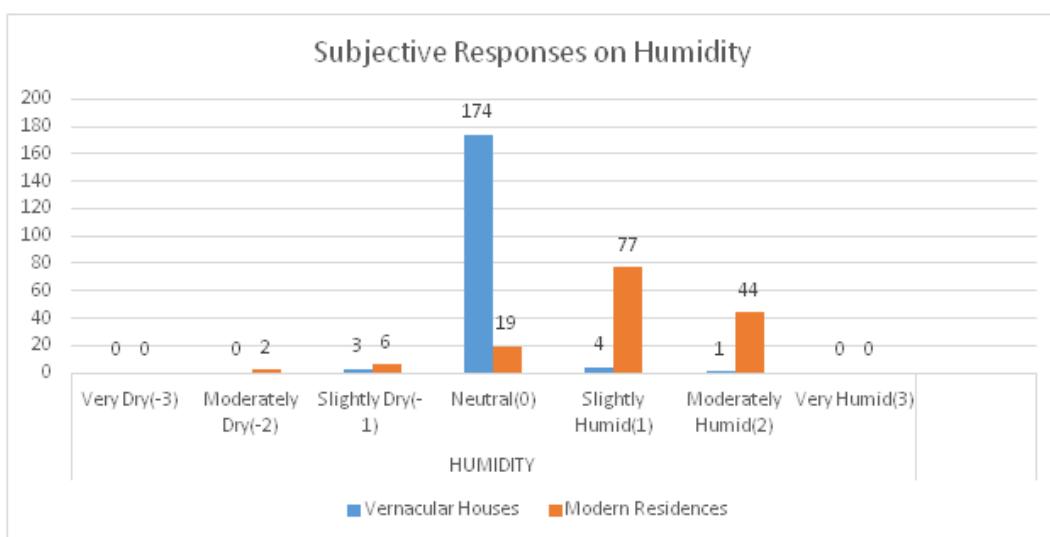
Figure-2: Subjective Responses on Humidity in Summer Season

Air movement plays a vital role in hot-dry climate. For the air movement distribution study is shown in Fig.3. In Vernacular Residences about 90% of the occupants are satisfied with the air movement in their residences for the comfort but around 60% of occupants of modern residences have responded for the same. In vernacular residences it is 2 for moderate still, 15 for slightly still, 163 for acceptable and 2 for slightly draught, whereas in modern residences it is 8 for Moderate still, 49 for slightly still and 90 for acceptable. None of them Have opted for very still, moderately still and very draughty in Vernacular Residences and slightly draught, moderately draught and very draughty in modern residences also. By the study it is found that maximum occupants of Vernacular residences are more comfortable for the air movement in their residences.
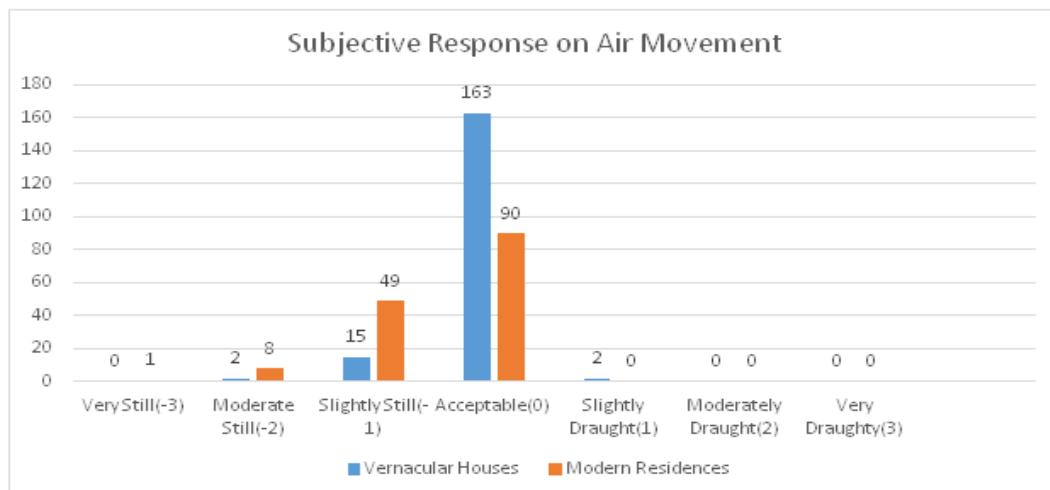
Figure-3: Subjective Responses on Air Movement in Summer Season

According to the ASHRAE standard 55 the comfort zone is considered to be sufficiently comfortable if more than 80% users are satisfied with the existing conditions. Fig 4 shows the distributive results out of 7-point scale survey conducted for indoor temperature, humidity and air flow in vernacular as well as modern residences of Kalaburagi. Based on the three parameters the occupants staying in the vernacular residences are more comfortable than the occupants of modern houses and according to the ASHRAE standards more than 80% residents of vernacular houses are more comfortable which is mainly due the solar passive features included in vernacular houses.
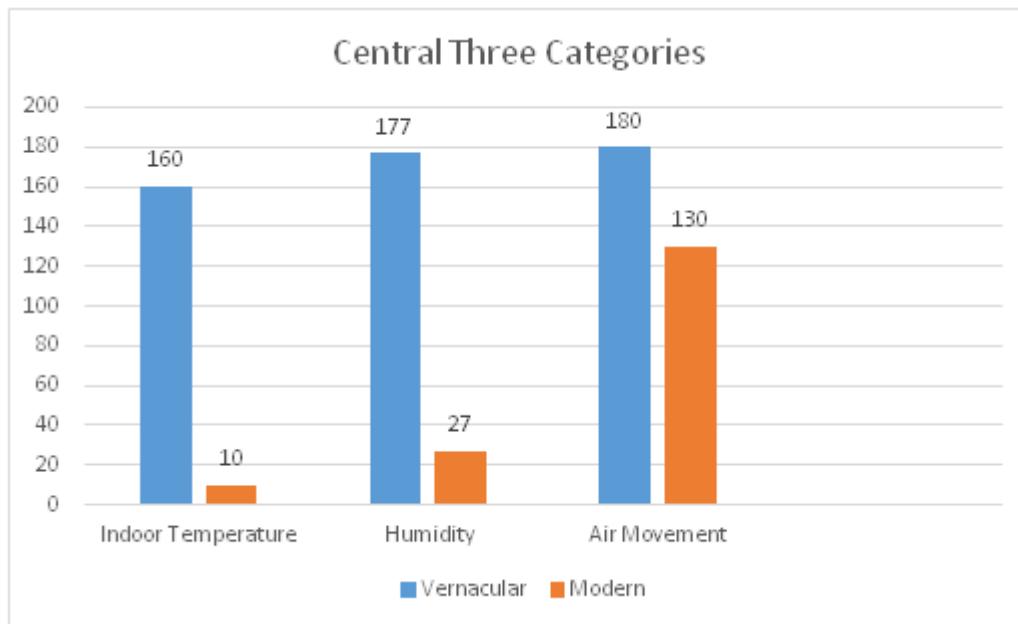
Figure-4: Distribution of Subjective Responses on Central Three Categories

In Kalaburagi during summers the thermal discomfort is mainly due to the high temperature and high humidity. This can be reduced by the proper air movement inside the building thereby reducing the temperature and humidity. From the study of Vernacular residences, it is found that controlled and continuous air movement is permitted in the building envelope, at the same time thick walls and roof controls the conductive heat entering inside the building. Walls are also well protected by roof overhangs against the heat radiations.
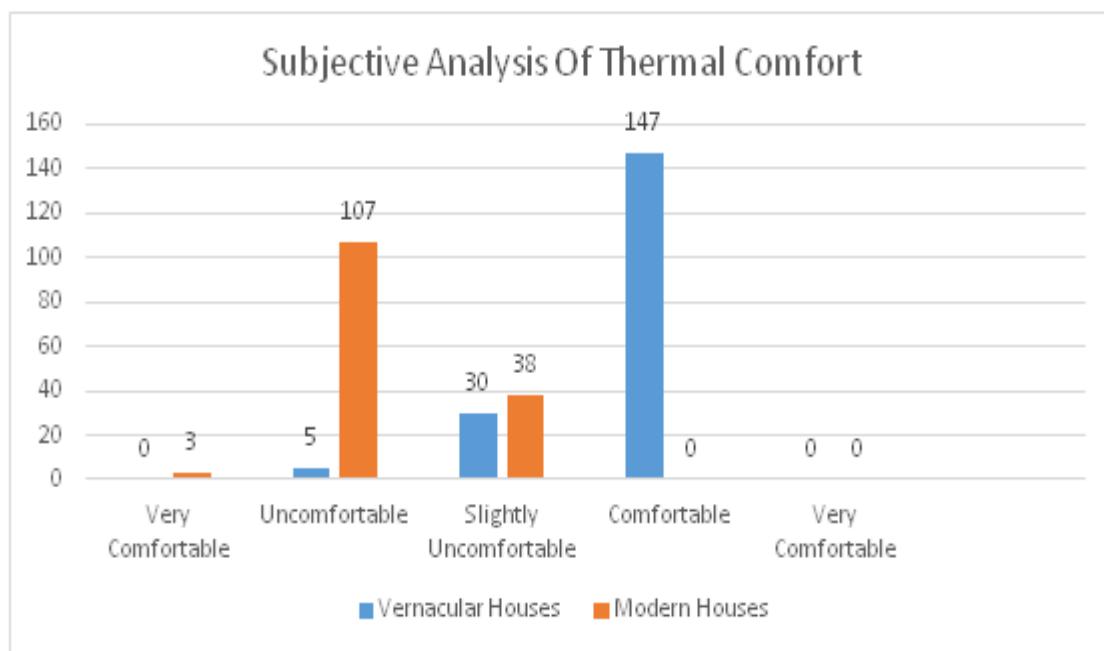
Figure-5: Subjective Responses on Thermal Comfort.

From Fig-5 and Fig-6 it's seen that about 75% to 85% of the occupants of Vernacular Houses are feeling comfortable and about 10% to 15% occupants are uncomfortable. In Modern residences about 70% occupants are uncomfortable and only about 30% occupants are comfortable in modern houses.
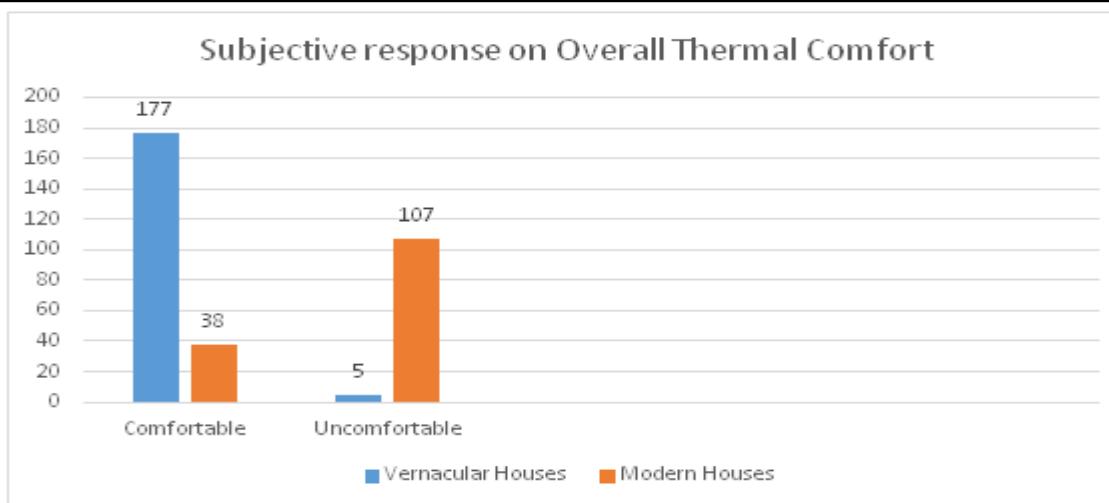
Figure-6: Subjective Responses on Overall Thermal Comfort.

During summer and when the situation is uncomfortable in both Vernacular and Modern residences 85% occupants have used Fan and Air Cooler to overcome the situation. But the condition is very alarming where 70% of occupants in Modern houses are using Air conditioner (AC) whereas only 5% occupants in Vernacular Houses during discomfort period.
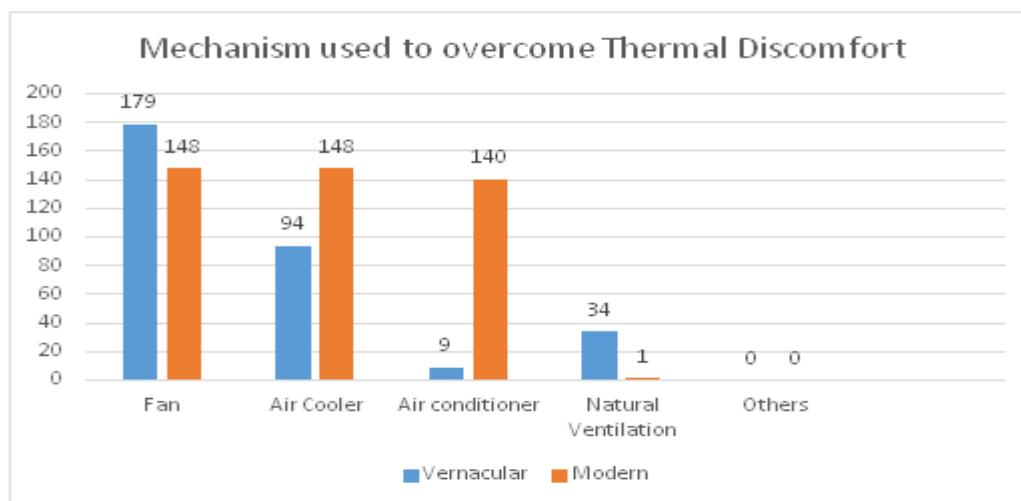
Figure-7: Mechanism used to overcome Thermal Discomfort.

Alarming increase in the use of Air cooler and Air condition in modern houses to maintain a comfortable indoor temperature during summers will cause the high energy demand and decrease the conventional energy source. But Vernacular houses are more effective in providing indoor thermal comfort by solar passive techniques. The results are in agreement with the experiment investigation done and shown in Fig-8.
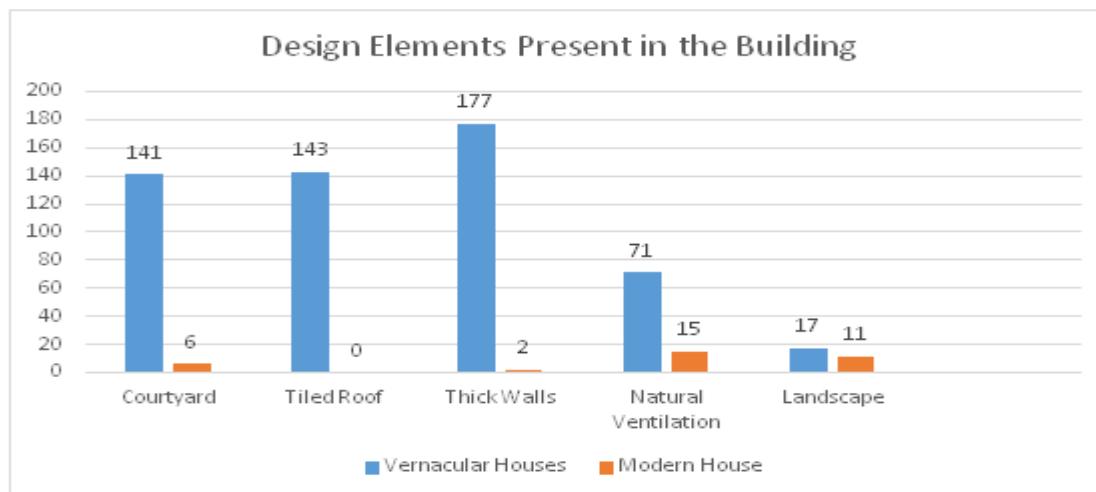
Figure-8: Various Design Elements Present in The Building.

4. CONCLUSION

For the present study Questionnaire survey of overall subjective responses was conducted for both Vernacular and Modern residences of Kalaburagi district for various parameters of Thermal comfort. rating scale of overall thermal comfort, measures to retain thermal comfort and characteristics elements of the buildings.

The subjective responses provide useful indicators on suitable solar passive architectural design for obtaining thermal comfort over environmental parameters consisting of temperature, humidity and air flow. The survey results substantiate that the vernacular houses of Kalaburagi district are more effective in providing comfortable indoor environment as compared to the modern houses. This is mainly due to the presence of solar passive designs in vernacular houses and absence of such designs in the present modern houses.

Hence it is concluded that comfortable living environment can be created in the modern houses with the limited or no energy usage if it is designed with the knowledge given by vernacular architecture.

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RECENT DEVELOPMENTS IN QSAR AND RELATED CHEMINFORMATICS/BIOINFORMATICS TECHNIQUES FOR DRUG DELIVERY SYSTEMS

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ABSTRACT

At the outset of early 80's, most of the tools used for the drug discovery were mainly based on techniques like Quantitative Structure Activity Relationship (QSAR), Computational chemistry and Cheminformatics. With the introduction of Bioinformatics and genomics in the early 2000 led to plethora of tools generating lot of databases about the genomics of different organisms. This led to the need of the invention of the target specific drug delivery system which should result into improved drug delivery system targeting and releasing the optimum doses drugs into the cell thus improving drug efficiency and avoiding possible side effects. The process is tedious which require target identification and validation in turn generating more data in favor and against the drug delivery system. In order to minimize the time and money involved in the drug discovery process and to make the process efficient, different computational strategies have been developed in recent years. These strategies are applied at the each area of drug discovery viz. target discovery, drug discovery and drug delivery. This leads to the acceleration of the process of selection and validation of the potential drug lead molecules. This article refers to a few such tools which have been developed recently and is an effort to integrate the different strategies of cheminformatics/bioinformatics like Computer Aided Drug Design (CADD), Quantitative Structure Property Relationship (QSPR), Quantitative Structure Activity Relationship (QSAR), Machine Learning (ML), Neural network (NN), Artificial intelligence (AI) Density Functional theory (DFT), Molecular Docking (MD), Virtual screening (VS), Molecular dynamics(MD) and Nanoinformatics such as Nano QSAR so to detect the bottleneck in the process of drug discovery and to provide the potent solution to the problem. More efforts are needed to synchronize the three different areas of drug discovery to merge the techniques of the cheminformatic and bioinformatics.

Keywords: Drug delivery system, Cheminformatics, Bioinformatics, QSAR, ML, AI, NanoQSAR.

1. INTRODUCTION

The modern scientific research has been immensely benefitted by the emergence of new computational techniques [1] leaving the impact on the new strategies of drug discovery.
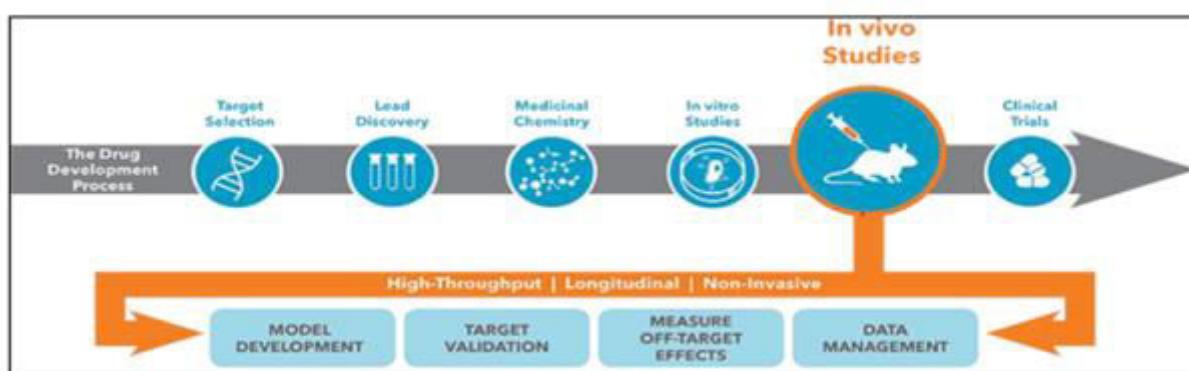
Figure 1: Stages of drug discovery and development process[1]

The main objective of techniques is to speed up the process of research in different areas like Chemistry and Drug discovery. Right from the early 1960's several tools have been used to explain and predict the drug-target interactions using several tools. Using the protein structures and the structural properties, researchers are designing new lead molecules as potential inhibitors. Genomics is the new area in the field of drug discovery which uses principles of pharmacogenomics to discover new potential targets. Computational chemistry applies the principles of statistical genetic on the potential lead molecules to be developed as drugs. Genomics is also contributing to the field of drug delivery process by using the molecular biology techniques. Hence different facets of science are contributing to the process of drug discovery in their own way and there is need to study the interconnections between the various fields. This article discussed different aspects of each step of the drug development process i.e. target identification, drug discovery, and drug delivery and the recent development associated with the process.

2. Development in the Process of Drug Discovery [2]

2.1 Target Identification: This is the first step of drug discovery which involves isolation of possible therapeutic targets which may be protein, nucleic acid or gene and to identify its role in the disease. Identification is followed by its characterization and recognition of molecular mechanism. Various principles involved are bioinformatics, cheminformatics, biochemistry, genetics and others. Various approaches can be applied at this stage with different applications like bioinformatics is used for data mining which identifies, selects and prioritizes the potential targets. Genetic association studies genetic polymorphism and find the connect with the disease while profiling leads to identification of changes in mRNA or proteins. Phenotype analysis brings out the in-vitro mechanistic studies and functional screening removes the non-suitable candidates.

2.2 Drug Discovery: Thus, computer-aided drug discovery/design methods (CADD) have emerged in recent decades as a powerful new tool in medicinal chemistry, with particular robust applications in reducing the time and costs of drug discovery. CADD is the new tool for in drug discovery process to reduce time and cost of drug development. CADD makes use of existing database related to the drug-target interaction to select a series of active compounds which may act as lead compounds. These compounds are then subjected to computational evaluations and optimization so as to filter out the lead molecules. The potency of the lead molecules is then tested using experimental method to validate the efficacy of the lead molecule.

2.3 Drug Delivery: The most advanced method of drug delivery is using nanoparticle which can be functionalized for target specification. These nanoparticles may be in the form of polymer, metallic, dendrimer, quantum dots, micelles and colloids. Theoretical computational approaches include molecular dynamics and Monte Carlo approach. Efforts are underway to optimize single nanoparticle to exhibit a desired behavior.
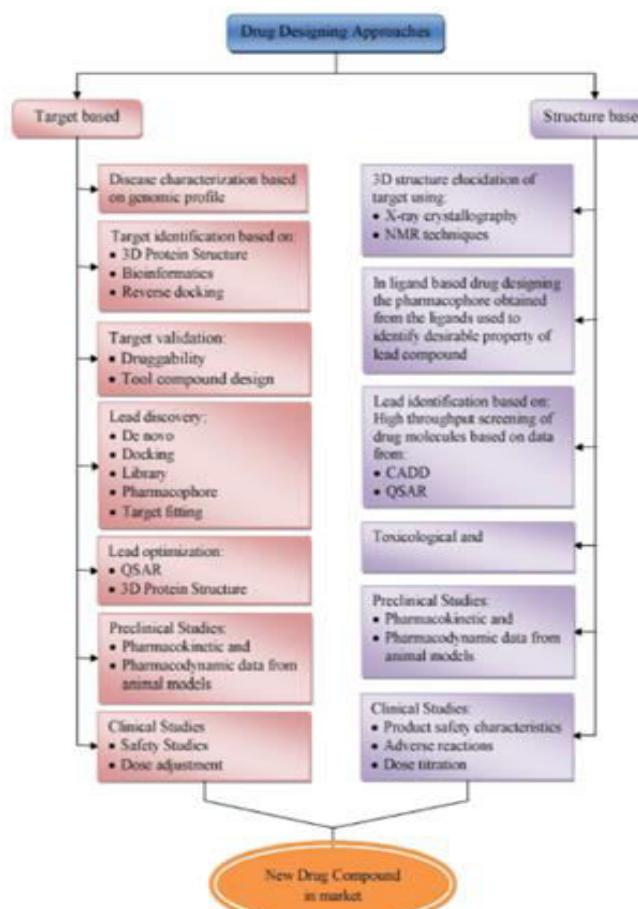
Figure 2: Different approaches for drug designing[2]

3. Recent Development in the Process of Drug Developments and Delivery

QSAR and Drug Delivery Prediction[3]: This article studied the nearly 6000 experimental affinities cyclodextrin and guest molecules using the software PaDEL which calculated about 1000 chemical descriptors for every molecule. The QSAR model developed was found to be highly efficient with $R^2 = 0.7$-0.8 for test set. Open source softwares MARS, random forest, Cubist, SVM, GBM, were used to predict the binding affinity of

cyclodextrin with small drug molecules. The result obtained from the QSAR model can be integrated previous proven models for predicting drug release curves for concern molecules. The developed models can also be modified for high-throughput research in drug delivery.

QSAR and Skin Permeability of Drug[4]: The investigation uses hierarchical support vector regression (HSVR) which is machine learning based with classical partial least square (PLS) in order to predict the skin permeability coefficient as well as to explore intrinsic permeation mechanism. The derived HSVR model was found to function better than PLS in addition it also delivered consistent performance upon the application of a mock test. PLS, was significant in interpreting the relevance between selected descriptors and skin permeability. Combination of the predictive HSVR models and interpretable PLS proved to be of great use for facilitating drug development and discovery by predicting skin permeability.
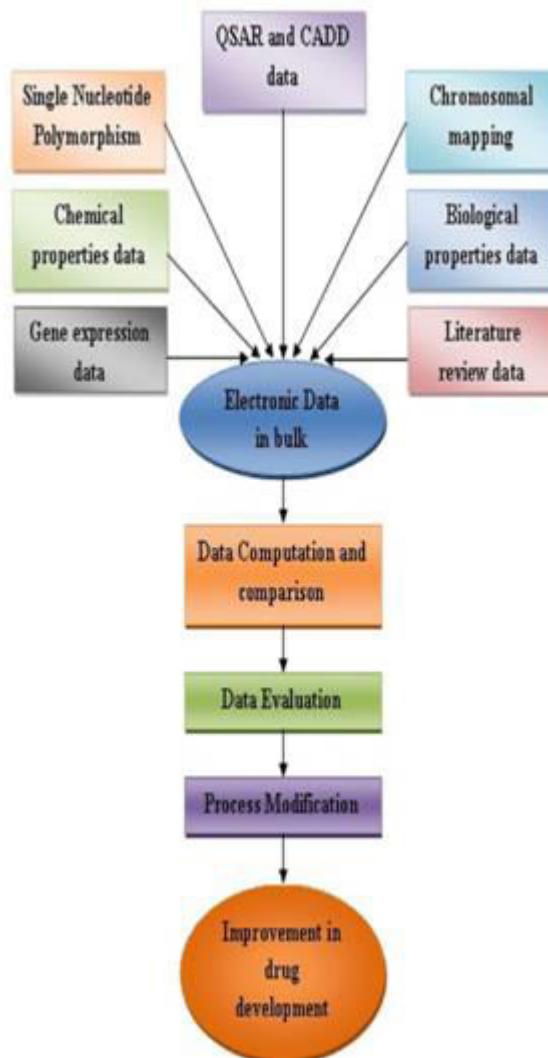
Figure 3: Data source and data computing in drug development [2]

QSAR And Heterolipids and Potential Nucleic Acid Delivery Materials[5]: The research paper used 56 amine-containing heterolipids as a training set with measured pKa values and applied SW-PLSR i.e. partial least-squares regression coupled with stepwise forward algorithm technique. The model gave r^2 value of 0.972 with internal q^2 ~83 and external pred_r^2~63%, respectively. The validation process of developed model was done by synthesizing a series of designed heterolipids and comparing measured surface pKa values of their nanoparticle assembly using a 2-(p-toluidino)-6-napthalenesulfonic acid (TNS) assay. A good agreement was found between the predicted and measured surface pKa values of the synthesized heterolipids with a r^2=0.93, thus validating the developed model. The developed model can successfully design target specific heterolipids as potential drug delivery system.

QSAR with Virtual screening (VS) and Molecular docking (MD) in drug discovery[6]: This review summarized several computational tools of Structure based Drug Delivery System (SBDDS) and Ligand Based Drug Delivery System (LBDDS) such as QSAR, molecular docking and virtual screening and their applications in the drug discovery and development programme. Other advanced tools like molecular dynamics simulation,

pharmacophore modelling, structure similarity search and fragment-based drug design are useful in the field of cheminformatics and bioinformatics. Artificial Intelligence (AI) along with omics tools (such as genomics, proteomics, metabolomics etc.) have been used effectively for for the drug discovery process.

QSAR and Transdermal Delivery of Drug [7]**:** The study investigates the structural requirement of penetration enhancers through skin using QSAR. Naturally active terpens, pyrrolidinone and N-acetylprolinate derivatives have been investigated for skin penetration of diclofenac sodium (DFS), 5-fluorouracil, estradiol, hydrocortisone (HC), and benazepril. The developed model showed that for 5-fluorouracil and DFS, activity increases with less hydrophobic enhancers. Molecular descriptors indicated that electron donor acceptor interactions are most important for enhancement of the delivery whereas for the rest a linear relationship was found to work between enhancement activity and n-octanol/water partition coefficients of enhancers.
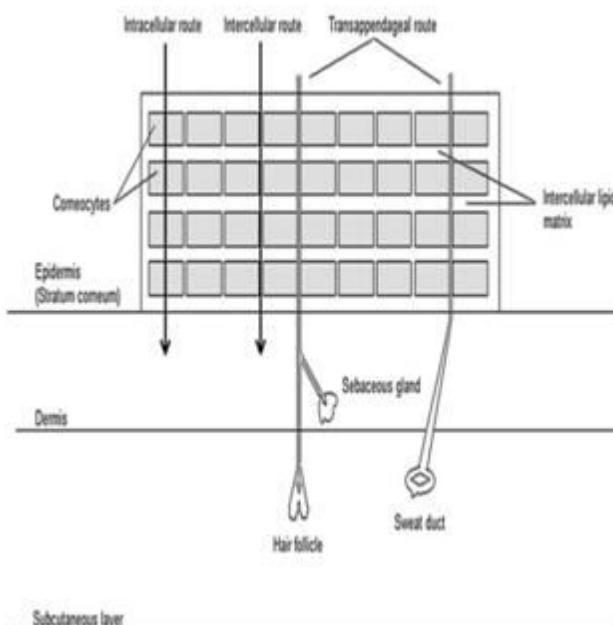
Figure 4: Potential routes of drug permeation through human skin (Ref. Patil, U.K. and Saraogi, R., 2014. Natural products as potential drug permeation enhancer in transdermal drug delivery system. Archives of dermatological research, 306(5), pp.419-426.)

QSAR and Drug Delivery through Stratum Corneum [8]**:** Descriptors like lipo-affinity index, topological polar surface area, MLogP and fragment complexity were studied for against the drug penetration power of penetration enhancers. The model was developed using Multiple Linear Regression (MLR) analysis and was validated with statistical analysis such as cross validation test, fraction of variance, quality factor, internal validation test, and standard deviation. The model developed was validated with cross validation test q^2 of 0.914 and fraction of variance r^2 of 0.913, which means more than 90% predictive efficiency. Author conclude that among the descriptors like Lipo-affinity index (LAI), Molecular descriptors Topological polar surface area (TPSA), Partition co-efficient (MLogP) and Fragment complexity (FC), LAI and MLogP are the most correlated with the penetration and that partition coefficient should be increased for better result. TPSA and FC should be kept low or negative in order to increase the penetration power of solvent. With the developed model, one can develop novel molecule by identifying logK and altering their structures.

QSAR and Toxicity Screening Sensitivity [9]**:** This article deals with the computational toxicology methods and its applications in the food and drug administration. Various software like MCASE (MultiCASE), Derek (Lhasa) and TOPKAT (Accelrys) were applied and have high sensitivity alerts (67–92% sensitivity) but poor sensitivity (18–27%) for non-alerting drugs for Salmonella mutagens. Such data may be useful to predict the toxicity f the drug but one has to take into account the predictive ability of the software. The reliability of the results and the sensitivity of the software can be increased by expanding the training data set.

QSAR and Plasma Protein Binding Analysis (PPI-QSAR) [10]**:**
In this study, independent variables were the intramolecular descriptors of drugs and the same for docking simulation between drug molecules. PPI-QSAR study was used to construct the QSAR models for human plasma protein binding. Multiple Linear Regression (MLR) was carried over 65 antibiotic drugs and the generated model was validated by residual, showing The R^2=0.87 and Q^2=0.77 while for the training set were

0.86 and 0.72, respectively. The results showed the it is best fit for the descriptors under consideration. Among the descriptors, the hydrogen bond related groups, polarity, drug–HSA interaction, shape of the drug molecules, aromaticity were found to be strongly correlate with the binding.

QSAR and Long Hydrocarbon Chemical Penetration Enhancers[11]: This work is about development and validation a QSAR model for Chemical penetration enhancers (CPEs) containing long hydrocarbon chain using genetic function approximation and Cerius2 software. A group of 6 compound formed test set while a set of 24 compounds was used as training set. The model showed statistical data like $F=15.75$, $r^2=0.814$ and $r^2_m=0.603$ and was used for prediction of enhancement ratio (ER). Descriptor which contribute to the maximum for ER were non-inter-correlated descriptors, namely surface tension in water (STW), surface tension (ST), dipolemagnetic (DM), highest occupied molecular orbital (HOMO), polar surface area (PSA) and lowest unoccupied molecular orbital (LUMO). When incorporated with additional descriptors from ChemSW which are specific for surfactants, lead to model with r^2 and r^2_m close to 1 and high values for F test and LOF. The developed model can be used to predict ER of CPEs of four categories of long chain hydrocarbons containing fatty acids, fatty esters, fatty amines and fatty amides.

Code	Name	Structure	ER
1	Octanoic acid		18.79
2	Decanoic acid		21.41
3	Undecanoic acid		13.66
4	Dodecanoic acid		15.75
5	Tridecanoic acid		20.67
6	Myristic acid		18.73
7	Palmitic acid		18.81
8	Stearic acid		20.51
9	Elaidic acid		24.63
10	Linoleic acid		23.85
11	Methyl hexanoate		14.20
12	Ethyl undecanoate		16.26
13	Methyl laurate		15.95
14	Methyl tridecanoate		16.60
15	Methyl myristate		20.37
16	Isopropyl myristate		20.08
17	Isopropyl palmitate		27.11
18	Palmityl palmitate		23.92
19	Diethyl sebacate		21.00
20	Glyceryl monooleate		33.23
21	Octanamide		16.77
22	Octyl amine		8.27
23	Decyl amine		11.98
24	Dodecyl amine		17.36
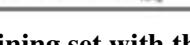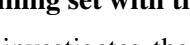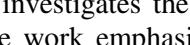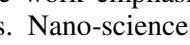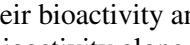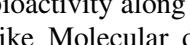
Figure 5: CPEs used as training set with their ER values [11]

QSAR And Nanomodeling[12]: The review article investigates the application of QSAR modeling over the nano-scale interaction at the nano/bio-interface. The work emphasizes the need of the in-silico and in-vivo approach to resolve the structure of nanomaterials. Nano-science suffers from the lack of knowledge of structural features of nanomaterials responsible for their bioactivity and the mechanism of action The problem is associated with the testing method for assessing the bioactivity along with modification of the existing methods. The article successfully discussed the techniques like Molecular dynamics (MD), Electronic Structure and Reactivity with Density Functional Theory (DFT), Hansen Parameters for nanotubes and photocatalytic activity which need to work in close contact with toxicologists and biochemists so as to design new and suitable tests for nanomaterials.

Nanoparticles As Antidepressant Drug Delivery System [13]: Alginate and chitosan nanoparticles were prepared and characterized for encapsulating the antidepressant drug Venlafaxine XR and further analyzing it as an effective drug carrier and delivery system. QSAR study of the two compounds were found to satisfy all parameter of LIPINSKI'S rule of five. The study revealed that strong electrostatic interaction exists amongst nanoparticles. The polymer nanoparticles were found to have significant binding energy which establish them as efficient binding agents. Moreover nano scale improves the dispersal and absorption rate of the drug.
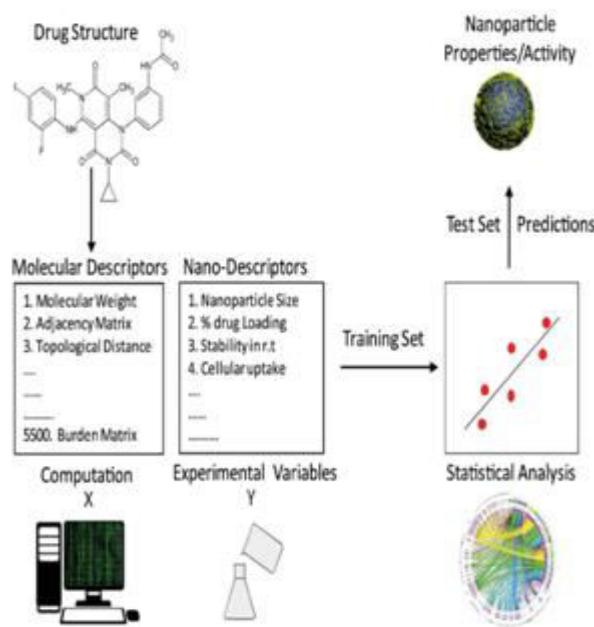
Figure 6: Scheme of Nano-QSAR for drug development[14]

Nano-QSAR[14]: The study deals with nanoinformatics including Nano-QSAR and use of computational methods for predicting properties of the nanomedicine for drug delivery. The limitation of nanomaterial is the complexity and heterogeneity which makes it difficult to calculate the descriptors. This can be overcome by using Nano-QSAR to calculate important descriptors related to size, shape, surface profile and density functions. This work on the principle that if every mutation needs a specialized drug to match it, then there has to be specialized carrier resembling molecular structure of the target. Thus drug can be personalized with respect to the disease, patient, and target tissue. New techniques like bar coded nanoparticle and antibody coated liposome personalized siRNA are few examples In the near future we will see as shift from a trial and error based field to a personalized drug delivery system.

QSAR As Means of Carrying Out Virtual Chemical Reduction [15]: This is comparative study of rate of colonic bacterial reduction of disulphide and nitro bonds as compared to azo bonds. A QSAR model was generated for bacterial reduction of nitro compound giving Hammett correlation with $\rho = 0.553$, $R^2 = 0.97$. Olsalazine, the symmetrical azo compound which is also a clinically used prodrug while 5-nitrosalicylic acid, which may also be regarded as a prodrug, as it does not release a residual moiety upon reduction. The Structure Activity Relationship (SAR) study of the reduction of nitro aromatic compounds has revealed that the electronic effects may be useful for optimizing the new prodrug and target specific drug delivery system.

Figure 7: Role of pharmacogenomics in DD[16]

Quality By Design (Qbd) Approach of Pharmacogenomics in Drug Development[16]: Pharmacogenomics and its two areas i.e. structural and functional employs genomic data for lead optimization via high throughput screening, evaluation of drug metabolizing enzymes, drug target identification and evaluation, drug transporters and drug receptors CADD and bioinformatics. Pharmacogenomics also helps in evaluation and optimization of the dosage forms re-evaluation of failed drugs for the treatment of new disease. But as of now, its applications are very limited in above mentioned area because of costly and non accessible techniques but with the technological advancement future medicine will be smart, safe or more efficacious based on pharmacogenomics approaches.

In-Silico High-Throughput Screening of Central Nervous System Drug Derlivery System (CNS-DDS)[17]: The work addresses high-throughput method for rapid screening of in vitro drug-brain homogenate binding which is based combining equilibrium dialysis with liquid chromatography mass spectrometry (LCMS) and straightforward sample pooling approach. Co-relation (R^2=0.906) of fraction unbound in brain (fu) between single compound measurements and 25-pooled compounds was observed with respect to the structurally diverse CNS compounds having wide range of fractions unbound. Authors report that this is the first time this have demonstrated consistent fraction unbound in rat and mouse brain homogenate also suggesting drug-tissue partitioning mechanism which is predominated by hydrophobic interaction. On the basis of this finding, a generic approach to estimate drug binding to various tissues is proposed. QSAR model for fu prediction is also presented by statistical modeling thus demonstrating a semi-high-throughput method for in vitro screening of drug brain homogenate binding. The derived method is more efficient with increased throughput, and offers other advantages like timesaving and the reduction of cost along with volume consumption. The derived model, can estimate the extent of drug binding to various tissues. Model developed suggest strong relationship between lipophilicity and fraction unbound but molecules with ClogP greater than 4 should be used cautiously, as they may afford fu less than 1%. To conclude, a new in-silico method is developed for rapid screening of drug tissue binding which help in developing CNS target based drug.

Artificial Intelligence (AI) And Drug Delivery System Design[18]: Target fishing (TF) is a method by which rapid prediction or identification of the biological targets can be done for correlating targets to the novel compounds. The review highlights the significance and challenges of AI and TF in the development of drugs and delivery systems AI can screen massive amounts of multivariate data, can solving the complex problems, gives accurate results, accelerate drug discovery. The most important specialty of AI platforms for is matching patients with the most relevant clinical trials which reduce errors and improve cost effectiveness. No other technique can handle molecular information and data connections providing molecular mechanisms of diseases revealing factors affecting cell or tissue function thus leads to development of more effective drugs or drug delivery systems. Hence AI key elements of drug development process and personalized medicine.
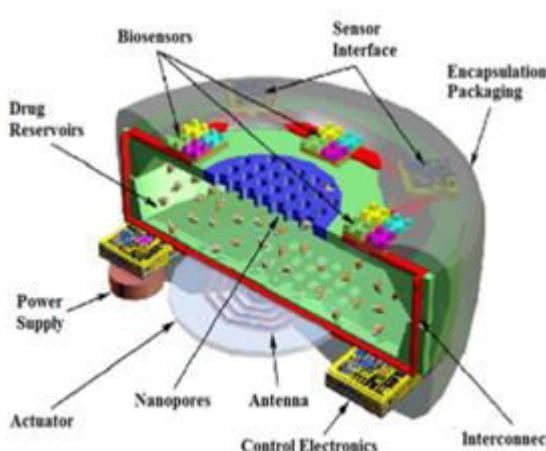
Figure 8: Implantable drug delivery system[18]

DFT (Density Functional Theory) and Adsorption of Antimalarial Drug [19]:
This study is about the interaction between three common antimalarial drugs chloroquine, primaquine and amodiaquine with the help of DFT method on acrylamide dimer and trimer as a hydrogel model in vacuum as well as in water. For this use of the function wb97xd with 6-31++G(d,p) basis set and polarizable continuum model (C-PCM) of solvent was done. It was found that the interaction between the antimalarial compounds and hydrogel model was exothermic as indicated by the binding energy around -3.15 to -11.91 kJ/mol with extent of interaction found varying as primaquine > amodiaquine > chloroquine. A strong charge transfer between the antimalarial and hydrogel model was shown as indicated by the natural bond orbital (NBO) calculation and

application of second-order perturbation theory. The findings also suggest that the interactions are polar in nature and hydrogen bond stabilizes the complex in water as well as gas phase. These result encourages to test acrylamide hydrogels as antimalarial delivery systems. QSAR study showed that he complexes could interact with water molecules as suggested by dipolar momentum, Log P, μ, solvation free energy and permitting swelling of the hydrogel and subsequent release of the antimalarial drugs. The results are in favor of amodiaquine (AQ) and primaquine (PQ) as suitable antimalarial drugs for delivery from an acrylamide-based hydrogel.

Artificial Intelligence And Machine Learning (ML) And ADMET[20]: The work emphasizes the importance of AI and ML in production of personalized drug with optimum absorption, metabolism, distribution, excretion and toxicity (ADMET). The use of AI and ML enhances the quality of the products, decreases the time required for drug discovery making the drug more safer with cost effectiveness. It ensures correct dose with batch to batch consistency of the drug thus leading to prediction and production of better quality drug within small time. Lastly it not only ensures the accuracy of the compounds in the clinical trials but ensure cost effectiveness of drug in the market also.

In-Silico Design Of Self-Emulsifying DDS[21]:
The article deals with design the self-emulsifying drug delivery systems (SEDDS) in which 4495 SEDDS formulation datasets were collected in order to predict the pseudo-ternary phase diagram by the ML methods. Best prediction performance were shown with Random forest (RF) approach with 91.3% accuracy, 92.0% sensitivity and 90.7% specificity in 5-fold cross-validation. The RF predictions were validated by experimental development of pseudo-ternary phase diagrams of meloxicam SEDDS which achieved excellent prediction accuracy of 89.51%. Molecular dynamic (MD) simulation revealed the diffusion behavior in water and the role of co-surfactants. To conclude, this research combined ML, central composite design (CCD), molecular modeling (MM) and experimental approaches to formulate a rational SEDDS design. The developed integrated methodology can set new example for future drug formulation design and will reduce dependence on traditional drug formulation design.
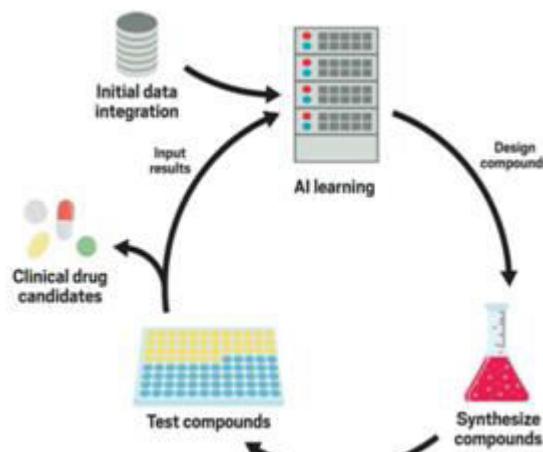
Figure 9: AI in drug design and development[20]

Artificial Neural Networks (ANN) And Drug Development[22]: Traditional and new emergent NN approaches have been discussed in this article. The approach discussed are backpropagation neural networks and their variants, self-organizing maps with associated methods, and deep learning. Important technical issue like over fitting is dealt with and its prevention by multitask modeling, estimation of applicability domain, regularization, and model interpretation. Various aspects of NN were combined like QSAR modeling, characterization, virtual screen and ADMET studies. Recent progress in deep learning has made NN even more prominent as it involves training of millions of neurons with millions of data points. ANN has emerged as very important tool in area of drug discovery.

CONCLUSION
Drug discovery is a complex process which involves various steps like the identification of candidates, synthesis of potential candidates, characterization with proper technique, validation of the approach, optimization of the process, screening and assays for therapeutic efficacy. Form the scratch to the final drug discovery, it takes about 12 - 15 years and mentor investment of US $1 billion. On an average, one in a million molecules screened reaches late stage clinical trials and is finally marketed as drug. To minimize the time and

money involved in the drug discovery and development process, need of the hour is to integrated various modern techniques of cheminformatics/bioinformatics like Quantitative Structure Activity Relationship (QSAR), Machine Learning (ML), Neural network (NN), Artificial intelligence (AI) Density Functional theory (DFT), Molecular Docking (MD), Virtual screening (VS), Molecular dynamics(MD) and Nanoinformatics. The recent development in these field have shown promising results and can provide the solution to the existing problem. With the integration and use of more such techniques, DDS will become more beneficial for the mankind.

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A STUDY ON MAKEOVER OF THE HOME AT LOW BUDGET

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ABSTRACT

The dream of owning a house particularly for low-income and middle-income families is becoming a difficult reality. It is necessary to adopt cost effective, innovative and environment-friendly housing technologies for the construction. The objective of low cost housing offers the means to be able to live the kind of life one desires and Cost of reduction is achieved by selection of more efficientmaterial or by an improved design. Construction of low cost housing by using the low cost construction materials increases the access to buildings by low income group peoples.

The research design for the present investigation was descriptive. To gather information on various aspects related to need for alternate material for low costhousing, Google form has been used as instrument of gathering data. It included the details about the advantages, disadvantages, need, environment friendly, budget friendly and techniques for low cost housing.

The major findings of the study was covering different age group of people in different cities to get their opinion on low cost housing. It covers that low cost housing is necessity in today time as it helps to have home for more people. Constructing low cost housing strength, durability and safety should be considered. To accomplish low cost housing respondents uses new construction techniques, good material, natural and local material, pollution prevention material, low energy consumption technique, recyclable & reusable material and local labors for cost reduction. Prefabricated technology should be used to complete the work fast. Mostly used material for low cost housing are bamboo, straw, cement, board, PVC board, jute, coconut and wooden chips ,fly ash, Aerocon panels, Ferro cement, rice husk ash bricks etc.

Keyword: Low cost housing, Environment friendly, Budget friendly, Natural and Local material etc.

INTRODUCTION

Low Cost budget for Complete Makeover of the Home is a different concept which deals with effective costing and following of techniques which help in reducing the cost construction through the use of available materials beside with and technology improved skills without losing the power, performance and life of the structure. There is huge misconception that low cost housing is suitable for only smaller works and they are built by using cheap building materials of low quality.

Certainly it's done by proper management of resources and implementing work in phases. Cost of reduction is achieved by selection of more efficient material or by an improved design. Construction of low cost housing by using the low cost construction materials increases the access to buildings by low income group peoples.

The effects of affordable housing on residents are profound and capable of transforming communities, especially when the projects are designed with an urban plan in mind. An affordable housing development that incorporates such elements improves residents' circumstances and empowers them with the tools they need to help themselves, succeed in their endeavors and become productive members of society. When housing is affordable, people can spend more energy and resources on healthcare, nutrition, education, day care, transportation and other important products and services. So after the reviews there was a need to study Low Cost Idea for Complete Makeover of the Home. So, the main aim of this study is Low Cost Idea for Complete Makeover of the Home.

RESEARCH METHODOLOGY

A research design is an arrangement of condition and collection and analysis of data in a manner that aims to combine relevance to the research purpose with scientific procedure. The research design for the present study was descriptivein nature. Descriptive research design is concerned with the conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident, or trends that are developing. The present study was conducted in general (for all localities) not specifying one place. The sample was selected with the help of snowball technique and the sample size was 36.The sample technique is different age group of people in different localities to coverits general review.

This study has been done with the help of creating data collection tool namely Google Form. Google form was developed for getting different reviews on low cost material for complete makeover of home from different people. Data collection tool has been done with the help of google form.

The purpose of research was explained so as to get the true responses. It has the questions regarding different /alternative materials for the complete makeover of the home.

FINDING AND DISCUSSIONS

The objective of low cost housing offers the means to be able to live the kind of life one desires and Cost of reduction is achieved by selection of more efficient material or by an improved design. Construction of low cost housing by using the low cost construction materials increases the access to buildings by low income group peoples.

The detailed presentation of the data makes the understating more scientific and specific.

Graph 1 represents that different age group so that each age group can express their own thought according-

Graph 1: Age

Graph 2 depicts that 77.8% respondents thought that it is necessary to use low cost material for their home as its necessary while designing the home they should use economical materials as its budget friendly which can be affordable by all classes of people.
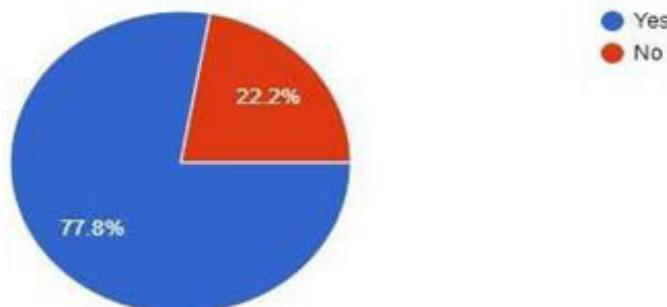
Graph 2: Necessity of low cost housing

Graph 3 covers that 75% respondents thought that it is necessary to use new construction techniques as it has higher efficiencies, less wastage and lower labour costs that could curb the overall costs in large projects.
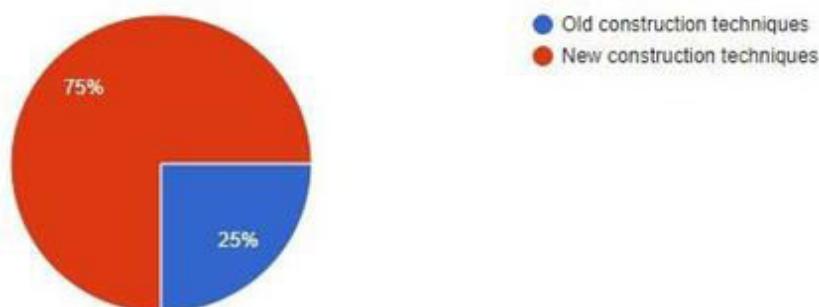
Graph 3: Construction technique for low cost housing

Graph 4 represent that 47.2% respondents thought to use good material for their homes because they are more durable that will last longer. V.Tam (2011) concluded that material and labour cost, can be saved by using the low cost housing technologies in comparison with the traditional construction methods for walling and roofing respectively. This proves the benefits and the trends for implementing low cost housing technologies in the industry.
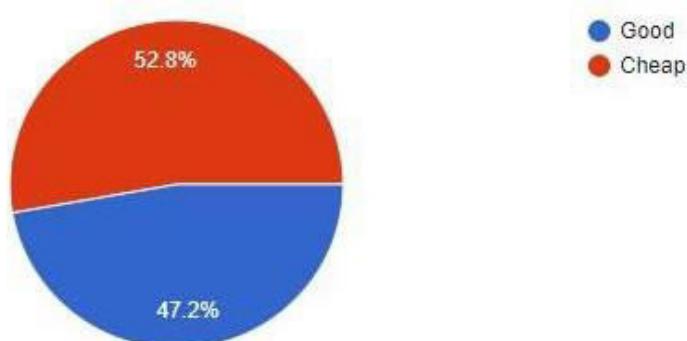
Graph 4: Type of material in low cost housing

Graph 5 represent that 58.3% respondents thought that we should not use brass for low cost housing as it has properties in it that makes its costly so people suggest to use bamboo, Kota and jute for low cost housing as its affordable, durable,& long life and locally available.

S.Shivapuji, M.Patil, et.al. (2016) also found that Bamboo is a renewable and versatile resource, characterized by high strength and low weight, and is easily worked using simple tools and easily available.
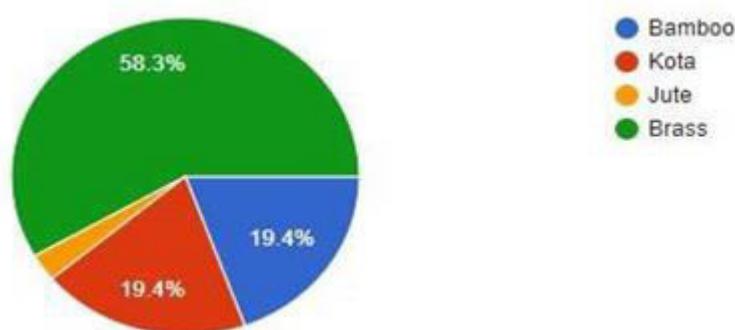
Graph 5: Materials used in low cost housing

Graph 6 covers that 83.3% respondents thought that to buy locally available material as it reduces the fossil fuels and associated pollutants required for shipping. It supports local businesses and feeds money into the regional economy. S.Ajim, B.Ajinkya, "et.al." (2017) concluded that it is necessary to adopt the construction methods using locally available material. It can be achieved by using low cost & locally available materials.
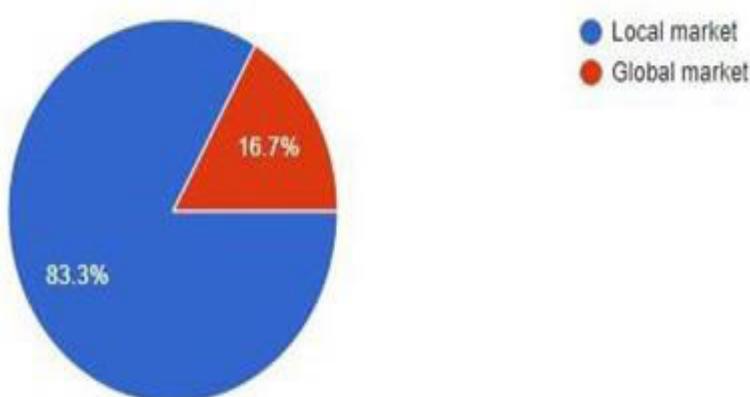
Graph 6: Buying of low cost housing material

Graph 7 depicts that 50% respondents thought that with low cost material we can build all kind of homes because material we use in lowcost are good and do have aesthetics which can appealing to eyes.

Graph 7: Types of home from low cost material

Graph 8 depicts that 58.3% respondents thought that Natural and local material, Pollution prevention and low energy consumption, Recyclable and reusable material are advantages of low cost housing. Similar to this study K.Jaiganesh, S.Dinesh "et.al."(2016) concluded that the best method to adopt is using natural materials, renewable materials, eco-friendly building materials used, using locally available materials and minimizing the resource allocation and innovative methods can implemented to reduce the cost and to achieve sustainable and Green building.
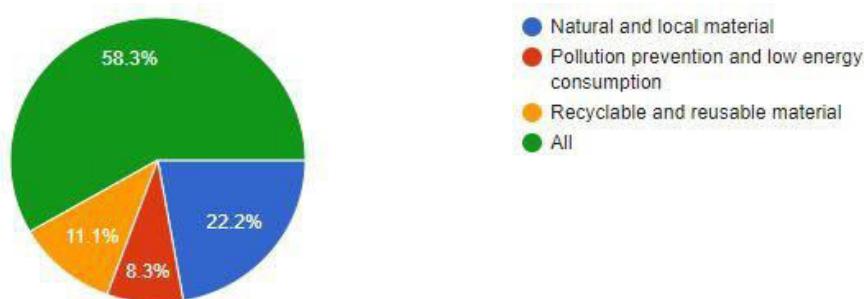
Graph 8: Advantages for low cost housing

Graph 9 covers that 58.3% respondents thought that to successfully complete the project with low cost idea one need to have all three skills like efficient planning in advance so there is no last minute chaos, project management to get material and labour at time and no misplacement of material and the alternative (low cost) material for the project.
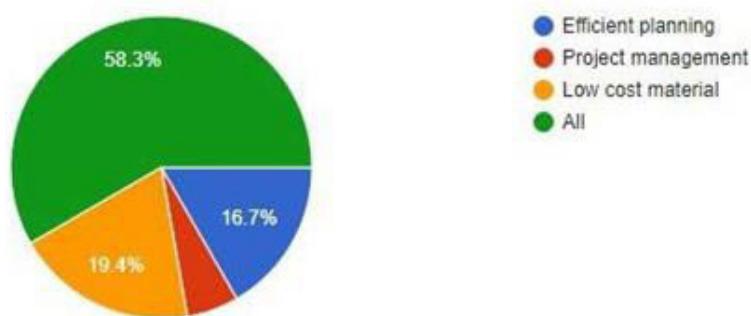
Graph 9: Methods for low cost housing

Graph 10 covers that 80.6% respondents thought that it is necessary to keep factors like strength, durability and safety in mind while choosing material for low cost idea for complete makeover of the home.
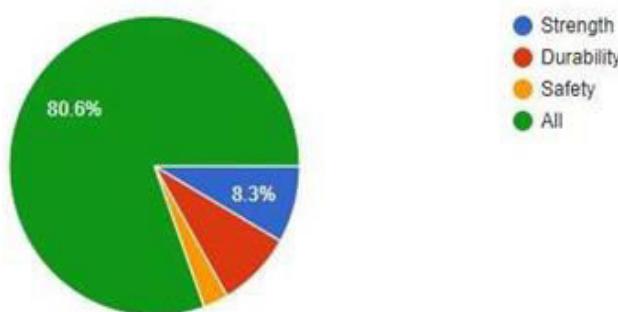
Graph 10: Important factors for low cost housing

Graph 11 represent that 88.9% respondents thought that it is necessary to have local labour because making local talent your first choice ensures that if growing pains or culture mismatches occur, your new employees won't be stuck in limbo. They're already local, so there aren't any relocation difficulties it's a particularly important point for new businesses to keep in mind as they grow and establish themselves.
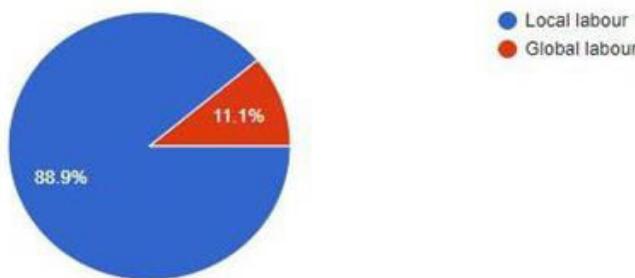
Graph 11: Labour selection for low cost housing

Graph 12 covers that 69.4% respondents thought that it is more preferable to have prefabricated techniques because it reduces the time you need to wait for a new house, Freedom to customise, Environment Friendly and Sustainable, Low Maintenance and Consistent Quality, Modern, Aesthetic and Trendy.
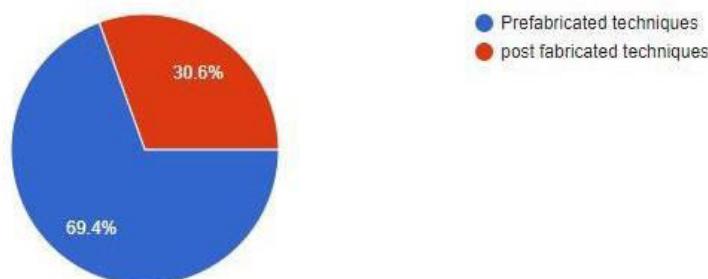
Graph 12: Techniques for low cost housing

Graph 13 covers that 83.3% respondents thought that jute, bamboo and rice hust are low cost material because they have durability, long live, strength, easy to maintain, locally available, low cost, easy to fit and reusable.
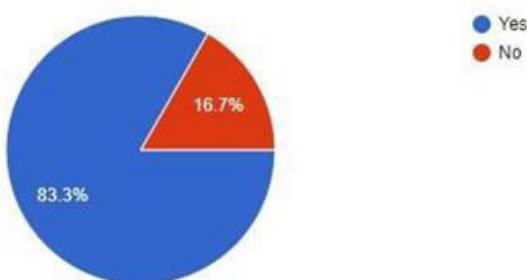
Graph 13: Low cost housing material

Graph 14 depicts that 66.7% respondents thought that recyclability is so important that it prevents pollution, reduces the need to harvest new raw materials, saves energy, reduce greenhouse gas emissions, saves money, reduces the amount of waste that ends up in landfills, and allows products to be used to their fullest extent.
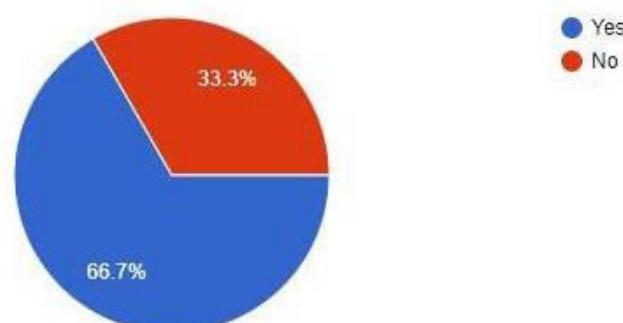
Graph 14: Recyclability of natural material in low cost housing

Graph 15 covers that 61.1% respondents thought that artificial material can be used because they are economical and good in appearance. In contrast to that study H.Jasvi, D.Bera (2015) concluded that the natural materials and their by- product so as to reduce the wastage or bye products obtained from industries and environmental pollution. Various natural materials with their property, advantages disadvantages, and their availability have been discussed.
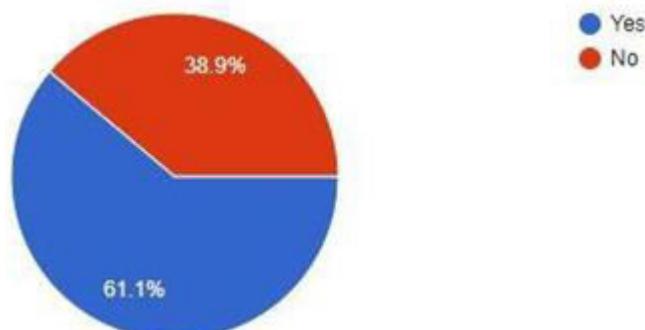
Graph 15: artificial material for low cost housing

Graph 16 represent that 63.9% respondents suggest that low cost construction can be accomplish with the help of regular field survey (visit) that how much work has been done, literature study and technical calculations that no material has been wasted at site. S.Palaniappan (2019) concluded that there are several technologies available for low cost housing. It is challenging to recommend one technology for a country-wide practice. Hence, a region-wise study should be done to choose an appropriate technology depending upon the context, location, climate, local requirements, locally available resources, occupant preferences, cultural issues, time, cost, sustainability and other factors.
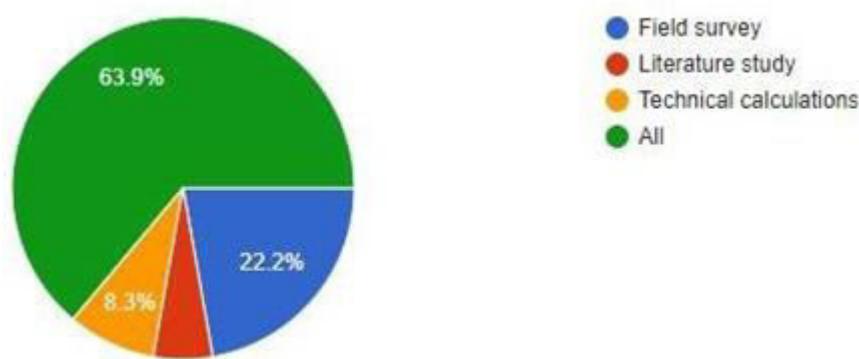
Graph 16: Low cost construction for building

Graph 17 depicts that 77.8% respondents thought that it is necessary to complete the project in short term because market changes every day that can affect the financial calculation of project and weather condition and festivals to keep in mind.
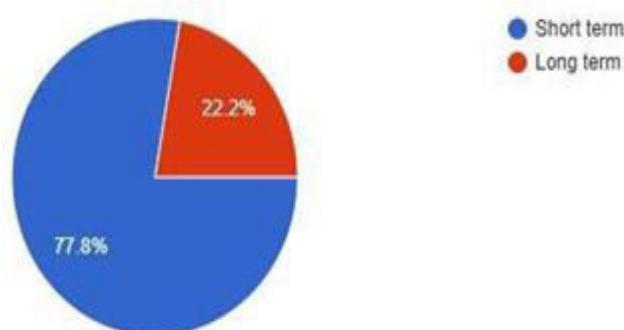
Graph 17: Time period for construction of low cost hosing

CONCLUSION

It was concluded that housing is one of the basic needs of mankind in terms of safety, security, self-esteem, social status, cultural identity, satisfaction and achievement. After analyzing various methods for low cost

building systems, the best method to adopt is using natural materials, renewable materials, eco-friendly building materials used, using locally available materials and Minimizing the resource allocation and innovative methods can implemented toreduce the cost and to achieve low cost housing.

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AN OVERVIEW ON: LIPID-POLYMER HYBRID NANOCARRIERS AS NEW DRUG DELIVERY APPROACH

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ABSTRACT
In the era of nanomedicine, the lipid and polymeric nanocarriers are the most prominent nanocarriers to deliver both hydrophilic and hydrophobic drugs which shows high bioavailability. Current research on drug delivery system is focused on combined attributes of both polymer and lipid nanocarriers with respect to enhanced stability, biocompatibility, and cellular uptake i.e. lipid polymer hybrid nanocarrier (LPHNC) system. These are the potentially emerging new drug delivery approach. It comprises core-shell nanostructure which is made up of polymer and lipid used in the polymer nanocarriers and lipid nanocarriers respectively. The applications of LPHNCs include drug delivery for anticancer, antibiotic agents, delivery of genetic materials, vaccines and diagnostic imaging agents. The purpose of this review is to introduce LPHNCs which include it's strucutre, advantages, disadvantages, mechanism of drug release, methods of preparation, characterization and applications.

Keywords: Polymer, Lipid, Hybrid Nanocarrier, nanomedicine, drug release, hydrophilic and hydrophobic drugs.

1. INTRODUCTION
Now a day, in the pharmaceutical field, Nanotechnology is highly used for the drug delivery system as a transporting vehicle. Nanocarriers attract high devotion because of their capability to deliver the therapeutic agents through nanocarrier systems, including lipid-based Nanocarrier and polymer-based Nanocarriers which are the two most promising classes of Nanocarrier, as demonstrated by an increasing number of research reports, clinical trials, standard drug products. Both classes of nanocarrier have some benefits and limitations in terms of their physicochemical and biological properties. Lipids are broadly used in various drug delivery systems like liposomes, nanostructured lipid carriers, and solid lipid Nanoparticles. Most lipids are biocompatible, biodegradable, harmless or mildly toxic, and non-immunogenic for the systemic and non-systemic administration because it is derived from natural sources. However, the lipid-based Nanocarriers have some drawbacks like physical and chemical instability during storage and insufficient drug loading. Polymeric Nanocarriers are made from natural and synthetic polymers and have various advantages like lesser particle size, better stability in biological fluids, high drug loading capability, and the ability to offer controlled drug release rates. But the polymeric Nanocarriers also have some limitations like containing toxic organic solvents in the production process and polymer cytotoxicity. Thus, to overcome these limitations of polymer and lipid Nanocarriers a new generation delivery vehicle of therapeutics termed 'Lipid-Polymer Hybrid Nanocarrier'(LPHNCs) has been developed[1-5,6].

1.1 Lipid-Polymer Hybrid Nanocarriers (Lphncs):
The LPHNCs comprise three components as shown in fig.no.1. They are 1) a polymer core in which the therapeutic substances are encapsulated, 2) an inner lipid layer enveloping the polymer core, the main function of which is to confer biocompatibility to the polymer core, and 3) an outer lipid-stabilizer or lipid-surfactant layer, which functions as a stealth coating that prolongs in vivo circulation time of LPHNCs, as well as providing steric stabilization[5,6]
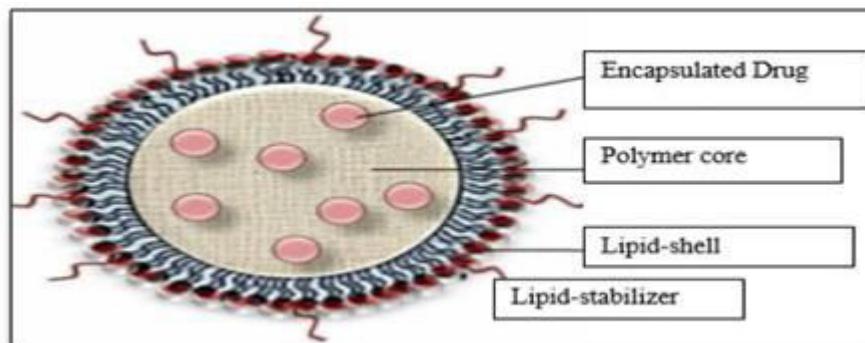
Fig.No.1. Structure of Lipid-polymer hybrid nanocarrier (LPHNCs)

1.2 Advantages of Lipid-polymer Hybrid Nanocarrier:

- The solid polymeric core act as a cytoskeleton that provides mechanical stability, controlled release, and high available specific area.

- The lipid shell enveloping the core is biocompatible and exhibits behavior similar to that of the cell membrane.

- High drug entrapment efficiency and drug loading capacity for a number of the compared to liposomes or polymer Nanocarriers.

- The LPHNCs entrap and deliver multiple hydrophilic and hydrophobic agents simultaneously.

- Particles smaller than 100 nm are promising for intracellular drug targeting.

- Greater ability to co-encapsulating therapeutic and diagnostic imaging agents.

1.3 Disadvantages Of Lipid-Polymer Hybrid Nanocarrier:

- It is difficult to confirm complete removal of organic solvent.

- Costly formulation

1.4 Mechanism of Drug Release from Lipid-Polymer Hybrid Nanocarrier

The structure of a hybrid nanocarrier consists of polymer core, a lipid monolayer that surrounding the core. The polymeric core affects the drug encapsulation and release. Drug release from Nanocarrier begins with diffusion processes, followed by erosion, then swelling of the matrix, as shown in fig.no.2. Hydrolysis causes the polymer to degrade, and the rate of deterioration is determined by the polymer's composition and molecular weight. The lipid shell act as a biocompatible shield, a template for surface modification, and a barrier for preventing the water-soluble drug from leaking out of the core[7,8].
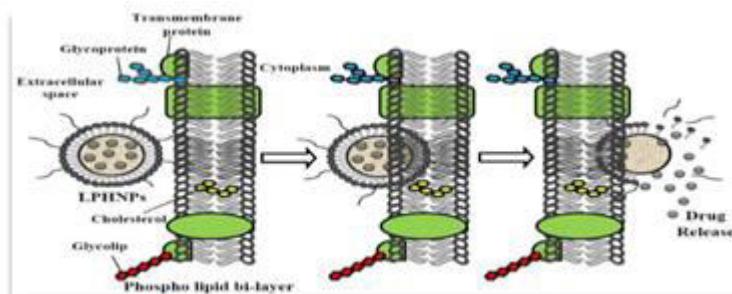
Fig. No. 2. Schematic diagram of release from the LPHNCs

2. Method Of Preparation Of Lipid-Polymer Hybrid Nanocarrier :

There are two main approaches of preparation methods:

I) Two Step Synthesis Approach

II) Single Step Synthesis Approach

2.1 Two Step Synthesis Approach

A) Conventional Two Step Method:

1) Emulsification Solvent Evaporation Method

2) Nanoprecipitation Method

- The polymeric core and lipid shell are prepared separately using two independent processes; then two components are combined by direct hydration, sonication to obtain desired lipid shell polymer core structure.

- Preparation of polymeric Nanocarriers: Polymer Nanocarriers preapared by Emulsification Solvent Evaporation (EME), Nanoprecipitation.

- Preparation of lipid vesicles: The lipid components can be prepared in the form of a thin dried film. Lipid is first dissolved in an organic solvent like chloroform. Subsequently it is subjected to rotary evaporation.

- The next step is the hydration of this dried film by solution of polymeric nanocarriers.

- Lipid vesicles prepared by above mentioned method will be exposed to different mixing protocols like Vortexing or Ultrasonication[5,6,8].

B) Non-conventional Two Step Method:

1) Spray Drying
In this method, polymeric nanocarriers were prepared by spray drying after which they were dispersed in dichloromethane solution containing the lipids. The lipid-polymer suspension was later spray-dried to produce lipid-coated polymeric nanocarriers[9,10].

2) Soft Lithography Particle Molding Technique
This method used to prepare LPHNCs for gene delivery. The polymer (Polylactic Glycolic Acid [PLGA]) dissolves in an organic solvent with a gene material Small interfering Ribonucleic acid (siRNA), then this polymer solution cast onto a polyethylene tetraphthalate (PET) sheet. The PET sheet was then heated while in conformal contact with a PRINT mold containing 80×320nm patterns, allowing the PLGA to flow into the mold and to solidify upon being returned to ambient temperature and produce a PLGA polymeric nanocarrier. The Nanocarriers were harvested from the mold by having the mold in conformal contact with a polyvinyl alcohol (PVA)-coated PET sheet. Nanocarriers were then released from the PVA-coated PET sheet using an aqueous solution oflipid(e.g.1,2-dioleoyl-3 –trimethyl ammonium- propane,1,2- dioleoyl-sn-glycero-3 phosphoe thanolamine) these lipid solutions dissolve the PVA layer and obtained the free LPHNCs[9,10].

2.2 Single Step Synthesis Approach
The main drawback of the two-step method is that the polymeric Nanocarrier and lipid vesicle are prepared separately, rendering the two-step method far from efficient in terms of time and energy expenses. As a result, more effective one-step approach has been devised. The one step method does not require preformed polymeric nanocarrier and lipid vesicle like two-step method. This method involves the mixing of polymer and lipid solutions after which they self-assemble to form LPHNCs by either Nanoprecipitation or emulsification solvent evaporation, which are the same techniques that have been routinely employed to prepare non-hybrid polymeric Nanocarriers[5,6,8].

1) Single Step Nanoprecipitation Method
In this method, the polymer and encapsulated agent dissolve in an organic solvent and the lipid dispersed in aqueous solution containing stabilizer. Heat the aqueous solution (65-70°c) to form a homogeneous dispersion. The polymer solution is then added dropwise to the aqueous solution under continuous stirring, the lipid get self-assemble around polymeric nanocarrier shown in fig.3. The hydrophobic tail attach to the polymer core and hydrophilic head sticks out to the external surface. Stirring continues to evaporate the solvent and centrifuge it to recover LPHNCs[5,6,8].
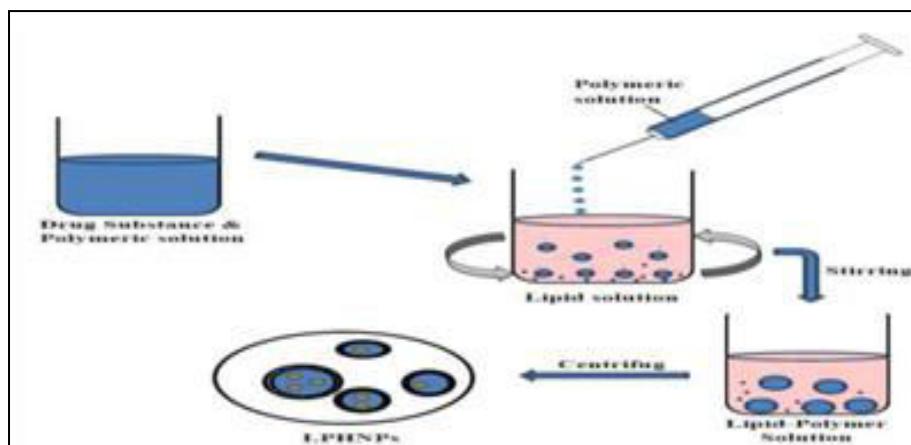
Fig. No.3.LPHNCs preparation by Single step Nanoprecipitation method

2) Single Step Emulsification Solvent Evaporation Method
The emulsification solvent evaporation method is divided into two types depending on the hydrophobic and hydrophilic nature of encapsulating agents.

A) Emulsification Solvent Evaporation Method (ESE) / Single ESE
A single ESE method is employed when the substance to be encapsulated is soluble in water-immiscible solvent (i.e. oil phase). In this method, the polymer and substance to be encapsulated is added to the oil phase (i.e. organic solvents). This oil phase is then added dropwise to the aqueous phase containing stabilizer under constant stirring or ultrasonication to form oil-in-water emulsion. When the oil phase is removed by evaporation, the polymer core is formed and simultaneously the lipid self-assembles around the polymer core thus forms LPHNCs. Alternatively, the lipid and polymer might be dissolved together in the oil phase.

B) Double Emulsification Solvent Evaporation Method (DESE)

This method is employed when the encapsulated substance does not dissolve in an organic solvent. For such substance, firstly substance to be encapsulated dissolve in the aqueous phase and this aqueous phase adds into the oil phase containing polymer and lipid under continue stirring or ultrasonication resulting from a primary emulsion (i.e.w/o). Then this emulsion is added into again aqueous phase containing the lipid with stabilizer to form double emulsion (w/o/w emulsion) under constant stirring and evaporate the oil phase to obtain finely LPHNCs.
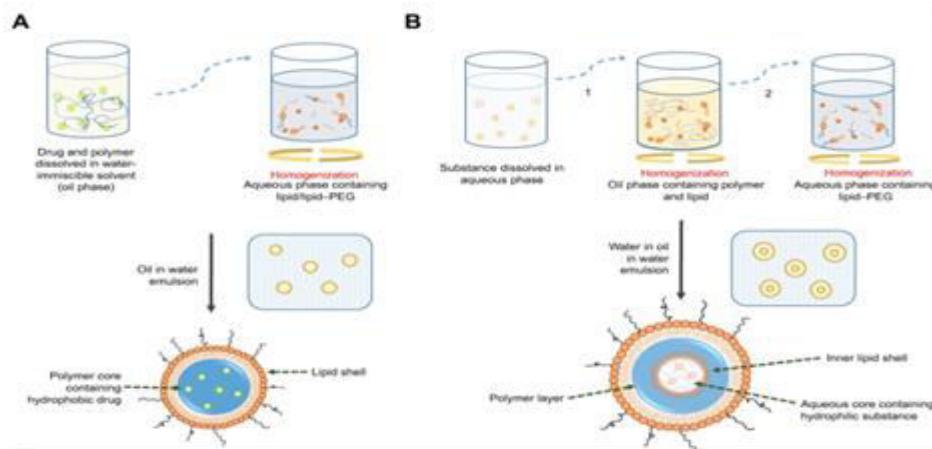
Fig. No. 4. LPHNCs preparation by ESE method — (A) Single ESE & (B) Double ESE

3. CHARACTERIZATION OF LPHNCS

3.1 Morphology

The shape and size of LPHNCs can be estimated by using scanning and transmission electron microscopy (SEM/TEM).TEM analysis is able to differentiate between core and shell type structure of LPHNCs[12].

3.2 Particle Size, Zeta Potential

The size of nanocarrier is important in a variety of functions including medication release, permeability and absorption and it is generally measured by Dynamic Light Scattering (DLS). But SEM, TEM are also oftenly used. Similarly, the zeta potential of nanocarrier is a measure of surface charge. The value of zeta potential implies the colloidal stability of LPHNCs[12,13].

3.3 Entrapment Efficiency

The dispersion of LPHNC is ultracentrifuged for 15 min at 14000 rpm at 4°C and the process is repeated until a clear supernatant is obtained. UV spectrophotometer is used to quantify the amount of unentrapped medication present in the supernatant. Examine each supernatant for three times and the percent entrapment efficiencyiscalculated using the formula :

$$\%EE = \frac{\text{total drug} - \text{unentrapped drug}}{\text{total drug}} \times 100$$

3.4 Ftir

The stability of LPHNCs and their interaction with other components is determined using FTIR analysis.This is accomplished by looking at the drug's spectrum, specific components, and formulations. The presence of intact drug peaks in LPHNCs indicates drug stability. While additional peaks may emerge in the event of a chemical interaction[12].

3.5 Differential Scanning Calorimetry (Dsc)

The DSC of sample is used to assess the stability and physical state of the components. A calorimeter used to perform DSC analysis of individual components, the drug, their physical mixes, blank and drug-loaded LPHNCs[12,13].

3.6 In-Vitro Drug Release

In-vitro drug release of LPHNCs can be determined by dialysis bag method. The study includes, dialysis bag containing LPHNCs which is placed in the compartment containing phosphate buffer media, the media agitated and samples withdrawn at pre-determined time intervals. To maintain the volume constant, the same amount of fresh medium is added after each sample removal. The amount of drug released is estimated using the UV spectrophotometer[12,13].

3.7 Stability Study

The LPHNCs can be kept at 2-8°C and 25 ± 2°C/60% RH for a period of 3months for stability checking. The stability of LPHNC is determined in terms of their particle size and entrapment efficiency.

4. Application of Lipid-Polymer Hybrid Nanocarrier

LPHNCs has various versatile drug delivery applications in the pharmaceutical field.

4.1 Drug Delivery

The LPHNCs have been enabled encapsulation of a wide range of drugs, regardless of their aqueous solubility, ionicity, and lipophilicity as demonstrated by some researchers. Most carriers have recently been discovered for medication delivery, however they do contain some limitations. Here, LPHNCs develop as a carrier that overcomes these limitations and shows high bioavailability.

4.2 Single-Drug Delivery

In the single drug delivery, various types of chemotherapeutic agents or drugs are used for the different types of cancer cells like breast cancer, prostate cancer, lung cancer, liver cancer, cervical cancer. The single Drug delivery from the LPHNCs has low in vitro cytotoxicity, is biocompatible with drug, has good cellular uptake, and has high drug release Kinetic[12,13,14].

4.3 Combinatorial Drug Delivery

A combination of different chemotherapeutic drugs or a combination of chemotherapeutic drugs with other therapeutic agents for effective anticancer therapy is generally required. Develop an LPHNCs that carries multiple drugs at a precise ratio that helps in drug release in a controlled manner and overcomes the limitations of a single drug delivery systems[15].

4.4 Actively Targeted Drug Delivery

In anticancer therapy, the delivery of chemotherapeutic agents should be targeted because the chemotherapeutic agents kill the cancerous cell as well as healthy cells. In the targeted drug delivery system, the maximum amount of drug reaches the cancer cell, not other cells. In which the targeting moiety is attached to the LPHNCs system that easily recognizes the cancerous cell and kills them[16,17].

4.5 Gene Delivery

Today the delivery of nucleic acid a very challenging process for the pharmaceutical company. The delivery of nucleic acid is very useful in the treatment of chronic disease, genetic disorder, cancers and another diagnostic purposes.The lipid-polymer nanocarrier is a more reliable carrier for gene delivery than other carriers because these are biodegradable, stable and long-lived nanocarrier vector delivery systems[18].

4.6 Diagnostic Imaging Agent Delivery

The LPHNCs are also used for the delivery of diagnostic imaging agents for the medical diagnostic approach. Quantum dots (QD), inorganic nanocrystals, barium sulphate, Gastrograffin and other diagnostic agents are utilised in CT, MRI, X-ray/Mammography, Ultrasound Fluoroscopy, Nuclear Medicine/ Molecular Imaging and Angiography/International, among other procedures[19, 20].

5. Conclusion

The LPHNC system is the most promising nanocarrier class, with a wide range of drug delivery applications in the pharmaceutical industry. The researcher's major goal is to develop an LPHNCs based medication delivery system for effective and safe clinic therapy that boosts efficacy while reducing hazardous side effects. LPHNCs overcome the limitations and various problems associated with lipid-based and polymer-based nanocarriers like drug leakage, polymer toxicity, instability during storage, less permeability and so on. Because the polymer core is coated with a lipid layer it easily permeates through cell membrane. LPHNCs are utilised to treat diseases such as cancer, tumours and immunotherapy as well as to administer antimicrobial agents, nucleic acids, hydrophilic and lipophilic drugs, single and multiple drug delivery.

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A STUDY ON CONSUMER BUYING BEHAVIOUR OF D-MART RETAIL OUTLET IN VIDYAVIHAR

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ABSTRACT

The study was conducted to know the consumers buying behavior of D-Mart retail outlet in vidyavihar. Any market comes into existence due to the customers as they are the kings of market, without consumers no business organization can run. D-Mart is a one roof hypermarkets chain that aims to provide a wide range of products to their consumers to fulfill their day to day requirements of any products. It is a favorite place of shopping for everyone due to the availability of varieties of products. Nowadays customer satisfaction is a must for the business. Everyone tries to satisfy their customers by offering different brands, sales, offers, quality, quantity and many more to attract customers. Thus the availability of a wide range of branded products at affordable prices at a single place changes the buying habits of every consumer of society. This study is to understand which level income of people are buying more from D-Mart. This reveals that the customers are satisfied with the services of D-Mart. To study further a survey research was conducted in which primary data was collected from 80 people who had visited D-Mart to buy any product. This will indicate the changed perception of every consumer's buying behavior towards D-Mart using different strategies.

1. INTRODUCTION

1.1: Brief meaning of Retail:
Any organization selling to final consumers whether it is a manufacturer, wholesaler or retailer-is doing retailing. It does not matter how the goods or service are sold. (by person, mail, telephone, vending machines or internet or where they are sold-in a store, on the street or in the consumer's home)". The sale of goods to the public in relatively small quantities for use or consumption rather than for resale.

1.2: Brief meaning of consumer buying behaviour:
Today's business is considered as a "consumer – oriented activity" which aims at understanding what is needed by the consumer and providing him with the right product, at the right price, at the right place at the right time. This help in maximizing consumer satisfaction. Modern business organization provides consumer with the products of his choice. Sound knowledge about consumer behaviour is needed for forming effective marketing strategies for an organization. Consumer behaviour is considered to be an inseparable part of marketing.

2: LITERATURE REVIEW

According to Avinash and B.V Sangvikar(2019), their objective is to provide insight about Dmart success of in India and their conclusion is D-mart techniques and strategies it uses for cost efficiency and higher sales and D-mart has restricted segmentation, this made D-mart more profitable.

According to M.Guruprasad(2018), Director research, Universal Business School , Concluded there was 50-50 opinion from customers of Badalpur and Karjat about online offering D-mart products and D-marts mainly faces the competition from small shop which deal in single variety of commodity.

According to Muhammad Sabbir Rahman, there is a strong relationship between consumer perception and behaviour in selecting a super market when age, gender and income play a mediating role. In addition, it is also found that consumers age differences have the highest influence on their buying behaviour.

According to Rajiv Lal,Ram Rao(1997) ,Everyday low pricing strategy has proved to be a successful innovation resulting in higher profits to super markets adopting it in competition with promotional pricing.

According to Howard Smith(2004),Multistore firms are common in the retailing industry project suggests that cross elasticity between stores of the same firm enhance market power. Profit margins for each chain, a survey of consumer choices and the data set of store characteristics are taken into consideration to estimate a model of consumer choice.

According to Krishnaveni(2006), Identified that the most important paradigm which is associated with promotion of loyalty among consumers is the attribute of quality. She concluded present generation invest more on the basic factors such as books, clothes, food, music and gadgets such as mobile phones.

According to Ronald E Milliman (1982), his paper critically reviews the literature available and presence and empirical study that examines the effects of the background music on in store shopping behaviour. It finds that music tempo variations can significantly affect the pays of in store traffic flow and dollars sales volume.

According to Peter R Dickson, Alan G Sawyer(1990), A model of grocery shopper response to price and other point of purchase information was developed. The findings suggest that shoppers tended to spend only a short time making their selection and many did not check the price of the item they selected.

According to Mr. Ansari Arbaz (2019)

● It has positioned itself in the market as discounted store.

● Youth likes shopping and moving around D-mart

● It has emerged as a hub of shopping specially for middle class people

● He used Hypothesis Test to choose factor for most while purchasing in his study

3. Selection of Topic For Research Project:

"A study on consumer buying behaviour of D-Mart retail outlet in Vidyavihar".

4: Objectives of Study:

I.   To know the consumer buying behavior of D-mart in Vidyavihar.

II.   To understand the factors influencing of consumer behavior of D-mart in Vidyavihar.

III.   Understand psychological factor and social factor influence consumer buying process.

IV.   To know the consumers reaction towards products, its quality and facilities provided by D-mart.

V.   To know the satisfaction level of D-mart in Vidyavihar.

5: Significance of Research Study:

This research is significance from various dimensions such as:

5.1: Study of consumer behaviour:

➢ How consumers think, feel, reason and select between different products, brands, etc.

➢ How consumers are influenced by their environment such as family, reference group, culture, values, etc.

➢ The behaviour of consumers while purchasing products, etc.

➢ An organization caters to the needs of different types of consumers, it cannot assume that all are similar. Every consumer is unique. Every has a different taste, lifestyle, need, income, preference, values, etc.

5.2: Study of consumer buying behaviour factors used in D-Mart

➢ **Marketing factors** like promotion, packaging, price, etc.

➢ **Personal factors** like age, education, gender, income level, occupation, lifestyle, personality, etc.

➢ **Cultural factors** like religion, social class, caste, sub – caste, traditions customs, etc.

➢ **Psychological factors** like buying motives, consumers perception about the product, attitude towards the product, etc.

➢ **Social factors** like social status, family, reference groups, etc.

6. COMPANY PROFILE

D-Mart is a one-stop supermarket chain that aims to offer customers a wide range of basic home and personal products under one roof. Each D-Mart store stocks home utility products – including food, toiletries, beauty products, garments, kitchenware, bed and bath linen, home appliances and more - available at competitive prices that our customers appreciate. Our core objective is to offer customers good products at great value.

D-Mart was started by Mr. Radhakishan Damani and his family to address the growing needs of the Indian family. From the launch of its first store in Powai in 2002, D-Mart today has a well- established presence in 221 locations across Maharashtra, Gujarat, Andhra Pradesh, Madhya Pradesh, Karnataka, Telangana, Chhattisgarh, NCR, Tamil Nadu, Punjab and Rajasthan. With our mission to be the lowest priced retailer in the regions we operate, our business continues to grow with new locations planned in more cities.

The supermarket chain of D-Mart stores is owned and operated by Avenue Supermarts Ltd (ASL). The company has its headquarters in Mumbai. The brands D-Mart, D Mart Minimax, D- Mart Premia, D Homes, Dutch Harbour, etc. are brands owned by ASL.

7. INDUSTRY PROFILE

➢ Retail businesses sell finished goods to consumers in exchange for money. Retail   businesses can include grocery, drug, department and convenient stores. Service related businesses such as beauty salons and rental places are also considered retail businesses.

➢ Indian retail industry has emerged as one of the most dynamic and fast-paced industries due to the entry of several new players.

➢ The retail sector in India is emerging as one of the largest sectors in the economy.

➢ The total market size of the Indian retail industry reached US$ 672 billion in 2017.It is forecasted to increase to US$ 1,200 billion by 2021 and 1,750 billion by 2026.

➢ India will become a favorable market for fashion retailers on the back of a large young adult consumer base, increasing disposable incomes and relaxed FDI norms

➢ India is ranked first in the Global Retail Development Index 2017, backed by rising   middle class and rapidly growing consumer spending.

➢ India's population is taking to online retail big way. India's E-commerce business will reach US$ 99 billion by 2024.

8. DATA ANALYSIS AND DATA INTERPRETATION

Q1) Name of Respondent :

No of respondents : 80 consumers from VidyaVihar area

Q2) Age Group:

Age Group	% No of respondent
20-30	50%
31-40	20%
41-50	22.5%
51-60	7.5%
60+	0
Total	100%
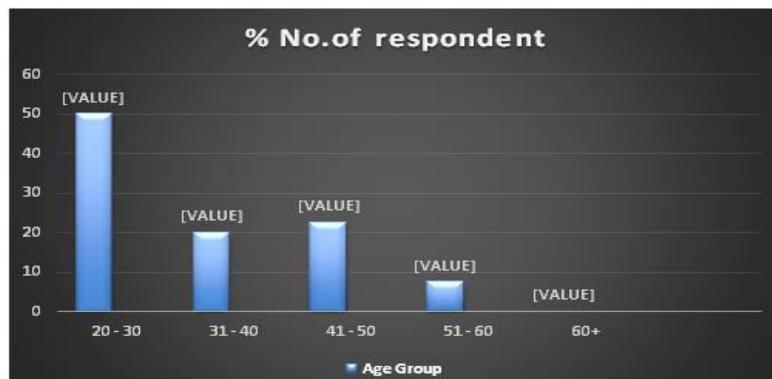
Interpretation: From the above diagram the highest no. of respondent are in the age group of 20-30 which is 50% and the lowest no. of respondent are in 60+ age group which is 0%.

Q.3) Gender:

Gender	% No of respondent
Male	22%
Female	78%
Total	100%
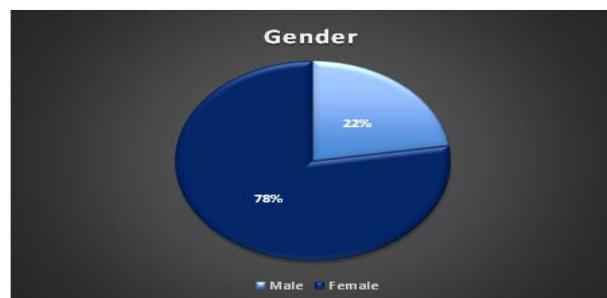
Interpretation: From the above diagram 22% respondents are male and another 78% are female respondent.

The largest no of respondents are female. There are 78% respondents.

The lowest no of respondents are male. There are 22% respondents.

Q.4) Occupation of customer:-

Occupation	% No of respondent
Service	46%
Business	20%
Profession(student)	20%
House wife	14%
Total	**100**
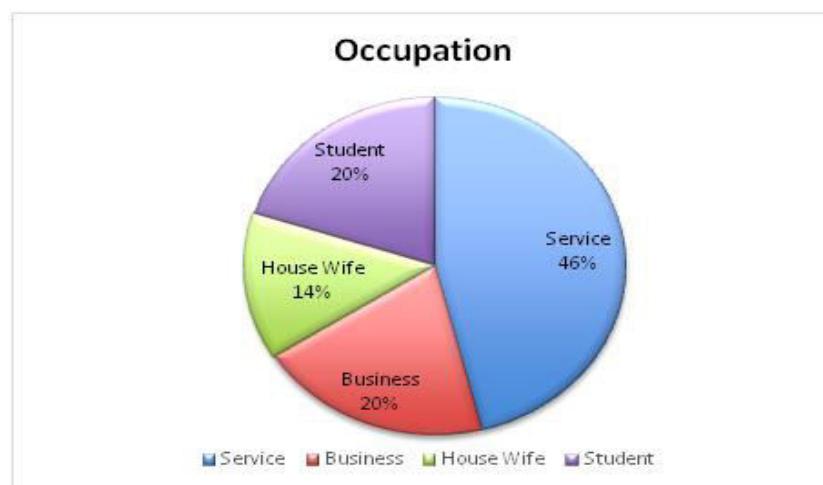
Interpretation: In above diagram the largest no. of respondent are service occupation there are 46% and the lowest no of respondent are house wife there are 14%.

Q.4 (a) Your Monthly Salary

Monthly Salary	% No of respondent
Less than Rs. 25000	61%
Rs. 25000 to Rs. 50000	25%
Rs. 50000 to Rs. 75000	7%
Rs. 75000 to 100000	3%
More than Rs. 100000	4%
Total	**100%**
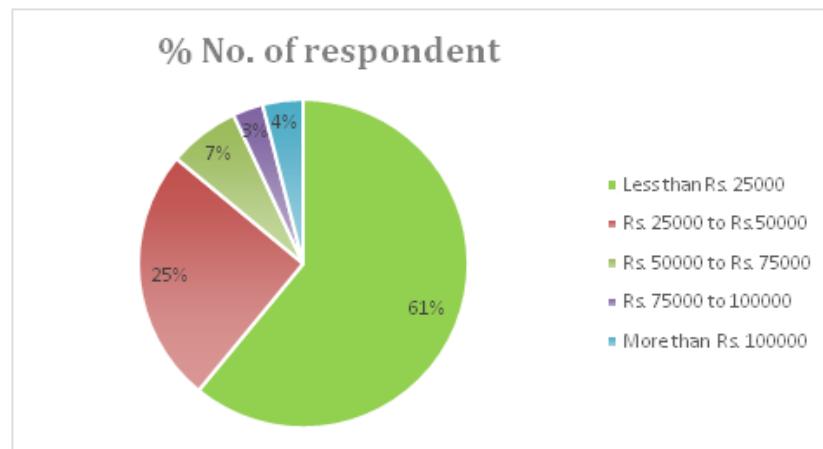
Interpretation: From the above diagram we can see 61% respondent have less than Rs.25000 monthly salary and lowest no of respondent have Rs.75000 to Rs.100000 there are 3%.

Q.5 Do you visit D–Mart regularly?

Particular	% No of respondent
Yes	52%
No	48%
Total	100
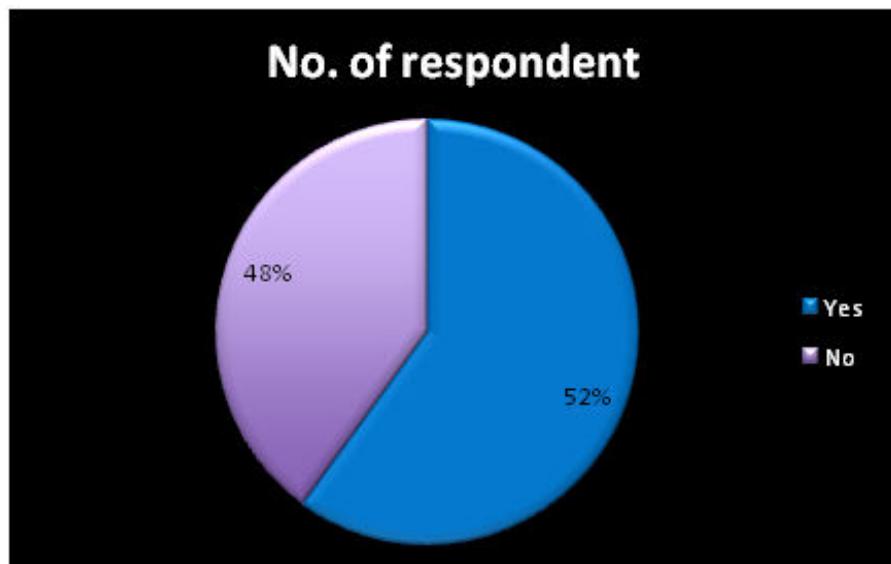
Interpretation: From the above pie chart 52% respondent are said yes and remaining 48% respondent said no.

The largest no of respondents are said yes. There are 52% respondents.

The lowest no of respondents are said no. There are 48% respondents

Q.5 (a) If Yes frequency of visits

Occupation	% No of respondent
Once in a two months	30%
Once in a month	48%
Once in 15 days	17%
Once in a week	5%
Total	100
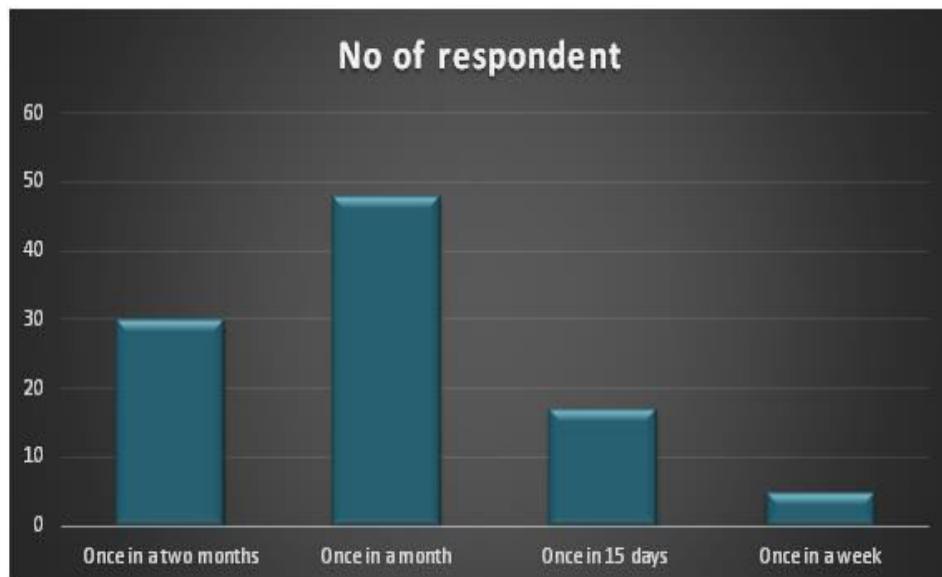
Interpretation: From the above diagram the largest no of respondent visit D-Mart in once in a month are 48% and lowest no of respondent visit once in a week are 5%.

Q.6. With whom you normally visit the D-Mart?

Particular	% No of respondent
Family	67%
Friends	30%
Relatives	3%
Total	**100**
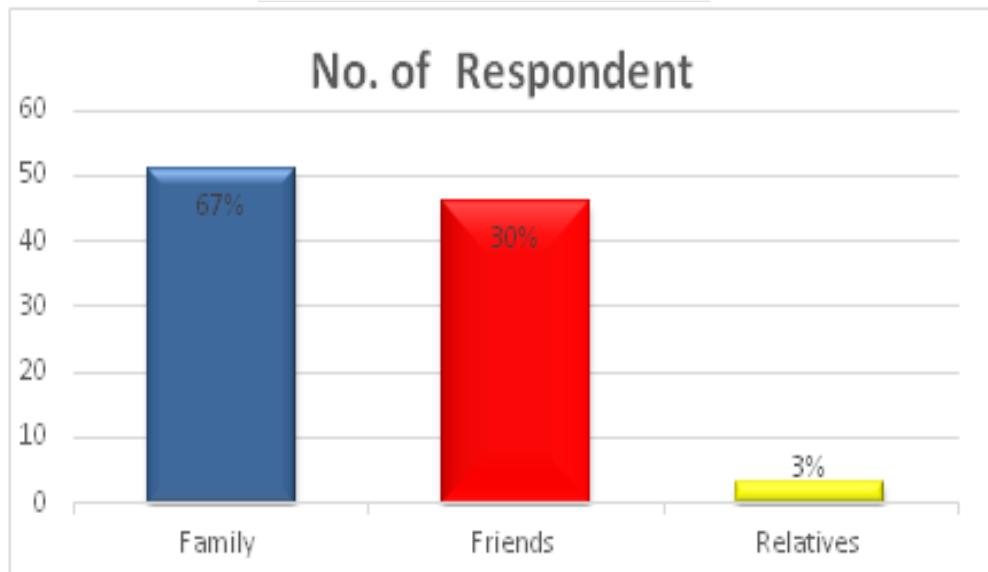
Interpretation: In the above diagram the largest no of respondent visiting D-Mart with family are 67%and lowest no of respondent visiting with relatives are 3%.

Q.7. From where are you normally buying the products?

Occupation	% No of respondent
Reliance Mart	10%
D-Mart	81%
Big Bazaar	2%
Online Apps	7%
Total	**100**
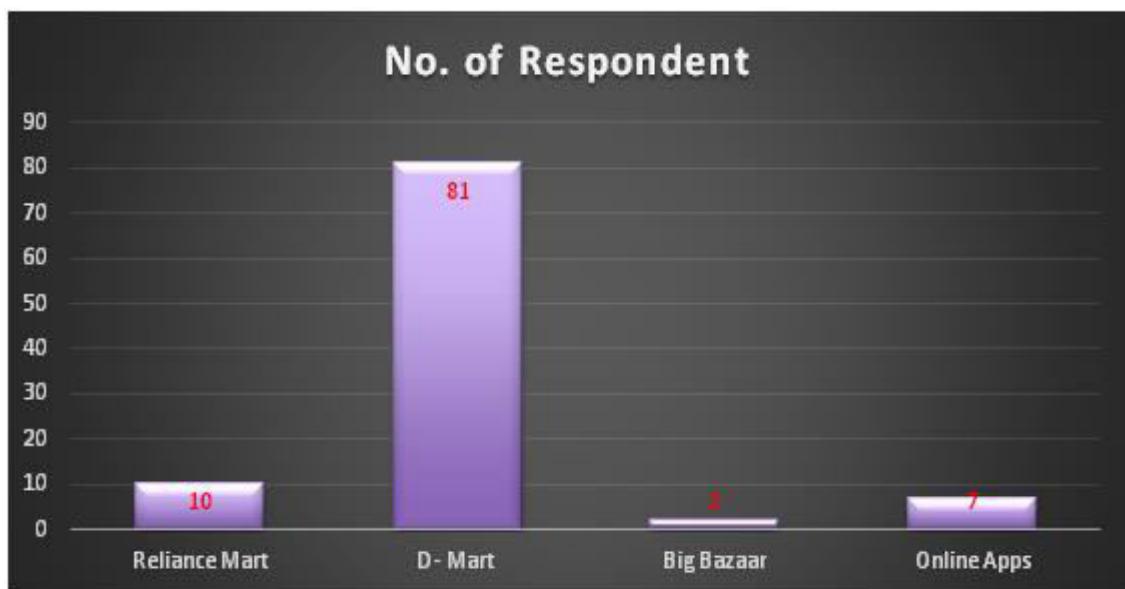
Interpretation: From the above diagram we can 81% of respondent are buying the product from the D-Mart and lowest no of respondent are buying product from the Big Bazaar there are 2%.

Q.8. Do you like buying at the D-Mart?

Particular	% No of respondent
Yes	98%
No	2%
Total	100
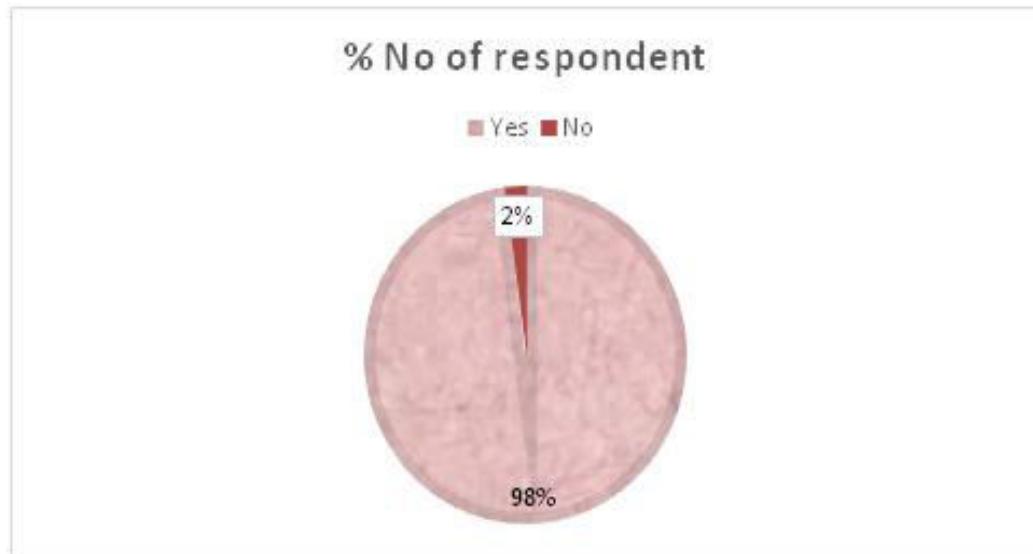
Interpretation: From the above pie chart 98% respondent are said yes and remaining 2% respondent said no.

The largest no of respondents are said yes. There are 98% respondents.

The lowest no of respondents are said no. There are 2% respondents.

Q.9. When do you prefer to go D-Mart?

Particular	% No of respondent
Week days	17%
Weekends	36%
Public holiday	35%
Working days	12%
Total	100
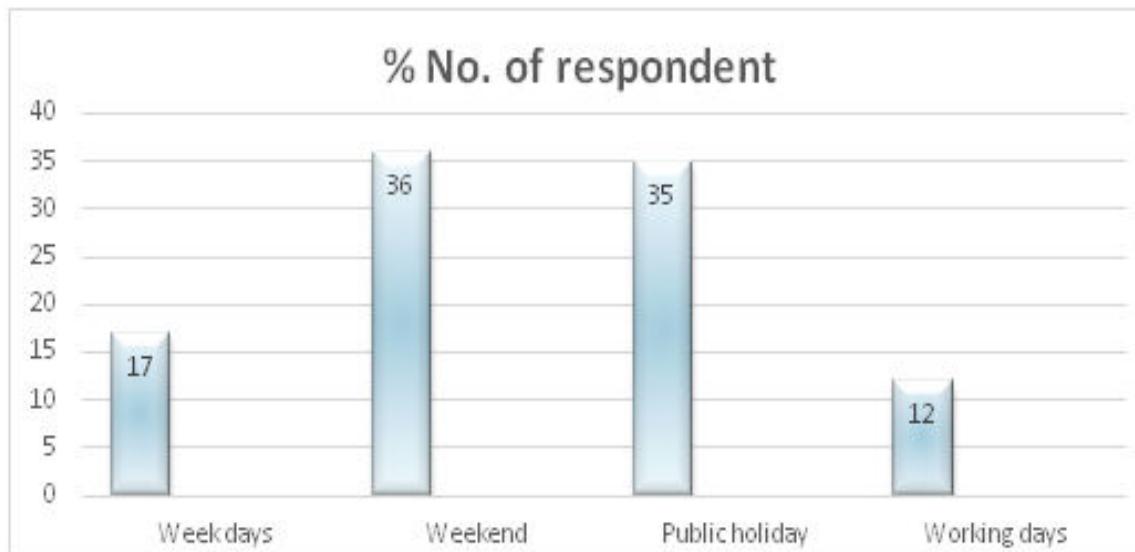
Interpretation: From the above diagram the largest no of respondent to go D-Mart in weekends are 36% and lowest no of respondent to go working days are 12%.

Q.10. How much do you normally spend in D-Mart in a single shopping?

Particular	% No of respondent
Less than Rs.1000	14%
Between Rs.1001 to Rs.2000	35%
Between Rs.2001 to Rs.5000	27%
More than Rs.5000	24%
Total	**100**
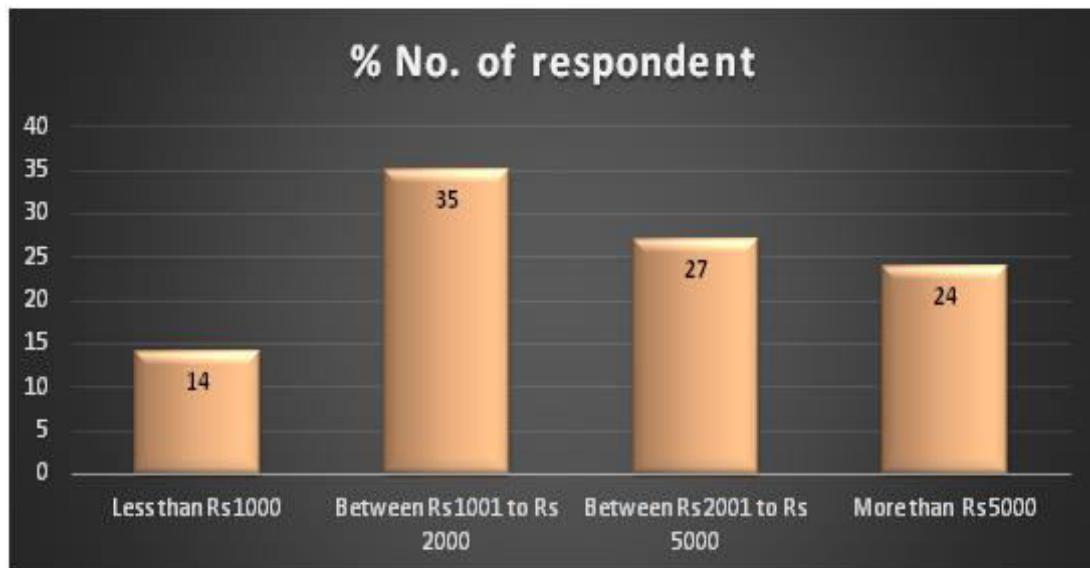
Interpretation: From the above diagram we can see 35% respondent normally spend between Rs.1001 to Rs.2000 in D-Mart in single shopping and lowest no of respondent normally spend between less than Rs.1000.there are 14%.

Q.11. From whom do you know about D-Mart schemes or product?

Particular	% No of respondent
Family members	51%
Friends	35%
TV	8%
Newspaper	6%
Total	**100**
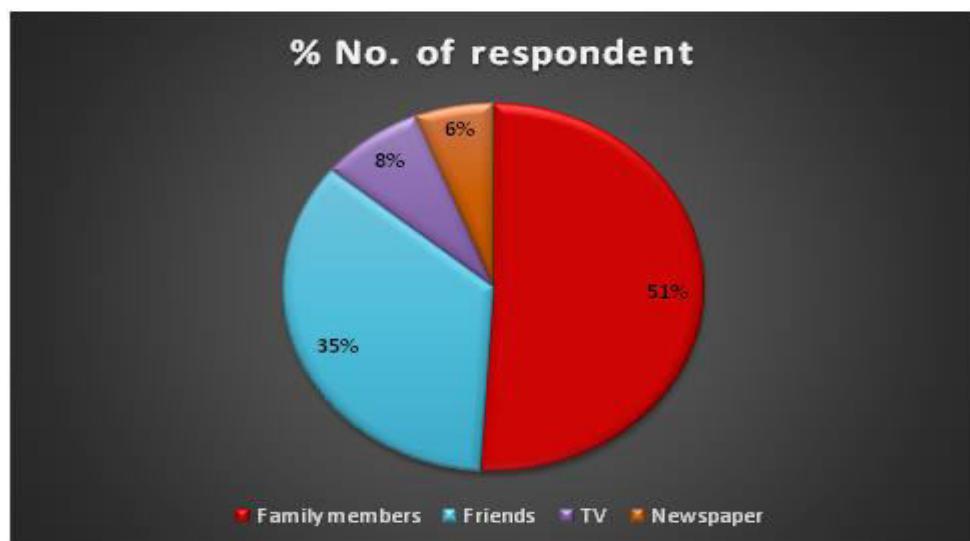
Interpretation: From the above diagram the largest no respondent are know about D-Mart from family members are 51% and the lowest no of respondent know about D-Mart from newspaper are 6%.

Q.12. Why you are buying products from D-Mart?

Particular	% No of respondent	Total
Variety	66%	100
Quality	73%	100
Price	69%	100
Offer & discount	75%	100
Convenient	30%	100
Ambiance	9%	100
Service	23%	100
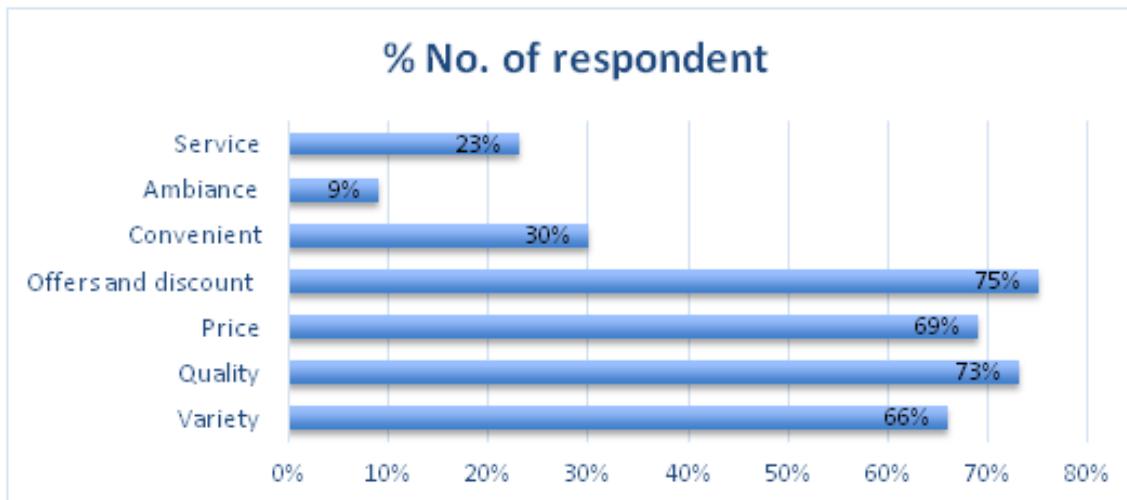
Interpretation: From the above diagram the largest no of respondent buying products from D-Mart for offer & discount time. There are 75%.and lowest no of respondent buying products for ambiance purpose. There are 9%.

Q.13. Do you think products sold in D-Mart are of GOOD quality?

Particular	% No of respondent
Yes	96%
No	4%
Total	100
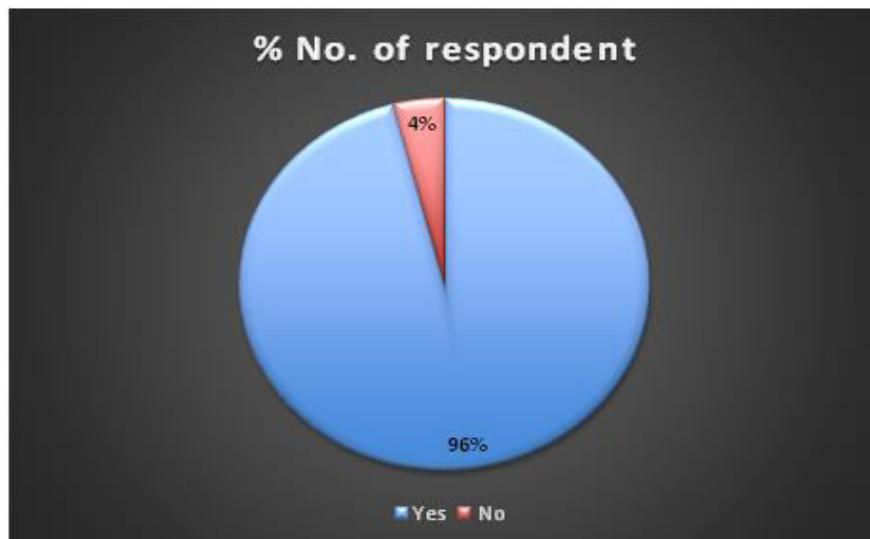
Interpretation: From the above pie chart 96% respondent are said yes and remaining 4% respondent said no.

The largest no of respondents are said yes. There are 96% respondents.

The lowest no of respondents are said no. There are 4% respondents.

Q.14. What is the role of following groups in your buying decision?

No of respondent	Group			
	Parents	Sibling	Friends	Others
Highly involved	57	28	28	15
Somewhat involved	19	32	35	15
Not involved at all	8	25	23	56
Total	100	100	100	100
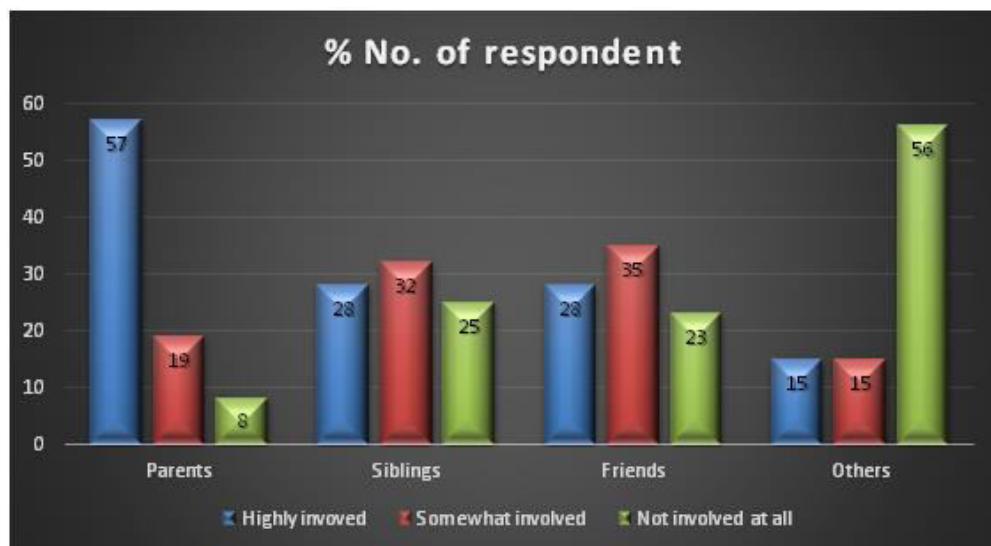
Interpretation: From the above chart role of parents group is higher than siblings, friends and others group to help in taking buying decision. This chart also provides the data of parents, sibling, friends and others group are highly influenced to customers at a time of taking decision, as per data every category is highly influencing to customers for buying products.

Q.15. Do you think best price and superior quality products are available at D-Mart?

Particular	% No of respondent
Yes	92%
No	8%
Total	100
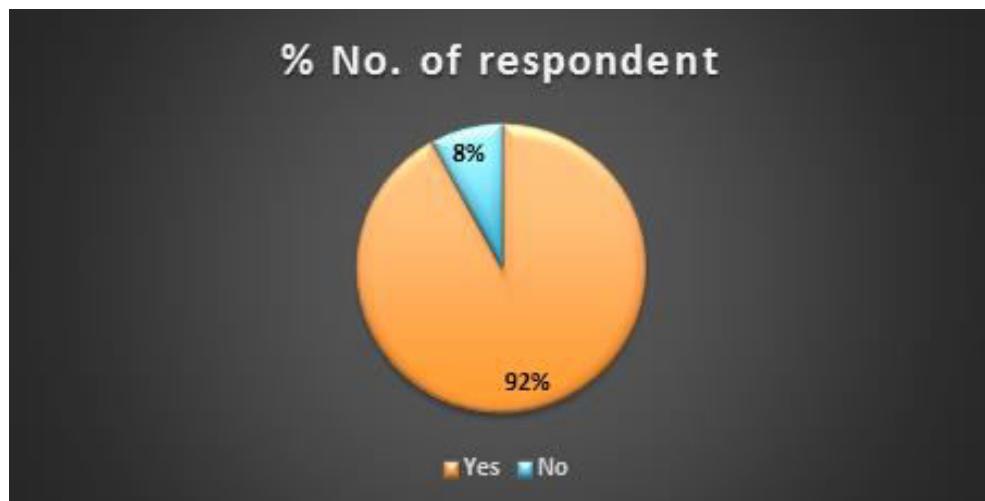
Interpretation: From the above pie chart 92% respondent are said yes and remaining 8% respondent said no.

The largest no of respondents are said yes. There are 92% respondents.

The lowest no of respondents are said no. There are 8% respondents.

Q.16. How much of these D-Mart attributes motivate you to buy from D-Mart?

Attributes	No of respondent			
	High	Little	Not at all	Total
Product Varity	59	19	4	100
Parking	25	34	10	100
Time saving	40	32	8	100
Customer service	39	31	9	100
Cost saving	52	25	2	100
Ambiance	30	42	6	100
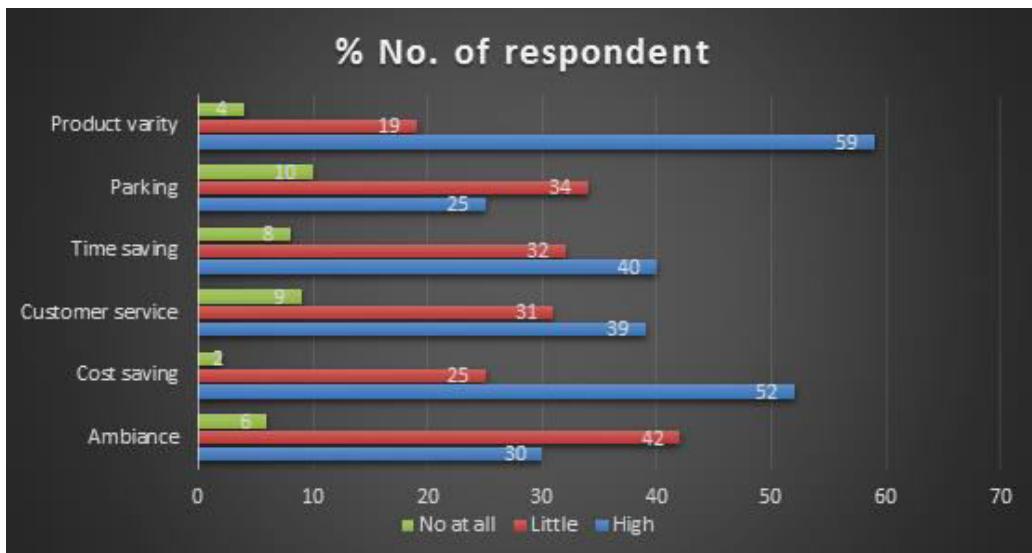
Interpretation: From above chart customers are motivated to buy from D-Mart mostly through product variety and cost saving of D-Mart, customers are also motivated through time saving and customer's services facilities offered by D-Mart. Every attribute of D-Mart motivates customers to buy from D-Mart.

Q.17. Have you ever seen the advertisement of D-Mart?

Particular	% No of respondent
Yes	54%
No	46%
Total	100
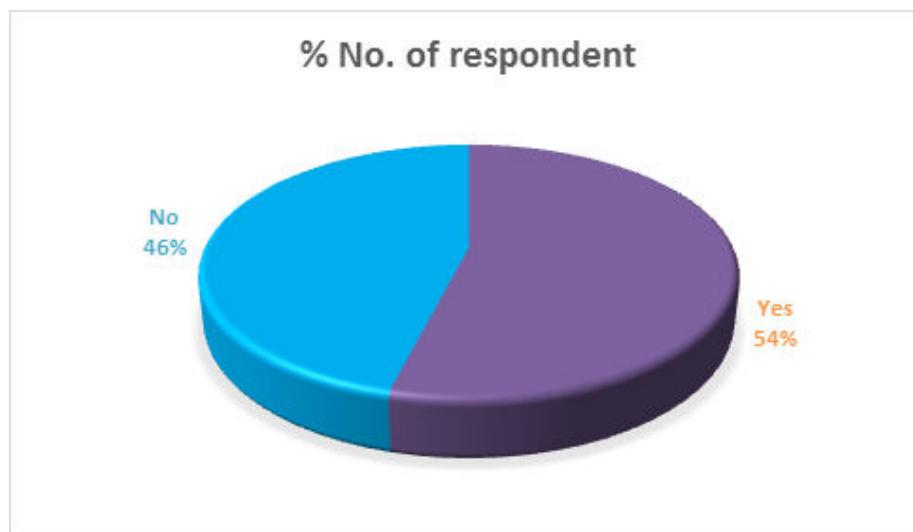
Interpretation: From the above pie chart 54% respondent are said yes and remaining 46% respondent said no.

The largest no of respondents are said yes. There are 54% respondents.

The lowest no of respondents are said no. There are 46% respondents.

Q.18. Are you satisfied from facilities of D- Mart?

Particular	% No of respondent
Yes	91%
No	9%
Total	100
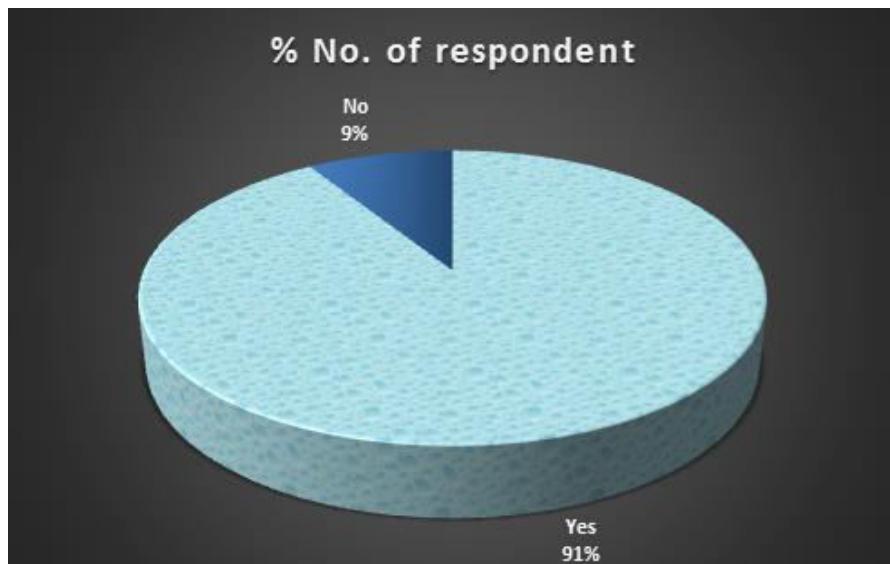
Interpretation: From the above pie chart 91% respondent are said yes and remaining 9% respondent said no.

The lowest no of respondents are said yes. There are 91% respondents.

The largest no of respondents are said no. There are 9% respondents.

Q.18 (a) If Yes which areas

Particular	% No of respondent
Parking	29%
Light & A.C	57%
Escalator & lift	50%
Shops product variety	80%
Product display by brand	47%
Entertainment	12%
Total	100
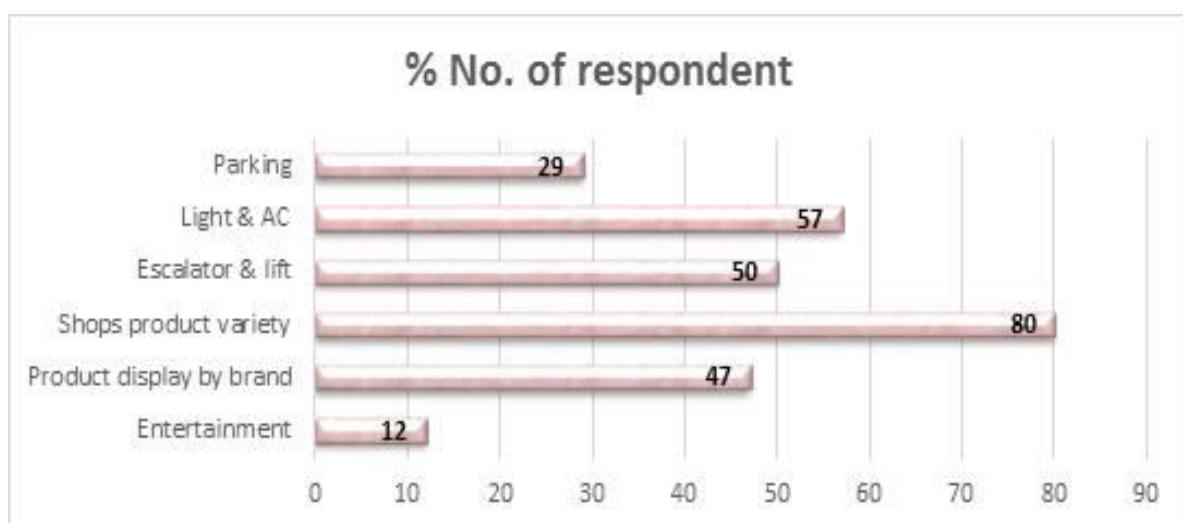
Interpretation: In the above bar chart the largest no of respondent highly satisfied from shops product variety facilities there are 80% and lowest no of respondent satisfied from entertainment facilities. There are 12%.

Q.19. How would you rate the employee behaviour in D-Mart out of 5?   **(1-worst, 5-very good)**

Particular	% No. of respondent
Rating 1	1.3%
Rating 2	2.5%
Rating 3	12%
Rating 4	54%
Rating 5	31%
Total	**100**
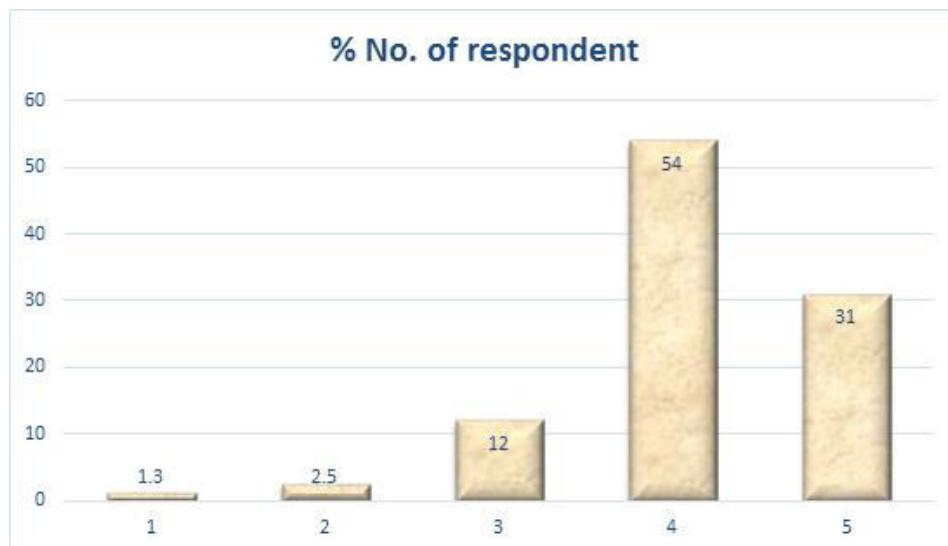
Interpretation: From the above bar chart the largest no of respondent giving 4th rating for employee behaviour in D-Mart are 54% and lowest no of respondent giving 1st rating for employee behaviour. There are 1.3%.

Q.20. Do you like purchasing product from D-Mart at the time of offers given   by D-Mart?

Particular	%No of respondent
Yes	94%
No	6%
Total	**100**
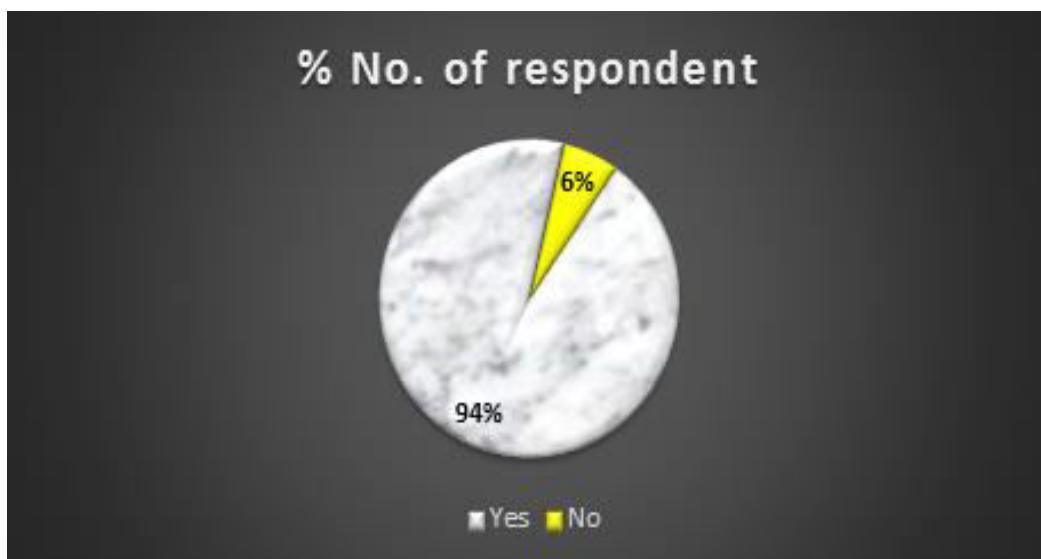
Interpretation: From the above pie chart 94% respondent are said yes and remaining 6% respondent said no.

The largest no of respondents are said yes. There are 94% respondents.

The lowest no of respondents are said no. There are 6% respondents.

Q.21. Do you have coupons membership?

Particular	% No of respondent
Yes	36%
No	64%
Total	100
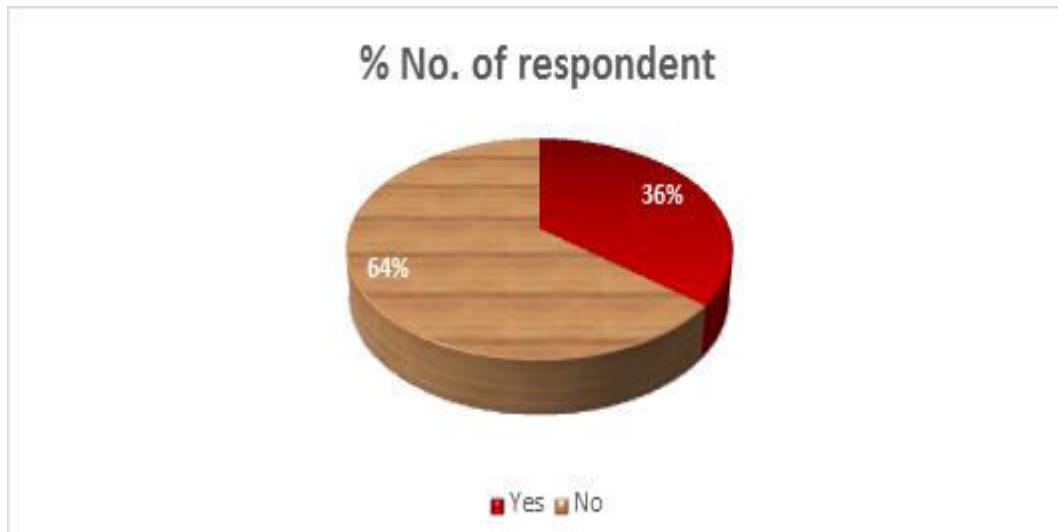
Interpretation: From the above pie chart 36% respondent are said yes and remaining 64% respondent said no.

The largest no of respondents are said yes. There are 36% respondents.

The lowest no of respondents are said no. There are 64% respondents.

Q.21 (a) If Yes are you buying product due to special discount offer to coupon   member holder?

Particular	% No of respondent
Yes	40%
No	60%
Total	100
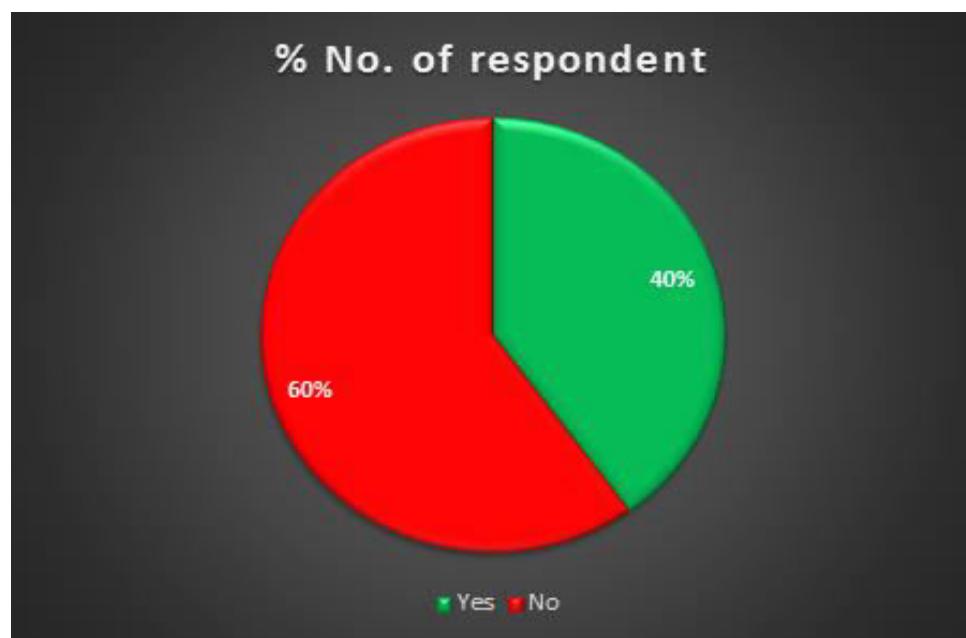
Interpretation: From the above pie chart 40% respondents are said yes and remaining 60% respondent said no.

The largest no of respondents are said yes. There are 40% respondents.

The lowest no of respondents are said no. There are 60% respondents.

Q.22. Are you satisfied with the service provided by D-Mart?

Particular	% No of respondent
Yes	97%
No	3%
Total	**100**

Interpretation: From the above pie chart 97% respondents are said yes and remaining 3% respondent said no.

The largest no of respondents are said yes. There are 97% respondents.

The lowest no of respondents are said no. There are 3% respondents.

Q.23. What is the response of the sales representative in D- Mart?

Particular	% No of respondent
Good	59%
Better	25%
Best	15%
Worst	1%
Total	**100**
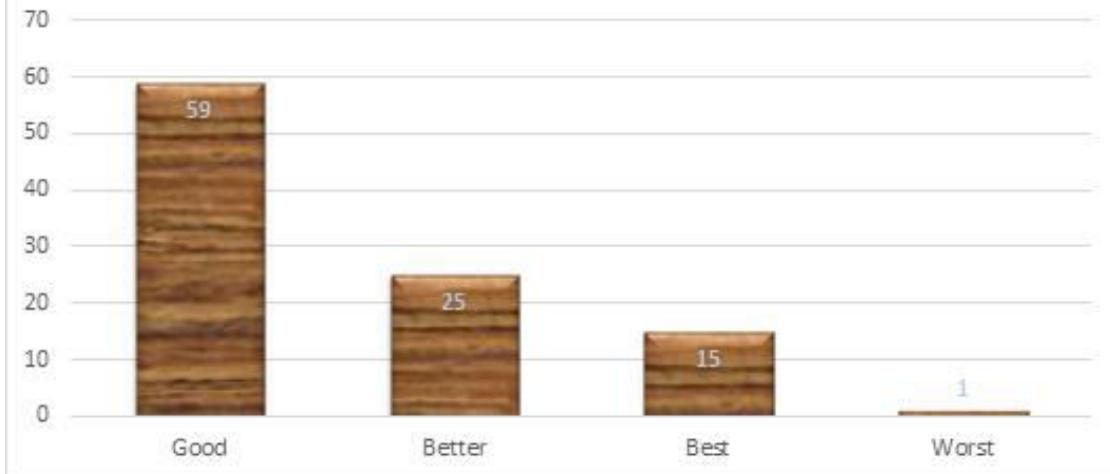
Interpretation: From the above bar chart the largest no of respondent giving good sales representative in D-Mart. There are 59%. The lowest no respondent giving worst. There are 1%.

Q.24. What do you normally expect after purchasing a product?

Particular	% No of respondent
Durability	43%
Style	44%
Prestige	34%
Uniqueness	33%
Utility	41%
Appearance	33%
Value for money	84%
Total	**100**
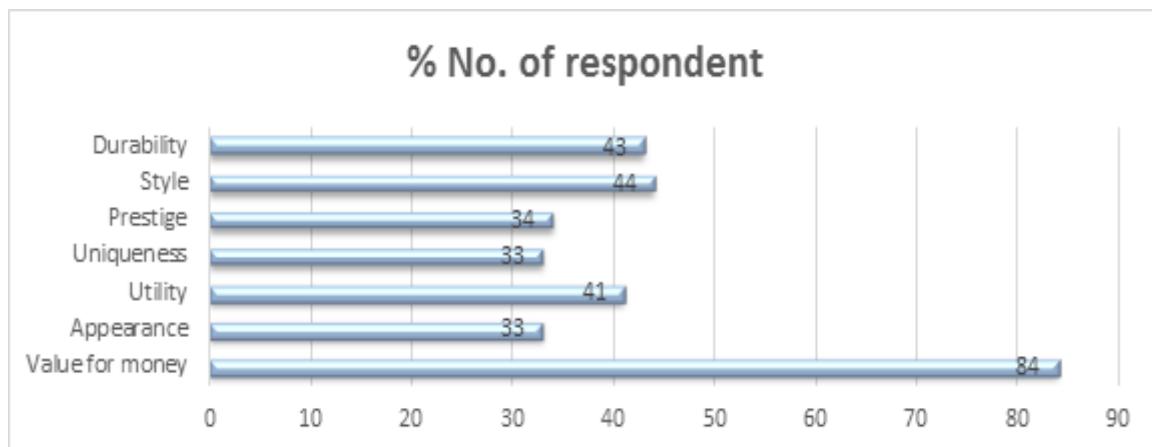
Interpretation: From the above bar chart the largest no of respondent normally expect after purchasing a product is value for money there are 84% and lowest no of respondent expect after purchasing a product is uniqueness and appearance there are 33%.

Q.25. Which category of product do you prefer to buy frequently?

Particular	% No of respondent
Clothes	60%
Utensils	54%
Electronic	43%
Groceries	64%
Sports	23%
Footwear	45%
Total	**100**
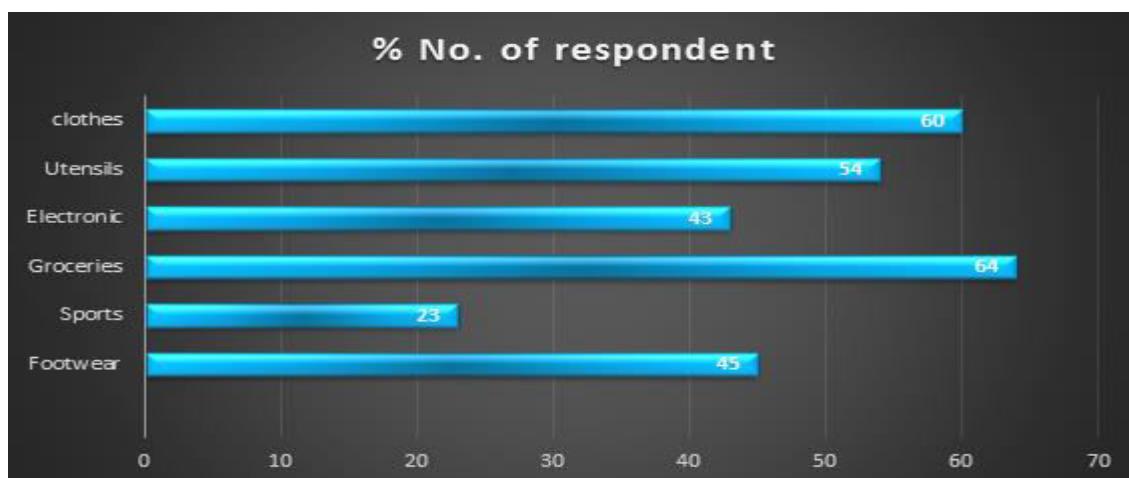
Interpretation: From the above bar chart the largest no of respondent buy frequently groceries products there are 64% and lowest no of respondent buy frequently sports products there are 23%.

Q.26. Are you happy with the location of D-Mart?

| Particular	% No of respondent
Yes	90%
No	10%
Total	**100**
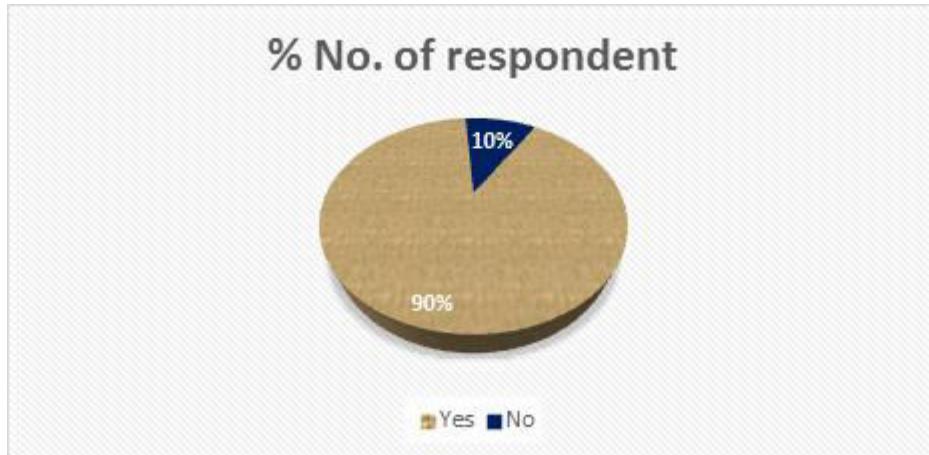
Interpretation: From the above pie chart 90% respondent are said yes and remaining 10% respondent said no.

The largest no of respondents are said yes. There are 90% respondents.

The lowest no of respondents are said no. There are 10% respondents.

Q.27. Rank the following features of D-Mart on the basis of your evaluation on price? (1-worst, 5-very good)

Particular	% No of respondent
Rating 1	0%
Rating 2	3%
Rating 3	16%
Rating 4	50%
Rating 5	31%
Total	**100**
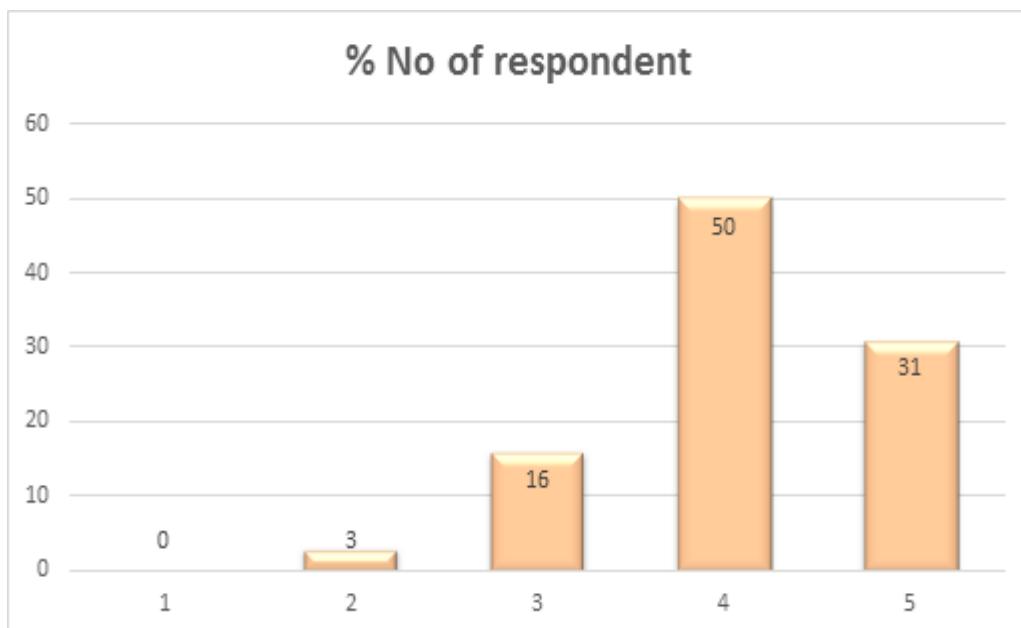
Interpretation: From the above bar chart the largest no of respondent giving 4th rating for evaluation on price in D-Mart are 50% and lowest no of respondent giving 1st rating for evaluation on price. There are 0%.

Q.28. Rank the following features of D-Mart on the basis of your evaluation on quality? (1-worst, 5-very good)

Particular	% No of respondent
Rating 1	0%
Rating 2	4%
Rating 3	24%
Rating 4	45%
Rating 5	27%
Total	100
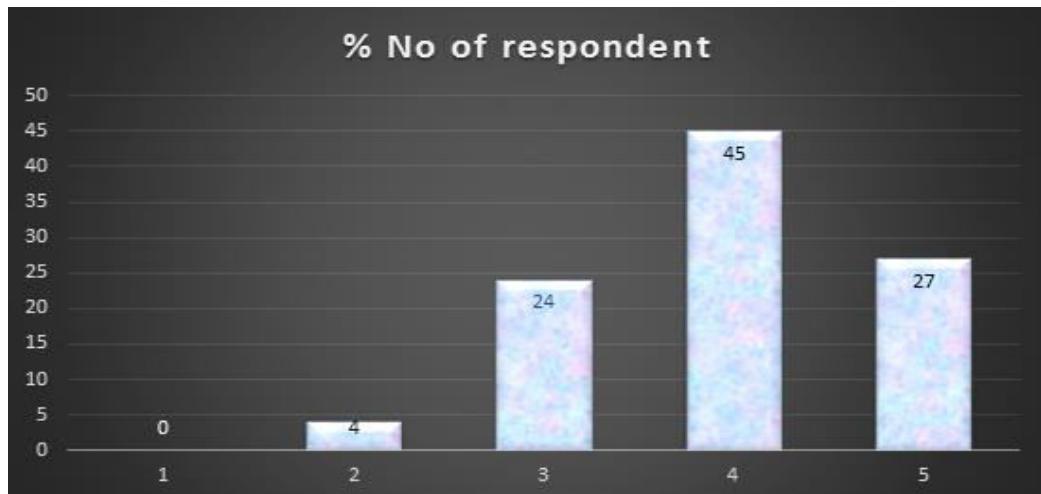
Interpretation: From the above bar chart the largest no of respondent giving 4th rating for evaluation on quality in D-Mart are 45% and lowest no of respondent giving 1st rating for evaluation on quality. There are 0%.

Q.29. How will you rank D-Mart in comparison with Malls?   (1-worst, 5-very good)

Particular	% No of respondent
Rating 1	3%
Rating 2	5%
Rating 3	22%
Rating 4	46%
Rating 5	24%
Total	100
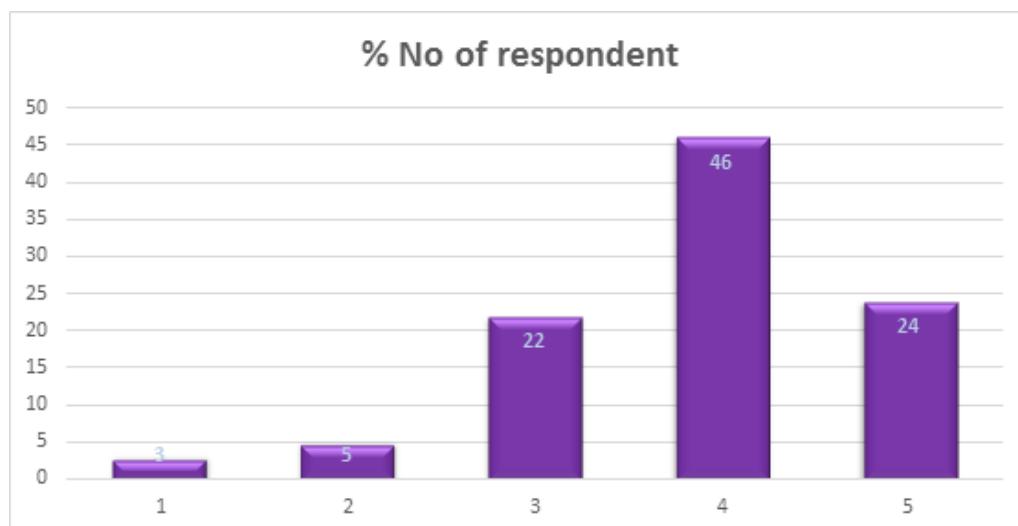
Interpretation: From the above bar chart the largest no of respondent giving 4th rank for D-Mart in comparison with malls are 46% and lowest no of respondent giving 1st rank. There are 3%.

9. CONCLUSIONS AND RECOMMENDATIONS

1. Overwhelming consumers (90% & more) are satisfied and happy with D Mart particularly on the Price front and Variety of goods in addition to their excellent employee behavior.

2. Most of the consumers (84%) found D mart products value for money .

3. Family (67%) as a unit does play role in the overall footfall of D Mart and parents (57%) have had a larger involvement in the younger members buying behavior , thus clearly giving an indication of multiple members involved in the buying decision rather than one individual

4. The spending volume of consumers of Rs 1001 to Rs 2000 (37%) and Rs 2001 to Rs 5000 (27%) and Rs 5000 & more (24%) inspite of majority respiondents being in the less than 25000 monthly salary bracket indicates that younger generations are more spend thrift category and enormous opportunity exists for tapping this huge category in India by retailers

5. The majority of consumers were visiting once a month and most of these were on weekends (36%) or public holidays (35%) indicating an opportunity to increase the frequency of visits to once a week by more aggressive sales promotions and discount schemes on Weekends (Friday evening to Sunday late night) to augment the sales of retailers every week.

10. SCOPE FOR FUTURE STUDY

a. To acquire a more comprehensive result of the consumers behavior towards D Mart, one can extend this study to more outlets of D Mart instead of just one.

b. The no of respondents of around 300 + would provide a better quantitatively and qualitatively results. Such study will provide more insights of the consumers behavior towards D Mart.

c. Having a better spread of respondents particularly with respect to Gender and monthly salary could have helped this research better in understanding the consumer behavior across various economic strata and remove the gender bias too.

d. The study of consumer behaviour could also be extended to other Retailers like Big Bazaar, Reliance Mart & also Online Apps to get a mouch broader consumer behavior rather than restricting to D Mart loyalists only.

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SCHOOL CHILDREN'S CREATIVE WRITING BEHAVIOURS AND THEIR VARIOUS EXPRESSIONS

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ABSTRACT

Attention, perception, listening, speaking, and body language are all communication abilities that should be used effectively in creative writing. This strategy allows youngsters to express themselves, their difficulties, and their envisioned world. Children are not inactive throughout activities, but rather dynamic. Creative writing helps children develop creativity, critical thinking, and teamwork abilities in addition to personal and social growth. Children can express themselves freely and successfully through creative writing. Students are encouraged to use their knowledge as well as their various abilities in the writing process and in their activities. Description, interpretation, and critical thinking are all developed through creative writing. However, children can communicate their thoughts, feelings, and dreams through creative writing. Most students struggle to write properly and express their thoughts effectively while writing. Writing skill development is a complex process that differs from person to person. Some students learn this talent more quickly and readily, while others need to practise for a long period. The purpose of this paper is to measure the effects of creative writing on children and to highlight the challenges that children face in learning to write creatively through various exercises.

Keywords: Creative Writing, Critical writing, Texting, Collaborative Writing, Originality

INTRODUCTION

The phrase 'Creative Writing' was coined in response to literary critics and theorists' dismissal of the writer's creative role. What is now called Creative Writing is a historical attempt to see literature as a creative activity rather than an artefact for analysis' (Myers 12). The biggest concern here is the distinction between 'Creative writing' and 'Other" writing', which could imply that some works of literature are creative and others are not (Mcvey 290). Imagination and personality are developed through creative writing. It is the act of a person freely penning out his or her feelings and opinions employing their ideas. The common thread running through all creative texts is the presence of passion and risk. Courage is defined as an individual's willingness to express his or her thoughts and opinions despite the demands and expectations of the majority and accepting responsibility for it.

Problem-solving and artistic skills can be developed through creative writing. Students' problem-solving skills are improved through creative writing activities, which allow them to come up with diverse solutions to challenges (Kirmizi 96). In terms of content, creative writing differs from other styles of writing. Its substance contains elements that show imagination and creativity in settings that are not commonly encountered or that do not appear to be thoughts shared by the bulk of society. There are two perspectives on creative writing. The first is a literary composition based on the writer's creativity, such as a story or a play, or on events that have actually occurred. The other is writing, which seeks to create an instructional and engaging document. Teachers can get to know their students better through creative writing, and students can become more conscious of their own diverse perspectives on various subjects.

EXPRESSIONS, TASKS AND CHALLENGES

Teachers may invite students to write about their experiences with written work and to describe any enjoyable writing assignments. Texting their friends has almost always been the most enjoyable writing activity. Some critics believe that texting, writing emails, and other kinds of technological communication are devaluing the language. It is thought that kids' pleasure of text messaging is a good place to start in building confidence. Students have learnt a new language, a grammar, and a set of customs through texting, and have succeeded in conveying meaning within limited space. They've mastered a whole new literary genre, and if they can do it, they can do it with others. With this new, condensed language under their belts, today's students are better prepared than past generations to tackle the most basic of academic writing assignments and lecture notes (Mcvey 294). We should encourage students to write outside of their studies, to keep a diary, create a blog, submit short articles to websites, or participate in online discussion to eliminate the mystery from the art of finding meaning through written words. Teachers can also give opportunities for students to write during class. Students are to be given one-minute papers to think and write critically on the spot, scribbling down answers, jotting down learning comments, and expressing their views and experiences.

Collaborative writing is required for children who are learning to write for the first time. They improve not only their technical writing skills, but also their feeling of responsibility. Sharing of different ideas, on the other

hand, plays an essential role in the formation of creative ideas. Personally, creative writing is impossible. Individual and group work activities can be used to execute it. Creative drama is a method that relies heavily on group collaboration. With its unique group dynamics, creative drama can help with socialization and collaborative writing. It is said that combining creative writing and creative acting strengthens fundamental cognitive capacities. Ambition, socialization, and problem-solving skills are all improved by activities that support each other. They also stimulate the artistic thinking (Kirmizi 97). Students frequently create poor literary text because they have not been fully instructed on what is expected of them, nor have they been presented a model of good writing in the given area. Developing basic academic writing abilities will not just prepare students for success in competitive exams and in the workplaces rather, it will have a substantial impact on the students' self-identity (Stuart 166). It is our obligation to guide and encourage our pupils as they build their writing talents.

It can be hard to convince students that reading is entertaining, so making writing enjoyable may seem impossible. Anxiety of the blank page is common among new students, who are hesitant to even begin a writing assignment. Writing is a strange world to them that they don't know how to navigate. They're afraid that a wrong turn early on may lead them to a spot from which they can't get out. Projects to integrate the two different areas are being implemented in developed countries such as England and the United States, and these are being applied to all educational curricula.

Projects emphasizing on the use of creative writing in elementary schools are designed and implemented in particular (McCaslin). While these projects allow the programme to be adaptable and they also draw students' interest. Students' literary skills are developed while they are engaged in creative writing. Students who understand that writing is an enjoyable activity are more likely to participate in writing activities. They would not look for ways to avoid having to write. The students in the experimental group discovered the fun element of writing thanks to the creative writing exercises, as evidenced by the reports. The activities, which were done in a wonderful way, made the pupils recognize that writing is not something to shun.

Many foreign schools and colleges are trying to teach creative writing, placing an increased focus on students' imagination and creativity. The emergence of creative writing as a discipline in higher education in recent years has altered the structure of curriculum at educational institutions all around the world. Additionally, there is creative reading, which gives lead to practice-based instruction. It has been noted that many of our critics were talented writers who were able to balance criticism and creativity in equal measure in their writing and thought processes. However, a creative act can also be a critical act, and vice versa. There are many different examples of the interaction between criticism and creativity in the writing programmes teachers and students have created, with a stronger emphasis on the actual application of writing skills. It is crucial to understand that creative writing has always existed outside of the curriculum and educational programmes, and it always will. For a meaningful engagement with writing and reading, literary theory is not a prerequisite in schools, libraries, reading and writing groups, online writing communities, or residential writing centres.

It is crucial to understand that creative writing has always existed outside of the curriculum and educational programmes, and it always will. For a meaningful engagement with writing and reading, literary theory is not a prerequisite in schools, libraries, reading and writing groups, online writing communities, or residential writing centres. Schoolchildren have been shown to have a special talent for creative writing, and their abilities help them develop as new writers with the support of their imagination and creativity. As a result, young writers are drawn to creative writing because they comprehend concepts intuitively rather than rationally, in addition to wanting to express their truths. It is language that most shows a person. Language is who we are to the world and to ourselves.

The usefulness of creative writing as a form of art that enriches the lives of many people is also recognised. Humans warm to well-crafted objects that reveal unexpected truths about our life. Additionally, creative writing brings insights that go above and beyond our desire to earn a living. Children who engage in creative writing become more aware of their surroundings and gain insight into the personalities of those they meet or will never know by name. It also draws their attention to the complex interplay between words, ideas, and feelings. The writer constructs narratives in many different forms of art by using the apparent magic of what is real and teachable.

The development of creative language and narrative is as natural to them as speaking. It is a characteristic of their human experience. Metaphor is a commonplace innovation for how they read and express the world around them and in themselves, whereas their literary mind is their core mind. Reading, practise, and creative experiment make up the core of creative writing. These factors alter and rebuild our children's hard wiring in a

variety of ways. However, we should encourage our kids to read and write in a unique manner. It is actually a complex and at the same time a simple process of imaginative creation. Children's minds engage with themselves, memories, and their senses of sound and music at even the most fundamental level. They hear language, see language, speak language, sing language, and come up with original ideas. Therefore, it is crucial to encourage children to compose poetry and plays during the early years of their education. For them, it is a useful writing lesson. If they want, let the characters speak. They will draw inspiration from their memories, incidents from their past, their imagination, and even their minor victories and failures.

CONCLUSION

Writing for children is seen to be the most important writing of all. It aids in the development of lifelong reading habits. It gives youngsters imaginary experiences that help them grow cognitively and emotionally. It is necessary to place a greater emphasis on children's reading styles in order to foster their creativity and initiative. They will be able to enhance their motivation in that sector by doing story book and picture book exercises. Encourage the students to try for new poetries. It reveals their originality and novelty. Sometimes they speak no new ideas but they may attempt to dismantle the individual human speaking subject. It's also true that critical writing prepares kids to write critically. It's important to remember that creative writing is purely imaginative, whereas critical writing is interpretive and argumentative. Both critical studies and creative practises are large fields that provide a wide range of writing styles.

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BENEFITS OF USING PLANTS IN INDOORENVIRONMENTS

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ABSTRACT

Indoor plants often add to the ambience of a house or any place they are kept at. Not only they make a place look more beautiful but some also purify inside environment. Plants also improve your health and help increase your focus. With the improving of the living environment for people demands, a lot of living space, office space, commercial space owner will choose to use plants to add vigor of the interior space, adjust the atmosphere of interior space. When choosing plants, weare faced with a variety of plants to choose, how to match becomes a difficult problem. The formal beauty has found a reference model for us to choose plants and also provided some theoretical basis for interior designers to match plants in interior space. Busy work, tired life is full of urbanite every day, a small plant, canbring a touch of spiritual comfort when we are tired. In the face of diverse and colorful plants, how to match in the interior space becomes the problem that we encounter when designing, the formal beauty provides the theory basis for this question. The study focuses on the topic of introduction of plants to indoor environments and its benefits. The data from the literature review showcases numerous benefits of plants in indoor environments. It was observed that the plants not only help in purification of air but also increase the happiness and the positive aura around the house. They can also be used to serve the purpose of home decor and to brighten up the dull corners.We also provided a Guide to indoor plants as well as a guide to indoor plant care. In conclusion, having plants in indoor environments has great many benefits and theynot only provide a constant supply of fresh air but also beautify the indoor aesthetics.

Keywords: Benefits, Indoor plants, Environment, Interior Space, Purify air

INTRODUCTION

Indoor plants often add to the ambience of a house or any place they are kept at.Not only they make a place look more beautiful but some also purify inside environment. Plants also improve your health and help increase your focus. With the improving of the living environment for people demands, a lot of living space, office space, commercial space owner will choose to use plants to add vigor of the interior space, adjust the atmosphere of interior space. When choosing plants, weare faced with a variety of plants to choose, how to match becomes a difficult problem. The formal beauty has found a reference model for us to choose plants and also provided some theoretical basis for interior designers to match plants in interior space. Busy work, tired life is full of urbanite every day, a small plant, canbring a touch of spiritual comfort when we are tired. In the face of diverse and colorful plants, how to match in the interior space becomes the problem that we encounter when designing, the formal beauty provides the theory basis for this question.

The introduction of green plants in indoor spaces has raised a great amount of interest motivated by the positive physiological and psychological benefits for humans . Plants have been found to have climate-mitigating effects such as thermal and humidity control- as a direct consequence of the evaporate cooling, differential shade cooling and solar gain heating of the foliage canopies and also contribute to potential energy savings. Subsequently, living greenery has becomea matter of interest for its effects on the physical quality of the built environment itself beyond its aesthetic appeal.

Studies on the benefits of plants are contributing to an increased use of plants to solve both environmental and health problems. The physical cause of the tangibleeffects, such as removing air pollutants, are relatively well understood.

The basis for the intangible effects, such as increased happiness, is not well- understood. A lack of understanding of the theoretical basis hinders the most effective use of plants to deal with these issues. This paper examines some of thestudies that have documented the beneficial effects of plants, focusing on those used indoors, and then examines some of the postulated reasons why humans respond positively to plants.

The focus of the study is to determine the benefits of plants in indoor environment. There are numerous benefits of introducing plants to indoor environments and some such advantages are as follows:

Purify the air, spruce up all dull corners, spread happiness, good for your mental well-being, heal you from within, helps in meditation, boosts productivity.

OBJECTIVE

To Study Benefits of Using Plants in Indoor Environment.

JUSTIFICATION

Plants bring natural beauty to our living spaces. By creating texture and balance, a room or patio can be transformed into an environment that comforts and welcomes. They've been proven to reduce stress so well that one glance at a plant lowers your heart rate. They also help clean the air we breathe by absorbing toxins and acting as little oxygen factories. Plants simply make us feel better. Plants are more than just ornaments. At some level, we are deeply connected to them.

In the current scenario, the world is modernizing everyday but with modernization comes a great price to pay. we've converted luscious green forests to Concrete jungles and are now facing the grave danger of Global warming. But fortunately, we've realized our error and we are now on the path to rectify it. Hence, we've adopted ways to modernize while causing minimum harm to the green life. Introducing plants to indoor environments is one such way to help the green life. These indoor plants not only supply us with fresh air but also induce a stress relieving aura and looking at them can help you calm down and anchor yourself. They also help in beautification of homes and brighten up the dull corners of your homes. The topic of indoor plants and their benefits play a vital role in the future of Interior designing.

REVIEW OF LITERATURE

Many of the research studies documenting the beneficial effects of plants on people have focused on plants outdoors or on scenes of nature. Research has shown that interior plants in individual containers can also produce the same benefits. Research has confirmed the stress-reducing benefits of passively viewing plants. It has demonstrated that people's impressions of a room and their mental well-being can be significantly improved when plants are added. It also has shown that productivity and mental functioning are improved and that pain perception can be reduced. Research on the effects of plants on people has shown, in essence, that plants are essential for people to be at their best. Plants are needed in our lives, all around us, every day. They have a civilizing effect; they humanize our surroundings.

METHODOLOGY

The research design for the present study was descriptive in nature. Descriptive research design is concerned with the conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident, or trends that are developing. During the search process, the researcher contacted the group of selected people. The purpose of research was explained so as to get the true responses. On the basis of the needs & preference of the people with regards to existing person name, area, age, location, preference for using plants in indoor environment, types of plants, types of plants by growth, name of plants, location for arrangements of plants. Google form questionnaire was assessed by the investigator to gather the information about the preference of using plants in their indoor environment. The data was gathered by the researcher between March 2022-April 2022.

FINDING AND DISCUSSION
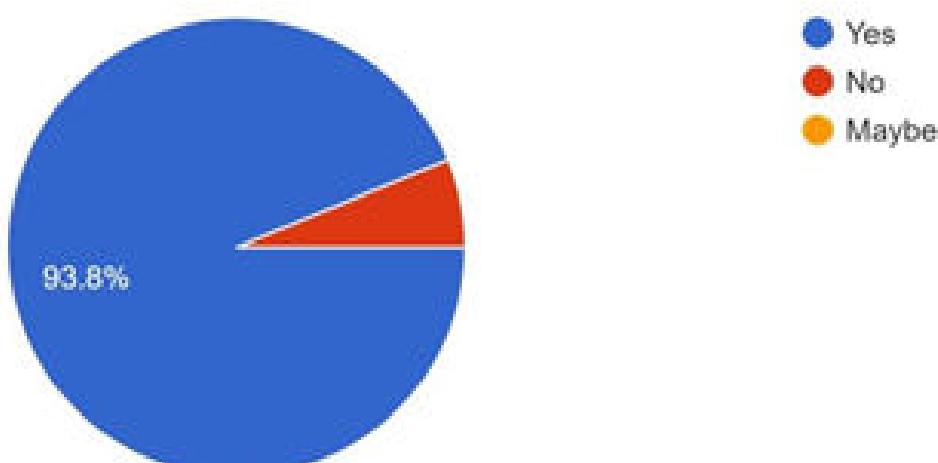
Fg.1 - Prefer to use plants in indoor environment

The figure 1 revealed that most people like to have plants in their indoor environment, to give aesthetic look of their home interior.
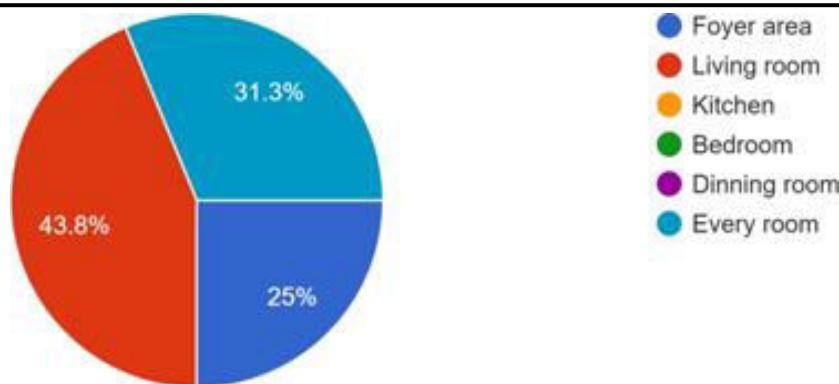
FG.2 - Prefer To Use Plants in Indoor Environment

Figure 2 revealed that most people like to have plants in the living room and in foyer area but 25% people like to have plants in every room to get good, fresh environment.
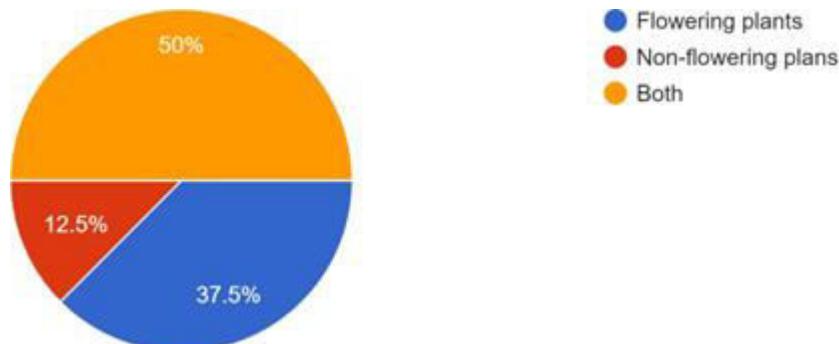
Fg.3 - preference for types of plants

As shown in figure 3, majority people prefer both flowering and non-flowering plantsbut out of rest 50% most of people like to have flowering plants in their interior space. To get flowery feel.
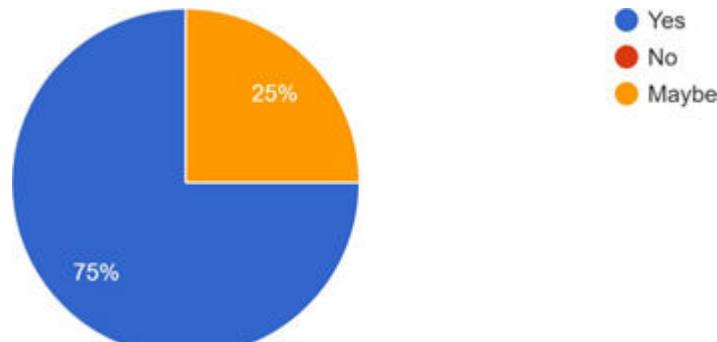
Fg.4 - Indoor plants helps to reduce stress

As shown in figure 4, 75% people thinks that using plants in indoor environment helps to reduce stress and that give peace full environment.
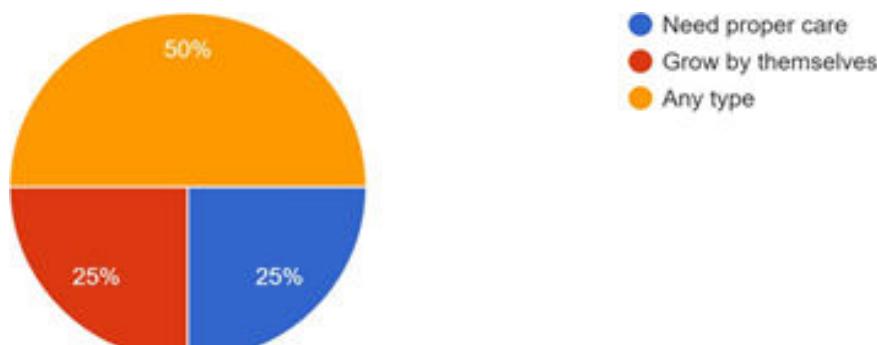
Fg. 5 - preference for types of plants

Figure 5 revealed that 50% people prefer to have any types of plants in their interior but25% people wants to have plants that need proper care and rest 25% people like to have plants that grow by themselves.
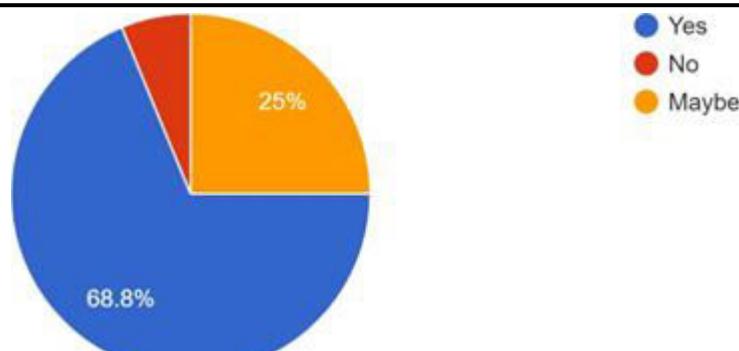
Fig. 6 - Huge impact of indoor plants in home environment

As shown in figure 6, Majority of people believes that indoor plants do have huge impact in their home environment, also the plants have health benefits too.
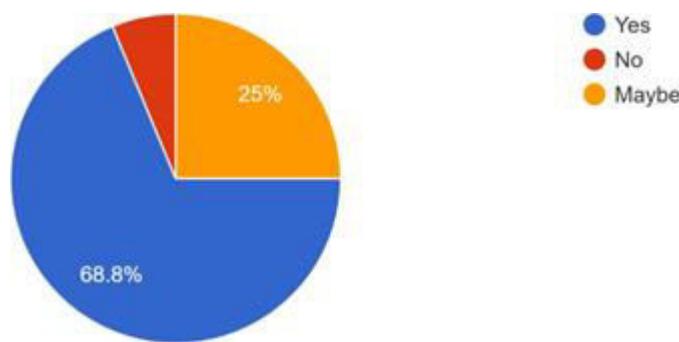
Fg.7 - Preference for vertical garden in home environment

As shown in figure 7, 68.8% people like to have vertical garden in their home environment to give aesthetic look to their home interior.
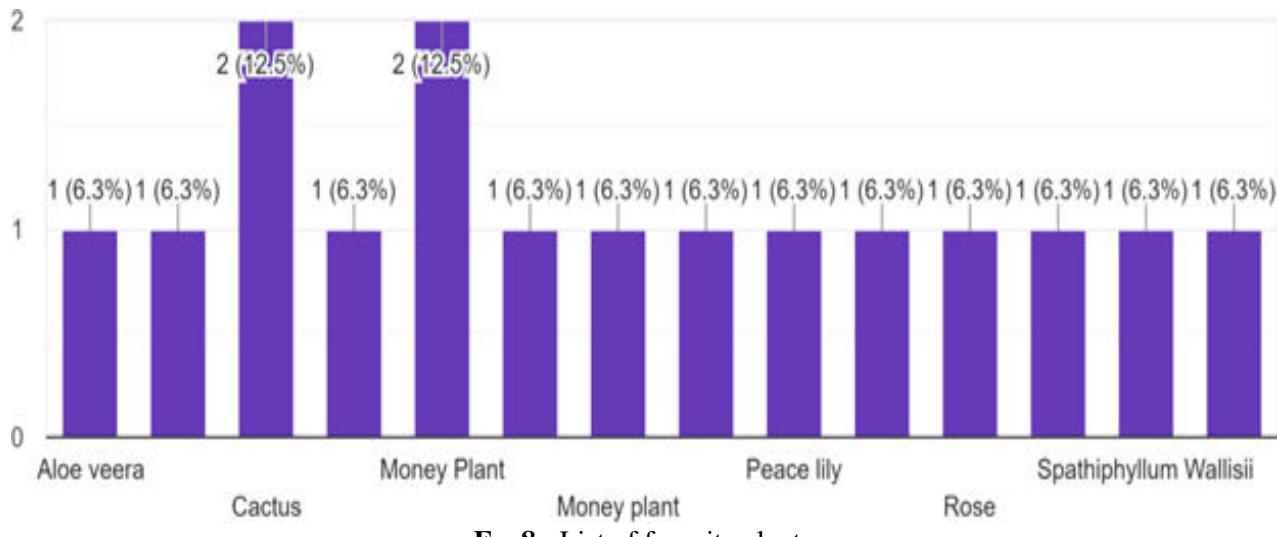
Fig. 8 - List of favorite plants

As shown in figure 8, Money plant and Cactus are most likable among Aloe Vera, Peace Lilly, Rose, Spathiphyllum Wallisi.

CONCLUSION

The study focuses on the topic of introduction of plants to indoor environments and its benefits. The data from the literature review showcases numerous benefits of plants in indoor environments. It was observed that the plants not only help in purification of air but also increase the happiness and the positive aura around the house. They can also be used to serve the purpose of home decor and to brighten up the dull corners. We also provided a Guide to indoor plants as well as a guide to indoor plant care.

In conclusion, having plants in indoor environments has many benefits and they not only provide a constant supply of fresh air but also beautify the indoor aesthetics.

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SCREENING OF ORIGANUM VULGARE AND THYMUS VULGARIS LEAF EXTRACT ALONE AND IN COMBINATION WITH ANTIBACTERIAL AGENTS AGAINST STAPHYLOCOCCUS AUREUS

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ABSTRACT

Staphylococcal infection have long been in our lives whether in form of a mild skin infections to really serious condition such as meningitis, osteomyelitis, bacteremia etc. The more we study about Staphylococcal infections the more aware we get of the fact that, this organism has been constantly evolving in order to evade the antibiotics prescribed for such infections. Staphylococcus aureus has gone from being Penicillin resistant to now being Vancomycin resistant. The mechanisms it keeps developing in order to avoid antibiotics are phenomenal and most of the drugs of our era are ineffective against S.aureus because of it being resistant of most of them. Therefore, In order to tackle this problem , In this study Antibiotics are combined together with natural compound extracts such Oregano and Thyme in order to achieve better inhibition of S.aureus in growth media. Antibiotics used were Vancomycin and Ciprofloxacin. A resistant strain was created using different concentrations of antibiotic i.e Ciprofloxacin. S.aureus was continually subjected to Ciprofloxacin in minute concentrations. It was observed that the resistant strain was more resilient towards the antibiotics alone and when antibiotics were used with natural extracts. Extracts alone were also used against S.aureus and inhibition was observed. It was found that oregano was more effective against S.aureus as compared to that of Thyme. In this study antibacterial drugs were also used in different Conecentraton (IC$_{50}$ and IC$_{25}$) with combination of natural products.

Indexterms: Antibiotics, Antibacterial Agent, IC$_{50}$, Resistant, Combination Theory.

INTRODUCTION

Staphylococcus aureus is a Gram-positive round-molded bacterium, an individual from the Firmicutes, and is a standard individual from the microbiota of the body, habitually found in the upper respiratory lot and on the skin. It is in many cases positive for catalase and nitrate reduction and is a facultative anaerobe that can develop without the requirement for oxygen[1]. Although S. aureus normally goes about as a commensal of the human microbiota it can likewise turn into a astute microorganism, being a typical reason for skin infections including abscesses, respiratory infections like sinusitis, and food poisoning. Pathogenic strains frequently promote infections by delivering virulence factors like potent protein toxins, and the expression of a cell-surface protein that ties and inactivates antibodies. S. aureus is one of the main microbes for casualties related with Antimicrobial resistance and the development of anti-microbial resistant strains, for example, methicillin-resistant S. aureus (MRSA) is an overall issue in clinical medication. Regardless of much innovative work, no vaccine for S. aureus has been approved.

An estimated 20% to 30% of the human populace are transporters of S. aureus[2][3] which can be found as a feature of the ordinary skin flora, in the nostrils,[2][4] and as a typical occupant of the lower regenerative plot of women[5]. S. aureus can cause a scope of sicknesses, from minor skin infections, for example, pimples[6], impetigo, bubbles, cellulitis, folliculitis, carbuncles, burnt skin disorder, and abscesses, to perilous illnesses like pneumonia, meningitis, osteomyelitis, endocarditis, poisonous shock condition, bacteremia, and sepsis. It is as yet one of the five most usual reasons for hospital or clinic acquired infections and is in many cases the reason for wound infections following a medical procedure. Every year, around 500,000 patients in medical clinics of the United States contract a staphylococcal infection, predominantly by S. aureus[7]. Up to 50,000 deaths every year in the United States are connected with S. aureus infections.

Methicillin-Resistant Staphylococcus Aureus (Mrsa)

Fleming discovered penicillin in the 1940s and pioneeredthe era of antibiotics for infection treatment (Klevens et al.,). At the time, the infectious diseases caused by S. aureus were well-controlled, but with thewidespread use of penicillin in the 1950s, penicillin-resistant S. aureus appeared in the clinic [9], [10] Penicillin-resistant S. aureus can produce penicillinase, which can hydrolyze the penicillin b-lactam ring, leading to resistance to penicillin. Later, scientists developed a new penicillinase-resistant semisynthetic penicillin named methicillin, which is resistant to the hydrolysis of b-lactamase [9], [11]. After being applied to the clinic in 1959, methicillin effectively controlled the infection of penicillin-resistant S.aureus [12], [13]. However, only 2 years after methicillin was applied, in 1961, British scientist Jevons reported the isolation of an MRSA strain; this resistance was produced by a gene encoding the penicillin-binding protein 2a or 2′ (PBP2a or PBP2′) (mecA)

which was integrated into the chromosomal element (SCCmec) of methicillin-sensitive S.aureus [14]. Moreover, MRSA has rapidly become the most frequently occurring resistant pathogen identified in many parts of the world, including Europe, the United States, North Africa, the Middle East and East Asia [15], [16]. According to its original source, MRSA is classified into hospital-acquired MRSA (HA-MRSA) and community-acquired MRSA (CAMRSA) [17]. In China, the proportion of hospital-acquired MRSA has reached 50.4% [18]. Additionally, based on the Centers for Disease Control (CDC) in the US, the mortality rate of MRSA infection has exceeded that of acquired immune deficiency syndrome (AIDS), Parkinson's disease and murder [19]. Thus, the analysis of the molecular characteristics of S. aureus, which has become the focus of global public health concerns, can help us understand the prevalence of S. aureus, monitor the evolution of S. aureus, discover new molecular features of S. aureus, and provide information for developing novel drugs to against

S. aureus

Natural products have served as powerful therapeutics against pathogenic bacteria since the golden age of antibiotics of the mid-20th century. However, the increasing frequency of antibiotic-resistant infections clearly demonstrates that new antibiotics are critical for modern medicine. Because combinatorial approaches have not yielded effective drugs, we propose that the development of new antibiotics around proven natural scaffolds is the best short-term solution to the rising crisis of antibiotic resistance.

In this research work results have been obtained by using natural herbs i.e Origanum vulgare and Thymus vulgaris. These natural products have been used individually and in Combination with antibiotics such as Ciprofloxacin and Vancomycin. The resulting figures are astonishing and may help in further studies on these natural herbs.

2. METHODOLOGY

2.1) Drug resistance generation in S.aureus gainst antibiotics Ciprofloxacin and Vancomycin

2.2.1 Preparation of Sterile Stock Solution of Antibiotics

20µM stock solution of ciprofloxacin and vancomycin were prepared. Ciprofloxacin & Vancomycin solutions used for Staphylococcus aureus (S. aureus) were prepared in distilled water. Stocks were filtered through 0.22µm syringe filter and stored in sterilized bottles. Stocks were stored at 4°C and brought to room temperature before use. Different working solutions were prepared according to the experimental requirements.

2.2.2) Generation Of Drug Resistance

The wild-type cells of S. aureus were grown instep wise increasing concentration of vancomycin and ciprofloxacin respectively over a duration of 2 months. The cultures were stabilized for 4-6 sub-cultures in presence of respective antibiotics before increasing the drug concentration. The final resistance achieved was 50uM in case of S. aureus.

2.3) Determination Of IC_{50} And MIC Of The Selected Antibiotics In Sensitive And Resistant S.Aureus.

IC_{50} (50% inhibitory concentration) and MIC (minimum inhibitory concentration) of the selected antibacterial drugs (ciprofloxacin, and vancomycin) were determined against wild type and resistant S. aureus by the micro broth dilution method.

170µl of respective media was added in 96 well plates. Different concentrations of the antimicrobial drug(s) were added in the wells.10µl of freshly grown cultures were added in all the wells as inoculums, 96 well plates were incubated at their respective temperature for 24 hours for S. aureus. Absorbance was measured 600nm in ELISA plate reader after proper shaking

3. RESULTS AND DISCUSSION

3.1) Growth Phases Over the Course of the Experiment

Growth curve of the bacteria S.aureus were observed over the 5 h course of the experiment. Figure 4 shows the growth curve for the S.aureus strain based on optical density measurements. It is evident that within the timeframe of the experiment (300 min) bacteria went through the lag phase (0-120 min) then entered an exponential (log) phase (>120 min) of growth. This is consistent with literature reports.

(A)

(B)
Figure 3.1: Staphylococcus aureus Cultured in BHI broth and Media Plate
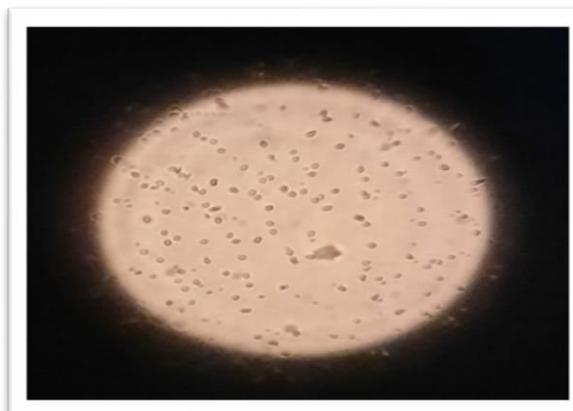
Figure 3.2: Staphylococcus aureus under microscope (100x)
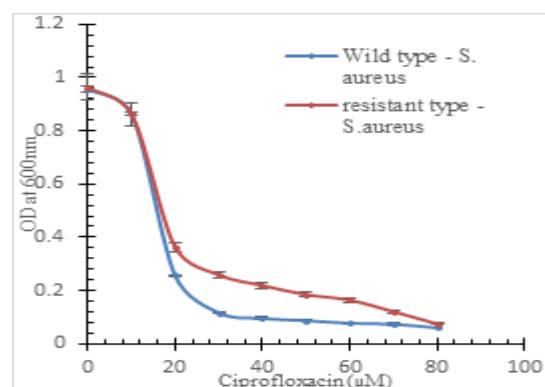
Figure 3.3: Inhibition profile of ciprofloxacin against wild type and resistant cells of S. aureus
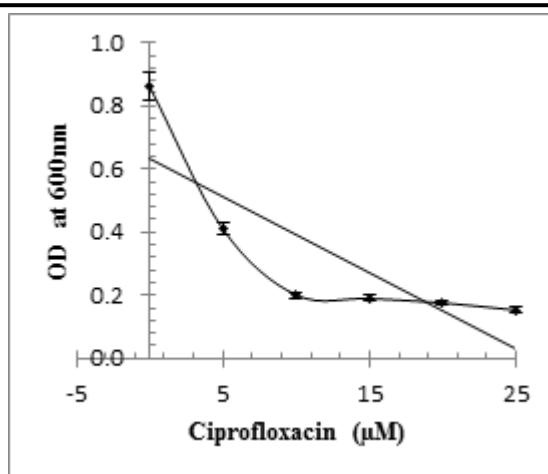
Fig 3.4: Determination of MIC and IC_{50} of Ciprofloxacin on S.aureus which were obtained 10μM and 5μM respectively.
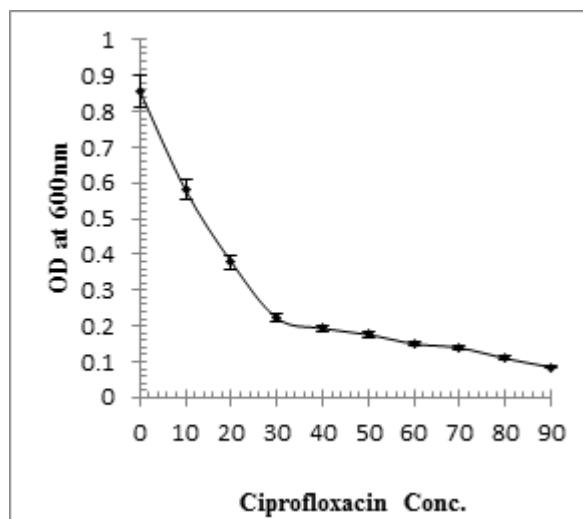
Fig 3.5: Effect of ciprofloxacin on wild type S.aureus MIC and IC_{50} obtained were 60μM and 18μM respectively.
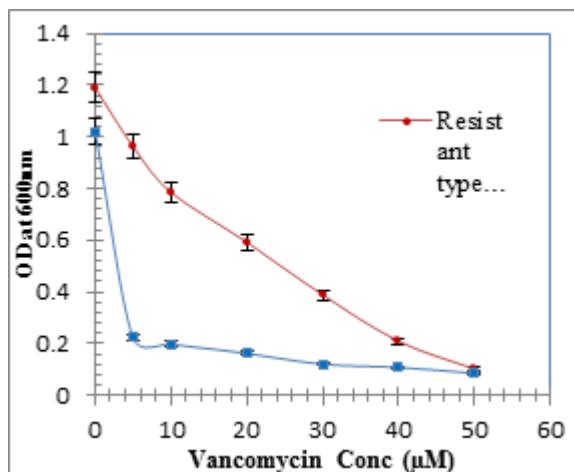
Fig 3.6: Effect of vancomycin on wild type and ciprofloxacin resistant S. aureus. MIC obtained for the wild type was **5μM** and for resistant cells was **40μM.** IC_{50} values for wild type and resistant was **6μM, 20μM** respectively.

Wild type and ciprofloxacin resistant S. aureus grown in the presence of 5μM-50μM vancomycin concentration and wild type S. aureus showed inhibition at low concentration of the vancomycin whereas resistant cells were quite stable over the same range of the drug concentration **(Fig 3.6)**.The IC_{50} obtained for the ciprofloxacin resistant cells against vancomycin was approximately 3 times higher than the wild type

The degree of resistance was calculated by dividing the IC_{50} for the resistant cells by IC_{50} value of the wild type. Degree of resistance in S. aureus against ciprofloxacin was 3.6 and for vancomycin it was 3.

3.2) Studies on effect of natural compounds on selected wild type and resistant organisms
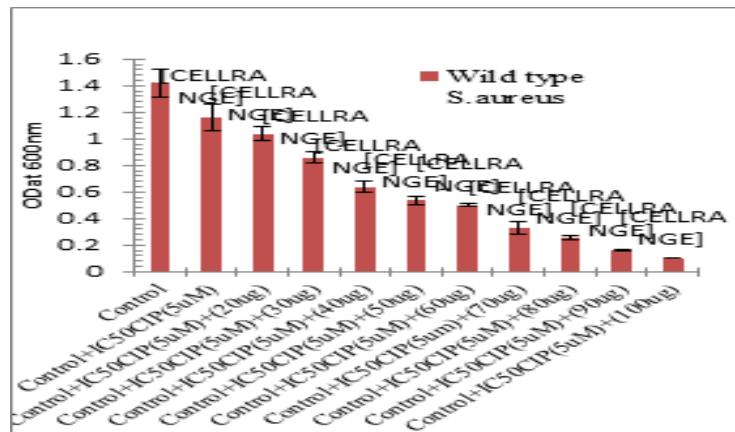
Fig 3.7: Effect of combination of oregano+ IC50 of ciprofloxacin on wild type cells of S. aureus. MIC of the combination was obtained at **70ug/ml.**
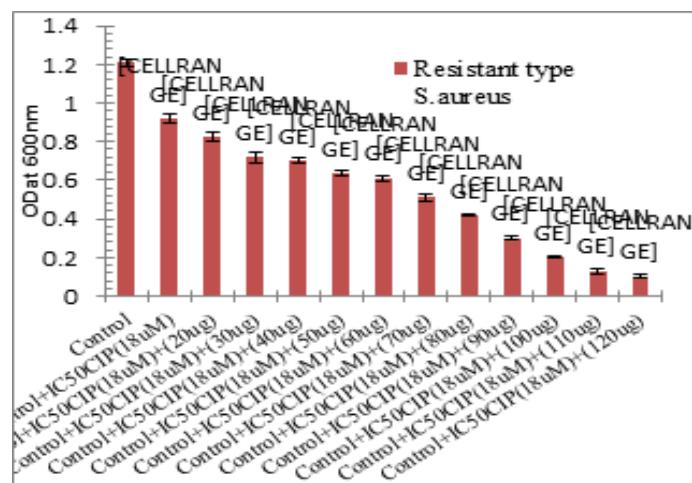
Fig 3.8: Effect of combination of oregano+ IC_{50} of ciprofloxacin on resistant cells of S. aureus. MIC of the combination was obtained at **l00ug/ml.**

3.2.1(A) Effect of the Oregano and Thyme extracts alone and in combination with antibiotics on wild type S. aureus.
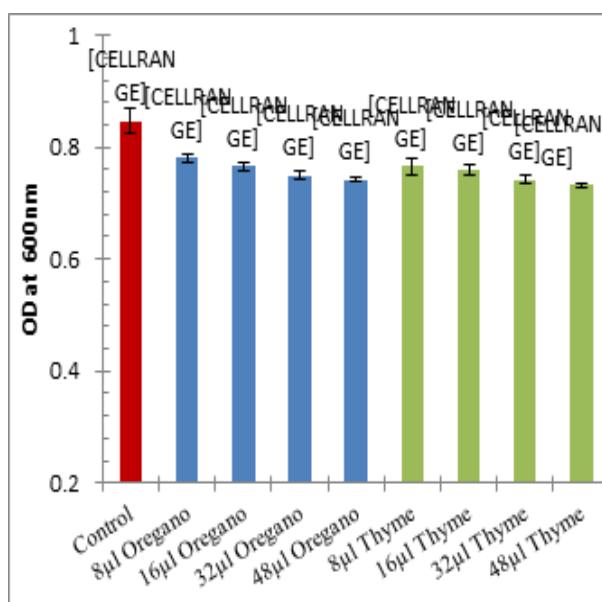
Fig: 3.9(A) Effect of Oregano and Thyme extract on wild type S.aureus.
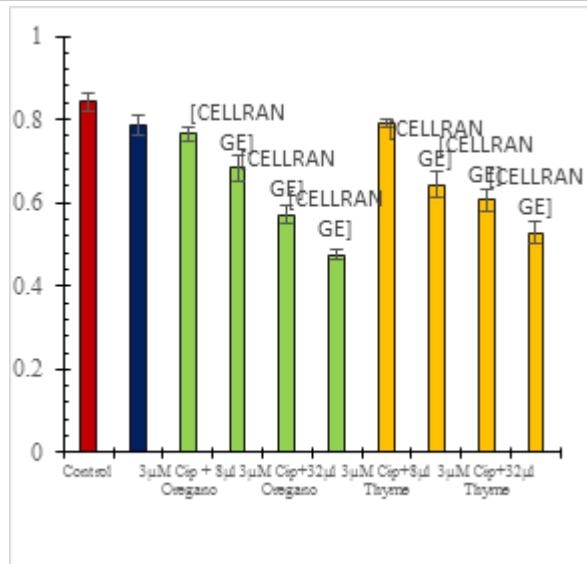
Figure 3.9(B): Effect of Oregano and Thyme extract + Ciprofloxacin (3µM) on wild type S.aureus.
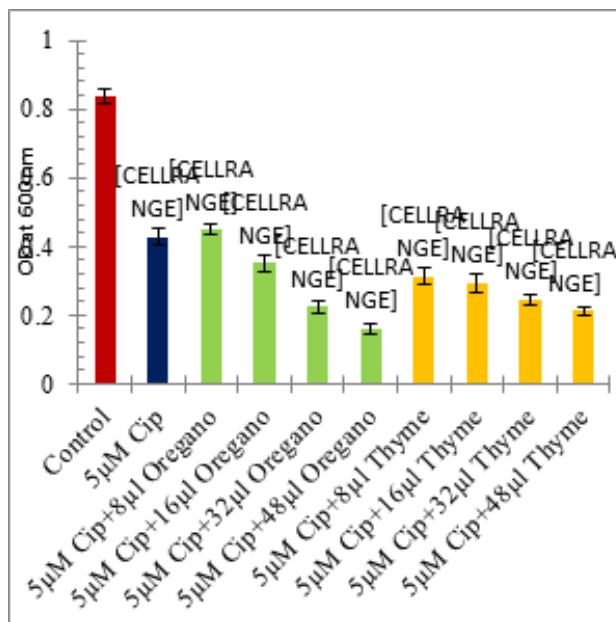
Figure 3.10: Effect of Oregano and Thyme + Ciprofloxacin 5µM on wild type S.aureus.
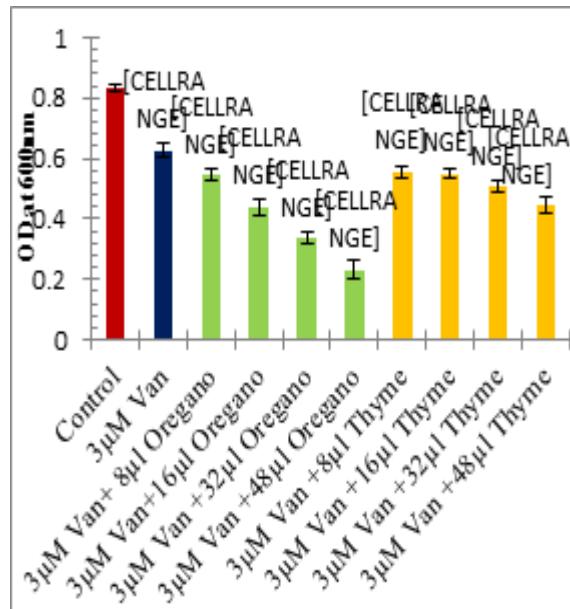
3.11: Effect of Oregano and Thyme +3µM Vancomycin on wild type S.aureus.
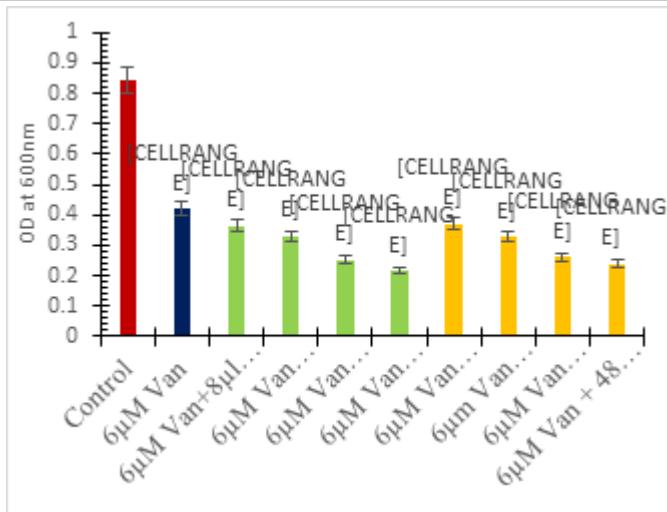
Figure 3.12: Effect of 6uM Vancomycin with Oregano and Thyme extracts

3.2.2 B) Effect of the Oregano and thyme extracts alone and in combination with antibiotics on resistant S. aureus
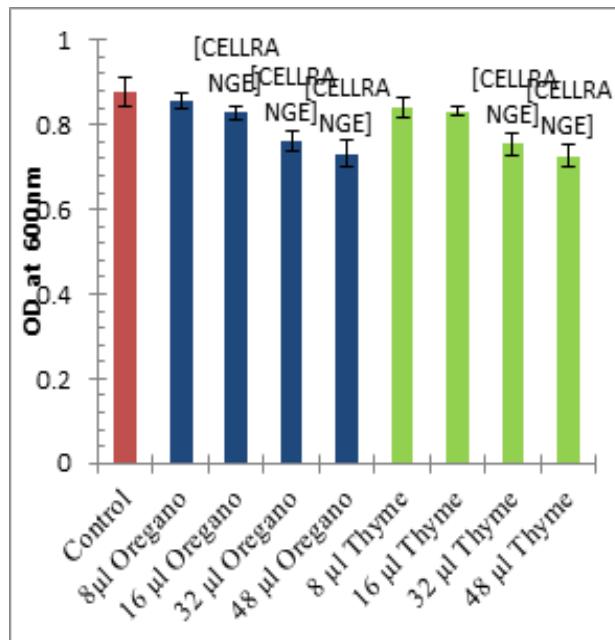
Figure 3.13 A: Effect of Oregano and Thyme extracts on resistant S.aureus.
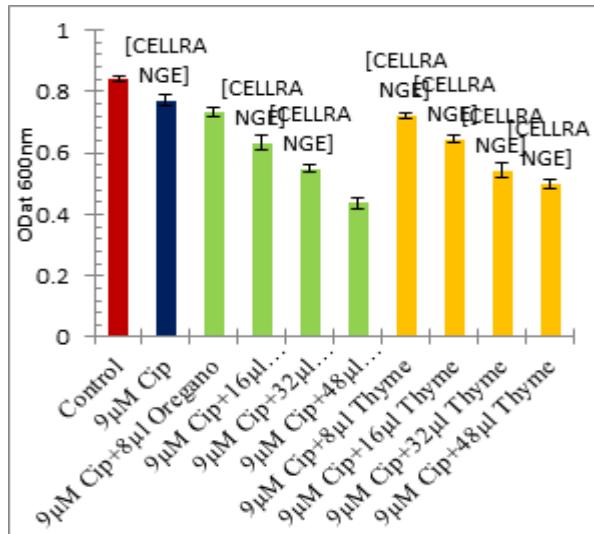
Figure 3.14 B: Effect of 9µM ciprofloxacin with Oregano and Thyme Extracts
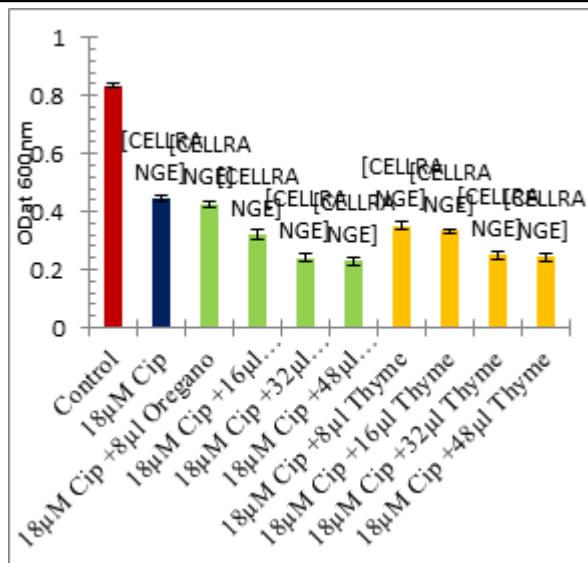
Figure 3.15: Effect of 18µM ciprofloxacin with Oregano and Thyme Extracts.
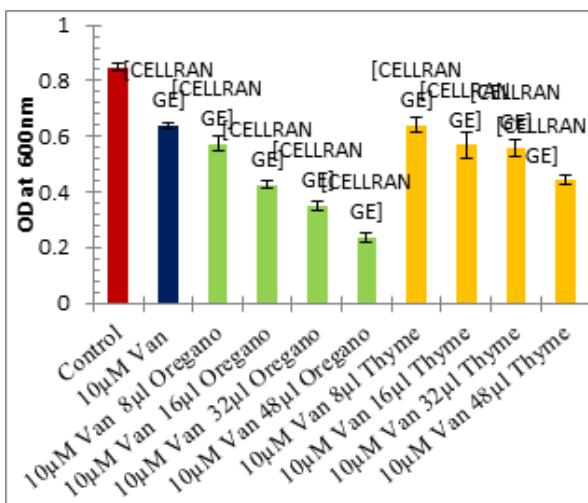
Figure 3.16: Effect of 10µM Vancomycin with Oregano and Thyme extracts.
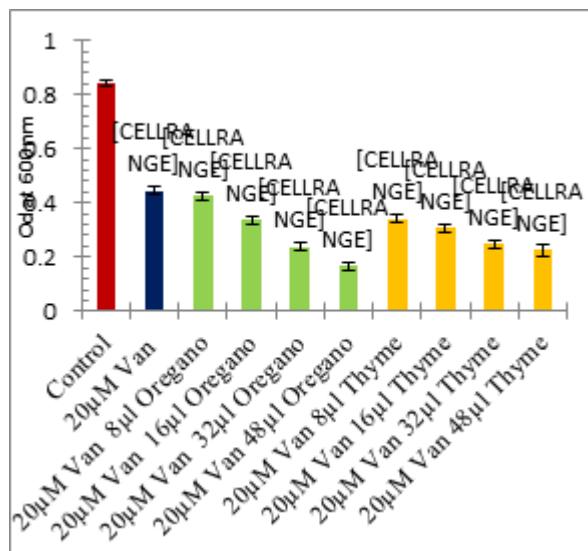
Figure 3.17: Effect of 20µM Vancomycin with Oregano and Thyme extracts.

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PERFORMANCE EVALUATION AS DATA CLASSIFICATION ESTIMATES AS STANDARD CREDIT CARD DETECTION

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ABSTRACT

Anticipating Visa portion default is fundamental for the productive game plan of a Banking and Financial Institutions. An accurate perceptive model can empower the association to recognize clients who might default their portion later on with the objective that the association can get included before to supervise peril and diminishing setback. It is far superior in the event that a model can help the Bank on Visa application underwriting to restrict the risk at straightforward. The inspiration driving this work is to survey the introduction of AI procedures on charge card default portion conjecture using Logistic Regression, Decision Tree Naive Bayes and K-Nearest-Neighbors calculations. The presentation of the estimations is surveyed through after execution estimations: precision, exactness and audit. The best result among four estimations for overall precision rate was achieved by Decision Tree model with a speed of 92.43%. We show that the Decision Tree performs best among others to the extent that accuracy.

Keywords: Credit card, Decision Tree, Naive Bayes, Logistic Regression and KNN

1. INTRODUCTION

In the current information world, more clients rely upon the Visa to pay their ordinary purchases in on the web and actual brick and mortar store, the proportion of gave Visas and the amazing proportion of Mastercard commitment by the card holders have rapidly extended. Regardless, a couple of individuals can't fittingly check the proportion of Mastercard credit that they can make due. Visa has been one of the most impacting cash related organizations by banks over the earlier years. Nevertheless, with the creating number of Mastercard clients, banks have been defying a raising Visa default rate. In that limit data examination can give deals with serious consequences regarding handle the current wonder and the board credit risks.

The gauge of Mastercard default is an essential issue in Banking and Financial Institutions in this manner has been attracting progressively more thought. Thusly, most Banking and cash related associations need to deal with the issues of Visa default despite the Mastercard swindles. Both the charge card check applied to the cardholders and the default opportunity organization after card gave is fundamental to the future accomplishment of most Banking and cash related foundations. In order to decrease the criminal portion of Visa holders, and play out the strong organization of Mastercard danger will uphold cash related and banking foundations to achieve expertise inclinations [1]. Banks use different frameworks and score cards to bunch clients as possibly extraordinary or conceivably horrible ones. At the present time, learning estimations will be used to analyze the chronicled credit data to eliminate plans from it, which would assist in expecting the likely default with crediting card accounts are turning credit lines, and thusly, banks and monetary experts have more options to actually screen and manage them appeared differently in relation to other retail progresses, for instance, contracts. In this manner, directing Visa portfolios is a likely wellspring of imperative impetus to money related establishments.

2. CLASSIFICATION

Game plan is the way toward finding a model or a limit that depicts and perceives data classes and thoughts, to use the model to predict the classes of things whose class mark isn't known. Data request can be viewed as a two-stage measure: learning step in which a classifier is developed depicting a fated game plan of classes or thoughts by separating the readiness set contained informational index tuples and their connected names [2]. In the resulting advance model is used for request by first evaluating the judicious exactness of classifier worked during the underlying advance. It is done using the test data. The precision of classifier on a given test set tuples is level of tuples that are precisely requested by the classifier. If the exactness is over some satisfactory level, the classifier can be used to expect future tuples whose class mark isn't known.

Portrayal is a kind of data assessment that can be used to create models portraying huge data classes. Game plan is a data mining methodology used to predict pack interest for data models. It is one of the critical systems in data mining and is used in various applications, for instance, plan affirmation, sickness assurance, customer relationship the leaders, and assigned displaying. The goal of the portrayal estimations is to assemble a model from a lot of getting ready data whose target class names are known and subsequently this model is used to bunch covered cases [3][4].

Plan is the most normal and most renowned data mining techniques. Game plan maps data into predefined social occasions or classes. It is typical suggested as managed learning considering the way that the classes are settled preceding taking a gander at the data. Course of action is the way toward finding a model that perceives data classes, to use the model to predict the class of things whose class name is dark. The decided model relies upon the assessment of a lot of getting ready data. Informational collections are rich with concealed information that can be used for watchful dynamic.

3. METHODOLOGY

At the present time made sense of about managed learning methods like Decision tree, Naive Bayes, Support Vector Machines and Logistic Regression structure models for our Mastercard defaults characterization issue.

3.1 Decision Tree

A Decision Tree is a judicious model that can be used to address the request model. Gathering trees are important as an exploratory strategy and are for the most part used in various fields, for instance, cash, promoting, prescription and planning. Choice trees are commonly addressed graphically as a different evened out structure that simplifies them to be interpreted than various systems [2] [3]. This design primarily contains a starting center (called root) and assembling of branches (conditions) that lead to various centers until we show up at leaf center point that contain official decision of this course. The decision tree is a really obvious model since its depiction is essential. Every inside center point tests a property while each branch connects with quality worth. Finally each lead names a request. Events are described by exploring the tree from the root center down to a leaf according to the consequence of the test center points along these lines. Each way can be changed then into a norm by joining the tests along these lines.

3.2 Naive Bayes

The Naive Bayes is a smart procedure for creation of quantifiable farsighted models [66]. NB relies upon the Bayesian speculation. This portrayal procedure examinations the association between every trademark and the class for every guide to deduce a contingent probability for the associations between the quality characteristics and the class [2][3]. During setting up, the probability of each class is figured by counting how much of the time it occurs in the readiness dataset. This is known as the "prior probability" P(C=c). Despite the prior probability, the estimation also enrolls the probability for the event x given c with the doubt that the characteristics are free. This probability transforms into the aftereffect of the probabilities of each single attribute. The probabilities would then have the option to be assessed from the frequencies of the events in the planning set.

3.3 K-Nearest Neighbor (Knn)

The KNN is a direct anyway convincing procedure for game plan. The KNN computation is a procedure for gathering objects reliant upon closest planning models in the part space. KNN is a kind of event based learning, or unresponsive acknowledging where the limit is simply approximated locally and all computation is yielded until gathering [2][6].

For a data record D to be requested, its K nearest neighbors are recuperated, and these designs a neighborhood of D. Bigger part projecting a polling form among the data records in the space is by and large used to pick the request for D regardless of considered distance-based weighting. Regardless, to apply KNN we want to pick a reasonable impetus for K, and the accomplishment of collection is a great deal of wards on this value. The critical hindrances in regards to KNN are: (i) its low efficiency - being a sluggish learning procedure denies it in various applications, for instance, dynamic web searching for an immense vault, and

(ii) its dependence on the decision of a "extraordinary worth" for K.

3.4 Logistic Regression

Calculated Regression is considered as the standard verifiable method for managing exhibiting twofold data [2] [3]. It is a predominant choice for a straight backslide which gives out an immediate model to all of the class and predicts hid cases basing on prevailing part vote of the models. During assumption, instead of predicting the point measure of the actual event, it develops a model to expect the possibilities of its occasion. In two class issue for example, whenever the odds are more imperative than half, by then the case is given out to the class allocated as 1 for YES and 0 for NO.

4. Experimental Results

The objective of this area is to evaluate four AI computations in regards to execution structures. A total report has been coordinated to evaluate estimate execution of four AI computations using charge card defaulters dataset was gotten from the UCI Machine Learning Repository [5]. The enlightening file contain 30000 Visa client record. Among them, 23364 or 77.88% are represented to have not defaulters while the remaining 6636 or 22.12% are defaulters. The dataset is disengaged in two sets. The readiness set is 70% (21000) and the

remaining 30% (9000) are used for testing. We have used the Python Programming to investigate four ML plan estimations.

We have applied the investigation on the test data after pre planning using four estimate models. We survey our four models using different execution estimations like precision, exactness, Recall and F1-Score, the Experimental results are showed up in the table-1 and same showed up in the Figure-1.

Table-1: Experimental Results of Algorithms

S.No	Algorithm	Accuracy	Precision	Recall	F1-score
1	Decision Tree	92.43	0.79	0.81	0.79
2	KNN	86.32	0.61	0.78	0.68
3	Logistic Regression	87.58	0.79	0.77	0.78
4	Naive Bayes	84.64	0.70	0.75	0.72
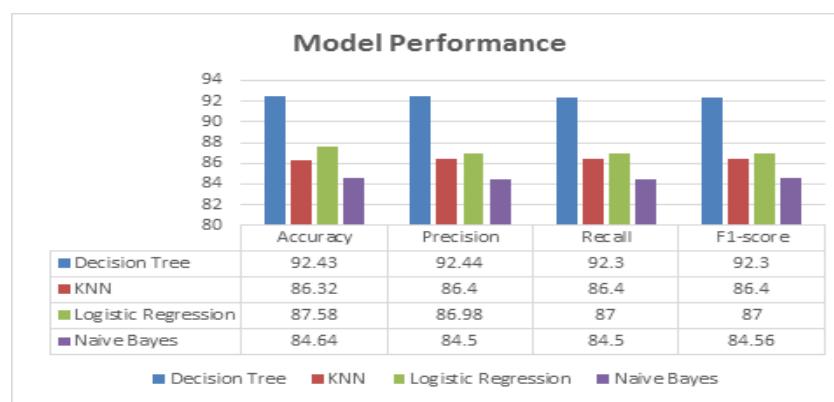
Figure-1: performance of algorithms

We find in the Figure-1, the introduction of the Decision Tree computation has accomplished 92.43% precision, KNN model has achieved 86.32%, Logistic Regression has 87.58% and Naive Bayes has accomplished 84.64%. As the result from assessment among the four estimations, we find that most important precision of Classification model is Decision Tree (92.43%). Precisely when wandered from exactness and survey are besides higher in the Decision Tree model when appeared differently in relation to other three models.

5. CONCLUSION

The gauge of Visa default is a fundamental issue in Banking and Financial Institutions in this way has been pulling in progressively more thought. The objective of this paper is to manufacture an exact classifier to expect on the off chance that a charge card record will default or not. Considering the examination of the results, Decision Tree has a most raised gauge precision of 92.43%. Banks can use AI models to assess credit risk of clients prior to yielding them charge card. Banks critical concern in to offer significant things and organizations to their clients and all together stay mindful of their adversaries they ought to stay creative and creative. By applying assessment in the business, banks can benefit in one or two ways. By taking into account the client to the extent that their risk level and applying the results from the model, it allows the bank to permeate sharp powerful into a business.

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ECONOMIC AND ACADEMIC AUTHORIZATION OF TRIBAL DEMOISELLE

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ABSTRACT

Women's Economic Empowerment relies heavily on education. It has taken center stage, yet most women, particularly in rural regions, have long been denied this right and subjected to extremely demeaning customs and obligations. Women in tribal societies are valued as economic assets and play an important part in their social, economic, and educational lives. However, they continue to lag behind in areas such as education, employment, and empowerment, among others. In terms of work engagement in forests, farms, marketplaces, and other realms of human life, tribal women are considered to be the equal partners with males. Tribal women's status in Indian society is somewhat contradictory. All elements of society, including tribal women, are given equal opportunity under the Indian Constitution. Tribal women face discrimination in a variety of ways. In the post-independence age, the communication media has also ignored indigenous women for a variety of reasons. Girls who are educated are more likely to succeed in their social, career, economic, and family lives. For women, education can entail attending classes, receiving training in capacity building and skill development, or, even better. This article examines the economic and academic Authorization of tribal demoiselle.

Keywords: Tribal women, children, Education, Empowerment

INTRODUCTION

Tribal education systems can be improved by recognising tribal culture, language, cognitive prowess, curriculum, and children's innate learning capacity. Since India's independence, the federal and state governments have launched a number of initiatives and programmes to educate the native population of the nation. Ashram Schools, Ekalavya Model Residential Schools, Kasturba Gandhi Balika Vidyalaya, pre-matriculatory scholarships, and vocational training facilities are a few of these. Policy analysts and educators have intended to acknowledge the tribal children's culture, language, cognitive capacity, curriculum, and innate learning potential. They think that this could reform the nation's tribal educational system. To secure comprehensive education in the tribal hinterlands, however, there is still more work to be done.

Importance of Education in Life and Society

Education influences life is general in society and employment. A person's education begins in preschool, then tertiary education, and ends with a bachelor's or PG or professional course. It is necessary to live in the modern world to acquire the skills and knowledge in the field of interest. Due to its importance, the federal and state governments spend a lot of money on developing the education system. To encourage people to study, they provide better educational institutions by spending heavily on infrastructure and establishing new institutions, sanctioning scholarships, other grants and services for the poor and needy. This allows them to pursue higher and professional studies and get employment opportunities in any industry or institution.

Education provides a platform for a decent livelihood. The person is employed in the public or private sector or intended to be useful for entry into professional service. Communication skills such as speech, signs, gestures and body language depend on an individual's good manners. Educated people can handle strong, confident, and optimistic body language. It helps a person to express their opinion better. They can communicate effectively with audiences at meetings and express their views through newspapers, letters, and video recordings.

Education of Tribal in India

Expansion of the elementary school system in tribal areas and reserving places for tribal children in middle and high schools and higher educational institutions are the focus of government policy, but efforts to improve a tribe's educational status have had mixed results. Recruiting qualified teachers and determining the appropriate language of instruction also remain problematic. Commission after commission on the "language question" asked at least in the primary school in the native language of the pupils. In some regions, tribal children entering school must first learn the official regional language, which often has nothing to do with their native tribal language. To achieve a formal education for their children, their commitment has varied widely, and they differ in extending education positively to their children. Education policies and their effectiveness vary from region to region. In the northeastern parts of India they have generally been spared the massive onslaught of outsiders. Schooling in these regions has helped them to secure political and economic advantages. Because of the effective education system, the highly qualified tribes are given opportunities in trades and leadership positions. It shows

that dropout rates in tribal schools are high. Many of the tribal children drop out of primary school and later become illiterates. Few other indigenous children continue their education through high school and some of them drop out. Some of them continue their higher education and find employment.

Teacher-Student Relationship

One of the most important elements in fostering meaningful learning in classrooms is the positive interaction between tribal students and their teachers. It is critical to recognise that the backgrounds of tribal children differ from those of their non-tribal classmates and teachers. The tribal pupils' culture, traditions, mannerisms, languages, and cultural heritage must be respected and valued. Surprisingly, a lot of tribal cultures have beneficial aspects. Promoting this amazing treasure of indigenous knowledge among tribal adolescents in schools and colleges should be the responsibility of the academic staff.

Medium of Instruction

Every state in India is required to offer suitable facilities for teaching children with their mother tongue, according to Article 350A of the Indian Constitution.

"The children's mother tongue should be the first medium of instruction". Then, gradually encouraging them to acquire the local tongue, Lokanath Panda, a specialist in linguistics who works in the tribal regions of Odisha, emphasised.

"Making sure that tribal pupils are receiving sufficient training at the primary stage could boost greater performance," he continued.

Some educators believe that tribal pupils learn slowly. The linguistic barrier must be overcomed with focus. The Gonds, Bhils, Santals, and other tribal communities in Odisha are receiving education in their native tongue.

Mohanty emphasised that "learning materials should be designed bearing in mind the socio- cultural and economic realities of tribal people".

Empowerment Of Tribal Women

In India, various initiatives have been taken time to time for empowering women. Especially constitution of India made some important provisions for women. Again, to uphold the Constitutional mandate, the State has enacted various legislative measures with aims to empower women of India. Apart from these efforts, some other initiatives are also worth mentioning in relation to the women empowerment in India. Brief view of these initiatives are as follows-

Constitutional provisions for empowerment of Scheduled Tribe women. The principle of gender equality is enshrined in the Indian Constitution in its Preamble, Fundamental Rights, Fundamental Duties and Directive Principles. The Constitution not only grants equality to women, but also empowers the State to adopt measures of positive discrimination in favor of women. The Preamble to the Constitution provides the definition of tribe in Article 366 and also has incorporated several provisions to safeguard and promote the interests and rights of the Scheduled Tribes in various spheres so as to enable them to join the national mainstream. Some of the Articles of the Constitution articulate Educational, Economic and Public Employment-related Safeguards towards tribal of India. Such as

- Article 15- Prohibition of discrimination on grounds of religion, race, caste, sex or place of birth,

- Article 15(4)- Reservation in educational institution has been provided, Article16- Equality of opportunity in matters of public employment,

- Article 16(4), 16(4A) and 16(4B)- reservation in posts and services has been provided,

- Article19- Protection of certain rights regarding freedom of speech, etc.,

- Article46- Promotion of Educational and Economic interests of Scheduled Castes, Scheduled Tribes and other weaker sections,

- Article335- Claims of Scheduled Castes and Scheduled Tribes to services and posts,

- Article 23 prohibits traffic in human beings and beggar and other similar forms of forced labour that has a special significance for Scheduled Tribes. In pursuance of this Article, Parliament has enacted the Bonded Labour System (Abolition) Act, 1976. Similarly,

- Article 24 which prohibits employment of Children below the age of 14 years in any factory or mine or in any other hazards activity is also significant for Scheduled Tribes as a substantial portion of child labour engaged in these jobs belong to Scheduled Tribes.

- Article330 provide reservation of seats for Scheduled Castes and Scheduled Tribes in the House of the People,

- Article332 granted reservation of seats for Scheduled Castes and Scheduled Tribes in the Legislative Assemblies of the States,

- Article334provides reservation of seats for Scheduled Castes and Scheduled Tribes in the Lok Sabha and the State Vidhan Sabhas (and the representation of the Anglo-Indian Community in the Lok Sabha and the State Vidhan Sabhas by nomination) would continueup to January, 2020.

Role of Education in Empowering Women

The most significant force influencing how people live is education. It gives one the ability to think critically, reason, make wise decisions, and defend oneself from oppression and abuse. It also increases one's knowledge and awareness. Education is seen as a key tool in empowering women since it expands their options for action and gives them the strength and self-assurance to take part in various facets of social, economic, and political issues. Education is a broad subject.

Education of women helps her in the following ways:

1. Education initially improves a woman's honour and dignity. A woman who has received education is better equipped to uphold both her own and her family's honour and dignity. A woman with education can speak out against oppression andinjustice.

2. A woman with education is more concerned with the family's hygiene and health. Because it encourages better decisions on child spacing, healthier eating and hygiene practises, and other factors, women's education also contributes to a decrease in child mortality.

3. Education transforms a woman into a financially stable and independent member of the family and society. A woman's education helps her to live a productive life in society. As a result, she can ensure her own survival as well as the survival of her children without having to rely on anyone.

4. Economic growth is significantly influenced by education. Better education not only increases individual wealth, but it also serves as a necessary (though not necessarily sufficient) precondition for long-term economic growth, according to Lutz, Creso Cuaresma, and Sanderson's 2008 conclusion.

5. A woman's ability to make more money is another way that knowledge gives her influence. A single year of elementary school has been demonstrated to enhance a girl's earnings later in life by 20%, according to the United Nations Educational, Scientific and Cultural Organization, or UNESCO.

6. Sixthly, across the globe, ladies underrepresented as voters and restricted from political involvement. The world organization women's programmes on leadership and participation recommend that civic education, coaching and every one aroundmanagement can improve political representation

7. Educated women political leaders or bureaucrats will more effectively fight against injustice and different crimes against women; ultimately resulting in a balanced society. The more women enter into politics and bureaucracy, the more doable is that the goal of world property development.

8. Several social evils and crimes against women like dowry, flesh trade, feminine infanticide moreover as harmful customary practices are often eradicated by educating ladies of a society.An educated woman plays a very important role in a civilized family and influences the thoughts and beliefs of its members.

Hence, right to education for all has been a global goal for decades, however since the 1990s, women's education and direction have acquire sharp focus. many landmark conferences, as well as the 1994 International Conference on Population and Development, command in Cairo,and also the 1995 Fourth World Conference on girls in Beijing, placed these problems at the centreof development efforts. The Millennium Development Goals unites the world leaders at the worldorganisation Millennium

As per United Nation report, education for women is the single most effective way to improve lives and health of a family and a society. Education not only benefits a woman individually to lead a healthier and happier life but it also benefits for the society as a whole. Because educated women have the skills, information and self-confidence that she needs to be a better parent, worker and citizen.

Today the developing as well as the underdeveloped countries strives for integral development. The goals of integral and sustainable developments will be nothing more than mere words if women are not educated and empowered.

CONCLUSION

This paper reveals that the socio-economic condition of the agricultural poor depends on their academic standards. From this experience, most of the social group households within the rural areas are causing their youngsters to varsities often then for higher studies also. As a result of this alteration in the social group community, several of the social group children became doctors, engineers, Gazetted officers, Civil servants, Teachers, and so on with neighboring forward Communities. Due to the State and Central governments' effort for providing higher educational facilities to the social groups children from early childhood Education to the higher education the objective of 100 percent literacy can be achieved.

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EFFECT OF UTILIZING STONE DUST IN CONCRETE WITH TAMARIND KERNEL POWDER AS ADMIXTURE

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ABSTRACT

Concrete, which is the concoction of cement, sand and coarse aggregate, is the most widely used building material now-a-days. Sand, an important material in concrete mixture becomes scarce in many of the cities. The extensive utilization of river sand also leads to an ecological imbalance. There is need to search for alternative materials which can replace the sand in concrete mix. Stone dust, a waste product obtained from the granite quarries, is one of the leading alternative materials to replace the sand. The admixtures are used to build up the properties of fresh and hardened concrete. Tamarind Kernel Powder (TKP) is obtained from the processing of tamarind seeds. In the present study, a concrete mix of M30 grade is casted by replacing sand partially with waste stone dust at varying percentages of 10%, 20%, 30%, 40% & 50%. The TKP was diluted and used as an admixture. The concrete was tested for compressive strength at 7 and 28 days, and the results were compared between the specimens without and with TKP.

Keywords: compressive strength, concrete, sand, stone dust, tamarind kernel powder.

1. INTRODUCTION

Concrete is amalgamation of binding material, fine aggregate, coarse aggregate, is predominantly used all over the world. The concrete strength depends on the properties of its constituent materials and their combined action. Fine aggregate, which is one of the important constituent materials, provide dimensional stability to the mixture. Now-a-days the construction activities are rapidly increasing as a result of which the available sources of river sand are getting exhausted. On the other hand the conservation of natural resources is also a great challenge for civil engineers. This situation leads to identify new sources of raw materials or search for alternative materials which can replace the traditional constituent materials in concrete.

Stone dust, a coarser version of sand, is a crushed stone which is obtained when stones are run through a crushing machine. This is also called as crusher run. The composition of stone dust depends on the kind of stone run through the crusher machine. After crushing, the stone dust is separated from the larger particles using screens. This waste stone dust is disposed on open grounds which will cause a serious threat to the environment[2]. Due to many properties the stone dust has, it becomes a useful byproduct to use for many jobs. Concrete prepared by partially replacing the sand with waste stone dust can attain the higher strength values[5].

Tamarind kernel powder (TKP), a creamy white coloured powder, is derived from the seed of the tamarind tree named Tamarindus Indica which is one of the most common trees of southern India. The cotyledon or kernel in tamarind seeds which is considered as a waste contains amylum and gum which is processed to transform into powder[1]. TKP is already being used in producing products like oil, gum and amylum[3]. This tamarind kernel powder has high water absorption and viscosity properties[7]. This TKP when mixed with water with proper dilution ratio gives a viscous fluid which is used as a thickening agent in textile industry. This TKP can be used as a natural admixture which is cheap when compared with the other chemical admixtures.

2. PRESENT STUDY

In this study, the effect of utilizing waste stone dust as a partial replacement to sand on properties of concrete with tamarind kernel powder was studied. The present study was carried out in two phases. In the first phase, the specimens were prepared by replacing sand with waste stone dust at varying percentages of 10%, 20%, 30%, 40% & 50% and without addition of TKP as admixture. In the second phase, the specimens were prepared by replacing sand with waste stone dust at varying percentages of 10%, 20%, 30%, 40% & 50% and with addition of TKP as admixture. The specimens were tested for compressive strength at 7 and 28 days, and results were compared between specimens made without and with TKP as admixture.

3. MATERIALS

3.1. Cement:

Ordinary portland cement (Brand: Priya cement) of 53 grade was used in this study. The initial tests were conducted on the test cement sample and the results were tabulated.

Table 1: Physical properties of cement

Property	Value
Fineness (%)	7
Standard consistency (%)	34
Initial setting time (min)	45
Specific Gravity	3.12

3.2. Fine Aggregate:

Sand was obtained from nearby river and the impurities were separated by passing the sand particles through 4.75 mm sieve. The initial tests were conducted and the results obtained are tabulated below.

Table 2: Physical properties of sand

Property	Value
Fineness modulus	2.89
Specific Gravity	2.74
Water absorption (%)	1.2

3.3. Coarse Aggregate:

Coarse aggregate was obtained from quarry in surrounding areas of Tirupati. The coarse aggregate having two fractions, 20 mm and 10 mm size individually sieved was used in this study.

Table 3: Physical properties of coarse aggregate

Property	Value
Fineness modulus	6.85
Specific Gravity	2.68
Water absorption (%)	0.3
Aggregate crushing value (%)	18.2

3.4. Stone Dust

The stone dust which was used in this study was obtained from aggregate crushing units. The waste stone dust collected was sieved from 4.75 mm sieve and the particles retained over the sieve were separated.

Table 4: Physical properties of stone dust

Property	Value
Fineness modulus	4.96
Specific Gravity	2.65
Water absorption (%)	2.1

The sieve analysis was performed on the stone dust and fineness modulus was evaluated by adding the % cumulative weight retained on different sieves and diving obtained value by 100. The fineness modulus of stone dust was come out to be 4.96. The gradation curve for stone dust was obtained by plotting graph between the sieve size and % cumulative weight passing. The grading of stone dust is confirming to Zone I.
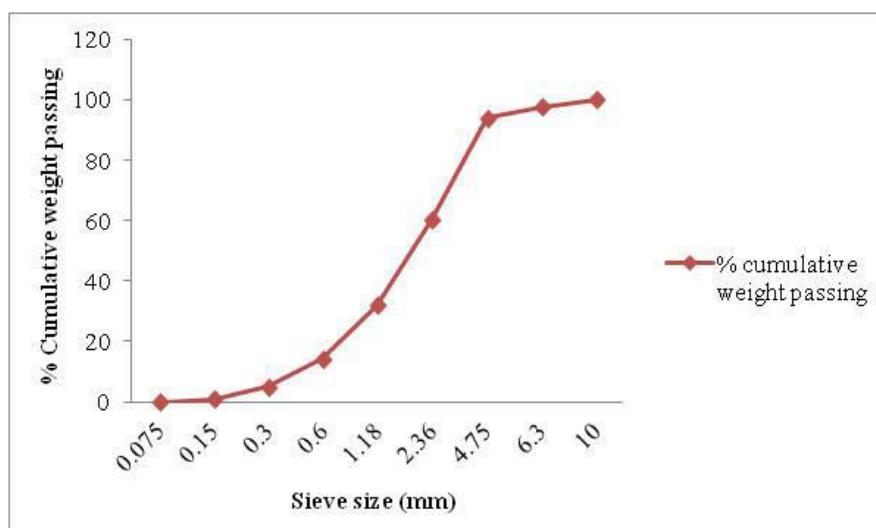
Fig.1 Gradation curve for stone dust

3.5. Tamarind Kernel Powder

Tamarind kernel powder was obtained from kernel processing industry near Ananthapuramu. Studies showed that there is notable increase in concrete strength when TKP is used as admixture up to 1% by weight of cement[4]. In the present study, the percentage addition of tamarind kernel powder was kept constant at 1% by weight of cement. The admixture was prepared by adding kernel powder in lukewarm water at constant dilution ratio 0.3. This mixture of kernel powder and water is stirred continuously in presence of heat till it achieves consistency. Later this mixture was added in the concrete mix.

4. Specimen Preparation and Testing

4.1. Mix proportion

The design mix of M30 grade concrete was carried out according to the IS specifications [BIS 10262:1982 and BIS 456:2000] for moderate exposure conditions. The mix design is as follows:

C : FA : CA : W   = 422.7 : 568 : 1147.14 : 184

C : FA : CA : W   = 1 : 1.34 : 2.71 : 0.44

4.2. Casting and Curing

In the present study, cube moulds of size 150 mm were used for specimens casting. In the first stage of study, the concrete cubes were casted by partially replacing the sand with stone dust and without addition of TKP. In the second stage of study, the specimens were casted with TKP added. All the cubes were well compacted using table vibrator. Later, the moulds were kept at room temperature. After 24 hours, the specimens were removed from moulds and were kept in the clean water for curing.

4.3. Testing Of Specimens

The compressive strength of cube specimens were tested using analog compression testing machine (capacity 2000 kN) at 7 and 28 days following the standard testing procedure. The crushing load was obtained and average compressive strength of the specimen was determined.

5. RESULTS AND DISCUSSIONS

The compressive strength of concrete specimens made of waste stone dust as partial replacement to sand with and without TKP admixture tested at 7 and 28 days are as follows.
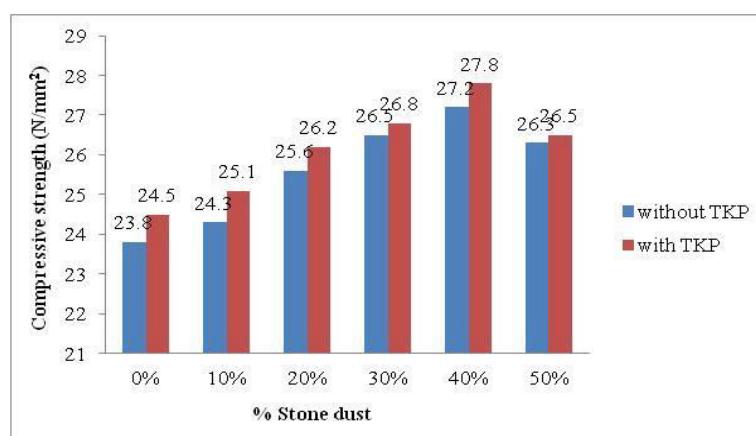
Fig.2 Compressive strength of concrete @ 7 days

Fig.3 Compressive strength of concrete @ 28 days

From the results obtained, it was observed that

- At 40% replacement of sand with stone dust without addition of TKP, the 7 day compressive strength of concrete stands at 27.2 N/mm^2 which is higher than the control concrete by 14.3%.

- At 40% replacement of sand with stone dust without addition of TKP, the 28 day compressive strength of concrete stands at 37.6 N/mm^2 which is higher than the control concrete by 6.8%.

- With the addition of TKP as admixture in concrete, the strength values are comparatively higher than those obtained without the addition of admixture.

6. CONCLUSIONS

From the experimental study on effect of utilizing stone dust in concrete with tamarind kernel powder as admixture, the following conclusions are made.

- As it was observed that by partially replacing the sand up to 40% with waste stone dust yield comparatively better results, it can be concluded that the waste stone dust can effectively be used as an alternative material to sand in concrete making.

- The addition of TKP as admixture to the concrete mix resulted in significant increase in strength of concrete. So, the TKP can be used effectively as a natural admixture in concrete to enhance its properties.

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FEATURE EXTRACTION OF ECG SIGNAL TO EXAMINE THE CARDIAC SEVERITY

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ABSTRACT

Our paper deals with feature extraction of Bio Medical signals using the continuous wavelet transform CWT and corresponding coefficients. We analyze the signal features, in various points of time and at different localization levels with multiple scales of the cwt. In this paper we have analyzed the digital data collected using the electrocardiogram for finding the heart disease considering data sets of twenty different disease cases using mat lab. Firstly we have filtered the ECG data for hum noise and muscle noise, using a series of filters and applied the zero cross algorithm for finding the no of zero crossings and the heart rate of each disease case. We have applied wavelet transform and found the wavelet 3D plot which is the representation of the wavelet coefficients, which helps for estimating the cardiac disease from the wavelet 3D plot of the patient's electrocardiogram.

Keywords: ECG, wavelet, feature extraction, hum noise, Zero crossing.

1. INTRODUCTION

In recent years, ECG signal plays an important role in the primary diagnosis, prognosis and survival analysis of heart diseases. Electrocardiography has a profound influence on the practice of medicine. The electrocardiogram signal contains an important amount of information that can be exploited in different manners. The ECG signal allows for the analysis of anatomic and physiologic aspects of the whole cardiac muscle. Different ECG signals are used to verify the proposed method using MATLAB software.

Time-frequency wavelet theory is used for the detection of tile threatening electrocardiography (ECG) arrhythmias. Wavelets are used extensively in Signal and Image Processing, Medicine, Finance, Radar, Sonar, Geology and many other varied fields. They are usually presented in mathematical formulae, but can actually be understood in terms of simple comparisons with your data.

In fact, beat detection is necessary to determine the heart rate, and several related arrhythmias such as Tachycardia, Bradycardia and Heart Rate Variation, it is also necessary for further processing of the signal in order to detect abnormal beats. The ECG feature extraction system provides fundamental features (amplitudes and intervals) to be used in subsequent automatic analysis.

Most of the clinically useful information in the ECG is found in the intervals and amplitudes defined by its features (characteristic wave peaks and time durations).The development of accurate and quick methods for automatic ECG feature extraction is of major importance, especially for the analysis of long recordings. Producing an algorithm for the detection of the P wave, QRS complex and T wave in an ECG is a difficult problem due to the time-varying morphology of the signal subject to physiological conditions and the presence of noise. Recently, a number of techniques have been proposed to detect these features.

2. ABOUT THE ECG SIGNAL:

The ECG is a graphic record of the direction and magnitude of the electrical activity that is generated by depolarization and depolarization of the atria and ventricles. One cardiac cycle in an ECG signal consists of the P-QRS-T waves. The Electrocardiograph is very useful term in the medical analysis of the patient's condition and reveals the present and future estimations of the heart diseases which help the doctors to take required steps for curing the heart problems. A normal ECG signal consists of the P-QRS-T. The QRS part of the ECG signal is useful in estimating the heart rate of the person in most of the cases. The two basic diseases or defects found in the heart function are APC and PVC. APC is Atria Premature Contraction and PVC is Premature Ventricular Contraction.
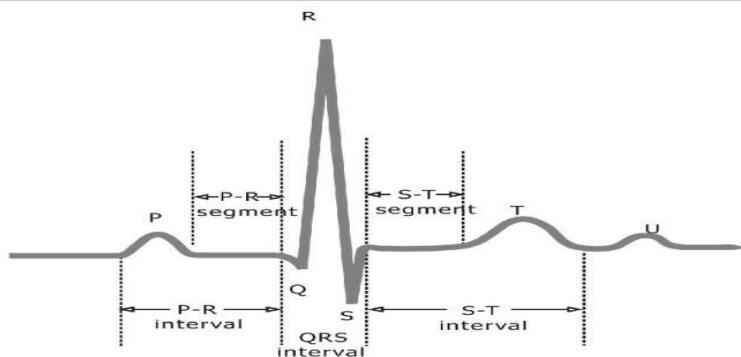
Fig 1. A typical ECG signal.

The QRS complex and the R to R interval are used to find the Arrhythmic beats and some famous algorithms are used to detect the QRS complexes using an algorithmic approach. An ECG is the combination of (P wave + QRS complex + T wave) and in general QRS complex is considerably larger than the P wave.

3. THE CONTINUOUS WAVELET TRANSFORM (CWT):

The wavelet transform is an emerging signal processing technique that can be used to represent real-life non stationary signals with high efficiency. Indeed, the wavelet transform is gaining momentum to become an alternative tool to traditional time-frequency representation techniques such as the discrete Fourier transform and the discrete cosine transform. By virtue of its multi-resolution representation capability, the wavelet transform has been used effectively in vital applications such as transient signal analysis, numerical analysis, computer vision, and image compression, among many other audiovisual applications.

4. THE WAVELET 3D PLOT AND OBSERVATIONS:

In MATLAB we use the function "cwt" and apply the wavelet using "morlet" mother wavelet. We store the digital data in a variable "data".

cwt (data,1:1:10,'morl','3Dplot');
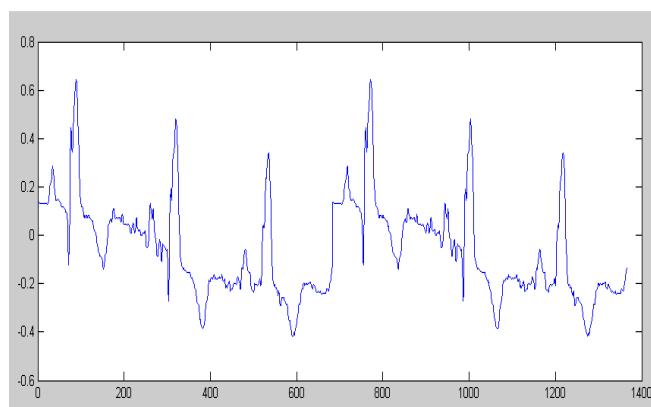
Fig 2. Sample ECG Signal from MIT database for the Congestive Heart Failure case.
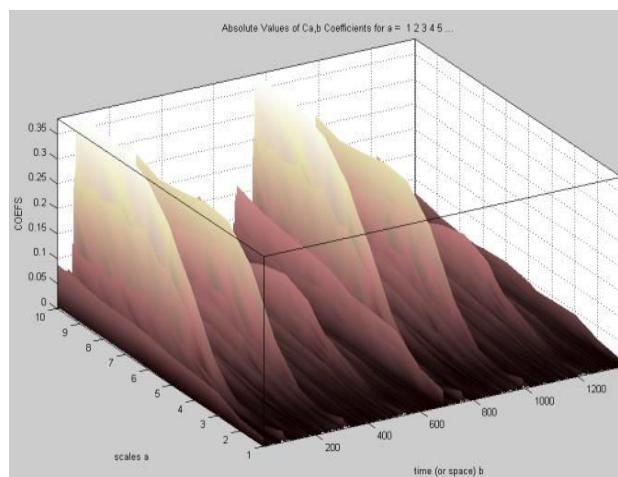
Fig 3. Wavelet 3D plot for ECG Signal from MIT database.

➤ The larger is the wavelet scale the more we can localize in to the signal and more is the computational complexity.

➤ The wavelet 3Dplot in the larger scale values resembles the signal for which the wavelet is found.

➤ The peak values in the base signal correspond to negative valued wavelet coefficients and vice versa.

➤ The wavelet generated for the initial scales is proportional to the signal taken or the ECG signal.

➤ The more is the scale range the computational complexity of the methodology to find the 3D plot increases to the respective extent.

➤ Wavelet generated with morlet mother wavelet looks better for finding even the minute changes of the signal in time axis.

➤ The wavelet for increasing scale number is faded down compared to the given ECG signal for each increasing scale value.

➤ Instead of visual observations comparison of ECG analysis using the wavelet coefficients yields better and accurate results.

5. IMPLEMENTATION STAGES:
➤ Collection of Bio Medical data.

➤ Collection of Reference data.

➤ Conversion in to digital values.

➤ Applying CWT and gathering the coefficients.

➤ Manual & Algorithmic approach for finding the disease.

6. ZERO CROSS ALGORITHM:
Heart Rate detection using notch filtering and band pass filtering with the use of 60-Hz Hum Eliminator and Heart Rate Detection Using ECG
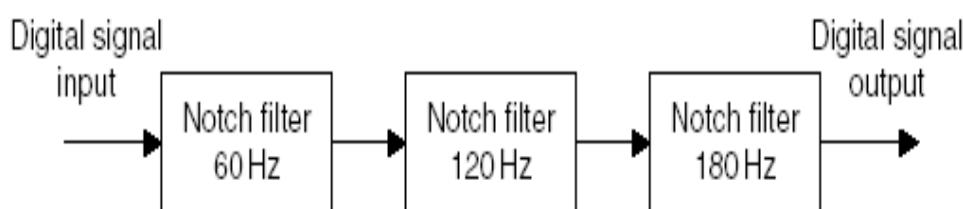
Fig 4. Hum noise filters for 60Hz, 120Hz, and 180Hz.

In this report we have explained the implementations on ECG data sets collected at 250Hz sampling rate. Hum noise created by poor power supplies, transformers, or electromagnetic interference sourced by a main power supply is characterized by a frequency of 60 Hz and its harmonics.

If this noise interferes with a desired audio or biomedical signal (e.g., in electrocardiography [ECG]), the desired signal could be corrupted. If such interference is severe the recorded ECG data becomes useless and we apply the signal enhancement to the ECG recording as shown in figure 5.It is sufficient to eliminate the 60-Hz hum frequency with its second and third harmonics in most practical applications. We can complete this by cascading with notch filters having notch frequencies of 60 Hz, 120 Hz, and 180 Hz, respectively.

6.1 Filter Designing:
Notch filter coefficients were designed using pole zero placement method for 60,120 and 180 Hz components removal. Band pass filter coefficients for removing muscle noise between 0.25Hz to 40Hz is done using bilinear transformation method. A major source of frequent interference is the electric-power system due to electric-field coupling between the power lines and the electrocardiograph or patient, which is the cause of the electrical field surrounding mains power lines. Another cause is magnetic induction in the power line, whereby current in the power line generates a magnetic field around the line. Sometimes, the harmonics of 60-Hz hum exist due to nonlinear sensor and signal amplifier effects.
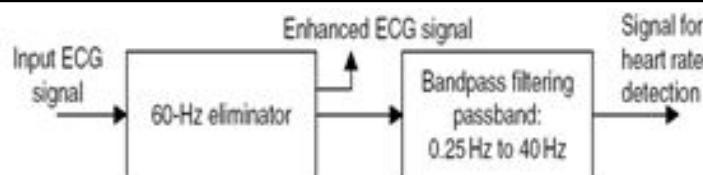
Fig 5. ECG signal enhancement system.

6.1.1   Analysis Estimated Results:
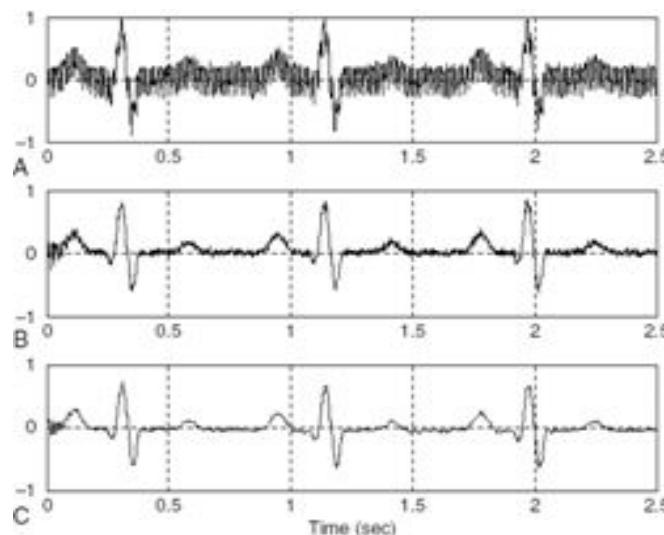
Fig 6. Results of ECG signal processing prior to   implementation of algorithm.

The first figure shows the ECG signal with Hum noise, the second one is the signal removed or filtered from the 60,120,180 Hz hum noise, the third one is the ECG signal filtered from the muscle noise.

6.2Algorithm:

The ECG data after filtered with 3 stages of notch filters and finally sent through band pass filter is considered for the heart rate calculation using the zero cross algorithm. The algorithm has some prerequisites to be assigned with, according to the size and sampling frequency of the considered data. After detecting the total number of zero crossings, the number of the peaks will be half the number of the zero crossings. The heart rate in terms of pulses per minute can be determined by

$$\text{Heart rate} = \frac{60}{\left(\frac{Number\ of\ enhanced\ ECG\ data}{f_s}\right)} \times \left(\frac{\text{zero-crossing number}}{2}\right).$$

Eqn 1. Calculation of heart rate from the no of zero crossings, Where fs = Sampling frequency.

7. RESULTS

All results are with reference to data sets of different sampling frequency with Zero cross algorithm applied individually. Table 1. Heart rate in beats per minute calculated using the zero cross algorithm for various disease cases.

Considered case of heart disease	Sampling frequency	No of zero crossings	Heart rate in beats/min
Congestive heart failure database	250	12	60
Long term ST database	250	14	70
Very subtle premature ventricular contraction	250	20	100
Maligant Ventricular ectopy database	250	28	56
Noramal sinus rythym database	165	38	125
AANSI AMI database	721	4	56
AF termination database	129	28	72
APNEA database	101	32	64
Long term ECG database	129	26	67

Sudden cardiac death hotler database	361	8	48
Poly somographic database	251	14	69
Postal ictal heart rate oscillations in partial epilepsy	201	18	72
Stress recognition in automobile drivers	16	16	46
AHA database	251	16	80
Congestive heart failure database	251	20	100
Intra cardiac atrial fibrillation	1001	4	80
MGH_MF Waveform database	361	6	86
CU ventricular tachyarrhythimia database	251	12	86
Wave alternas challenge database	501	6	60
PAF prediction challenge database	129	34	87

8. CONCLUSION:

Long Term ST Database with Manually corrected beat annotations with sampling frequency of 250 Hz (row 9 in table 1).
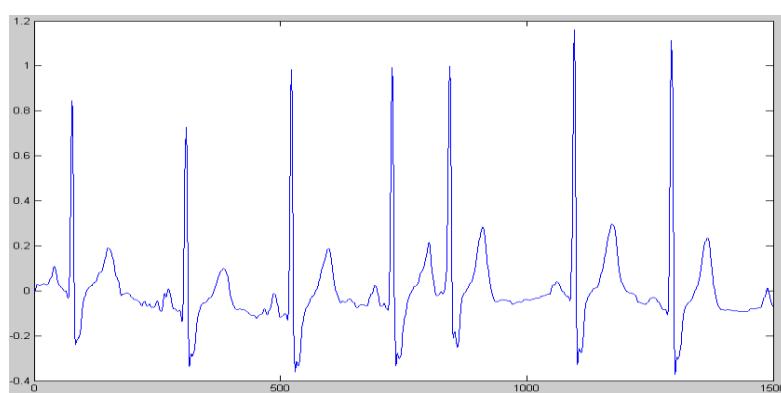
Fig 7. Actual ECG signal
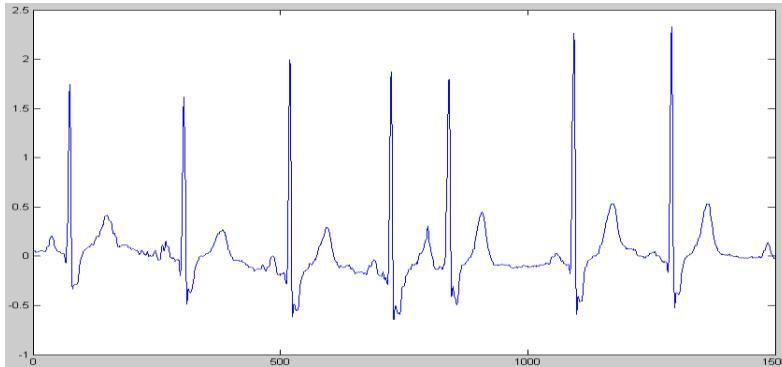
Fig 8. ECG signal filtered for hum noise and muscle noise.
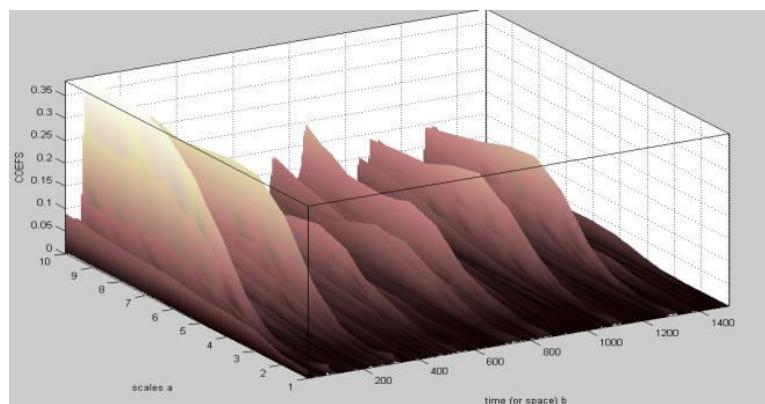
Fig 9. Wavelet 3D plot for the above ECG.

Output of the Algorithm:

1) No of Zero Crossings = 14.

2) Heart Rate in (Beats/Min) = 17.

We conclude that the above implementation helps for the detailed analysis of the biomedical data for finding the diseases and severity.

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WATER QUALITY STUDY OF MALGAON LAKE

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1.1 INTRODUCTION

Impact of human activities on the global environment is so much that even the hydrological cycle is affected, and humanity needs to be prepared for such changes that are being imposed on the Earth. The anthropogenic impact of the last decades on our aquatic environment has shown that a responsible use of our natural resources is mandatory to guarantee sustainable conditions (Boehrer and Schultze,2008). Many lakes modified to the extent that they changed their appearance, besides creating lot of benthic deposition due to the negligence in preserving the environment. This also resulted in their stratification alteration due to the human impact or due to climatic change. The first step in forecasting such evolutions is to understand the environmental processes. A good understanding of stratification is required not only to prognosticate the future of our lakes but also to better interpret the past from lacustrine sediment cores (Kjensmo,1988, Brauer,2004). Such interpretations and studies not only record the lake history but also to conclude on the climate in the past by relating variations of the lake sediments to circulation patterns in lakes and finally climatic conditions triggering these changes. Deep lakes generally show the complete stratification and some already undergone permanent stratification. Many medium and small depth lakes do not generally circulate completely in vertical direction; as a result do not show a homogenized, overturning water body at any time during the annual cycle. The permanent stratification has decisive impact on the redistribution of dissolved substances, such as nutrients or oxygen, and hence determines the biocenosis that can form in the lake [4,5,6]. An important role is played by the chemical transformations that undergoes due to nutrient inflow and climatic variations, in lake stratification. Great variations in salinity and chemical composition of dissolved substances were found in lakes. As a consequence, fresh water assumptions may be acceptable for some considerations, while for many lakes, or more detailed investigations, these assumptions fail. Separate approaches may be required to satisfactorily reflect given conditions under such cases. This study on lake stratification is intended to be useful in understanding the water quality status and its variation during any time of annual cycle.

1.2 STUDY AREA: Malgaon lake is situated in Malegaon village which is located in Miraj tahsil of Sangli district in the state of Maharashtra. It is situated at latitude of 16.867 N, and longitude 74.717 E with total population of 26917. The lake is almost at the center and attracted many human and animals' activities resulting in the contamination of water. Map of the study area is presented in Fig.1. Agriculture is the main occupation in the area with only around 38% of the population under the earning category. It experiences hot and dry weather during the period of February to June with temperature as high as 42 ^{0}C and winter temperature as low as 15 ^{0}C.

1.3 METHODOLOGY: Samples on fortnight basis were collected at different locations, as sown in Fig.1, from the lake and transported to the laboratory for testing. A total of 13 parameters carried out in the laboratory as per the Standard Methods, APHA, 2017 and Manual for Water and Wastewater Analysis, NEERI.

Fig.1: Malgaon Lake with sampling stations

2 **RESULTS AND DISCUSSIONS:**   Laboratory analyzed results for selected important parameters are presented in Table 1. Temperature for the lake water ranged from a minimum of 10 ^{0}C during January to a maximum of 27.2 ^{0}C during the month of May, as presented in Fig.1. Temperature variation of water affects the dissolved oxygen concentration and affects the entire aquatic life and the plants. Lake overturning is also due to the difference in temperature at different depths of the lake. Temperature in lake water does not remain constant throughout its depth, instead varies depending on climatic conditions. This results in density variation. During summer the epilimnion layer is warmer compared to thermocline and hypolimnion and lighter remaining as the top layer. This gets during winter and cold season as the top layer i.e. Epilimnion layer becomes dense due to cold climate and bottom layers becoming warmer, resulting in the overturning of lakes.

pH value of the lake water ranged from a minimum of 7.4 during October to a maximum of 8.6 during September, with an average of 7.9. Too low and high values of pH can adversely affect the living and plant life in the lake. Many of the species and the plants survive in the pH range of 6.5 to 9, although some can survive outside this range. pH variation can also affect the solubility and toxicity of chemicals and heavy metals present in water. However, in the present study lake water maintained the pH value in the optimum range throughout the annual cycle.

Table 1: Analyzed Result of Lake Water Samples

Sample	pH	EC µS/cm	TH	T Alk	TDS	Ca	Mg	Na	K	COD	BOD	Cl	DO
S1	8.2	400	384	182	1180	34.6	19.4	58.2	18.2	218	122.2	169.5	5.4
S2	7.8	420	309	316	1320	42.3	21.3	46.4	20.2	264	77.1	146.5	3.6
S3	8.4	380	356	118	1090	30.6	18.3	38.9	8.2	184	92.6	138.6	4.3
S4	8.2	390	407	156	1650	28.4	20.1	41.5	10.3	196	93.9	116.4	2.8
S5	8.3	368	315	216	1880	54.2	16.4	64.6	11.2	208	117.2	124.4	3.2
S6	8.6	418	288	206	1430	46.3	22.1	55.3	9.6	224	163.4	132.6	4.1
S7	7.4	410	344	168.5	1720	39.6	17.2	41.3	11.6	184	116	152.4	5.6
S8	7.8	388	418	162	1810	44.2	12.6	48.2	22.3	168	91.2	106.5	4.7
S9	7.9	364	294	212	1350	29.6	19.4	35.2	23.4	187	124	134.6	2.6

Note: All values in mg/L, except pH and EC.

Some variations were recorded for the pH value of bore well water samples and less compared to the lake water. pH indicates the nature of water quality as acidic or alkaline. It plays an important role in the biological process of all the aquatic organisms (Wetzel 2004). EC values recorded in the range of 420 µS/cm to 364 µS/cm. Maximum EC value was recorded during spring and the minimum during winter. Enrichment of ions in the water bodies, probably due to anthropogenic or natural sources indicate increased concentration of EC. A significant human contribution was observed during the study, which along with natural sources must have contributed to the enrichment of ions in the lake water. Electrical conductivity of the water signifies the presence of biogenic and abiogenic impurities in water (Upadhyay et al.,2012). Since there is elevated temperature during the months of summer and monsoon seasons, the surface water evaporates resulting in an increase in the salt concentration in the water body (Kaushik and Saxena, 1999). The high value of electrical conductivity in lakes also shows the pollution status (Kadam, 1990). The lake has recorded high conductivity during monsoon season, reflecting degraded water quality.

Seasonal variation for TDS was recorded high during monsoon at S5 location and minimum during autumn at S3, as presented in Table 1. Higher TDS values in monsoon and low concentrations were also recorded by (Rahaman et al., 2013). Maximum turbidity of 46 JTU was recorded at S4 location during monsoon and minimum of 16 JTU at S1 during winter. Suspended solids, like silt, colloidal organic matter, clay, plankton and other organisms impart turbidity to the water (Dorner et al., 2007).

Dissolved oxygen in water is necessary for respiratory metabolism of most aquatic organisms and affects the solubility and availability of many nutrients and therefore determines the productivity of aquatic ecosystems (Wetzel, 2001). Maximum DO recorded was 5.6 mg/L at S7 location of the lake during winter and the minimum was 2.6 mg/L at S9 location during summer. DO concentration decreases during summer and steadily increases in autumn, reaching maximum during winter following the law of solubility of gases (Tian et al. 2012). BOD

concentrations recorded higher values during summer with a maximum of 163.4 mg/L at S6 location during summer and a minimum of 77.1 mg/L at S2 location during winter as presented in Table 1. Similar kind of BOD concentrations were also recorded by Liu et al. (2010) during the studies on Seasonal variations of phytoplankton community structure in relation to physico-chemical factors on Lake Baiyangdian, in China. Maximum alkalinity of 316 mg/L was recorded at S2 location during summer and a minimum of 118 mg/L during winter at S3. Alkalinity comes from rocks and soils, salts, certain plant activities, and certain industrial wastewater discharges. High concentrations of alkalinity may adversely affect many chemical and biological processes in the water and different organisms have different ranges of pH within which they flourish. Higher alkalinity in water reduces the diversity in the lake as it stresses the physiological systems of most organisms and may reduce reproduction.

Calcium and magnesium occur in all kind of natural waters. Maximum concentrations of calcium and magnesium recorded were 54.2 mg/L and 22.1 mg/L at S5 and S6 respectively. Minimum values recorded were 28.4 mg/L and 12.6 mg/L at S4 and S8 for calcium and magnesium respectively. Again the higher concentrations were found during summer and lower during winter season. These cations are responsible for imparting hardness to water and total hardness for the lake water recorded higher concentrations. High concentrations of hardness and lower were observed during summer and winter respectively. This may be due to the fact that water quantity decreases during summer resulting in the increased concentrations.

2.2 Statistical Correlation of Lake-Water Contaminants: Existing interaction between minimum of two continuous variables with values ranging between − 1 and +1 is exhibited by Pearson's correlation (r). This correlation statistical tool was used to correlate the lake-water contaminants recorded during the study. A positive value indicates positive correlation between variables, while negative value implies negative correlation. Negligible connection between parameters is indicated by r = 0. In most cases, strong correlation exists within parameters when r > 0.7, while moderate correlation exists when r ranges between 0.5 and 0.7 (Saleem et al., 2012). Pearson's correlation results assessed for physicochemical parameters of water samples in the study area is presented in Table 2. pH is poorly correlated with Mg^{2+}, Na^{2+} and BOD, and very poorly with Ca^{2+} and COD as observed from Table 2. Further, pH showed negative correlation with EC, total hardness, alkalinity, TDS, K, chlorides and dissolved oxygen. Electrical conductivity showed poor (r < 0.5) positive correlation with alkalinity, Mg^{2+}, Na^{2+}, BOD, chlorides and COD, whereas EC had moderate (0.5 < r <0.7) correlation with COD, as observed from Table 2. However EC indicated negative correlation with other parameters, i.e., TDS, total hardness and K^+. Totally, the results indicated that approximately 21%, 57% and 22% of the physicochemical parameters to be strongly (r ≥ 0.7), moderately (0.5 < r < 0.7) and poorly (r < 0.5) correlated.

Lake water was also examined for its WQI for all the sampling stations. Weighted arithmetic WQI method was followed in arriving at the index value. Parameters selected to assess the WQI were pH value, EC, total hardness, turbidity, total alkalinity, TDS, Ca^{2+}, Mg^{2+}, chlorides and NO_3^{2-}. Standard maximum limits for these selected parameters were considered as per BIS: 10500 – 2012, and WHO. Proportionality constant, 'K' was then evaluated, and also q_n and W_n. WQI, as per the weighted arithmetic method was then calculated using the following equation:

$$WQI = [(\Sigma W_n * q_n)/\Sigma W_n]$$

Where,

W_n = Unit weight for the nth parameter.

q_n = Quality rating for nth parameter.

Water Quality Index was found for each of the sampling station, and the results are presented in Table 4.

Table 2: Pearson's Correlation for the analyzed parameters

Parameter	pH	EC	TH	T. Alk	TDS	Ca	Mg	Na	K	COD	BOD	Cl	DO
pH	1												
EC	-0.143	1											
TH	-0.146	-0.076	1										
T Alk	-0.184	0.357	-0.583	1									
TDS	-0.315	-0.149	0.196	-0.027	1								
Ca^{2+}	0.059	0.180	-0.31	0.401	0.559	1							
Mg^{2+}	0.380	0.432	-0.526	0.407	-0.580	-0.276	1						

Na^{2+}	0.420	0.118	-0.075	0.230	0.273	0.754	-0.073	1					
K	-0.492	-0.115	0.044	0.431	-0.051	-0.072	-0.228	-0.148	1				
COD	0.181	0.578	-0.475	0.828	-0.324	0.275	0.692	0.370	0.051	1			
BOD	0.411	0.099	-0.490	-0.063	-0.014	0.239	0.321	0.362	-0.240	0.015	1		
Cl	-0.131	0.389	-0.245	0.191	-0.605	-0.194	0.437	0.075	0.017	0.419	0.180	1	
DO	-0.288	0.483	0.327	-0.306	-0.085	0.120	-0.294	0.176	-0.070	-0.142	0.093	0.508	1

WQI for the water can also be found by using other methods, such as National Sanitation Foundation Water Quality Index (NSFWQI), Canadian Council of Ministries of the Environment Water Quality Index (CCMEWQI) and Oregon Water Quality Index (OWQI). As this weighted arithmetic water quality index incorporates multiple water quality parameters, combining in to a mathematical equation that exhibits the health of the water source through a number, called as Water Quality Index. Suitability of such water source, either surface or ground, for drinking and agriculture purpose can be arrived at by getting the WQI. Table 3 indicates the status of water quality for any source based on this WQI (Chatterji and Raziuddin, 2002).

Table 3: Water Quality Index and Water Quality Status

Water Quality Index	Water Quality Status
0 - 25	Excellent Quality
26 - 50	Good Water Quality
51 - 75	Poor Quality
76 - 100	Very Poor Water Quality
>100	Unsuitable for drinking

Table 4: Water Quality Index and Water Quality Status for Malgaon Lake

Stn.No.	Water Quality Index	Water Quality Status
S1	96.04	Very Poor Water Quality
S2	88.86	
S3	86.88	
S4	82.19	
S5	90.96	
S6	95.59	
S7	82.45	
S8	78.82	
S9	64.65	Poor Quality

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As presented in Table 4, WQI for the lake water range from a maximum of 96.04 for S1 sampling station to a minimum of 64.65 for the S9 station. Values for S1 to S8 exceeded the index value for 'very poor water quality' status, whereas the index value for S9 exhibited 'poor quality' status. WQI values indicated an increasing trend for all the stations, which exhibits that the water quality totally is very poor, and needs to be treated before used for drinking purpose. This indicated that the lake water is loaded with pollution. This heavy pollution and deterioration of lake water quality can be attributed to lack of proper sanitation, unprotected lake site and the boundary, high anthropogenic activities and direct dumping of waste materials in and around the lake.

3. Lake Stratification: Temperature difference at different levels in the lake water leads to density difference. This is the main cause for the lake stratification which is also helped by the wind force. Thermal stratification holds for a longer period, i.e. from summer to autumn and winter, for deeper lakes (Boehrer and Schultze, 2008). However, the present study is limited only to a 3 m deep lake where such a long period stratification is ruled out. But temperature difference does occur as the depth increases. The warm surface water layer, which generally occurs during summer, is called epilimnion, while the warmer water beneath the surface, which does not mix with epilimnion during stratification, is the hypolimnion. These layers are separated by the temperature gradient, thermocline, which is formed between the two contact layers. Generally atmosphere and epilimnion exchange heat and volatile substances, like gases. Besides, the epilimnion is overturned episodically by wind force or during the periods of lower temperature during the stratification period. In most of the lakes, it is the wind factor which is decisive for the epilimnion depth. But some exceptions also exist where wind may be weak and other factors can contribute to the epilimnion thickness. Present Malgoan Lake is one such where wind factor is negligible and other factors evolve to be the most dominant. Thickness of epilimnion is not constant over the stratification period. A thin layer is formed in spring and gradually gains thickness due to wind action till autumn when colder water from the surface can erode the stratification. Thermocline can form a special

habitat due to its high gradient. Organisms that can regulate their density can position themselves in the strong density gradient. Further, inanimate particles can accumulate on a level representing their density. Apart from this motile organisms can settle in the thermocline, with the advantage of layers, epilimnion and hypolimnion. This results in the formation of a separate layer, called metalmnion, due to its own characteristics (Boehrer and Schultze, 2008). Decomposition of organic matter, especially in nutrient rich lakes, can cause oxygen depletion, resulting in a so-called metalimnetic oxygen minimum. In contrast to this if photosynthesis can overcome the oxygen uptake in this zone, due to penetration of light; a metalimnetic oxygen maximum can be encountered (Boehrer and Schultze, 2008). In the present study, no clear distinction of metalmnion was observed. This might be due to the fact that the depth of the lake under study was shallow.

4. CONCLUSIONS

Present study on Malgaon lake reveals that many contaminants exceed the limits for drinking water standards, and also organic pollution is more. This makes the water unfit for the direct use. Due to human activities and uncontrolled stretch of the lake, the quality of water is continuously deteriorating. The cause of water contamination is obviously due to human interference and lack of awareness among the villagers. Water from the lake is to be properly put for treatment before its use for human beings, and also for agricultural purpose.

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CONSUMER BUYING BEHAVIOR AND ITS AFFECT ON RETAIL STORES

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ABSTRACT

Authors made a conscious effort to understand the relevance of the retail market, the structure of the buying population and how their buying behavior affects the retail stores. Writers also made an attempt to discuss population, demographic and Geographic factors that affect or influence the buying behavior of a customer. These factors allow the retailer- to calculate the market potential and growth of the retail store in a particular area. Understanding consumer behavior is a prime factor for the successful formulation of a retailing strategy. This article gives a detailed explanation of factors that influence the consumer's buying behavior and its impact on the retailer.

Keywords: Consumer buying Behavior (CBBR), market, Consumer buying Decision Making (CBDM)

1. INTRODUCTION

To understand the purchasing patterns of customers, it is vital to understand the customers' nature and examine the external factors that influence their buying behavior. The increasing value perception among customers is putting more pressure on the retailer to offer merchandise superior quality that is valuable to the consumer's eye. Retailers explore investment opportunities after analyzing the customer's needs, aspirations, shopping preferences and buying behavior.

In India, there are huge differences in the social practices and food habits of people in various regions. The cultural differences in India, when compared to the rest of the world and even with other countries within Asia, are striking. Before liberalization, the Indian market was a seller-driven market. But liberalization has changed the face of the Indian retail market, especially in the Fast Moving Consumer Good (FMCG) and consumer durables sector. Liberalization also witnessed the entry of multinationals resulting in a radical improvement in the models, features, technology and sizes of consumer durables available in India, Since 1991, the FMCG sector in India has been trying to cater to the consumers, according to the mindset of the Indian consumer, and to deliver quality products at low costs, In short, consumers have gained much significance in the market with a wide range of products, a multitude of brands (Indian and foreign), various financing options, large one stop shops, colorful stores and shopping malls.

Retailing includes the purchasing and selling of products and services to the consumer who buys them for individual and household consumption. The consumption of goods and services depends on the individual's preferences and choices. Thus, consumer behavior plays a crucial role in determining the success and growth of retail stores.

2. BAZAAR (MARKET)

A market can be defined as a group of consumers or organizations that is interested in a particular product, has the resources to purchase the products and is permitted by the law to acquire these products. A market definition begins with the total population and progressively narrows down to the target market and then to the penetrated market. Figure 1 gives various definitions of a market.

A retail market is a place where all the retailers complete with each other for recognition and acceptance through various merchandise promotional activities. Thus, to understand the retail market, one has to understand the structure of the buying population and their behavior.

Defining the market is the first step in understanding it. Since the market consists of consumers whose needs differ market segmentation is necessary understand those needs and to select the consumer groups that the retailer will serve. To define a market a retailer should follow the process given below:

A. **Total population:** Determine the total number of people residing in 'a particular area in which a retailer operates.

B. **Potential market**: Identify the individuals In the-total population who are interested In buying the product/service.

C. **Available market:** Identify the, individuals in the potential market who have enough money to buy the product/service.

D. **Qualified available market**; The' individuals in the' available market who are legally permitted to buy the product/service.

E. **Target market**: Identify the portion of the qualified available market, that the firm has decided to serve.

F. **Penetrated market:** Identify the individuals in the target market who have purchased the product.

Thus the market can be defined as group of consumers or organizations that is interested in a particular product, has the resources to purchase the products, and is permitted by the law to acquire these products.
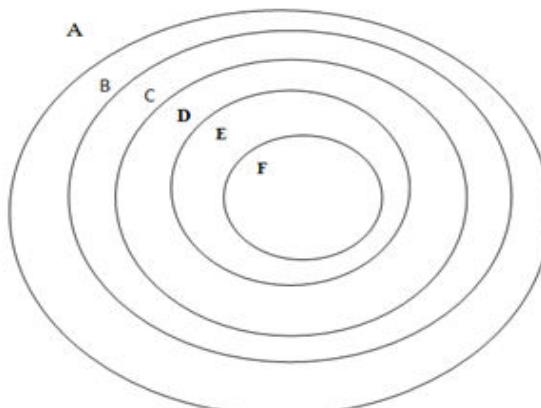
Figure -1

A retail market is a place where all the retailers compete with each other for recognition and acceptance through various merchandise promotional activities. Thus, to understand the retail market, one has to understand the structure of the buying population and their behavior

The retailer should understand the structure of the population and their buying behavior, so that he can cater to the needs of the buyer in a better way. Buying behavior deals with the process a consumer undergoes while deciding whether to purchase a product/service or not. Based on the customer's nature and his intentions behind purchasing the merchandise, the buying population can be divided into two categories - the consumer market and the organizational Market. Figure 2 gives the classification of buying population. Consumer market: Consumer markets consist of the individuals or the households, which are the ultimate users of goods and services; Consumers purchase goods and services for their personal use or for the use of their families. The consumer market plays a crucial role in the success of a retail store. To understand the consumer market, a retailer should analyze the geographic and demographic distribution of the population.

Consumers' buying behavior or their decisions is influenced by factors like individual preferences, social factors (like the influence of reference group, family life cycle and purchase system). The geographic distribution helps the retailer to analyze the classification of the population -- rural, urban and suburban - which helps him to understand the purchasing power of the population. The demographic features explain the classification of the population on the basis of their age, gender, family life cycle, income distribution, and race and ethnicity, which are the major factors that influence the buying behavior of a consumer market. These geographic and demographic features help a retailer understand the purchasing behavior of the target market.

3. **CLASSIFICATION OF BUYING POPULATION**
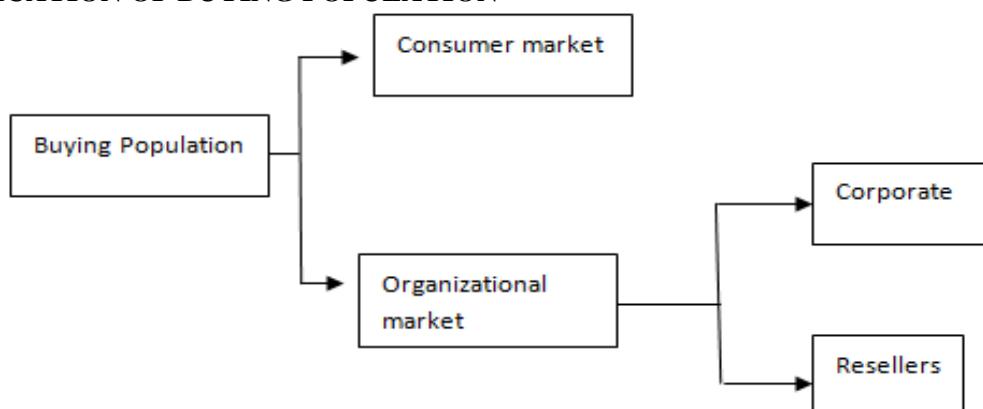
Figure -2

a. Organizational Market: An organizational market is comprised of corporate and resellers who represent intermediate consumers of merchandise. The corporate buyers are those companies that cit her buy the merchandise offered by the retailer for corporate use, or promote soles for the retailer by giving coupons to their employees. Resellers are those who buy merchandise in large quantities: It discounted prices from the retailers, and sell them at normal prices in their shops. The organizational market differs significantly from the consumer markets because the consumers look for products that satisfy their own needs while the organizations look for products that satisfy the needs of their consumers.

4. CONSUMER BUYING BEHAVIOR

A consumer's buying behavior refers to the response and reaction of the ultimate consumer to various situations involved in purchasing and using various goods and services. A retailer has to understand consumers' buying behavior as consumer responses to various marketing strategies would determine the retailer's success. For understanding the retail customers' buying behavior, a retailer should collect information relating to what a customer likes to buy and in what quantity, who buys, from where (location) he wants to buy, who are the ones who influence a customer, etc.

a. Buying Considerations - What Consumers Buy?.

The first step towards understanding the consumer buying behavior is to find out what consumers buy and their motives behind buying them. Generally, consumers buy products, which are capable of satisfying their' needs. Thus a product is anything that is offered to a market and is capable of satisfying the needs of the customer. Successful products include tangible and intangible features that match the consumer's expectations. Realizing the customer's expectations and viewing the product in its broader perspective allows retailers to plan and offer products accordingly. Here, we have to define the products from a buyer's perspective, where he looks at a product based on its

- Tangibility
- Durability
- Availability

b. Product Tangibility

A product's tangibility is based on its physical and material properties that enable the customer to touch or feel it. Generally, consumers consider a sense of feel of touch as the tangibility of a product. Thus a customer can hold, lift and feel a tangible product, whereas intangible goods cannot be touched and felt.

The degree of product tangibility varies for goods, services and ideas. The tangibility of a good refers to its size, shape and weight along with its chemical and biological nature, for example, a pen, a dress or a car. Services are predominantly intangible in nature and they are the result of the application of human skills for solving a consumer's problem. A service need not necessarily be associated with the sale of a product. Services range from personal services to professional services, entertainment, etc.

Ideas are highly intangible services, which include all. Opinion or a concept related to a specific event or situation. Here the retailer markets the concept or an idea to the end consumer.

c. Product Durability

The durability of a product is the capability of a product to endure or to last. Based on the useful life span of a product, some products are durable and others arc non-durable. Durables are products that are capable of serving the customer for a long period of time. Non-durables are products that last for a very short time. Non - durable goods arc perishable by nature.

d. Product Availability

Depending on the level of availability expected by the customers, products can be put in three categories:

- Convenience products
- E- Shopping products
- Specialty products

e. Convenience products: Convenience products are relatively inexpensive, frequently purchased products, and the consumer spends only minimum time to find the product and purchase it. Customers expect these products to be readily available at the nearest retail outlet. Bread, biscuits, milk are some examples of convenience goods. Even though these products carry lower margins, retailers prefer to stock these convenience products as they have a high turnover.

f. **Shopping products**: Shopping products are items for which buyers are willing to make more offers to plan for and purchase. For shopping products, consumers spend considerable time in comparing the brands and sellers with regard to price, product features, quality, service, warranties, etc. Shopping products include furniture, appliances and stereos. Compared to convenience products, shopping products are more expensive and consumers are not loyal to any particular brand.

g. **Specialty products:** Specialty products are those products while purchasing which, the consumer is least concerned about the time, effort or expense involved. Here the consumers do not accept any substitute and are willing to spend any amount of money to obtain that particular item. These products are available in a limited number of retail outlets.

h. Buying Situations

The volume of goods and services that a consumer buys depends on his requirements and his willingness and ability to purchase. Thus the volume of a retailer's business in a particular market depends on the following:

✓ Consumer population

✓ Consumer requirements

✓ Consumer potential

✓ Consumer Population

The volume of goods and services that would be sold in a particular area depends on the total number of 'consumption units' in that area, Depending on the product and its intended usage, the 'consumption unit' can be a 'house hold' or a 'person.' For example, when a person buys a home appliance or garden equipment, he is spending for the household, and hence the 'consumption unit' would be a 'household'. On the other hand, when he purchases an ice-cream or seeks medical or legal service, the purpose of which is personal, the consumption unit is a 'person.' Thus: the 'consumption units' will depend on the type of product purchased and this is the focus area for determining the market potential.

The total market potential can be calculated by counting the number of consumption units. Thus, a market's total consumption capacity is a function of the total number of consumption units that make up that market.

i. Consumer Requirements: After determining the number of consumption units, a retailer should also determine what percentage of these units actually requires a particular product. A person's requirement for a particular good or service depends on his needs and wants. Needs can be defined as an internal desire to satisfy a physiological or psychological urge. Wants are a person's desire for a specific product or service that can satisfy his needs.

i. Ability to buy

A consumer's ability to buy refers to his purchasing power. In other words; it is the financial ability of a consumer to purchase a good, thus, the buying power of a consumer is determined by factors such as the consumer's disposable income, asset position and available credit.

Here, the major factor is the amount of money that the consumer can spend on products that he needs and that he desires to own/purchase, a person's income can be expressed in different ways, like the total income, disposable income and discretionary income. Total income refers to the sum total of the incomes received' by an individual in the form of salaries/wages, rents, interest, investment, pension and so on, an individual cannot spend his total income. Because he needs to pay taxes, has to allocate some amount for his savings and has to take care of his basic needs.

Disposable income refers to the income that remains after tax deduction and other deductions from the total income, Thus the disposable income in hand is used by the consumer for spending and saving, Though a retailer can use this disposable income, to a certain extent, to forecast the demand or requirement for essential goods, the figures of disposable income are not useful to calculate the capacity of the market for luxury goods and non - essential products. Discretionary income is that portion of an individual's or a family's income that remains after purchasing the basic necessities, Based on their discretionary income, the consumers spend on entertainment, household recreation, etc,

j. Willingness to buy

Though a consumer may have enough income to purchase a product, he may not buy the product because he is not: interested, Hence the income of the person is not the only criterion for determining the buying process of a product. The buying process is also dependent on various other factors like, psychological factors and acceptance

by the peer group and family. For, example, psychologically a customer may not be willing to buy a product. This is because of his perception about the product that it may not satisfy one of his particular needs.

Sometimes the customer is a slow decision - maker by nature, which may delay the buying process. The customer requires more information about the product and a lot of time to evaluate the product on the basis of the available information. These factors delay a customer's buying process.

5. Consumer Buying Process - How do consumers buy

The decision- making process of the customer takes place in six steps:

- Stimulus

- Problem awareness

- Information search

- Evaluation of alternatives

- Purchase

- Post purchase behavior

Whenever a customer purchases a product, he goes through a process of decision-making. He may or may not go through all the six steps mentioned above in the decision-making process. The steps in the decision -making process depend on the past experiences of the consumer. For example, a' person who shops regularly at a particular store may not undergo all the six steps that a new customer would.

i. Problem Awareness

Under problem awareness, the consumer not only is aroused by social, commercial and physical stimuli, but he also realizes that the good or service under consideration may solve a problem of shortage or an unfulfilled desire. Sometimes, it becomes difficult to understand why a person moves from the stimulus stage to the problem awareness stage. Every customer who comes to a particular retail store may purchase the same product, but for different reasons, like convenience, price, image, quality, service and durability, without revealing these motives to the retailer.

ii. Information Search

When a person feels the necessity to satisfy the unfulfilled desire or solve a shortage problem, he starts collecting information about a particular good or service that can help him do so. Here, a customer undertakes information search to serve two purposes:

- To determine the alternative goods or service available to solve the problem

- To ascertain the characteristics of each of the alternatives.

iii. Evaluation of Alternatives

Once the customer gains enough information about all the products available, he can make a list of alternatives. He can then arrange them in an order of priority according to his tastes and preferences. The customer can then select the best of the alternatives available. The customer has to make a careful evaluation of the information. This is because while deciding on the purchase, customers sometimes has two or three good alternatives, here, the customer has to rank the product according to his personal criteria, and the criteria for taking a decision also vary from customer to customer. Some customers may rank price, quality and color in this order while others may

iv. Purchase

Once the consumer has finished his evaluation of alternatives and finalized the product he wants to buy, he is ready to make the purchase. A purchase act is an exchange of money or promise to pay for the ownership or use of goods or service. While a purchase takes place in a retail store, three factors are deemed important from the store's perspective as well as the customer's perspective - the place of purchase, purchase terms and availability.

v. **Place of purchase**: Before purchasing a product, a customer needs to identify the store/place from where he/she would like to buy the product. A customer can buy a product either from a store (kiosk, supermarket, jewelry store) or non-store (at home, or at office) location. A customer evaluates the alternate stores just like he evaluates the various product alternatives. Customers' select store-based retailer on the basis of location, store layout, customer service, sales help, store image and the level of prices. While for evaluating a nonstore-based retailer the stores image, customer service, level of prices, interactivity and convenience are considered. Convenience is another basis of consumer's selection.

VI. Post purchase behavior: after buying a product, the consumer may have a tendency to contact the store again for two purpose for future purchase and for re evaluation of the already purchased product. The consumer will also re-evaluate the further purchase made at the store. If the retail store is able to provide the satisfaction expected by the customer

CONCLUSION

Any organization's growth and survival ill the highly competitive market depends on how well it understands its customers and responds to their current and potential needs. In the retail industry, understanding the retail customers plays an important role in the success of a retail store. The development of technology and globalization has led to a new era of consumerism where retailers focus completely on meeting the needs, wants and priorities of the consumer.we discussed about the market and the various factors influencing the buying behavior of a retail customer.

To understand the nature of the retail market, a retailer should analyze various factors like population, demography, and the geography of a particular area. Population analysis helps the retailer to understand potential markets. The population of all area is based on various parameters, like immigration and emigration rates, race and ethnicity. Immigration and emigration rates help the retailer to understand the actual population of a particular area. Race and ethnicity help the retailer to understand the choices and buying patterns of the consumers.

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TECHNO - INNOVATIVE TRENDS IN HRM - A CONCEPTUAL STUDY

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ABSTRACT

The corporate environment is made smart, inclusive, and sustainable thanks to technologically advanced methods, which also serve as the cornerstone for all of its major themes. To achieve environmental resilience, the measures must be developed and put into place with an eye on their ability to adjust to various external shocks. The first stage should focus on long-term sustainability through enhancing citizen engagement by using ICTs more frequently. The new services and applications will be improved in the following phase so that different user types can adapt to them. In addition to having knowledge on how to integrate technology, community, environment, and sustainable socio-economic situations, one necessity is having a comprehensive view of the current system. Technology has rendered the idea of a "classical workplace of employment" obsolete. These days, employees may work from anywhere at any time thanks to mobile devices and laptops. The position of employees around the world has been completely reshaped by generation. Nearly every area of HR has altered as a result of the most recent changes in production, from testing to regular general performance control. Some business experts claim that one factor that greatly affects the HR department is the time of year. Current HRM models show that as firms try to make HR work more trustworthy and "strategic," expectations about HR responsibilities alter. In this article, recent trends in staff development will be identified, and research on these patterns will be reviewed.

Keywords: technological development, workplace, personnel, information and communication technology , techno innovative trends

BACKGROUND

Information technology has transformed the globe and given people access to various institutions. Information technology is crucial to our daily lives and has an impact on every part (Wahaj, 2021). In order to better enable employees to learn and grow, interact, give feedback, guide their activities, and manage individual people, HR technology providers are increasingly creating staff applications first. (Synerion, 2011). The last ten years saw advertisers build HR systems to noticeably increase HR control, improve file preservation, and assist in reorganising HR strategies. Nearly every aspect of HR today is being transformed by digital technology, from hiring and acquisition to skills and overall performance management. Technology in HR is used to efficiently manage human resources, improve human resource management, and recruit, retain, and maintain a workforce. (Erica Volini, 2017). Technology nowadays has shown itself to be more able to adapt, develop, and overcome obstacles with resiliency.

OBJECTIVES OF THE STUDY
1. To investigate current techno innovations and trends in HRM.
2. To comprehend the function of IT in HRM.
3. To study the future path of human resources.

Human Resource Management: Technological Trends

Today, a variety of HR technology is assisting HR professionals in managing their most challenging situations, with more advanced technologies are likely to be available. Here's a short look at what's happening in the world of HR technology. There has been a major shift in how we work, when we work, and how we assess progress since the pandemic hit the world. The years 2020 and 2021 irrevocably altered the system's regulations.

New HR technologies are now being developed to alter how organisations find, hire, onboard, and manage personnel. According to Gartner data, 90% of HR leaders seek to either maintain or raise their technology budget, while only a third plan to reduce it. This demonstrates that employers are ready in every respect to adopt the evolving HR trends. The HR sector should implement such a working style that increases employee flexibility while maximising quality and performance if it wishes to keep winning the match. In response to a Gartner survey, nearly 60% of HR leaders stated that developing vital skills and abilities will be their top focus in 2022.(Forbes Human Resources Council). The hybrid work approach exists to empower people and maintain their engagement even during challenging times. The entire focus is on achieving greater business results while guaranteeing employee wellness, rather than paying undue attention to the workplace.

Every HR professional needs to be ready to support the tremendous transformation that the move to hybrid work will bring about in the upcoming years.

Mobile Is Becoming A New HR Technology Platform.

Organizations are finding it difficult to properly familiarise the personnels with their HR plans but with the prevalence of smartphones and the desire of workers from all professions to access business plans on their handheld phones. Worldwide, there are currently over seven billion calls per day.((Michael Stephan, 2016) . Emerging HR practises, which incorporate design thinking, social, video, and mobile technologies, include designing and creating mobileapplications and taking end-user experience into account. Mobile technology offers a fresh way to improve the experience of both employees and baptismal candidates. How many of us are addicted to cell phones shouldn't be a surprise. According to a recent research, 37% of mobile users get pay check information via the HR app on their cellphones. It would provide a wide range of tools for managing and utilising talent in enterprises. Second, it assists HR managers in changing their emphasis from overseeing a workforce to generating profits for the business.

The HR picture has already begun to be dominated by smartphones. The workforce has begun using mobile devices to access HR applications across multiple operations. As a result, businesses are starting to think about HR solutions that offer the interface that employees want. The production of apps by a typical android app company has become popular, and it successfully simplifies the fundamental HR operations.

DAILY TIME SPENT ONLINE PER CAPITA WORLDWIDE (2011-2019), BY DEVICE
Source: Statista
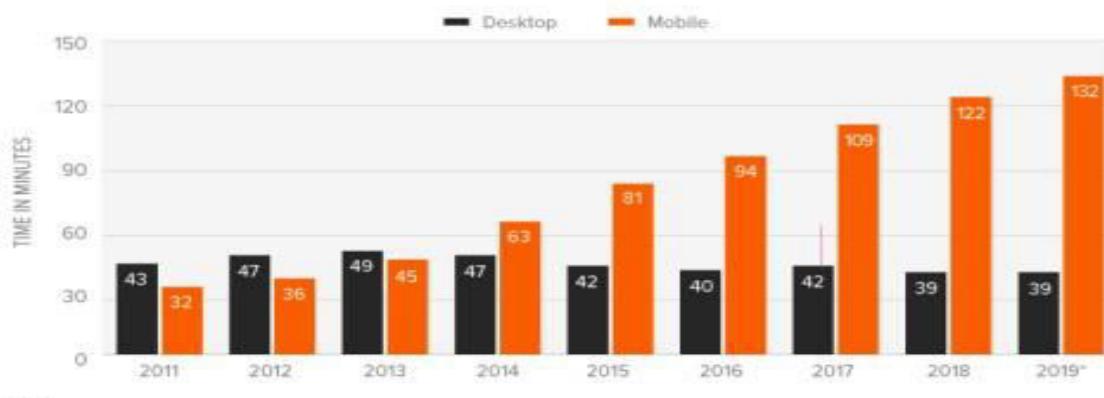
*Estimate
Note: Mobile passed desktop in 2014

The usefulness of innovative financial mechanisms in fostering the adoption and growthof technologically innovative practises

Governments should use the current crisis as an opportunity to enhance, competitive, resilient, and efficient business environments. Due to budget constraints, governments cannot meet the significant investment needs of the digital revolution on their own. It is essential to tackle the current problem by looking into new sources in order to spend budgets more effectively, as finance is becoming increasingly important and the financing mechanisms range from government budgetary support to large. Smart investments in sustainable smart infrastructure can promote productivity and innovation in the commercial sectors. Since technological adoption is projected to continue at an accelerated rate, it is also crucial that "aligning infrastructure investment with climate policy will be important for carbon reduction and preparing for a digital future"(Nirmal Jain, 2020).

Around the world, smart infrastructure technology is being implemented in all aspects of life at an increasing rate. Smart digital technology has the potential to improve the post-crisis environment by increasing employment, income, and means of subsistence. This justifies increasing political will and financial support for the sector's smart infrastructure. Governmentscan now promote smart infrastructure through encouraging public-private partnerships due to the public sector's limitations on financial and technological resources. Traditional business paradigms are being challenged by smart city solutions as services.

The Internet of Things (IoT) is being used to combat the COVID-19 situation, return us to ourjobs in a secure manner, and jumpstart the world economy.(singh bedi,2020).

Cloud-Based HR

The HR department can be transformed from a convoluted bureaucracy to a business driver byinnovating and reforming using the most recent HR technologies. The HR department has thepotential to grow into a respected service provider and advice partner, with happy clients in theform of managers and employees. Additionally, HR software must be cloud-based. Only cloud-based HR technologies make it feasible to manage human resources in a quick and effective manner for teams that are deployed globally. Two advantages of cloud-based HR are equivalent. Cloud-based tools give employees better control over their data while also enabling HR to have real-

time access to employee information and make informed decisions. In turn, this makes it more simpler for businesses to assess output and participation.

Utilizing cutting-edge technology across all HR roles and areas of the firm is what is meant by HR transformation. Technology-wise, in the past this meant paying a licence fee for proprietary HR software that was either hosted on corporate servers or externally, and possibly outsourcing some tasks to a third party who would take care of the software and processing. However, using cloud-based technology to enhance service delivery and customer experience is a key component of HR transformation today.

Employees and managers can access a cloud-based HR management (HRM) system online, and it is standardised throughout the entire organisation, including all divisions, subsidiaries, and nations. It is completely maintained by an outside source. Some businesses have made some progress and now utilise a hybrid approach, where some HR tasks are handled in the cloud, some are outsourced, and some are still handled by proprietary software. However, solutions that are entirely cloud-based are quickly replacing these mishmashes.

The following are the Benefits of a Cloud-Based HR Management System Savings in IT support

Lower prices

More value from HR Greater productivity

Source: statista
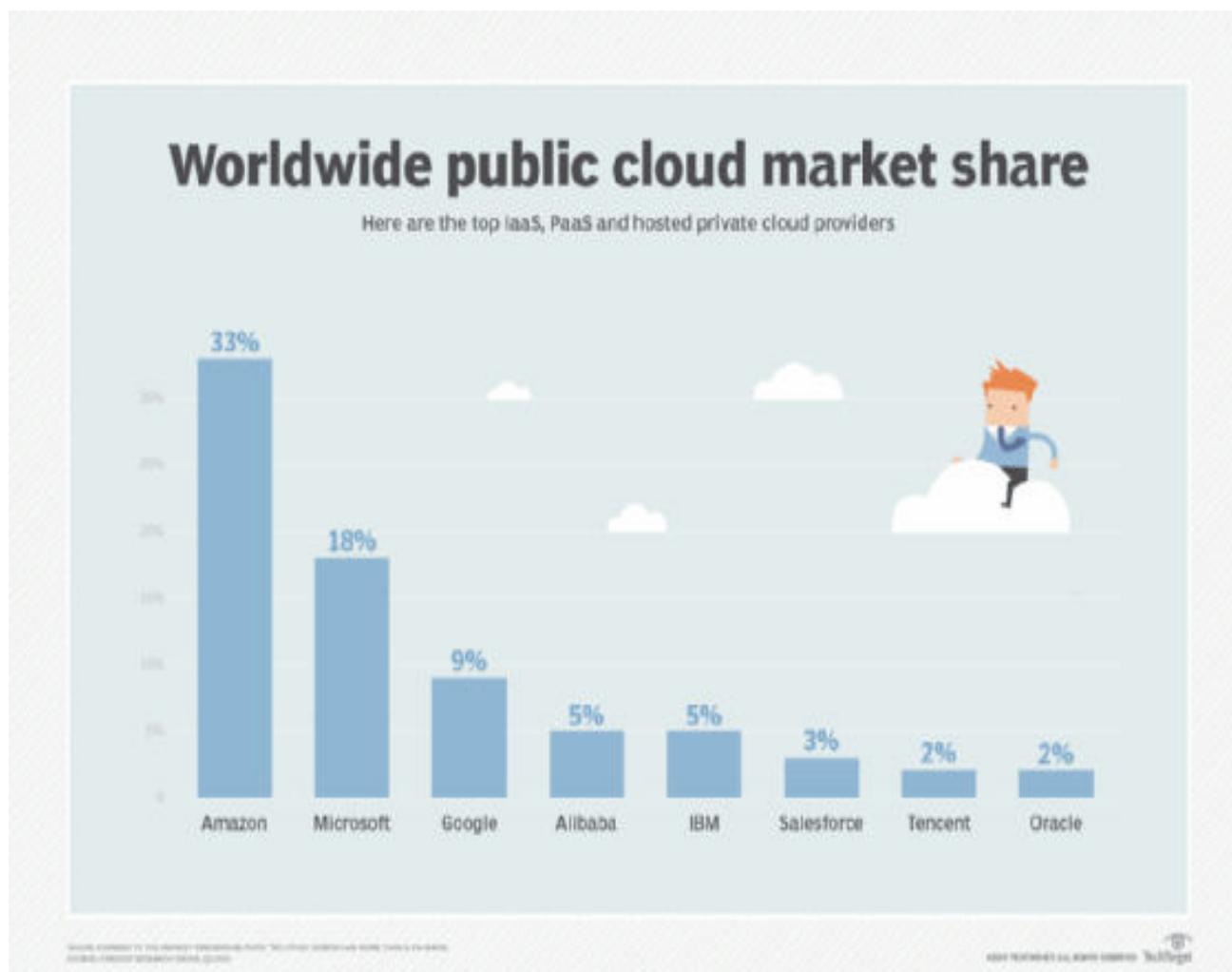
Wearable Technology

What you wear can have a significant impact on how well your products operate and how productively you work (Wearable in HR: Pocket HRMS Brings in a New Twist, 2019). The goal of wearable technology is to collect personnel information that was previously difficult to access when paired with HR software. The wearable gadget enables workers in emergency offerings, construction, and other places to call for assistance as soon as possible. The wearable technology, which is integrated with HR software, provides the HR branch with important health records, including information on sleep quality, steps taken, exercise, and more.

End-user spending of wearable devices worldwide from 2018 to 2021, by category (in billion U.S. dollars)
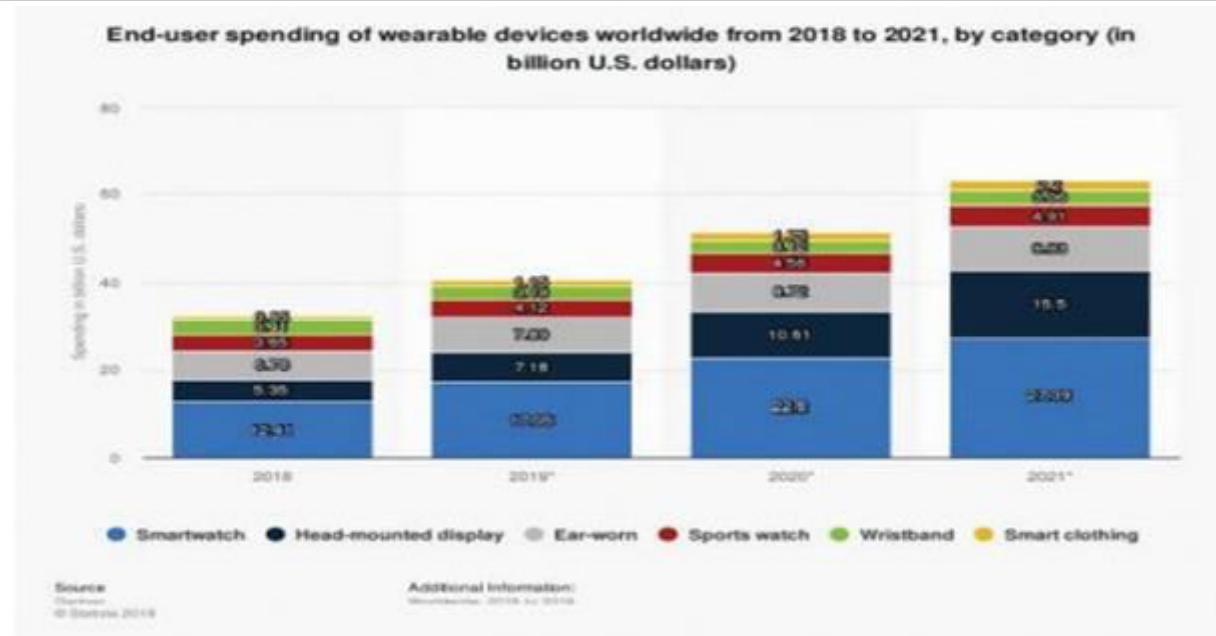
Employee management may get a new dimension thanks to wearable technology. On their smart wearables, for instance, users (businesses) can promptly inform their employees about leave approvals or rejections, attendance, employee time management, etc.

Employees in industries like emergency services, construction, etc. can request assistance much more quickly thanks to wearable technology.

When coupled with HR software, wearable technology gives the HR department crucial healthinformation about employees' sleep patterns, activity levels, exercise regimens, etc.

The Technological Innovation Practice's Outlook For The Future
Nearly every facet of life, from the personal to the professional, has been completely upendedby the COVID-19 epidemic. According to Jordan Bar Am (2020), the majority of businesses anticipate that COVID-19's effects will fundamentally alter how they conduct business over the next five years, and nearly as many believe that the crisis will have a long-lasting effect ontheir consumers' requirements. However, the businesses also concur that the crisis will bring about sizable new growth prospects, although this differs greatly by industry. They strongly believe that they will surely use the innovation-related activities to be stabilised and return to normal and feel confident and prepared to deal with the changes they foresee.

Future of HR Technology

HR technology will be guided by fundamentals of employee psychology

HR technology will compensate for human weaknesses and enable human strengthsHR technology will enable employees to act more naturally

HR Technology will allow companies to coordinate and specialize HR activitiesHR technology will unleash the capability of an infinitely complex workforce HR technology will support people's capacity for adapting to change

Digital Transformation - Coin's Other Side
While we are concentrating more on the positive aspects of digital technology, critiques aboutits excessive use are also growing. In adjusting their tactics in response, governments should keep in mind that a greater reliance on digitalization runs the risk of creating new digital gaps, according to an OECD report. (OECD, 2020). The survey also shows that there is a significantskills gap between different demographic groups and nations. People with higher skill or financial levels use the Internet and online activities more effectively and have better access toinformation, employment opportunities, and amenities for health and education.

CONCLUSION
Although generation is a significant factor in the shift of operational software and human resources from effective human resource management to business operations, the cohort itselfis no longer the one responsible for these changes. Because HR technology is still in its early stages, analytics must be used to provide greater productivity, seamless transitions between roles, ethical testing, learning and development, competitive attraction, hiring ideal personnel,and an unending list of other goals.

Digitalization will be fundamental in the post-pandemic era, and it is essential to ensuring company resilience and boosting the economy. According to experts, the "New Normal" in the upcoming years will be much more tech-driven and create more significant issues. Consequently, businesses should be ready for a volatile commercial and economic environment. In the post-pandemic context, a highly prospective digital transformation strategy is essential to reviving business in terms of jobs and money. The technological innovation paradigm needs to be capable of making significant contributions to changes in how we live, work, and conduct business. We can adapt and meet the challenges in the new normal with resilience as we become more aware of the COVID-19 effects and the potential of digital technology and Industry 4.0 in helping to understand it.

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SYNTHESIS AND STUDIES ON ANTIBACTERIAL, ANTIOXIDANT ACTIVITIES OF N-HYDRO PYRAZOLINE DERIVATIVES

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ABSTRACT

A new series of Pyrazoline derivatives were prepared from halogenated chalcones and hydrazine hydrate using sodium hydroxide as base in ethanol. All the newly synthesized compounds were evaluated for their antibacterial activity in vitro against gram +ve bacteria S. aureus, B. subtilis and gram -ve bacteria P. aeruginosa, E. coli by Agar Well diffusion method. The tested compounds 6a, 6b, 6d were found to have good antibacterial activity as compared to standard Ciprofloxacin drug, while remaining compounds showed moderate to poor activity. Antioxidant activities of the compounds were determined by DPPH and Hydroxyl radical scavenging assay. The tested compound 6i was found to have good DPPH radical scavenging activity as compared to standard Ascorbic acid drug while remaining compounds showed moderate to weak activity. The tested compounds 6h, 6i were found to have good potential to scavenging hydroxyl radical as compared to α Tocopherol drug while remaining compounds showed moderate to weak activity. The chemical structures of the compounds were confirmed by IR, ^1H NMR, Mass, C^{13} NMR spectroscopic data.

Keywords: pyrazoline, hydrazine hydrate, antibacterial and antioxidant activity.

1. INTRODUCTION

Pyrazoline, among the various 5-membered heterocyclic compounds has drawn attention towards it because of its various pharmacological activities. pyrazolines are a five membered heterocyclic having two adjacent nitrogen atoms within the ring with only one endocyclic double bond and is basic in nature. A lot of research work has been done on synthesis and biological activities of various pyrazoline derivatives over the years.

Gram positive bacteria like S. aureus can cause several skin infections, chronic biofilm infections on medical transplants and the repressor of poison, food poisoning, bone and joint infection, bloodstream infections[1-6] Some B. subtilis strains are responsible for causing rope spoilage in bread dough and baked goods.[7] Gram negative bacteria like E. coli can cause food poisoning, gastroenteritis, urinary tract infection, neonatal, meningitis and diseases like diarrhea, hemorrhagic colitis by lethal strains are the common sight signs.[8-10] Pathogen like P. aeruginosa affecting resistant compromised patients. It is known as the foremost reason of illness and death in cystic fibrosis patients and as one of the leading causes of nosocomial infections.[11]

Antioxidant is the molecule that forbids the oxidation of other molecules. Human body has a multifaceted system of natural enzymatic and non enzymatic antioxidant action which reduces the unsafe effect of free radical and other oxidant. Free radical are responsible for producing disease like Cancer, Cardiovascular disease, Alzheimer's disease, mild cognitive impairment, Parkinson disease, and Ulcerative colitis.[12-13] Antioxidant- and antioxidant-nutrient-rich foods may be crucial in the fight against disease. By preventing disease, antioxidants may be very helpful in enhancing quality of life.

Pyrazoline derivatives display tremendous biological activities such as Antimicrobial, Antibacterial, Antifungal[14-18], Antioxidant, Anti-inflammatory, Analgesic[19-23], Anti-Cancer/ Antitumor/ Cytotoxic[24-28], Anti-HIV[29], Antiinfective[30], Anticonvulsant[31-32], Antiamoebic[33-34], Antileishmanial[35], Acetyl Cholinesterase inhibition[36], Anti-diabetic[37], Antitubercular[38]. The history of pyrazoline shows that it attracted many chemists to explore pyrazoline as a biologically active molecule. The study of biological evaluation of pyrazoline derivatives has been an interesting field of pharmaceutical chemistry.

In this work, a series of new derivatives of N-Hydro Pyrazoline were synthesized (**scheme 1)** and evaluated for their antibacterial actvity in vitro against gram +ve bacteria S. aureus, B. subtilis and gram -ve bacteria P. aeruginosa, E. coli by agar well diffusion method. antioxidant activities of the synthesized compounds were also determined by DPPH and Hydroxyl radical scavenging assay.

2. EXPERIMENTAL SECTION

2.1 Materials and Methods

The substituted chalcones **3(a-i)** were used for synthesis. The chemicals, hydrazine hydrate (99.9%), ethanol and potassium hydroxide were obtained from SD Fine chemical Limited and were used for the reaction without purification. Reflux method was used for synthesis of Pyrazolines **6(a-i)**. The Melting points of synthesized compounds were determined in open capillary tube using melting point equipment and were uncorrected. IR spectra recorded with Shimadzu FT-IR by KBr pellets. ^{1}H-NMR and C^{13}NMR spectra were recorded in deuterated (CDCl$_3$) at an Bruker 300 MHz spectrophotometer. MASS spectra were recorded at Pexciex API 2000 spectrometer.

2.2. General Procedure for Synthesis of Pyrazolines

A mixture of Chalcone **3(a-i)** and hydrazine hydrate in ethanol and NaOH was refluxed for 5-6 hrs and monitored by TLC using pet ether : ethyl acetate (7:3) as a eluent system. After completion of the reaction, the reaction mixture was cooled at room temperature and poured in crushed ice or cold water. The separated solid was filtered, washed with ethanol then dried and recrystallized from ethanol. **6(a-i).** The spots were visualized in an ultraviolet light chamber at λ=254-266 nm. The structures of synthesized substituted N-Hydro Pyrazoline compounds **6(a-i)** were confirmed by spectral analysis (IR, 1HNMR, MS and C^{13}NMR)

.**Scheme (1): Synthesis of substituted N-Hydro Pyrazolines 6(a-i).**
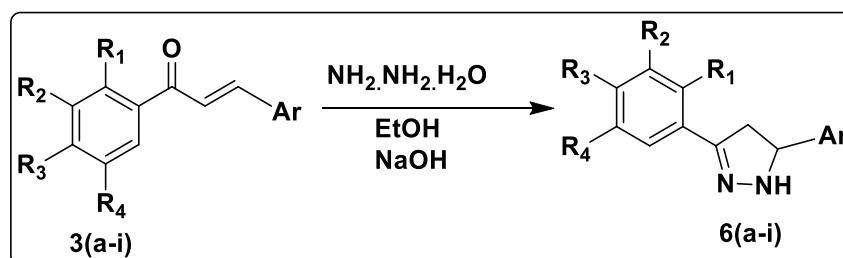
Table No. 1. Substitution Pattern of substituted N-Hydro Pyrazolines 6(a-i).

Entry	Product	R$_1$	R$_2$	R$_3$	R$_4$	Ar
1	**6a**	OH	Br	H	Br	4-Cl Benzaldehyde
2	**6b**	OH	Br	H	Br	4-Br Benzaldeyde
3	**6c**	OH	Br	H	Br	Thiophene -2-aldehyde
4	**6d**	H	Br	OH	Br	4-Cl Benzaldehyde
5	**6e**	H	Br	OH	Br	4-Br Benzaldeyde
6	**6f**	H	Br	OH	Br	Thiophene -2-aldehyde
7	**6g**	OH	Br	OH	Br	4-Cl Benzaldehyde
8	**6h**	OH	Br	OH	Br	4-Br Benzaldeyde
9	**6i**	OH	Br	OH	Br	Thiophene -2-aldehyde

Table 2. The Physical data of synthesized substituted N-Hydro Pyrazoline compounds are tabulated as in the Table 4.2. 6(a-i)

Entry	Product	M/F & M/W	Yield %	M.P.(°C)	R$_f$ Value	Color	Nature
1	**6a**	C$_{15}$H$_{11}$Br$_2$ClN$_2$O (430)	84	164-166	0.84	Orange	Crystalline
2	**6b**	C$_{15}$H$_{11}$Br$_3$N$_2$O (474)	74	142-144	0.78	White	Crystalline
3	**6c**	C$_{13}$H$_{10}$Br$_2$N$_2$OS (402)	80	157-159	0.64	Faint Red	Crystalline
4	**6d**	C$_{15}$H$_{11}$Br$_2$Cl N$_2$O (430)	82	168-170	0.52	Yellowish	Crystalline
5	**6e**	C$_{15}$H$_{11}$Br$_3$N$_2$O (474)	74	161-163	0.50	White	Crystalline
6	**6f**	C$_{13}$H$_{10}$Br$_2$N$_2$OS (402)	78	191-193	0.62	Light Green	Crystalline
7	**6g**	C$_{15}$H$_{11}$Br$_2$ClN$_2$O$_2$ (446)	76	145-147	0.80	Purple	Crystalline
8	**6h**	C$_{15}$H$_{11}$Br$_3$N$_2$O$_2$ (490)	70	151-153	0.48	Greyish	Crystalline
9	**6i**	C$_{13}$H$_{10}$Br$_2$N$_2$O$_2$S (418)	72	159-161	0.54	White	Crystalline

2. 3. Spectral data of synthesized N-Hydro Pyrazoline compounds:

2.3.1: 2,6-dibromo-4-(5-(4-bromophenyl)-4,5-dihydro-1H-pyrazol-3-yl) phenol

(Compound No. 6e)
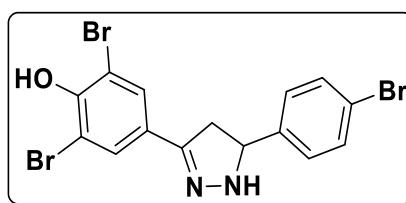
IR (KBr) cm^{-1} :3471(-OH str.), 3386 (-NH str.), 1581(-C=N str.),

1485(-CH=CH str.), 1438 (-C=C str.),

559-690 (C-Br str.)

^{1}H NMR :11.50 (s, 1H, -OH, D_2O exch.), 7.7-7.9 (m, 6H, Ar-H)

(CDCl$_3$)(δ ppm) :6.5 (s, 1H, NH, D_2O exch.), 3.00-3.10 (dd, 1H,

H_A), 3.6-3.7 (dd, 1H, H_B), 4.4-4.5 (dd, 1H, H_X),

MS (m/z) :473 (M-1).

2.3.2: 2,4-dibromo-6-(5-(4-chlorophenyl)-4,5-dihydro-1H-pyrazol-3-yl) benzene-

1,3-diol. (Compound No. 6g)
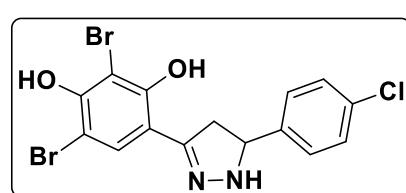
IR (KBr) cm^{-1} :3417 (-OH str.), 3316 (-NH str.), 1589(-C=N str.),

1488 (-CH=CH str.), 1423 (-C=C str.),

758(C-Cl str.), 678 (C-Br str.),

^{1}H NMR :12.9 (s, 1H, -OH, D_2O exch.), 11.5 (s, 1H, -OH,

(CDCl$_3$)(δ ppm) D_2O exch.), 7.8 (s,1H,Ar-H), 7.5-7.7 (m, 4H , Ar-

H), 6.5 (s, 1H, NH, D_2O exch.), 2.9-3.1 (dd, 1H,

H_A), 3.5.-3.7 (dd, 1H, H_B), 4.4-4.5 (dd, 1H, H_X),

MS (m/z) : 445 (M-1).

^{13} C NMR (CDCl$_3$) (δ ppm) :
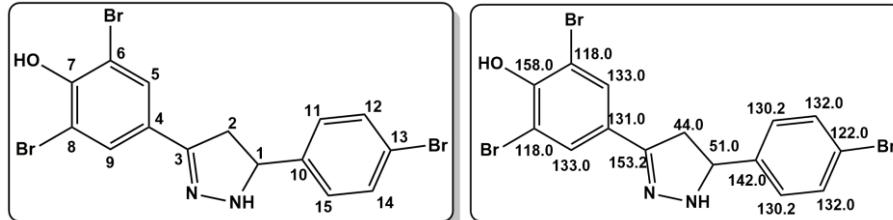
The total no. of carbon atoms in compound **6e** are 15 but carbon no. 5,9 6,7, 11,15 and 12,14 of Aromatic ring are equivalent, remaining 7 carbon atom are non-equivalent in nature, hence it shows 11 peaks in its ^{13}C NMR spectrum. The peak at 158 ppm (C$_7$) is due to C-OH carbon atom of aromatic ring. The peak at 44 ppm (C$_2$) and 51 ppm (C$_1$) shows the presence of -CH$_2$ and -C-NH carbon of pyrazoline ring respectively. The peak appeared at 153 ppm (C$_3$) is due to imine carbon (C=N) atom. The values appeared at 142 (C$_{10}$), 133 (C$_5$ & C$_9$), 132 (C$_{12}$ & C$_{14}$), 130 (C$_{11}$ & C$_{15}$), 131 (C$_4$), 122 (C$_{13}$) and 118 ppm (C$_6$ & C$_8$) are due to aromatic carbons.

3. RESULT AND DISCUSSION

3.1. Chemistry

This article describe a base catalyzed method for synthesis of Pyrazolines by the reaction of Chalcone and Hydrazine Hydrate in presence of sodium hydroxide in ethanol as solvent. The progress of the reaction was monitored by TLC. The synthesized Pyrazolines were poured in ice cold water and neutralized with dil. HCl solution. The obtained solid was filtered, washed with water and recrystallized from ethanol (**scheme 1**). The substitution pattern and physical data of synthesized compounds **6(a-i)** is given In **Table 1 and 2** .

3.2. Antibacterial Activity Of Synthesized N-Hydro Pyrazoline Compounds.

The 2-Pyrazolines synthesized from Hydrazine hydrate and Phenyl hydrazine, were screened for antibacterial activity against different bacterial strains. Microbial Suspension of (100 uL) containing 108 cfu mL-1of bacteria on Mueller-Hinton agar (MHA) medium was used. The extracts were diluted in 100% Dimethyl Sulphoxide at the concentrations of 5mg/ml. The Mueller Hinton agar was melted and cooled to 48-50 ^{0}C and standardized inoculums (1.5 X 108 cfu/ml, 0.5 McFarland) was added aseptically to the molten agar and pours in to sterile petri dishes to yield solid plate. Well were prepared in the seeded agar plate. The compound whose activity was to be checked, it was introduced in the well (6mm). The plates were incubated in the incubator over night at 37^0C. The antibacterial spectrum of the extract was determined for the bacterial species in term of zone sizes around each well. The diameters of zone of inhibition produced by the compound were compared with standard Ciprofloxacin where as DMSO is used as negative contro[39.] The results were recorded in **Table 3**.

Table 3. Antibacterial activity of N-Hydro Pyrazoline compounds 6(a-i).

Sample	Diameter of zone of inhibition (mm)			
	Gram +ve Bacteria		Gram –ve Bacteria	
	B. subtilis	S. aureus	E. coli	P. aeruginosa
6a	**21**	**22**	**16**	**24**
6b	15	**19**	13	18
6c	07	10	-	-
6d	**19**	**21**	**15**	**20**
6e	11	15	11	17
6f	-	08	07	-
6g	10	13	09	15
6h	09	10	-	13
6i	-	-	07	07
Ciprofloxacin (Standard)	26 mm	30 mm	20 mm	28 mm

Among the N-Hydro Pyrazolines **6(a-i),** compounds **6a, 6d** showed good antibacterial activity against gram positive bacteria B. subtilis. while compound **6b**, compounds **6c, 6e, 6g, 6h** showed weak activity and **6f, 6i** doesn't show antibacterial activity against B. Subtilis pathogen. Compounds **6a, 6d, 6b** showed good antibacterial activity against gram positive bacteria S. aureus while compound **6e**, showed moderate activity. Cmpounds **6c, 6f, 6g, 6h,** showed weak activity and **6i** doesn't show antibacterial action against S. aureus pathogen. Compounds **6a, 6d** showed good antibacterial activity against gram negative bacteria E. coli while compounds **6b**, **6e** showed moderate activity. Compounds **6g, 6h, 6f,** showed weak activity and **6c, 6h** doesn't show antibacterial activity against E. coli pathogen. **6a, 6d,** compounds showed good antibacterial activity against gram negative bacteria p. aeruginosa while compounds **6b, 6e, 6g** showed moderate activity. Compounds **6h, 6i**, showed weak activity and **6c, 6f** doesn't show antibacterial action against p. aeruginosa pathogen. The antibacterial study of N- Hydro pyrazoline 6(a-i) has compared with Ciprofloxcin as a standard drug.

However, some substitution pattern may influence the antibacterial activity. The data **(Table-1)** reveals that the Pyrazoline compounds **6a, 6d**, **6b** exhibited good zone of inhibition in millimeter that means these compounds prohibit growth of gram positive as well as gram negative bacteria, due to N-hydro Pyrazoline ring, three electron withdrawing group i.e two bromine at 2, 4 position in one aromatic ring, one electron withdrawing group Chlorine at 4th position in another aromatic ring and one phenolic -OH group near Pyrazoline ring. The compounds **6e, 6b, 6g** showed moderate zone of inhibition in mm that means these compounds prohibit some what less growth of above said bacteria as compare to the **6a, 6d, 6b** due to three electron withdrawing group i.e two bromine at 2, 4 position in one aromatic ring, one bromine at 4th position in other aromatic ring and one phenolic -OH group away from N- hydro Pyrazoline ring. The compounds **6c, 6g, 6i** showed weak zone of

inhibition that means these compounds inhibits very less growth of bacteria due to two electron withdrawing groups i.e bromine and one thiophenyl ring, which has less electron withdrawing effect as compared to chloro and bromo phenyl ring.

3.3 Antioxidant activity of synthesized N-Hydro Pyrazoline compounds 6(a-i).

Newly synthesized compounds were tested for their antioxidant activity using DPPH radical scavenging assay and hydroxyl radical scavenging assay.

3.3.1. DPPH Assay:

DPPH (2, 2, diphenyl-1-picrylhydrazyl) radical scavenging assay was carried out as per reported methods with slight modification.[40] 1ml of test solution (Test compound) added to equal quantity of 0.1mM solution of DPPH in ethanol. After 20 min of incubation at room temperature, the DPPH reductions were measured by reading the absorbance at 517 nm due its odd electron.[41] The compounds (hydrogen donors) that interact with DPPH radicals reduce the radicals to corresponding hydrazines.[42] Ascorbic acid was used as reference compound.

The DPPH radicals scavenging activity was calculated according to the following equation:

Radical scavenging activity (%) =A control –A sample/ A control x 100

Where A control is the absorbance of the control (Ascorbic acid) and A sample is the absorbance of tested compound.

3.3.2. Hydroxyl Radical Scavenging Assay:

Hydroxyl radical scavenging activities were determined by the earlier reported method.[43] The reaction mixture contained 60 µl of 1 mM, $FeCl_3$, 90 µl of 1 mM 1,10-Phenanthroline, 2.4 ml of 0.2 M phosphate buffer (pH 7.8), 150 µl of 0.17 M H_2O_2, and 1.5 ml solution of individual compound. Reaction mixture was kept at room temperature for 5 min in incubation and absorbance was measured at 560 nm using spectrophotometer, α-Tocopherol was used as reference compound.

The hydroxyl radicals scavenging activity was calculated according to the following equation:

% Inhibition = $[(A_0-A_1)/A_0 \times 100]$

where A_0 was the absorbance of the control (α-tocopherol) and A_1 was the absorbance of tested compounds.

Table 4. Antioxidant activity of 2-pyrazoline compounds (6a-i)

Sample	DPPH radical scavenging assay (%)	OH radical scavenging assay(%)
6a	24.13±0.54	38.67±0.59
6b	44.75±0.67	48.45±0.33
6c	52.13±0.38	58.66±0.55
6d	22.46±0.55	34.45±0.36
6e	28.60±0.66	42.29±0.24
6f	46.39±0.84	53.50±0.42
6g	62.67±0.78	65.31±0.40
6h	66.36±0.25	**69.46±0.39**
6i	**75.55±0.35**	**77.58±0.75**
Standard	**93.11±0.15** **Ascorbic acid**	**90.87±0.98** **α Tocopherol**

DPPH Radical Scavenging Activity Of N-Hydro Pyrazoline Compounds:
All of the tested compounds showed DPPH radical scavenging activity i.e., antioxidant activity. Among the tested compound **6i** was found to be good DPPH radical scavenger while moderate effect was found in compounds **6h, 6g, 6c, 6b**. the compounds **6a, 6d, 6e, 6f** showed weak DPPH Radical Scavenging activity.

The DPPH scavenging activity order of the tested compounds was 6i > 6h > 6g > 6c > 6f > 6b > 6e > 6a > 6d.

Hydroxyl radical scavenging activity of N-Hydro Pyrazoline compounds:
All the compounds 6(a-i) were screened for hydroxyl radical scavenging activity. the good hydroxyl scavenging activity attributed in part of more phenolic OH group present in the compounds **6i, 6h.** the weak effect was found in compounds **6g, 6c, 6f, 6b**. The compounds **6a, 6d, 6e** showed weak potential to scavenging hydroxyl radical.

The hydroxyl scavenging activity order of the tested compounds was 6i > 6h > 6g > 6c > 6f > 6b > 6e > 6a > 6d.

4. CONCLUSION

In summary, a new series of N Hydro pyrazoline derivatives **6(a-i)** were synthesized by the reaction of chalcones and hydrazine hydrate with good to moderate yield. These pyrazoline compounds were analysed by their physical constant and spectroscopic data. In-vitro antimicrobial behaviour was studied by Agar Well diffusion method using two gram +ve and –ve bacteria. the compounds **6a, 6b, 6d** showed good antibacterial activity against all four pathogen whereas remaining compounds exhibited moderate to weak antibacterial activity as compared to standard. Compounds **6h, 6i** showed good antioxidant or DPPH radical scavenging activity. compound **6i** showed good antioxidant or OH radical scavenging activity. It can be concluded that the electron withdrawing groups enhances antibacterial action and more hydroxyl groups present in a pyrazoline compound increase the antioxidant activity.

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OSTEOARTHRITIS: MANAGEMENT

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ABSTRACT

Osteoarthritis is one of the most common musculoskeletal diseases today. It is one of the leading causes of dysfunction that affects quality of life. Osteoarthritis is a very common disease affecting joint cartilage. Pain relief, improved joint function, and joint stability are the main goals of treatment. Weakness and muscle atrophy contribute to the progression of the disease. The diagnosis is based on a history of joint pain worsened by movement, which may result in disability in activities of daily living. Plain radiography, magnetic resonance imaginig, ultrasound, laboratory testing may help in diagnosis. This article presents on overview of the current knowledge on osteoarthritis sign and symptoms, diagnosis, treatment strategies are discussed.

Keywords: Osteoarthritis, Musculoskeletal, Plain radiography, Treatment

INTRODUCTION

Osteoarthritis is a common chronic, inflammatory joint disease that most often affects middle age to elderly people. It is commonly referred as "wear and tear" of joints; OA is now recognized as a disease that affects the entire joint, including the cartilage, joint lining, ligaments, and bone. Although it is more common in elderly person, it is not really accurate to say that the joints are just "wearing out". It is characterized by the breakdown of cartilage, bony alterations in the joints, tendons and ligaments deterioration and varying degrees of inflammation of the joint lining (called the synovium). Osteoarthritis most commonly affects the hands, lower back, neck, and weight- bearing joints such as knees, hips, and feet. Osteoarthritis affects just joints, not internal organs. Treatment for osteoarthritis aims to relieve pain and enhance function. There is no cure for the osteoarthritis, but some treatments may slow disease progression [1].

SIGNS AND SYMPTOMS

1. Pain
The most prevalent symptom is chronic pain, the concentration of Excitatory Amino Acids (EAA), particularly glutamate; rises during the development of knee joint inflammation which is released from the sensory neurons in the spinal cord contribute to hyperalgesia and pain in the afflicted location. The pain tends to worsen with activity, especially following a period of rest; this has been called the gelling phenomenon [2].

2. Joint Stiffness
Osteoarthritis usually presents as morning stiffness, but it usually lasts for less than 30 minutes. Patients may also complain of asymmetric joint locking and/or joint instability. The concept of joint stiffness in arthritis and related disease was introduced in the early 1960s. It is shown that Surface Active Phospholipid (SAPL) (synovial surfactant) are capable of reducing friction to very low levels and providing excellent mobility, this lining is deficient in osteoarthritis and lead to stiffness of joint [3,4].

3. Muscle Weakness
Quadriceps muscle strengthening is a vital function in knee joint protection. According to cross-sectional studies, strength is related to physical function and that increasing quadriceps strength reduces pain and improves function. A study suggests that thigh muscle strength may protect the knee joint against damage and slow down the progression of osteoarthritis [5]. An Atherogenic Muscle Inhibitor (AMI) is a presynaptic, continuous reflex inhibition of muscle activity in the joint that occurs following significant joint damage. It inhibits quadriceps strength and prevents their full activity. Weak quadriceps have been linked to a greater rate of force being applied to the knee joint. AMI is induced by activation in numerous inhibiting pathways, and the severity of the condition varies depending on the amount of joint damage [6].

4. Bone Enlargement And Swelling
Pathological alterations in articular cartilage in the knee joint caused by a variety of factors result in soft tissue blockage and edema, blood circulation disturbances, chondrocyte erosion and damage, and even increased bone density and cystic abnormalities resulting in swelling and pain [7].

Diagnosis

Osteoarthritis is primarily a clinical diagnosis hence physicians can confidently make the diagnosis based on the history and physical examination in most cases presented. But tests to be performed to support the diagnosis and rule out other etiologies [8,9].

1. Plain Radiography

Radiograph findings such as asymmetric joint space narrowing, osteophyte formation, subluxation, subchondral sclerosis, and distribution patterns of osteoarthritic changes, is beneficial for the diagnosis [10].

2. Magnetic Resonance Imaging (Mri)

Rarely required unless the diagnosis is uncertain or there is a need to understand early disease onset and the natural history of the disease. Bone, cartilage, menisci, labrum, ligaments, and all soft tissues are three dimensionally evaluated.

3. Ultrasound

Extremely sensitive for detecting synovial cysts that occasionally form in osteoarthritis patients. Ultrasound evaluates the ligaments and tendons around the joint, which can be strained or torn because of osteoarthritis.

4. Laboratory Testing

Markers of inflammation (erythrocyte sedimentation rate and C-reactive protein level), Immunologic tests (antinuclear antibodies and rheumatoid factor) required if there is any indication of joint inflammation or synovitis. Uric acid level is suggested only if gout is suspected [11].

Treatment

The current treatment for OA, which includes both non-pharmacologic and pharmacologic approaches is primarily focused on pain relief and functional improvement.

Non-Pharmacologic Therapy

1. Exercise

Patients with OA often avoid physical activity due to pain, which leads to muscle atrophy and increased stress on the joints. Inactivity caused by osteoarthritis pain reduces the muscle mass surrounding the joint, causing it to become unstable. Aerobic capacity is also lowered, raising the risk of obesity. Muscle strength and endurance, flexibility and joint motion, and aerobic activity all benefit from exercise [12].

2. Weight Loss

Weight loss reduces pain, enhances physical activity, and changes the structure of the joint cartilage. Weight loss improved joint pain, stiffness, and function in early randomized controlled trials (RCTs).Some trial showed that, significant weight loss (20% of body weight) induced by surgery in morbidly obese patients with knee osteoarthritis not only improved pain and function, but also reduced markers of inflammation, it has been shown to have a structural effect on cartilage. However, voluntary and involuntary weight loss in older patients results in loss of muscle and bone mass, leadingto an increased risk of falls and fractures. Weight loss should be prescribed in elderly patient with extreme caution and under expert guidance, and only for those who are obese [13].

3. Ice and Heat

Regular application of superficial heat or cold is a relatively safe and inexpensive treatment and can be recommended for patients with knee osteoarthritis alone or in combination with other treatments.

Ice is essential for acute pain and is also beneficial after exercise. Ice therapy promotes capillary vasoconstriction, which reduces blood flow and metabolic activity, reducing inflammatory edema and providing analgesia. It is the safest anti-inflammatory "medicine," but it requires discipline to use effectively. It is reasonable to apply ice for 10-20 minutes after an activity.

Heat increases capillary blood pressure and cellular permeability, resulting in increased swelling and edema. After the swelling and edema phases have stabilized, heat should be applied. Heat has the effect of increasing blood flow and local metabolic activity while also relaxing muscle spasms [14,15].

Pharmacologic Therapy

1. Analgesics

Paracetamol is used first line up to a dose of 1g four times a day. It is safe and effective treatment for patients with mild-to-moderate osteoarthritis. Paracetamol has no significant anti-inflammatory activity. Among analgesics, it's generally viewed as the safest on gastric mucosa, blood pressure, and renal function. A recent

study, however, showed that acetaminophen has an impact on both COX-1and COX-2, which raises concern regarding long-term safety [16].

2. Non-Steroidal Anti-Inflammatory Drugs (Nsaids)

All oral NSAIDs, selective or nonselective, should be prescribed with caution in the elderly because of their adverse effects on the kidneys, blood pressure (similar to COX2 inhibitors), cardiovascular system and gastrointestinal tract. NSAIDs are more effective than acetaminophen in controlling pain, but in one study the effect was small; on the other hand, the side effects are significantly higher. All NSAIDs are thought to have similar analgesic effects, with an analgesic effect of about 30% and an improvement of function of about 15%. Renal and gastrointestinal side effects are a major cause of morbidity and mortality, especially in the elderly. If the patient is at risk for peptic ulcer disease, a gastroprotective agent in the form of an H2 antagonist, misoprostol, or a proton pump inhibitor should be prescribed [17].

The rate of significant upper gastrointestinal complications was reduced by 50% in the Rofecoxib group, but there was a significant excess of myocardial infarction in this group. There are concerns that the loss of antiplatelet activity with the coxib class of drugs may contribute to an excess of cardiovascular complications, particularly in the elderly, who are at high risk for thrombosis, Brain and heart. They should not be used as first-line therapy in these patients and should be avoided if the patient is taking aspirin [18].

3. Intra-Articular Corticosteroids

Intra-articular steroids have a rapid onset of action (several days) and a relatively short duration of action (3-4 weeks), unlike Hyaluronic acid, which has a slower acting and longer duration of action. According to most studies in the literature, intra-articular steroid injections show better pain relief without improving function. For obvious reasons, this treatment option should not be used for the management of osteoarthritis itself but can be a useful adjunctive treatment when additional palliation is needed [19].

4. Hyaluronic Acid Derivatives

Hyaluronic acid is a polysaccharide with a high molecular weight that is found in large amounts in synovial fluid and cartilage. In osteoarthritis, the molecular weight and quantity of hyaluronic acid decreases. Intra-articular injections of hyaluronic acid increase the viscosity and elasticity of synovial fluid. It is safe and well tolerated, but it is costly. Molecular weight is high. HA is administered once every 3-5 weeks and has a delayed onset but long-lasting impact (up to 3-6 months). Many studies, but not all demonstrate that HA can reduce pain and increase physical activity [19,20].

Surgery

Surgical treatments, when used for the proper indications, offer patients a good potential solution for their ar- thritis and allow for a return to athletic activities.

Surgical treatments, when used with proper indications, offers patient a good potential solution for their arthritis and allow for a return to normal activity but must be explored when nonsurgical measures fail. Various surgical procedures can be performed based on individual criteria, including arthroscopic debridement, high tibial osteotomy, monocondyle replacement, patellofemoral replacement, unicondylar knee arthroplasty or total knee arthroplasty [21,22,23].

- **High Tibial Osteotomy (Hto)**

Attractive option in the attempt to prolong lifespan of the affected joint. The basic premise of HTO is to redirect the mechanical axis from the degenerated weight bearing load is shifted from worn out compartment, passed through healthier cartilage of relatively well preserved compartment.

- **Unicondylar Knee Arthroplasty (UKA)**

Patients indicated for UKA are classically low demand patients aged >60 years who have low body mass index, intact ligamentous structures, isolated medial compartment osteoarthritis with no extension or flexion contractures.

- **Total Knee Arthroplasty (TKA)**

Results have got better significantly with advancements in polyethene durability and prosthesis design. Improvements in design have led to 90% survivorship rates at 10 to 15 years as well as better pain relief and functional recovery. Even with good medical results with long term follow up in older patients, TKA is usually reserved as last treatment option, especially in younger and active patients as it could associate with dysfunction, weakness, psychological distress, and comorbidities with inadequate surgical outcomes.

CONCLUSION

Osteoarthritis is the most common form of arthritis, and it is a major public health concern worldwide one of the foremost causes of chronic disability in older adults. The symptoms are often associated with significant functional impairment, as well as sign and symptoms of inflammation, including pain, joint stiffness, muscle weakness, bone enlargement and swelling. Exercise, weight loss, ice and heat reduce pain and improve muscular strength, and functional ability. Robust outcome measures are needed to assess the efficacy of any disease modifying osteoarthritis drug in the future.

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MAPPING OF RECENT RESEARCH OUTPUT ON CORONAVIRUS: A REVIEW LITERATURE

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ABSTRACT

Scientometric research is one of the most effective approaches for quantitatively evaluating scientific research outputs of important information and citation databases for understanding and monitoring the state of scientific publications in many topic areas. The study exposes numerous elements of Coronavirus Disease literature, including year-by-year distribution, growth parameters, literature doubling time, geographical distribution, organisational distribution, language distribution, form distribution, most prolific authors, and source distribution. This systematic review on Coronavirus examined the research literature published in 26 peer-reviewed articles published during 2020-2021.

Keywords: Scientometric Study, Coronavirus, COVID-19, SARS, MERS, Review Literature

1. INTRODUCTION

Bibliometrics is the study of books, papers, and other publications using statistical methods. In the subject of library and information science, bibliometric approaches are extensively utilised. The sub-discipline of bibliometrics that deals with the examination of scientific publications is known as Scientometric. Scientometric is related to and has overlapping interests with Bibliometrics and Informetrics. "Scientometric" is the English translation of the title word of Nalimov's classic monograph Naukometriy in 1969, which was relatively unknown to western scholars even after it was translated into English.

Coronaviruse is a group of related RNA viruses that cause diseases in mammals and birds. In humans and birds, they cause respiratory tract infections that can range from mild to lethal. Mild illnesses in humans include some cases of the common cold (which is also caused by other viruses, predominantly rhinoviruses), while more lethal varieties can cause SARS, MERS and COVID-19, which is causing an ongoing pandemic. In cows and pigs they cause diarrhea, while in mice they cause hepatitis and encephalomyelitis.

2. REVIEW OF LITERATURE

Malik, A. A. Et Al., (2021)[1] Infectious diseases remain a complex, recurring, and challenging a threat to the public's health Coronaviruses have had a wide range of effects on people's health, mobility, and socioeconomic status. Despite the importance and size of the influence of epidemics to pandemics, there is a paucity of material on comprehensive coronavirus research performance across time. The purpose of this study was to conduct a scientometric analysis of coronavirus-related literature, including COVID-19. The Web of Science was used to gather information about coronavirus studies (WoS). We included and retrieved all categories of articles (28,846). The "R-Bibliometrix" software was used for extensive analysis examining a wide variety of metrics to quantify the amount and quality of the articles. In general, an upward tendency has been noted over time, with the United States and China leading the way, followed by the United Kingdom, Europe, and a few other developed nations. Only the first six months of 2020 supplied roughly 46.5 percent of total papers, whereas the previous two decades contributed around 39.5 percent. Networking was shown to be mostly between affluent countries, with modest contributions from resource-limited countries, suggesting that more collaboration is required. The recent post-COVID publishing increase is at an all-time high, unprecedented, and fast increasing. The current COVID-19 epidemic, according to the authors, should serve as a wake-up call for more collaborative, worldwide research.

Pal, J. K. (2021)[2] The new coronavirus study has produced a lot of scholarly material. Over the course of five months, a total of 14,588 scientific papers regarding nCoV-2 and COVID-19 were produced (as indexed in Scopus on 31 May 2020). Such a knowledge explosion has sparked a lot of curiosity in learning more about the research environment in this newly constituted sector. This work uses quantifiable elements of the published dataset to establish scientometric dimensions of the new coronavirus (2019-nCov) research. The rate of publishing increase (1600 percent) is highly important in the researchers' synergic response to combating the most extensive sequence of an RNA virus, according to the findings. In fact, they've increased their output to an average of 100 pieces every day. Many scientific publishers have made their preprint servers public in order to make their articles instantly available, even if Open Access is enabled. More than 500 journals from 240 academic publishers have published the scientific content. While the top 10 publishers accounted for about 70% of the publications, around 25% of the research were funded by 300 different organisations. Finally, it analyzed the publications' impact to showcase the most influential contributions of the new coronavirus research.

Hussain, A. Et Al., (2021)[3] the study's main purpose was to map Cerebral Palsy (CP), 1990-2020 bibliometric study of highly cited scientific output All records linked to CP were retrieved via the web of science database. The reviews' Impact Factor was calculated using the IF2019 edition of Clarivate Analytics' Journal Citation Report (JCR). The Hirsch Index (h-Index) was created using a database of the most active writers and organisations. Biblioshiny, ScientoPy, and VOS viewer all exploited co-citation networks connecting efficient writers of highly cited publications. The most influential country in submitting publications was the United States, with the Royal Children's Hospital Melbourne (Australia) being the most productive institution, according to the study's major findings. The journals Developmental Medicine and Child Neurology contain the most papers on CP research. It may open up new avenues for future study, such as mapping CP literature research output: a bibliometric analysis of article publishing in a certain nation or continent.

Colavizza, Giovanni Et Al., (2021)[4] As the COVID-19 epidemic spreads, scientists from all fields are banding together to share their knowledge. CORD-19, a collection of COVID-19 and coronavirus papers, has been made public, along with requests for assistance in mining the data and developing tools to better search it. On social media, CORD-19 items from 2020, particularly editorials and letters, are disproportionately popular. While we support the CORD-19 effort wholeheartedly, it's vital to note that CORD-19 encompasses more than COVID-19 and coronavirus research.

Atlasi, R. Et Al., (2021)[5] in this research, There were 56,402 records and 309 hot papers recovered in all. Three of the hottest publications were in the field of endocrinology. Original papers were the most prevalent kind of publishing, with editorial articles coming in second. The United States had the most documents released, followed by China. The first and second sources were ranked as "British Medical Journal" and "Journal of Medical Virology," respectively. The top-ranked organisation with a high proportion of scientific publications was "Harvard University," while the top-ranked journal with highly-cited pieces was "the Lancet." COVID-19 literature is expanding at a rapid pace.

Surulinathi, M., Prasanna Kumari, N. and Jayasuriya, T., (2021)[6] As per the Web of Science database, a total of 433 publications were published on Covid19, which received 52567 citations between 1989 and 2020 Each publication received an average of 121.4 citations. The study reached its pinnacle in 2020, with 97 publications (all of which earned at least 500 citations) and the largest amount of citations (14623). It was discovered that the number of publications is increasing at an exponential rate. This might be due to a new branch of research aimed at unravelling the mysteries behind the Covid-19 Vaccine. The scientists published 18 single-author papers and 2906 multi-author collaborative papers. The Citing Articles (References) Index is 15055, while the Collaboration Index is 7.05.

Ay, M.O. Et Al., (2021)[7] Coronavirus disease 2019 (COVID-19) caused by the novel coronavirus SARS-CoV-2 has been the focus of study across the world since it was proclaimed a pandemic. COVID-19 vaccine research, in particular, has been a source of optimism for everyone. The goal of this study was to use the Web of Science Core Collection Database to analyse the whole literature and present the current status of COVID-19 vaccination material. On January 20, 2021, we entered the keywords "COVID-19" and "vaccine" into the Web of Science Core Collection Database. We looked at Web of Science categories, document kinds, organisations, funding agencies, authors, journals, countries, languages, and study topics. The analysis included a total of 2,765 papers with a total of 24,202 citations. The majority of the articles were written by the authors themselves. The top three categories were Immunology, General Internal Medicine, and Experimental Medicine Research. Harvard University, the University of California System, and the University of London were the most prolific universities. The author with the most publications was Dhama K., followed by Mahase E. and Baric RS. The Journal of Biomolecular Structure Dynamics has the most articles published. The majority of the material was written in English. The most productive country was the United States of America, followed by China and India. Vaccine research is a rapidly expanding sector that is critical in the battle against COVID-19. Researchers may be able to determine the future viewpoint by doing detailed analysis of vaccination articles.

Surulinathi, M. Et Al., (2021)[8] The study examines India's performance based on its publication output in Covid-19 during 2020-2021, based on several parameters, including the, institutional profiles of Papers with a lot of citations and the most prolific writers. The study makes use of Covid-19 data from the Web of Science international interdisciplinary bibliographical database, which spans two years. All India Institute of Medical Science has 489 publications (1266 citations), Post Grad Inst Med Educational & Res has 171 (666 citations), Dr. DY Patil University has 85 (382 citations), Indian Institute of Technology has 54 (349 citations), Manipal Academy of Higher Education has 59 (279 citations, and Banaras Hindu University has 56 (279 citations (171 Citations). Kumar A from Armed Forces Medical College, Dept Ophthalmology, Pune (Maharashtra state) has 115 publications and 372 citations (H-Index 10), Wiwanitkit from Dr DY Patil Univ, Pune (Maharashtra state)

has 91 publications (411 citations) (H-Index 11), Kumar S from Jai Narayan Vyas Univ, Jodhpur (Rajasthan state) has 85 publications (421 (359 Citations).

Danesh, F. and Ghavi Del, S. (2020)[9] this applied research was carried out using scientometrics methods and an analytical approach. The statistical population of this article includes 5128 Documents on the topic of coronaviruses indexed on the World Wide Web from 1970 to 2019. Excel 2016 was used to examine the keywords collected from MeSH. According to data analysis, the year with the most science production was 2005, while the year with the most citations was 2019.

Ram, S. (2020)[10] Coronavirus (CoV) is a big virus family that causes respiratory and intestinal illness in humans and animals. Due to its recent breakout at the start of the year 2020, it has become an issue in the China area. The present outbreak of coronavirus illness (COVID) has become lethal, confining residents of China's Wuhan province to their homes. When Severe Acute Respiratory Syndrome (SARS-CoV) spread in Hong Kong and Middle East Respiratory Syndrome (MERS-CoV) expanded in the Middle East Region in 2003, the two kinds of CoV became pandemic. Using the SCOPUS database, this bibliometric analysis attempts to trace the trends in research related to "Coronavirus" over a 50-year period. The analysis was conducted using the term Coronavirus, and the results were assessed for yearly growth, productive nations, institutions, authors, journals, highly cited publications, and research emphasis.

Singh, S. (2020)[11] the ongoing threat to the mankind is COVID-19 has shaken the whole world and till date there is no solution for the same. COVID-19 is a new form of coronavirus. There is need of research on COVID-19 to find the antidote/vaccine. As per WHO (4 April 2020)1,056,159 Confirmed cases and 57,206deaths from 208 countries have been reported. Thus, to analze the research trend on COVID-19, the bibliometric analysis has been done on COVID-19 literature extracted from the web of science database for the period of 1st Jan to 31st March 2020. The analysis showed that there are 489 documents and top most sources publishing on COVID are BMJ and Lancent.

Varshney, M. et al., (2020)[12] there were a total of 1106 responses from around 64 cities in the country. Four hundred and fifty-three of the replies had at least one missing item, thus they were removed from the analysis. The average age of the respondents was roughly 41 years old, with a male to female ratio of 3:1 and about 22% of respondents working in health care.

Senel, E. and Topal, F. E. (2020)[13] our main source for this study was Web of Science Collection database. All items published between 1980 and 2019 were included. A distribution map of global scientometric networks and production in coronavirus publications were created. The most productive countries were the United States, China, Germany, the United Kingdom, and the Netherlands. Except for a few nations in Asia and Africa, coronavirus literature has been published from practically every country on the planet.

Ram, S. and Nisha, F. (2020)[14] in this paper, an analysis of 806 highly cited articles was carried out based on the data retrieved from SCOPUS multidisciplinary database on 'Coronavirus' Between 1970 and 2020, research was published. To retrieve data from the fields title, abstract, and keyword, the phrase 'Coronavirus' was utilised. Furthermore, the citation life cycle of highly cited publications, as well as the performance of authors, institutions, countries, and journals, were examined. There were a total of 18,116 articles published from January to March 2019; and 1221 items published from March to March 2020. Highly cited publications in coronavirus research were defined as those having more than 100 citations. There were 806 publications with more than 100 citations that were evaluated for the data analysis based on this criteria. The majority of the highly referenced papers came from the United States. The most productive publication was the 'Journal of Virology,' which published the majority of the highly referenced papers.

Thelwall, M. (2020)[15] the speed with which biomedical specialists were able to identify and characterize COVID-19 was partly due to prior research with other coronaviruses. Early COVID-19's potential spread and mortality were also simpler to forecast thanks to epidemiological comparisons with Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). Using Mendeley reader counts for early academic impact evidence, this study determines if academic interest in past coronavirus research has transferred into interest in the main source material. The findings show that SARS and MERS studies from 2008 to 2017 had very significant increases among Mendeley readers in April and May 2020.

Radha, L. (2020)[16] Scientometrics study is one of the most efficient methods of quantitative a critical assessment of a scientific publication Coronaviruses are a kind of virus that affects both humans and animals at times. There are seven different types of coronavirus, but the most recent one is termed new corona (Covid19), and it is quickly spreading among humans.

Ahmad, M and Batcha, M. S. (2020)[17] From 2011 through 2020, the article investigates and analyses the global literature on "Coronavirus Disease" in terms of the production of research papers as indexed in Web of Science's Science Citation Index Expanded (SCI-E). Up to March 20, 2020, 6071 research records on Coronavirus Disease had been published, according to the study. The study looked at the various scientometric components of the research records published throughout the study period.

Mukherjee, B. (2020)[18] this COVID-19 (n-CoV) belongs to a large family of viruses known as Coronaviruses are viruses that cause respiratory and gastrointestinal sickness in both animals and humans. The current study aims to comprehend global trends in coronavirus-related illness research during the previous seven decades. As a result, it aims to give an objective appraisal of research in this field. The fusion and penetration process of this virus with 'gastroenteritis virus' and 'mouse hepatitis virus' were two major areas of research connected to this illness on which the research concentrated (mhv).

Laksham, S. et at., (2020)[19] This study presents the Year-by-year research growth, worldwide publishing share, patterns of research communication channels, and the most prolific journals were all examined at the global level of Coronavirus research production from 1989 to March 2020. A total of 7381 papers were obtained from the Web of Science citation database using the search keyword "Coronavirus" OR "Covid 19" and restricted to Open Access Publications from 1989 to 2020.

Zyoud, S. H. and Al-Jabi, S. W. (2020)[20] the bibliometric analysis indicated that there were 19,044 publications on Scopus published on COVID-19 during the early stage of the outbreak (From December 2019 until June 19, 2020). 9140 (48.0 percent) of these publications were articles, 4192 (22.0 percent) were letters, 1797 (9.4%) were reviews, 1754 (9.2%) were editorials, 1728 (9.1%) were notes, and 433 (2.3 percent) were other. The United States (4479; 23.4 percent) had the most publications on COVID-19, followed by China (3310; 17.4 percent), Italy (2314; 12.2 percent), and the United Kingdom (2314; 12.2 percent) (1981; 10.4 percent). The most fruitful was the British Medical Journal. The universities that published the most COVID-19 research were Huazhong University of Science and Technology, Tongji Medical, and Harvard Medical School.

Patil, S. B. (2020)[21] the current outbreak of Coronavirus Disease 2019 (COVID-19) has posed There are several issues that the entire globe must face. Lockdowns were imposed in a number of nations and territories. The scientific community has increased its Research and Development (R & D) operations in order to combat the ongoing epidemic. Many publications have removed their paywalls and made coronavirus literature freely available. The current study looked at 2184 COVID-19 papers that were indexed by the Dimensions database between January 1st and March 27th, 2020. The investigation discovered a multi-authorship pattern in COVID-19 literature.

M. Surulinathi (2020)[22] This article gives a Scientometric study of Web of Science-indexed Covid-19 Vaccine research literature. In order to develop future protective and adaptive measures, it is necessary to assess research activities. The goal of this study was to evaluate research activities in the Covid-19 vaccine literature. Scopus, Documents on "Covid-19 literature," was used to apply a Scientometric technique. The research was conducted from 1971 until 2020. The Coronavirus Vaccine literature search yielded 7181 results. In 2020, the number of publications will have increased to 4402. Vaccine journal documents got the most publications (203), followed by Journal of Virology with 104 articles and Nature with 96 publications. The United States has a productivity index of 2178 (H-Index-114), China has a productivity index of 1068 (H-Index-75), India has a productivity index of 678 (H-Index-26), and the United Kingdom has a productivity index of 614. (H-Index-53).

Kappi, M. et al., (2020)[23] Web of Science database was searched on February 26, 2020 for Publications on the Corona virus (COVID-19) from 1997 to 2020. It was done on the same day to eliminate any potential bias resulting from database updates because the metrics change over time. All sorts of publishing were evaluated, with the exception of errata publications. Year of publication, kind of publication, patterns of international collaboration, research institutions, journals, impact factor, h-index, language, and times cited are among the analysis factors. There were a total of 12612 Corona virus (COVID-19) research papers published across the world. Corona virus (COVID-19)-related papers came from 25 countries/territories, demonstrating that Corona virus (COVID-19) research has expanded globally. With 4524 papers written over 32 years, the United States was the most prolific contributor, followed by Peoples R China (2667 articles). The total number of citations for these papers has now surpassed 8,015, with each publication receiving an average of 9.01 citations. Corona virus (COVID-19)-related papers had an h-index of 48. The United States also has the highest h-index (32), followed by Saudi Arabia (26) and the United Kingdom (21). (22). Out of the overall number of publications for each country, the Netherlands produced the highest proportion of papers with international research cooperation

(72.7%), followed by the United Kingdom (71%) and Germany (69.1%).

Kagan, Dima, Jacob Moran- Gilad and Michael Fire (2020)[24] The COVID-19 epidemic has highlighted the scarcity of information on new coronaviruses. Over the last two decades, we looked at how prior coronavirus outbreaks and other emerging viral epidemics have been examined. We show that the research community's interest in a developing virus is briefly related with the dynamics of the incidence, and that when the first epidemic declines, a sharp reduction in interest is seen. This results to fewer cooperation and a lack of long-term commitment in coronavirus research.

Haghani, Milad et al., **(2020)[25]** Following the advent of the COVID-19 worldwide pandemic, there was an avalanche of study. More than a thousand research on this issue have already emerged in the scholarly literature in only a few months. We examine the bibliometric features of these works, as well as those addressing Coronaviruses in general, in this brief review. Furthermore, a scoping review of the literature on COVID-19 was conducted.

Haghani, M. and Bliemer, M.C., (2020)[26] Macro-syntheses of the scholarly literatures generated In reaction to the three most significant coronavirus epidemics, namely SARS, MERS, and Covid-19, researchers discovered striking structural similarities in all three literatures, suggesting that they are all made up of three key components. Public health emergency management papers were the first to combine in each case, followed by studies on viral chemistry and clinical therapies. Despite the similarities in structure and publishing trends after each epidemic, the quantity of academic study spurred by the 2019 Novel Coronavirus outbreak remains a startling phenomena, probably unparalleled in the history of scientific publication.

FINDINGS AND CONCLUSION:

After a review of several articles mentioned above it can be summarized that literature on Coronavirus and the significance of Scientometric analysis. It has been observed that Scientometric study has gained a lot of popularity and its one of the most imperative tools to examine the growth of any field and to evaluate the parameters such as authors' productivity, citation, institute productivity, popular sources and keywords, many other important indicators. This type of analysis enables the researcher to identify the research gap in the previous studies. Scientometric study help researchers for continuing research, policies making, fund allocation, geographical distribution on particular research area. **Danesh and GhaviDel (2020)** This article's statistical population consists of 5128 Coronavirus subject area documents indexed on the WoS between 1970 and 2019. Excel 2016 was used to examine the keywords collected from MeSH. According to data analysis, the year with the most science production was 2005, while the year with the most citations was 2019. In the last half-century, "Enjuanes L." is the most widely published author, the United States is the most productive country, and the University of Hong Kong is the most productive organisation in Coronavirus. (Singh, 2020) As per WHO (4 April 2020) 1,056,159 Confirmed cases and 57,206 deaths from 208 countries have been reported. The top two authors of the field are Mahase E and Drosten C. The most cited paper is Huang Cl, 2020 DOI:10.1016/S0140-6736(20)30183-5.The maximum contribution is from China and the top most organization is University of Hong Kong, Homg Kong. **Ram and Nisha (2020)** Based on data gathered from the SCOPUS interdisciplinary database on 'Coronavirus' research published between 1970 and 2020, this work conducted an analysis of 806 highly cited papers. There were a total of 18,116 articles published from January to March 2019; and 1221 items published from March to March 2020. Highly cited publications in coronavirus research were defined as those having more than 100 citations. There were 806 publications with more than 100 citations that were evaluated for the data analysis based on this criteria. The majority of the highly referenced papers came from the United States. The most productive publication was the 'Journal of Virology,' which published the majority of the highly referenced papers. Between 1973 and 2016, these highly referenced papers were published. The study's major goal was to map Cerebral Palsy (CP), a bibliometric analysis of the highly referenced research output from 1990 to 2020, according to Hussain et al., (2021). All records linked to CP were retrieved via the web of science database. The reviews' Impact Factor was calculated using the IF2019 edition of Clarivate Analytics' Journal Citation Report (JCR). The Hirsch Index (h-Index) was created using a database of the most active writers and organisations. Biblioshiny, ScientoPy, and VOS viewer all exploited co-citation networks connecting efficient writers of highly cited publications.

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DESIGN OF RCC BEAM BY USING C PROGRAMMING

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ABSTRACT

Beam design is done mainly by manual method or using design and analysis software. In this project, a C coding has been done for the design of a simply supported reinforced concrete beam and design of a simply supported reinforced concrete slab. Computer is very useful tool in the engineering works but sometimes computer software has some limitations. The solution could be an appropriate use of computer programming. Knowledge of programming allows to solve various civil engineering difficulties.The design criteria will change with the grade of concrete and grade of steel used. Indian standard design procedure has been followed, and the clauses in the IS 456:2000, has been followed during the coding. This coding has done to overcome the delay in the manual calculations, to obtain the accuracy in the result calculations. Also the unit conversion is not allowed in the coding, and all the dimensions are to be submitted in millimeters only.

Keywords: Beam, C programming, simply supported.

1. METHODOLOGY

This project is to develop a C program for design of RCC beam. In that the major part of this project is based on C language. To develop this program " Turbo C " Software is essential. Important knowledge for this project that is divided into four parts: (1) Literature Review (2) Study of C language (3) Theory of Design of Reinforced concrete beam and (4) Develop a program.

The literature review is a search for keywords about research in applied computer language for civil engineering such C/C++ ,computer program. One of the literature reviews is developing program for Analysis of standard beam conditions by C programming. Whereas, someone did Analysis by STAAD-PRO and Design of Structural Elements by MATLAB. But in this project we will design RCC beam by developing C Program.

In this project, We refer to IS-456:2000 standard.Besides, we learn about the fundamentals of C language to be used to develop the program.

a) Statements Used In The Program

If Else

In this statement if condition are satisfy true, then a single or block of statement executed otherwise another single or block of statement is executed.

Nesting Of If …Else

When there are another if else statement in if-block or else-block, then it is called nesting of if-else statement.

Ladder If Else

In this type of nesting there is an if else statement in every else part except the last part. If condition is false control pass to block where condition is again checked with its if statement.

Array

Array variable can store more than one value at a time where other variable can store one value at a time.

Switch Case

Switch case statement evaluates a given expression and based on the evaluated value(matching a certain condition), it executes the statements associated with it.

For Loop

In a program, for loop is generally used when number of iteration are known in advance. The body of the loop can be single statement or multiple statements.

Break

Sometimes it becomes necessary to come out of the loop even before loop condition becomes false then break statement is used. Break statement is used inside loop and switch statements.

b) Operators used in program

Arithmatic Operator
This operator used for numeric calculation. These are of either Unary arithmetic operator, Binary arithmetic operator. Where Unary arithmetic operator requiredonly one operand such as +,-, ++, --,!, tiled. And these operators are addition,subtraction, multiplication, division. Binary arithmetic operator on other hand required two operand and its operators are +(addition), -(subtraction), *(multiplication), /(division), %(modulus). But modulus cannot applied with floating point operand as well as there are no exponent operator in c.

Assignment Operator
A value can be stored in a variable with the use of assignment operator. The assignment operator(=) is used in assignment statement and assignment expression. Operand on the left hand side should be variable and the operand on the right hand side should be variable or constant or any expression. When variable on the left hand side is occur on the right hand side then we can avoid by writing the compound statement.

Relational Operator
It is use to compared value of two expressions depending on their relation. Expression that contain relational operator is called relational expression.

Increment And Decrement
The Unary operator ++, --, is used as increment and decrement which acts upon single operand. Increment operator increases the value of variable by one .Similarly decrement operator decrease the value of the variable by one.

Logical or Boolean Operator
Operator used with one or more operand and return either value zero (for false) or one (for true). The operand may be constant, variables or expressions. And the expression that combines two or more expressions is termed as logical expression.
Where logical NOT is a unary operator and other two are binary operator. Logical AND gives result true if both the conditions are true, otherwise result is false. And logial OR gives result false if both the condition false, otherwise result is true.

C has three logical operators :

Operator	Meaning
&&	AND
||	OR
!	NOT

2. Design Considerations
There are some certain steps and procedures to be followed to design the beam.

a) For singly reinforced beam

1) Calculation of Depth
Required depth (dreq)= √Mu/Rumax*b

OverallRequireddepth (Dreq)= dreq+dia/2+clear cover

Provided depth (dprov)= D-dia/2-clear cover.

2) Calculation Of Ast
Ast=0.5*fck/fy(1-√1-(4.6*Mu/fck*b*dprov))*b*dprov

Number of bars = Ast/π/4*dia2

3) Calculation Of Shear Reinforcement
Nominal shear stress i.e. Tv is calculated by IS 456:2000(Clause no.40.1)

Ptlim= Ast/b*1/dprov*100

Design shear strength of concrete i.e. Tc is calculated from Table no.19 in IS 456:2000.

Tcmax has taken from Table no.20 in IS 456:2000.

Comparing Shear stresses -

Tv<Tv/2 - No need of shear reinforcement

Tv<Tc - Nominal shear reinforcement is required

Tcmax>Tv>Tv - Shear reinforcement is required

Calculation of spacing in shear reinforcement

Minimum of -

Sv1= 0.75*dprov

Sv2= Sv2=0.87*fy*Asv*1/0.4*1/b

Sv3=300

b) For Doubly Reinforced Beam

1) Calculation Of Mulim
For Fe250 - Mulim=0.149*fck*b*dprov*dprov

For Fe415 - Mulim= 0.138*fck*b*dprov*dprov

For Fe500 - Mulim=0.133*fck*b*dprov*dprov

2) Check For Singly Or Doubly Reinforced Section
If Mulim is less than Mugiven then it is Doubly reinforced section. And if Mulim is greater than Mugiven then it is Singly reinforced section.

3) Calculation Of Ast
Ast1 is calculated by following formula

Mulim = 0.87*fy*Ast1*(dprov-0.42*xumax)

Ast2 is calculated by, Mu1= Mugiven- Mulim

Mu1= 0.87*fy*Ast2*(dprov- cc- dia/2)

Now, Ast= Ast1+Ast2

4) Calculation Of Asc
Asc is calculated by following formula

Mu1= fsc*Asc*(dprov- cc- dia/2)

5) Calculation Of Shear Reinforcement
Nominal shear stress i.e. Tv is calculated by IS 456:2000(Clause no.40.1)

Ptlim= Ast/b*1/dprov*100

Design shear strength of concrete i.e. Tc is calculated from Table no.19 in IS 456:2000.

Tcmax has taken from Table no.20 in IS 456:2000.

Comparing Shear stresses -

Tv<Tv/2 - No need of shear reinforcement.

Tv<Tc - Nominal shear reinforcement is required.

Tcmax>Tv>Tv - Shear reinforcement is required.

6) Calculation Of Spacing In Shear Reinforcement
Minimum of -

Sv1= 0.75*dprov

Sv2= 0.87*fy*Asv*1/0.4*1/b

Sv3=300

3. RESULTS AND DISCUSSION
The maximum bending moment of a beam is acting at mid span of beam so we will have to provide maximum steel in the part of mid span of beam. The section of the beam must be able to resist the   maximum bending moment to which it is subjected. The section of the beam must be able to resist the maximum shear force to which it is subjected. Shear design of reinforced concrete beam involves the determination of spacing between

stirrups. According to conditions which is given in calculation of shear reinforcement and Calculation of spacing in shear reinforcement we determined shear reinforcement details.
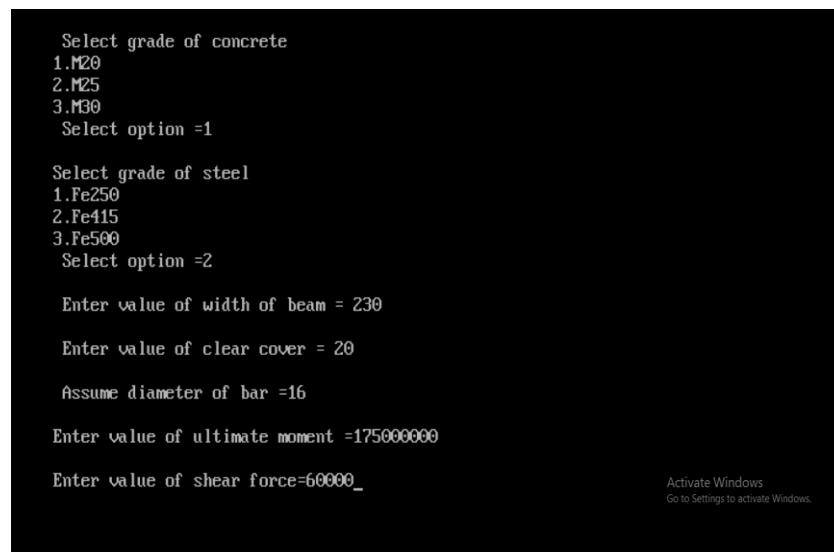
Fig. - Input
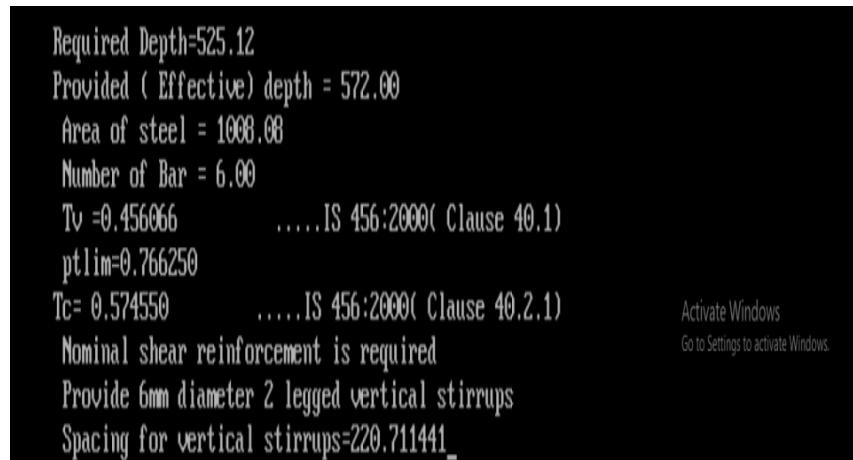
Fig.-Output

4. CONCLUSION
❖ C programming helps to reduce lengthy calculations. Values obtained very accurately with minimum time by using C programming.

❖ The program run successfully with reasonable speed and reliability, thus achieving the basic aim of carrying out this work.

❖ The C coding is sufficient for design of RCC Simply supported Slab and Beam.

❖ As engineer, our knowledge about programming will develop, which prove to be value addition for us. Now a day world is getting faster day by day, to survive in competitive world programming skill is very useful.

❖ Satisfied results are obtained for this programming when compared to manual calculations.

❖ With the help of basic knowledge of C language, new software can be invented by user. The programming environment selected in the project work, is found quite user friendly due to manual errors are avoided.

5. ACKNOWLEDGEMENT

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FINANCIAL PERFORMANCE ANALYSIS OF SMALL FINANCE BANKS IN INDIA: AN EAGLE MODEL APPROACH

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ABSTRACT

The Indian banking sector is the country's economic backbone. Bank supervision and monitoring have grown increasingly as a result of major non-performing assets and bank failures during the 1980s. Continuous banking sector performance evaluation is thus necessary to ensure an economy's financial stability. This study's objective is to use the EAGLE model to assess the financial performance of selected small finance banks. Small finance banks such as AU Bank, Equitas Bank, Ujjivan Bank, and suryoday Bank were selected on the basis of being listed on a stock exchange. To obtain this objective financial data, the bank's annual reports for the years 2017–18 through 2020–21 were consulted. ANOVA test was used to calculate the variance among a bank's financial variables, and the EAGLE model was used to rank the banks. The study's findings demonstrated that small finance banks operated successfully during the time of the study. However, according to EAGLE standards, Suryoday Bank placed first in the growth and liquidity categories, showing exceptional performance, and second in the earning and equity parameters. AU bank secured the first rank in earning and assets parameters with superior performance and secured the second rank in growth parameter and fourth rank in equity parameters respectively. Equitas and Ujjivan bank secured the last position in earning, assets, and growth parameters with below-average performance. The tabulated values of most of the variables are more than the significant value of 0.05. As a result, the null hypothesis for the study's variables is accepted, which suggests that there are no statistically significant differences among any of the chosen samples.

Keywords: Financial Performance, EAGLE model, Small Finance Banks, RBI

INTRODUCTION

Healthy financial institutions will be critical to India's economic growth and development. The banking sector is the backbone of the Indian economy and plays a crucial role (Sonaje and Nerlekar,2017). Because the economy is continually changing, it is necessary to adapt the financial system to meet the demands of the market. A bank is a financial entity that provides its customers with basic financial services such as deposits and lending (Abhijit and Raghavendra, 2018). Financial inclusion, defined as the provision of fundamental financial services to all excluded sections of society, is the government's primary focus. The Reserve Bank of India is a regulatory organization that oversees and regulates the entire banking system in India. Small finance banks are the most recent of many steps the Reserve Bank of India has done to pursue the economy's fundamental goal of financial inclusion. Small finance banks are a form of a specialized banks whose major goal is to bring the underserved into the financial system. Small finance banks provide basic financial services to those who are economically challenged. Small businesses, small or marginal farmers, micro or tiny businesses, the unorganized sector, and farmers are among the beneficiaries (Kamatam & Vijay, 2020). The SFBs are registered as public limited corporations under the Companies Act of 2013. Section 22 of the Banking Regulation Act of 1949 governs them. SFBs may also be given scheduled bank status if they start operations and meet the requirements of Section 42(6)(a) of the Reserve Bank of India Act, 1934 (Nanadhini & Rathnamani, 2021). SFBs are low-risk variants of scheduled commercial banks that accept deposits and provide loans. Small finance bank depositors will put their money into several products, including current and savings accounts, fixed deposits, commercial papers, and refinancing. A small finance organization must first obtain RBI approval before beginning construction on a new branch. Small finance banks are required to lend 75% of their Adjusted Net Bank Credit to specific sectors of the economy under the RBI's priority sector lending (PSL) policy.

Though the importance of performance evaluation in the banking industry for long-term growth and development has been recognized, a system that first assesses all elements of banks and then identifies their strengths and flaws to assure continued improvement is still required. Performance evaluation systems have evolved over time as computing tools have improved, from single-aspect systems to more complete systems that cover all elements of banks. In this study, the EAGLE model was used to analyze the financial performance of four small finance banks. The creator of the EAGLE model, Dr. John Vong, has published and presented his ideas about banking profitability throughout the US and Europe. The critical parameters of the EAGLE model are earning potential, asset quality, growth, liquidity, and equity, and each main parameter has a sub-parameter.

REVIEW OF LITERATURE

Sneha 2015 evaluated the financial performance of three public & three private sector banks using the CAMEL approach for the period ranging from 2010-2013. The study exhibits that HDFC bank is ranked first followed by ICICI Bank & Bank of Baroda. The study concludes that private banks are growing at a faster pace than public sector banks.

Vijay and Shriram 2017 analyzed the performance of eleven commercial banks in India from the period 2013 to 2017, using the CAMEL approach. The study observed that Kotak bank and HDFC bank are the top performers while the public sector giant State bank of India and Punjab National Bank are at the bottom. This study also revealed the financial position and soundness of the top eleven commercial banks.

Ahamed Lebbe 2016 evaluated the comparative ability of the financial performance of banks in Sri Lanka. For this purpose data were collected from private and public banks for the period from 2005 to 2015, using the CAMEL model. The study found that private banks are best in all parameters of CAMEL and financial performance. However, the performances of public banks were less compared to private banks. From the findings, the study revealed that capital adequacy, asset quality, and earning quality were significantly correlated with financial performance, and management efficiency and liquidity were not significantly correlated with the financial performance of the banks.

Birajit 2017 evaluated the relative performance of selected commercial banks using the CAMEL rating system. For this purpose, data were collected for the period of 13 years from F.Y. 2001-02 to F.Y. 2013-14. The study concludes that HDFC Bank was found to be the best bank, based on its overall CAMEL ratings performance, which was followed by Bank of Baroda and Axis Bank. The study also showed that SBI and BOI were found to be at the bottom of the table in the composite ranking whereas ICICI Bank was found to be in fourth place. The results of the one-way Anova test also showed that there is a statistically significant difference between the CAMEL ratios of selected commercial Banks in India, thus, signifying that the overall performance of commercial Banks is different.

Sneha 2019 analyzed the performance of selected public and private sector banks using the CAMEL model. The study was analytical in nature and based on secondary data covering a period of five years from 2013-2018. The study concludes that HDFC Bank is ranked first followed by IndusInd Bank & Axis Bank. Mostly private sector banks were having a better position in terms of most of the parameters of camels rating compared to public sector banks. The study suggested that banks cannot be judged solely based on the absolute values of the camel ratios.

Santosh and Roopali 2014 By using the CAMEL technique, the country's banking sector's performance and soundness were examined. The top 8 market-capitalized banks are analyzed, and numerous parameters affecting them are computed using secondary data obtained from several reliable sources for 6-years, from the financial years 2007-08 to 2012-13. In terms of capital adequacy, the results indicated that Kotak Mahindra Bank is in the lead, followed by ICICI Bank. Among its peer group, SBI has the highest NPA level, followed by ICICI Bank. PNB has the highest grade in this criteria, indicating that its management is very effective. The highest-earning quality belongs to SBI and PNB. The two companies that manage their liquidity the best are Kotak Mahindra and ICICI. According to the study's findings, SBI comes in the first place, followed by PNB and HDFC Bank.

Lavanya and Srinivas 2018 analyzed the financial performance of select private sector banks and compare them using CAMEL Model. The study is related to a period of five years from the financial year 2012-2013 to 2016 – 2017. The CAMEL model helped to measure the performance of banks from each of the important parameters like Capital Adequacy, Assets Quality, Management Efficiency, Earning Quality, and Liquidity. From the analysis of select private banks, ICICI Bank, HDFC Bank, KOTAK MAHINDRA Bank, AXIS Bank, and YES Bank, the study is concluded giving the relative positions of the banks.

Panboli and Kiran 2019 examined the financial performance of certain private and public sector banks. Five banks from the private sector viz. ICICI, HDFC, Axis, YES, Kotak Mahindra, and five banks from the public sector viz. SBI, PNB, BOB, UBI, and Canara bank were chosen for this analysis. The data were collected for a period from 2012-2013 to 2016-2017 (5 years). CAMEL analysis (Capital adequacy, Asset quality, Management Efficiency, Earning Quality, and Liquidity) was applied towards assessing the performance. The study concludes that HDFC & AXIS Bank are considered as performing above average; whereas PNB & Canara Bank is seen as below average. The study also reveals that in all the parameters of the CAMEL Model and its sub-parameters, the performance of the private sector is found to be better than the public sector.

Kajal Kiran 2018 analyzed the financial health of top public and private sector banks in India using CAMEL analysis. Four private sector banks and seven public sector banks have been chosen as a sample for this purpose. Data for the study was gathered from the annual reports of the relevant banks and covers the years 2013–2014 through 2016–2017. According to the study's findings, private sector banks perform better than public sector banks. The study suggests that public sector banks should concentrate on capital sufficiency, asset quality, management effectiveness, and earning quality while private sector banks should improve performance on the liquidity component.

Meraj Banu 2019 compared private sector banks, public sector banks, and international banks to examine the operational performance of the Indian banking sector, including short-term liquidity, solvency, and profitability. The cash-deposit ratio and credit-deposit ratio are two examples of the numerous ratios utilized in the study as a proxy for liquidity. Net interest margin and investment to deposit ratios are used to assess the solvency of banks. Equity, advance, and investment ratios are utilized to calculate profitability return on assets. According to the study, there is a significant relationship between public, private, and foreign sector banks' returns on equity, investments, assets, and advances in terms of profitability. The findings imply that the credit-deposit ratio and the cash-deposit ratio have a favourable impact on the short-term liquidity of banks.

OBJECTIVES OF THE STUDY
This research study's primary goal is to rank small finance banks using the EAGLE model. It also analyses, rates, and compares the financial performance of a few selected small finance banks using several factors, including earnings, assets, growth, liquidity, and equity.

RESEARCH METHODOLOGY
Scope of the Study: The study covers only four small finance banks in India and EAGLE model are used to evaluate their performance and efficiency to come to a conclusion that which bank is leading position in performance and efficiency.

Sources of Data: Data is collected from secondary sources, which include Annual Reports, Data published on bank websites, and Journals.

Sample Size: The Sample is selected Randomly. Data of the top four small finance banks listed on the stock exchange is collected for the period of 4 years, from 2018 to 2021.

Tools for Analysis: Ratio analysis and the one-way ANOVA test have both been applied as accounting and statistical methods. At a 95% confidence level, we tested all of the financial parameters of the EAGLE model. The EAGLE model's parameters and sub-parameters were used to rank these selected small financing banks.

HYPOTHESIS OF THE STUDY
(H0) There is no significant difference in the performance of AU bank, Equitas Bank, Ujjivan Bank, and Suryoday Bank in terms of

1] Earning ratios - return on assets, interest income to total assets, and return on net worth.

[2] Asset Quality ratios – gross NPA, net NPA, and total investment to total assets ratio.

[3] Growth ratios – growth of net profit and growth of advances.

[4] Liquidity ratios – liquid assets to total assets, current assets to total assets, and investment to total deposit.

[5] Equity ratios – capital adequacy ratio and total advances to total assets.

ANALYSIS AND RESULT
6.1 Earning

Earnings from banks are a reflection of their operations, profitability, and expansion. Table 1 represents the sample's return on assets from 2017–18 to 2020–21. All banks except Equitas Bank earned continuous ROA of 0.3% to 1.65% from 2017-18 to 2020-21. AU bank earned a maximum ROA of 2.5% in 2020-21 and also secured the first rank in terms of ROA. In 2020-21 ujjivan bank earned least ROA 0.04% because of a huge decrease in net profit of a bank. AU bank secured first position in ROA parameter at last four-year average (1.95%) followed by Suryoday bank (1.57%), Equitas bank (1.19%), and Ujjivan bank (1.05%).

Table 1: Return on Assets (RoA)

RETURN ON ASSETS (%)				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	2.04	0.3	0.08	0.6
2018-19	1.48	1.43	1.88	3
2019-20	1.81	1.38	2.21	2.5
2020-21	2.5	1.65	0.04	0.2
AVG.	1.957	1.19	1.052	1.57
RANK	1	3	4	2

Table 2 reveals the return on net worth earned by the banks from 2017-18 to 2020-21. AU and Equitas bank earned a continuous increase in return on net worth but au earned the first rank in terms of return on net worth. The maximum percentage of return on net worth earned by AU bank (21.98% in 2020-21), equitas bank (12.51% in 2020-21), ujjivan bank (13.98% in 2019-20), and suryoday bank (14.1% in 2018-19). AU bank secured the first rank followed by Equitas, suryoday, and Ujjivan bank in terms of return on net worth ratio of a bank.

Table 2: Return on Net Worth (RoNW)

RETURN ON Net Worth (%)				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	12.8	1.57	0.42	2
2018-19	14.03	9.8	11.49	14.1
2019-20	17.9	9.75	13.98	11.2
2020-21	21.98	12.51	0.26	1
AVG.	16.677	8.407	6.537	7.075
RANK	1	2	4	3

Table 3 shows the II/TA ratio for a sample of small finance banks from 2017–18 to 2020–21. The maximum percentage of II/TA ratio earned by AU bank (10.16% in 2019-20), Equitas bank (13.69% in 2019-20), Ujjivan bank (15.49% in 2017-18), and Suryoday bank (14.26% in 2019-20). Ujjivan bank secured the first rank followed by Suryoday, Equitas and AUbank in terms of II/TA ratio of a bank.

Table 3: Interest Income to Total Assets (II/TA)

Interest Income to Total Asset				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	9.38	11.59	15.49	13.26
2018-19	9.04	13.39	13.32	14.09
2019-20	10.16	13.69	14.68	14.26
2020-21	9.59	12.92	13.76	11.56
AVG.	9.54	12.89	14.31	13.29
RANK	4	3	1	2

Table 4: Calculation of Group Rank

Calculation of Group Rank				
Ratios	AU	Equitas	Ujjivan	Suryoday
ROA	1	3	4	2
RONW	1	2	4	3
II/TA	4	3	1	2
Avg.	2	2.6	3	2.3
Rank	1	3	4	2

Table 4 indicated the ranking status of selected banks for the earning factors. In terms of earnings, AU Bank came out on top, followed by Suryoday Bank, Equitas Bank, and Ujjivan Bank.

Table 5: Result of ANOVA Test

Results of Anova test					
Source of Variation	SS	df	MS	F	P-value
ROA					
Between Groups	1.994525	3	0.664842	0.701603	0.569023
Within Groups	11.37125	12	0.947604		
Total	13.36578	15			
ROE					
Between Groups	268.9819	3	89.66062	2.65822	0.095759
Within Groups	404.7549	12	33.72958		
Total	673.7368	15			
II/TA					
Between Groups	51.27008	3	17.09003	19.29314	0.000
Within Groups	10.6297	12	0.885808		
Total	61.89978	15			

The outcome of the hypothesis testing of the earning sub-parameters is shown in Table 5. At a 5% level of significance, there is no difference between the ROA and ROE results of the chosen SFBs. The null hypothesis is accepted since the p-value is greater than 0.05. The null hypothesis is rejected since there is a significant difference between the outcomes of II/TA and some selected SFBs, as shown by the p-value of 0.0000 and the F value of 19.29314 at a 5 percent significant level.

Assets

Table 6 indicates that AU bank reduced its gross NPA ratio from 2% to 1.7% from 2017-18 to 2019-20. The highest percentage of gross NPA was registered in the year 2020-21 by Suryoday bank: 9.4%, Ujjivan bank: 7.1%, Equitas bank: 3.59%, and AU bank: 4.3%. AU bank (2.5%) registered the first position in terms of Gross NPA ratio followed by Equitas bank (2.89%), Ujjivan bank (3.17%), and Suryoday bank (4.37%).

Table 6: Gross NPA

Gross NPA %				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	2	2.73	3.7	3.5
2018-19	2	2.53	0.9	1.8
2019-20	1.7	2.72	1	2.8
2020-21	4.3	3.59	7.1	9.4
AVG.	2.5	2.89	3.17	4.37
RANK	1	2	3	4

Table 7 shows the net non-performing assets ratio of all the selected small finance banks from the period 2017-18 to 2020-21. Ujjivan bank secured the lowest NNPA ratio of 0.2% in 2019-20. Ujjivan bank also registered the lowest percentage of net NPA at 1.03%, followed by AUbank:1.38%, Equitas bank at 1.52%, and Suryoday bank at 1.9%.

Table 7: Net NPA

Net NPA %				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	1.27	1.46	0.7	1.9
2018-19	1.29	1.44	0.3	0.4
2019-20	0.81	1.66	0.2	0.6
2020-21	2.18	1.52	2.93	4.7

AVG.	1.38	1.52	1.03	1.9
RANK	2	3	1	4

Table 8 reveals total investments to total assets ratio during the research period. As can be seen from this analysis, the TI/TA ratio of Suryoday Bank increased steadily between 2017–18 and 2020–21, rising from 14.39% to 27.92%. The highest percentage of TI/TA was registered by AU bank: 25.31% in 2019-20, Equitas bank: 28.97% in 2017-18, Ujjivan bank: 13.01% in 2017-18, and Suryoday bank: 27.92% in 2020-21. It can be seen from table 8 that AU bank secured the first rank in TI/TA ratio followed by Suryoday bank, Equitas bank, and Ujjivan bank.

Table 8: Total Investment to Total Assets

Total Investment to Total Assets				
year/banks	AU	Equitas	Ujjivan	Suryoday
2017-18	16.19	28.97	13.01	14.39
2018-19	21.95	14.87	11.1	17.51
2019-20	25.31	12.12	13.01	15.06
2020-21	20.96	14.99	12.34	27.92
AVG.	21.1	17.73	12.36	18.72
RANK	1	3	4	2

Table 9 shows that AU bank registered the first position in the asset quality parameter of the EAGLE model followed by Equitas and Ujjivan secured the second bank whereas Suryoday bank secured the last rank.

Table 9: Calculation of Group Rank

Calculation of Group Rank				
Ratios	AU	Equitas	Ujjivan	Suryoday
GNPA	1	2	3	4
NNPA	2	3	1	4
TI/TA	1	3	4	2
Avg.	1.33	2.66	2.66	3.33
Rank	1	2	2	4

Table 10: Result of ANOVA Test

Results of Anova test					
Source of Variation	SS	df	MS	F	P-value
GNPA					
Between Groups	7.842919	3	2.614306	0.476997	0.70417
Within Groups	65.76908	12	5.480756		
Total	73.61199	15			
NNPA					
Between Groups	1.54085	3	0.513617	0.347525	0.79164
Within Groups	17.73515	12	1.477929		
Total	19.276	15			
TI/TA					
Between Groups	163.5585	3	54.51951	1.942775	0.176586
Within Groups	336.7525	12	28.0627		
Total	500.311	15			

The 95 percent confidence level for the assets quality parameter of the EAGLE model is shown in Table 10. Since the estimated values of 0.70417, 0.79164, and 0.176586 are greater than 0.05, there is no statistically significant difference in the gross NPA ratio, net NPA ratio, or TI/TA ratio performance of AU Bank, Equitas Bank, Ujjivan Bank, and Suryoday Bank. The F values are 1.9427, 0.347525, and 0.476997. The above result indicates that the null hypothesis for the gross NPA ratio, net NPA ratio, and TI/TA ratio is accepted, indicating that there is no significant difference in the performance of the selected small finance banks.

Growth

The performance of growth of net profit and advances of banks shows how the employees of banks are working for better financial performance. Table 11 depicts the highest percentage of Net profit growth registered by AU bank: 76.73% in 2019-20, Equitas bank: 561.5% in 2018-19, Ujjivan bank: 2802.9% in 2018-19, and Suryoday bank: 755.27% in 2018-19. In the growth of net profit parameter, Ujjivan bank secured the first position.

Table 11: Growth of Net Profit

Net Profit growth (%)				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	-64.47	-69.43	0	-32.95
2018-19	30.74	561.5	2802.94	755.27
2019-20	76.73	15.7	75.65	28.1
2020-21	73.49	57.7	-97.63	-89.31
AVG.	29.12	141.3	695.2	165.2
RANK	4	3	1	2

Table 12 indicates the increase of certain banks' advances from 2017–18 to 2020–21. AU bank and Suryoday bank in the initial period of the study showed highly positive growth of advances 103.21% and 92.15% in 2017-18 also showed a steep downfall in the percentage of advances growth 103.21% to 28.22% and 92.15% to 12.76%% during the period 2017-18 to 2020-21. AU bank registered the first position in the advances growth parameter followed by Suryoday bank, Equitas bank, and Ujjivan bank.

Table 12: Growth of Advances

Growth of Advances				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	103.21	35.16	25.16	92.15
2018-19	71.41	50.45	43.86	70.14
2019-20	18.29	18.4	33.08	31.81
2020-21	28.22	22.73	3.21	12.76
AVG.	55.2	31.6	26.3	51.7
RANK	1	3	4	2

Table 13 shows the ranking status of the shortlisted banks according to the EAGLE model's growth parameter, with Suryoday Bank holding the top spot.

Table 13: Calculation of Group Rank

Calculation of Group Rank				
Ratios	AU	Equitas	Ujjivan	Suryoday
GoA	1	3	4	2
GoNP	4	3	1	2
Avg.	2.5	3	2.5	2
Rank	2	4	2	1

Table 14 depicts the hypothesis testing of net profit growth and advances growth parameters at 95% confidence level. The tabulated value of net profit growth is 0.431433 and advances growth is 0.604933 which is more than the significant value of 0.05. The F value of net profit growth is 0.9874 and advances growth is 0.6378. The outcome demonstrated that there is no significant difference in the growth indicators between AU Bank, Equitas Bank, Ujjivan Bank, and Suryoday Bank. Therefore, both parameters accepted the null hypothesis.

Table 14: Result of ANOVA Test

Source of Variation	SS	df	MS	F	P-value
Results of Anova test					
GoA					
Between Groups	2482.39	3	827.4633	0.987447	0.431433
Within Groups	10055.79	12	837.9823		
Total	12538.18	15			
GoNP					
Between Groups	1063056	3	354352.1	0.637893	0.604933
Within Groups	6666047	12	555503.9		
Total	7729103	15			

Liquidity

The ability of banks to pay their liabilities as they mature is indicated by their liquidity. Sub-parameters of a bank's liquidity status include the ratio of liquid assets to total assets, cash to total assets, and total investment to total deposits. Table 15 indicates that Ujjivan bank recorded a continuous increase in the percentage of LA/TA ratio from 5.23% to 12.65% in the period from 2017-18 to 2020-21. Suryoday Bank recorded the highest percentage of LA/TD ratio 15.61% during the period 2019-20. Equitas bank secured the first position with an average of last four years LA/TD ratio of 10.97% followed by Suryoday bank, Ujjivan bank, and AU bank.

Table 15: Liquid Assets to Total Assets

year/banks	AU	Equitas	Ujjivan	suryoday
LIQUID ASSETS TO TOTAL ASSETS				
2017-18	9.35	9.09	5.23	9.57
2018-19	5.33	7.99	7.96	7.34
2019-20	8	13.13	7.29	15.61
2020-21	9.26	13.67	12.65	8.88
AVG.	7.985	10.97	8.28	10.35
RANK	4	1	3	2

Ttable 16 depicts the C/TA ratio from 2017–18 to 2020–21. Ujjivan bank registered a continuous increase in the percentage of C/TA ratio from 2.63% to 8.39% in the period from 2017-18 to 2020-21. Suryoday bank registered the lowest percentage of C/TA ratio 1.12% in 2019-20. Ujjivan bank secured the first position in C/TA ratio based on last four years' average (5.22%).

Table 16: Cash with bank to Total Assets

year/banks	AU	Equitas	Ujjivan	suryoday
cash to total asset				
2017-18	2.61	2.9	2.63	1.42
2018-19	2.48	2.55	3.24	1.28
2019-20	2.49	1.97	6.65	1.12
2020-21	3.04	2.08	8.39	1.53
AVG.	2.65	2.37	5.22	1.33
RANK	2	3	1	4

Table 17 shows total investment to total deposit in the period from 2017-18 to 2020-21. Equitas bank recorded a steep downfall in the percentage of TI/TD ratio from 68.82% to 21.71% in the period from 2017-18 to 2019-20. Suryoday Bank also registered a continuous decrease in the percentage of TI/TD ratio from 41.53% to 28.37%

in the period from 2017-18 to 2019-20. Ujjivan bank recorded the lowest percentage of TI/TD ratio 19.15% in 2020-21. Suryoday bank secured the first position in TI/TD parameters.

Table 17: total investment to total deposit

Total investment to total deposit				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	38.5	68.82	32.66	41.53
2018-19	36.87	26.02	20.68	41.69
2019-20	40.77	21.71	22.22	28.37
2020-21	30.06	22.6	19.15	57.55
AVG.	36.55	34.78	23.67	42.28
RANK	2	3	4	1

Table 18 revealed the ranking status of banks according to the sub-parameters of their liquidity condition. In terms of liquidity position characteristics, Suryoday Bank came in the first place, followed by AU Bank, Equitas Bank, and Ujjivan Bank.

Table 18: Calculation of Group Rank

Calculation of Group Rank				
Ratios	AU	Equitas	Ujjivan	Suryoday
LA/TA	4	1	3	2
C/TA	2	3	1	4
TI/TD	2	3	4	1
Avg.	2.66	2.33	2.66	2.33
Rank	3	1	3	1

Table 19: Result of ANOVA Test

Results of Anova test					
Source of Variation	SS	df	MS	F	P-value
TI/TD					
Between Groups	727.5816	3	242.5272	1.348413	0.305159
Within Groups	2158.334	12	179.8612		
Total	2885.916	15			
C/TA					
Between Groups	32.77723	3	10.92574	5.559714	0.012594
Within Groups	23.58195	12	1.965163		
Total	56.35918	15			
LA/TA					
Between Groups	26.47357	3	8.824523	1.019318	0.418328
Within Groups	103.8874	12	8.657281		
Total	130.3609	15			

As per table 19 p-value of TI/TD ratio is 0.305159 and LA/TA ratio 0.418328 which is more than the significant value of 0.05. The F value of TI/TD ratio and LA/TD ratio were 1.3484 and 1.019 respectively. The above result shows there is no statistically significant difference in the financial performance of all selected small finance banks in terms of TI/TD ratio and LA/TD ratio. Hence the null hypothesis is accepted. The p-value of C/TA ratio is 0.0125 which is less than the significant value of 0.05. There is a statistically significant difference in C/TA ratio parameter hence null hypothesis is rejected.

Equity

Table 20: Capital Adequacy Ratio

CAPITAL ADEQUACY RATIO				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	19.31	29.63	23.04	37.9
2018-19	19.31	22.44	18.94	35.03
2019-20	21.99	23.61	28.81	29.57
2020-21	23.37	24.18	26.44	51.47
AVG.	20.995	25.122	24.307	38.49
RANK	4	2	3	1

Table 20 demonstrates that the CAR ratio is maintained by Basel II and RBI standards by AU Bank, Equitas Bank, Ujjivan Bank, and Suryoday Bank. From 2017–18 to 2020–21, the CAR of AU bank increased continuously, rising from 19.31 percent to 23.37 percent. The four banks with the highest percentages of CAR were AU Bank (23.37%), Equitas Bank (29.63%), Ujjivan Bank (28.81%), and Suryoday Bank (51.47) in the respective years 2020–21 and 2020–21, respectively. A higher CAR shows that the bank did not use its resources for lending and that it will be able to meet its obligations when they become payable. The lowest percentage of CAR was registered by Ujjivan bank 18.94% in 2018-19. Suryoday bank secured first position in CAR parameter followed by Equitas bank, Ujjivan bank, and AU bank.

Table 21 shows the ratio of the equity parameter's total advances to its total assets from 2017–2018 to 2020–21. The highest AD/TA ratio was recorded by AU bank in 2017–18 at 70.79 percent, followed by Equitas bank in 2018–19 at 73.55 percent, Ujjivan bank in 2017–18 at 77.43 percent, and Suryoday bank in 2017–18 at 72.79 percent. Ujjivan bank registered the first position in AD/TA parameter with last four-year averages of 75.4% followed by AU bank with an average of at 67.96%, Equitas bank 67.69%, and Suryoday bank at 67.29%.

Table 21: Advances to Total Assets

ADVANCES TO TOTAL ASSET RATIO				
year/banks	AU	Equitas	Ujjivan	suryoday
2017-18	70.79	57.9	77.43	72.79
2018-19	69.94	73.55	76.78	71.23
2019-20	64.04	71.17	76.28	65.83
2020-21	67.08	68.16	71.11	59.33
AVG.	67.962	67.695	75.4	67.29
RANK	2	3	1	4

Table 22 displays the equity parameter of the EAGLE model's ranking status for all selected banks. In the equity metric, Ujjivan Bank came out on top, followed by Equitas Bank and Suryoday Bank. The last rank in the equity parameter was secured by AU Bank.

Table 22: Calculation of Group Rank

Calculation of Group Rank				
Ratios	AU	Equitas	Ujjivan	Suryoday
CAR	4	2	3	1
ADV/TA	2	3	1	4
Avg.	3	2.5	2	2.5
Rank	4	2	1	2

Table 23: Result of ANOVA Test

Results of Anova test					
Source of Variation	SS	df	MS	F	P-value
CAR					
Between Groups	717.5359	3	239.1786	8.005926	0.003389
Within Groups	358.5024	12	29.8752		

Total	1076.038	15			
ADV/TA					
Between Groups	181.0516	3	60.35052	2.358552	0.122967
Within Groups	307.0555	12	25.58796		
Total	488.107	15			

Table 23 explains the outcome of the CAR and AD/TA ratio at a 95% confidence level. The p-value for the CAR was 0.003, which is below the 0.05 level of significance. F value of CAR was 8.005. P tabulated value of CAR is less than the significant value so the null hypothesis is rejected whereas the p-value of ADV/TA was 0.1229 which is more than the significant value of 0.05 so the null hypothesis is accepted.

Table 24: Overall Rank Status

EAGLE	AU	EQUITAS	UJJIVAN	SURYODAY
E	1	3	4	2
A	1	2	2	4
G	2	4	2	1
L	3	1	3	1
E	4	2	1	2
AVG	2.2	2.4	2.4	2
RANK	2	3	3	1

Table 24 depicts the total rank status of chosen small finance banks using EAGLE factors. In this research study, Suryoday bank secured the first position with an outstanding performance followed by AU bank in the second position with superior performance. Equitas bank and Ujjivan bank secured the third position with an average performance which means that it is a good banks. This analysis clearly indicates that Suryoday Bank and AU Bank's performance was exceptional, superior, and average in all areas including earnings, assets, growth, liquidity, and equity.

CONCLUSION

Based on our research, we have come to the conclusion that financial variables including earnings, assets, growth, liquidity, and equity can accurately reflect a significant portion of small finance banks' profitability. According to the aforementioned results, Suryoday Bank placed first in the growth and liquidity categories, showing exceptional performance, and second in the earning and equity parameters. AU bank secured the first rank in earning and assets parameters with superior performance and secured the second rank in growth parameter and fourth rank in equity parameters respectively. Equitas and Ujjivan bank secured the last position in earning, assets, and growth parameters with below-average performance. Equitas and Ujjivan bank should pay attention to these parameters to improve their profitability. All the selected small finance banks have maintained the capital adequacy ratio as per RBI norms. The tabulated values of most of the variables are more than the significant value of 0.05. As a result, the null hypothesis for the study's variables is accepted, which suggests that there are no statistically significant differences among any of the chosen samples. Finally, this study's findings show that the small finance banks chosen based on their listing on the Indian stock exchange— AU Bank, Equitas Bank, Ujjivan Bank, and Suryoday Bank—had a satisfactory performance by EAGLE standards.

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PRADHAN MANTRI MUDRA YOJANA: AN OVERVIEW

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ABSTRACT
Financial inclusion is a strategic concern for the policy-makers since it fosters inclusive prosperity by allowing the impoverished to put their earnings into the formal financial network remitting funds to their members in villages, freeing them from the clutches of usurious financiers. In India, 22 percent people still suffer from poverty (Dr. Anurag B. Singh, Priyanka Tandon). Through a new financial inclusion initiative taken on called "Pradhan Mantri Mudra Yojana," the Central government of India (GOI) has taken significant reform toward funding the unfunded micro-enterprises by lending up to Rs. 10 lakhs to "non-corporate, non-farm small/micro-enterprises". All banks, including "Public Sector Banks", "Private Sector Banks", "Regional Rural Banks", "State Co-operative Banks", "Foreign Banks", and "Nonbanking Financial Institutions" (NBFC)/"Micro Finance Institutions" (MFI), are authorized to lend under PMMY. The present study provides a comprehensive review of the "Pradhan Mantri MUDRA Yojana" based on secondary data to gain a deeper understanding of the scheme's contribution to the development of different vulnerable sectors of society, such as women, the poor, the unemployed, various backward classes, and others. It is observed that the scheme plays an important role in encouraging "Inclusive Growth", "Employment", "Women Empowerment" and "Development of MSMEs".

Keywords: Pradhan Mantri MUDRA Yojana, Financial Inclusion, Employment, Poverty, Development

INTRODUCTION
Poverty is characterized by the absence of economical resources to meet one's necessities such as food, shelter, water, clothing, education, healthcare, and so on (en.wikipedia.org). As a consequence, the poor's world is full of struggle, privation, starvation, and anxiety. Extreme poverty is classified into two groups: absolute poverty (when an individual lacks to afford necessities such as food, water, clothing, and shelter) and relative poverty (when an individual perceives the subjective charge of everyday living engagement. It is the percentage of household expenditure that is around 50 or 60 percent of the country's median household income. It is an effective tool for determining income disparity for that nation.) (World Bank). In 2010, the "United Nations Development Programme", in collaboration with "Oxford Poverty and Human Development Programme", devised the "Global Multidimensional Poverty Index" to evaluate global poverty comprising ten primary indicators partitioned into three categories: health, education, and living standard (UNDP). Within India's curriculum between 2018 to 2022, UNDP will focus on three key areas: "inclusive growth, environment and energy, and system and institutional strengthening" (UNDP, 2019).

What is Financial Inclusion?
Financial inclusion is interpreted as a catalyst for economic growth via a formal financial system, where an economy can drive growth, upsurge investments in human capital, lessen the probability of economic shocks, and so on. Beyond all else, financial inclusion reinforces inclusive, sustainable, and sturdy economic growth (business-standard.com). It is interesting to note that 7 of the 17 SDGs ("Sustainable Development Goals") of the United Nations for 2030 recognize financial inclusion as a crucial driver that can contribute to offering a better living for various vulnerable populations. There are numerous psychological, emotional, physiological, sociological, and technological impediments that obstruct financial inclusion (blog.iilm.edu).

Some definitions of Financial Inclusion
"Financial inclusion may be defined as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups such as the weaker sections and low-income groups at an affordable cost.", Dr. C. Rangarajan, Chairman, The Committee on Financial Inclusion.

"Financial Inclusion is the process of ensuring access to appropriate financial products and services needed by all sections of the society in general and vulnerable groups such as weaker sections and low-income groups in particular at an affordable cost fairly and transparently by mainstream institutional players", Shri S.S. Mundra, Deputy Governor, Reserve Bank of India (2016).

Government efforts to promote Financial Inclusion
The government of India has launched a slew of schemes, including the "Atal Pension Yojana", "Ayushman Bharat Scheme", "Micro Finance", "Pradhan Mantri Jan Dhan Yojana", "Pradhan Mantri Fasal Bima Yojana", "Pradhan Mantri MUDRA Yojana", "Pradhan Mantri Jeevan Bima Yojana", "Pradhan Mantri Vaya Vandana Yojana", "Sukanya Samruddh Yojana", "Swabhiman Yojana", "Start-Up India/Stand-Up India" to encourage

financial inclusion (www.bankbazaar.com). Among all of the initiatives listed, the PMMY (Pradhan Mantri Mudra Yojana) plays a vital role in promoting financial inclusion in India.

Overview of Pradhan Mantri MUDRA Yojana (PMMY)

Mudra is an abbreviation for "Micro Units Development & Refinance Agency Ltd.", a financial organization established by the Indian government to enhance and rehabilitate various micro/small non-corporate and non-farming firms (mudra.org.in). Rather than explicitly financing NCSBS, MUDRA refinances major Last Mile Financiers such as "SFBs (Small Finance Banks)", "NBFCs (Non-Banking Finance Companies)", "MFIs (Micro-Finance Institutions)", "RRBs (Regional Rural Banks)", "Societies registered under Section 8 Companies (formerly Section 25)" and "Trust" consciously involved in the business of lending to such micro/small enterprises embroiled in trading, manufacturing, etc. including allied agriculture activities up to a maximum limit of Rs. 10 lakhs. MUDRA has introduced an official platform through which diverse lending institutions, including banks, can immediately enter their accomplishments, which are then consolidated by the system to generate reports for assessment (mudra.org.in). Beneficiaries are to be handed MUDRA cards under PMMY.

What is MUDRA Card?

MUDRA Card is a Rupay debit card that is employed to withdraw cash from ATMs and perform other commercial functions. The terms and conditions for getting a loan are governed by the provisions and regulations of lending institutions, which are administered by the RBI.

Products offered under Pradhan Mantri MUDRA Yojana

According to the amount of loan issued, the loan facility under PMMY is categorized into three parts- Shishu (up to Rs. 50000), Kishore (from Rs. 50000 to Rs. 500000), and Tarun (from Rs. 500000 to Rs. 1000000) (mudra.org.in). PMMY has several key beneficiaries, including "Business loans for shopkeepers and traders (financial aid on lending to individuals for operating their shops/trading & business activities/service enterprises / non-farm income-producing activities with a loan size of up to Rs. 10 lakhs)", "Textile Manufacturing Activities (power looms, handlooms, chikan work, traditional embroidery and handwork, khadi activity, dying, apparel design, knitting, cotton ginning, and others)", "Social/Personal Activities (activities like as beauty parlors, salons, gymnasiums, tailoring shops, dry cleaning, photocopying facilities, cycle and motorcycle repair shops, medical stores, and so on), "Food Products Sector (activities such as achaar making, papad making, sweet shops, jam/jelly making, agricultural produce prevention at the rural level, food stalls, cold chain vehicles, ice-cream stalls, biscuits making, and so forth.)", "Agro-allied Activities (poultry, beekeeping, pisciculture, livestock rearing, dairy, agri-clinics, etc.) ", "Transport Vehicles (purchase of transport vehicles for goods and passengers such as auto-rickshaws, taxis, three wheelers, small goods transport vehicles, tractors, trolleys, power tillers, etc.)" (mudra.org.in).

Figure 1 The process to apply for MUDRA Loan under PMMY
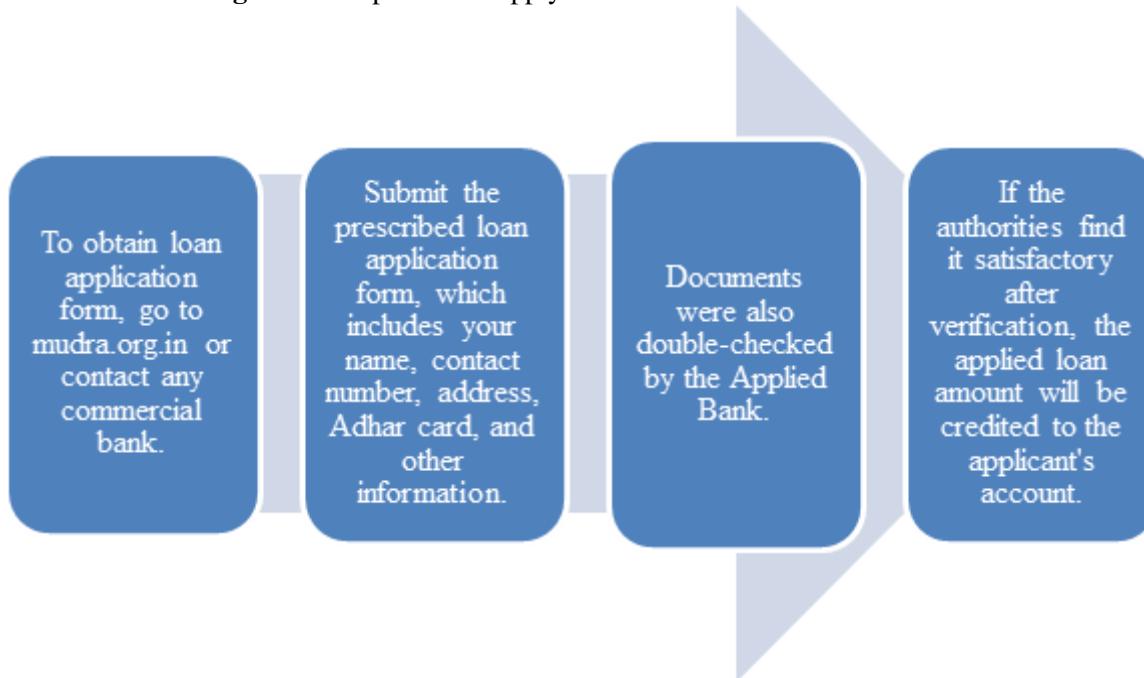
Source: Researchers' compilation

Some essential requirements that must be met to be eligible to apply for Mudra loans in various categories are- age limit between 18 to 65 years, only non-farming and non-corporate businesspeople involved in manufacturing, processing, service, and trading services, the organization must be registered with the concerned ministries (mudra.org.in).

DISCUSSION

(Venkatachalam S & Simon, 2015) studied the role of MUDRA in funding "micro and small businesses" in India. The study remarked that the MUDRA ("Micro Units Development Refinance Agency") is a developmental finance authority that will nurture and finance micro industrial units in the country that SIDBI and other formal financial institutions still had not been successful in approaching. The study noted that the rates charged by various MFIs and NGOs engaged in financial intermediation were lower than those charged by the informal sector, were nonetheless seen and perceived as quite excessive in certain quarters, and had become a subject of criticism and annoyance. The MUDRA was a real game-changer since it charged a low-interest rate in comparison to other MFIs and NBFCs. The study urged that wide parameters for administration costs and loan rates be devised to promote "Financial Inclusion" in the nation. (M Gowda & Ramesh, 2015) evaluated and presented the PMMY provisions, particularly MUDRA's role in organizing financial aid to micro-enterprises, surveyed 74percent of the recipients were women, and nearly 50percent of the total loan portfolios belonged to SCs, STs, and OBCs. Furthermore, 28 percent of the loanees were first-time entrepreneurs, which means they were the first one in their family to pursue entrepreneurial ambitions. (Shahid & Irshad, 2016) made an effort to know about the MUDRA Yojana and its main goals. Secondary data sources such as newspapers, periodicals, and different websites, including the MUDRA Yojana website, were used to analyze such facts, product offerings, and performance in Karnataka. According to the study, MUDRA funding assistance is organized into four categories: "Micro-Credit Schemes", "Refinance Schemes for Banks", "Women Enterprise Programs", and "Loan Portfolio Securitization". The study observed that the number of PMMY Loans Sanctioned and Disbursed increased from Rs. 137449.27 Crores, Rs. 132954.73 Crores to Rs. 65062.28 Crores, and 62749.30 Crores respectively from 2015-16 to 2016-17. According to the study, MUDRA serves the task of an apex refinancer, with low-cost borrowing expected to be its USP, striving to fill a yawning hole in India's microfinance industry yet believing that judging the PMMY, which was still in its initial phases, was not the best time. (Chaudhary A., 2017) established that following the enormous success of PMJDY ("Pradhan Mantri Jan Dhan Yojana"), PMMY ("Pradhan Mantri Mudra Yojana") demonstrated an active role in "financing the unfinanced". MUDRA Yojana was specifically for NCSBS ("Non-Corporate Small Business Sector") and played an important part in encouraging such organizations to develop and flourish. An in-depth interpretation of MUDRA banks had been delivered, along with a thorough examination of the scheme's purposes, different kinds of services, and influence on the Indian economy. (Agarwal & Dwivedi, 2017) stressed the significance of micro-unit sectors and corresponding their credit requirements. The study highlighted that the indian government launched a flagship scheme known as "Pradhan Mantri Mudra Yojana" to support the unfunded micro-enterprises- enterprises in the economy. The data used was entirely secondary and was derived via journals, publications, research papers, and reports available on the "MUDRA" scheme's online webpage. Based on the study, the PMJDY, or "Pradhan Mantri Jan Dhan Yojana," contributed 0.2 percent to the "MUDRA" scheme, and women entrepreneurs outnumbered men in relation to the disbursed amounts under the scheme. It was discovered that growth in the minority sector was still insignificant. Despite the fact that their percentage share has increased, they really need to be focused more. It was urged that the "MUDRA card" could be used more frequently than usual, and Women entrepreneurs should be directly supported to overcome the challenges faced by them. Bijender and Chhikara K.S. (2017) tested the functionality of PMMY (all three products, "Shishu," "Kishore," and "Tarun" independently), category-wise, i.e., General, O.B.C., SC, S.T. The researchers concluded that in Haryana, the participants of the O.B.C. section held the broadest stake under "Shishu," i.e., 27 percent of the overall determined by the number of "Accounts opened," while the enrollees of the S.C. category received the highest proportion of "Loan Sanctioned," accounting for 51 percent of the entire. Judging by the proportion of "Accounts Opened," General and O.B.C. category claimants had the strongest interest in "Kishore" and "Tarun" PMMY products, accompanied by S.C. and S.T. category. (John et al., 2018) thoroughly investigated the intricacies of the "Micro Units Development & Refinance Agency" in collaboration with "Small-Scale Industries" in Karnataka. According to the study, the interest rates under the MUDRA yojana were comparatively lower than the other small finance schemes. MUDRA loans were intended to support 58 million local entrepreneurs and firms which was a significant number in the contemporary economy. The study concluded that with the advent of PMMY, and Mudra, India had aided small organizations and non-cooperate firms to a great extent. (A. Mahajan, 2018) explored different "Pradhan Mantri MUDRA Yojana" offerings and their increased emphasis on "small business owners" and freelancers. According to the scheme's geographical review, "Tarun" product was preferred in

both the north and west of the country, "Shishu" in the east, and "Kishore" in the south. Pursuant to the results, 2.76 crore women received funding out of a total of 3.48 crore accounts, or a stunning 79 percent. MFIs contributed significantly to the financing of women under PMMY. **Ibrahim P.A. (2018)** did a comparative analysis of numerous government initiatives based on "Areas", "Credit Amount", "Financial Institutions", "Number of Accounts", and so on, using appropriate analytical tools such as percentages, ANOVA, and so on. The analysis relies solely on secondary data and concluded that MUDRA is amongst the most effective initiatives undertaken by the Government of India. Both the "Number of Accounts Opened" and the "Amount of Loans Disbursed" under MUDRA Yojana's various products ("Shishu", "Kishore", and "Tarun") exhibited uptrend year over year. In previous years, MUDRA Yojana reached out to underprivileged parts of society, with 73.41 percent of accountholders being women and 25.16 percent being new entrepreneurs. The researchers indicated that northern states' participation rates were lower than those of other states. 'Shishu' had the most accounts opened, while 'Tarun' had the fewest. MUDRA Yojana has significant potential if the government focuses on loan quality rather than quantity and improves the gamut of beneficiaries. **Haris M., Subash T. (2018)** discussed the significance of MUDRA loans, PMMY products and services, and analyzed the performance of several small business units in the state of Kerala The study primarily focuses on the role of various lenders such as "NBFCs", "Small Finance Banks", and "Co-operative societies" in lending to numerous different business undertakings engaged in trading goods, manufacturing and distribution, and service. **(Verma, 2019)** endeavored to investigate the origins of MUDRA Bank and assessed its effectiveness the state of Madhya Pradesh. The whole MUDRA loan amount in the state was reported to have climbed from Rs. 8096.74 Crore in FY 2015-16 to 10506.45 Crore in FY 2016-17. In the fiscal year 2017-18, the sum was raised to Rs. 14399.82 crore. The study concluded that the "MUDRA Yojana" was productive in accomplishing its goals and had shown to be a game-changer in MSME funding, and was likely to play an important role in creating "employment", "new venture creation", "financial inclusion", and "inclusive growth" in the country. **(Vevek et al., 2019)** carefully studied the MUDRA Scheme's regional, state, and category-wise loan amount contribution, including the association between the scheme's products ("Shishu", "Kishore", and "Tarun") and regional GDP. The study determined that the loan approved for "Shishu" was the highest from 2015 to 2018, accompanied by "Kishore" and "Tarun." People were apparently interested in the category "Shishu" followed by "Kishore" and "Tarun." When compared to "Shishu," the amount allocated for "Kishore" and "Tarun" increased season after season. The study is restricted to percentage and correlation analysis. **(History & Bank, 2019)** investigated the objectives, role, and various product offerings of PMMY, including its commitment to financial inclusion in India. A secondary data-based study was performed using different books, newspapers, and pertinent websites such as MUDRA Yojana, PMJDY, and Government Publications. The study asserted that MUDRA developed an ambition of "formalizing the informal" and further "funding the unfunded". Such steps would considerably boost the morale of our youthful, educated, and competent workforce by allowing them to become first-generation entrepreneurs and also enabling existing small businesses to expand their operations. **(Y. D. Mahajan, 2019)** diagnosed and associated the impact of "PMMY" on distinct types of micro-enterprises in Maharastra from 2015 to 2018. The categories included are SC, ST, OBC, and Women micro-enterprises. The Shishu category was identified to make up the bulk of loan applications. Loan clearances grew by far more than 25percent and 31percent, respectively, over the years. The existing societal underprivileged sectors (SC/ST/OBCs) enrolled in the PMMY campaign at a rate of 55percent in terms of loan accounts and 34percent in regards of loan amount permitted. It's been concluded that the scheme benefited enormously around 3.50 crore new loan accounts/entrepreneurs, resulting in the emergence of employment for a significant number of people throughout the country; however, there seems to be a deficiency in distributing loans to entrepreneurs. **(Mayekar, 2019)** attempted to fill the research gap by determining the roles, functions, and loans sanctioned by Mudra Bank in Goa utilizing data from 2015-2018. Secondary data was used, then tabulated and graphically presented. The credit campaign resulted in loans to 22.50 lakh borrowers, compared to a target of 25 lakh borrowers, for a total of 4120 crore. It was discovered that in 2015-16, the actual loan sanctioned for 'Shishu' was 94.2 Cr, but the actual disbursed amount was 89.83 Cr. In 2018-19, the sanctioned amount was Rs. 34.42 Cr, but the actual disbursed amount was Rs. 33.22 Cr. 'Kishore' sanctioned amount in 2015-2016 was Rs. 164.78 Cr., but disbursed amount was Rs. 155.73 Cr., and sanctioned amount in 2018-19 was Rs. 82.27 Cr., but disbursed amount was Rs. 75.13 Cr. TARUN sanctioned amount in 2015-16 was Rs. 140.35 Cr. and real disbursed amount was Rs. 130.48 Cr. and sanctioned amount in 2018-2019 was around Rs. 87.61 Cr. while actual disbursement was Rs. 79.05 Cr., yet small firms typically encounter numerous hurdles when trying to retrieve a loan from a bank. As a result, they possibly end up taking big risks. **(Punjab, 2020)** evaluated the status and significant problems in the successful enforcement of the "Pradhan Mantri MUDRA Yojana" in rural development in Himachal Pradesh. A secondary data-based analysis was done employing formerly published research publications, SLBC annual reports, the Himachal Pradesh Government's annual

economic survey, and the MUDRA's official website. It was reported that banks in Himachal Pradesh had disbursed loans of Rs. 2,900.07 crores to 1,72,864 micro and small entrepreneurs, comprising Rs. 1220.91 crores belonging to 66,346 new micro-entrepreneurs. It was determined that the MUDRA Scheme had emerged to be a watershed moment in rural development by creating ample jobs. It was disclosed that the state's financial inclusion initiative, through MUDRA Yojana, faced various challenges in its execution, including geographical, health, and educational impediments, gender concerns, caste and religion, household discouragement, and fewer female enrolments than male. **(Poonam, 2020)** examined the Mudra Yojana's strategies to encourage "Women's Entrepreneurialism" in Haryana (District-wise) from 2016 to 2019. The study revealed that on a nationwide scale, there was a proportionate increase of about 18 percent in the case of both "Accounts Opened" and "Loan Amount Sanctioned" to Women; nevertheless, there is a 4 percent increase in "Loan Amount Sanctioned" and a 10 percent reduction in "Accounts Opened." From inception to 2018-19, the total increase in "Accounts Opened" and "Loan Amount Sanctioned" in Haryana was 348.74 and 808 percent, respectively. **(Basak, 2020)** focused on the "Pradhan Mantri Mudra Yojana" and MUDRA Bank in the association with financial inclusion and reviewed PMMY performance from foundation to 2018-19. During the time, the CAGR of the scheme was 32.77 percent underneath loan sanctioned and 32.86 percent under loans disbursed in India. The CAGR of the no. of PMMY loan sanctioned under "Shishu", "Kishore", and "Tarun", respectively, was 16.07 percent, 47.24 percent, and 62.42 percent. It was acknowledged that financial inclusion had morphed in a positive direction since the scheme's foundation, and there had been a broader shift in the realm of microfinance. **(Kumar, 2020)** evaluated the regional growth of the scheme since implementation up to year 2017-18. It was established that the scheme's biggest distribution was recorded in southern India (30percent), although the east was also notably targeted with a 25 percent share. However, further emphasis was demanded on north-east India, which had the weakest share with 4percent. **(Singh & Kumar, 2020)** undertook a primary data-based research work to investigate the determinants of the "Pradhan Mantri MUDRA Yojana", the samples were recorded using a customized questionnaire, and the considered respondents were branch managers, assistant managers, and other responsible officials of different governmental and non - governmental banking institutions. Although more than 480 respondents were solicited at their branch locations, a total of 161 questionnaires were collected. Cronbach's alpha was adopted to determine the validity and reliability of the acquired data, and furthermore that, the data was evaluated using "Exploratory Factor Analysis" employing SPSS. The study discovered six factors of PMMY success, and these factors were considered committed for raising awareness of start-ups and job creators in the underserved areas because there was not any requirement for collateral. It is recommended that the scheme was appropriate for both banks and borrowers. As a corollary, it should be sustained by the central government because it was a very close equivalent to other credit programs of the government. **(Bhayana et al., 2020)** conducted a comprehensive review of the Pradhan Mantri MUDRA Yojana from its commencement to the fiscal year 2018-19. The study's findings found a modest disparity in the number of loans sanctioned and distributed under the scheme. The study specifically looked at the "Pradhan Mantri MUDRA Yojana" in different states, and even the overall performance of all financial institutions that were involved in its execution and according to the analysis, public sector banking institutions took the lead in regardless of the amount sanctioned for the fiscal year 2018-19, followed by private sector banking institutions. Non-Banking Finance Companies, on the other hand, surpassed Small Finance Banks by 147percent in terms of target completion. **(Kandpal & Grover, 2020)** investigated the efficacy of "Mudra Yojana" in supporting the unfunded on "Women Empowerment". It was uncovered that the outstanding loan represented more than 81 percent of the total disbursement made in the three years after the scheme's commencement, with women beneficiaries accounting for 78 percent of the total outstanding obligations. It was asserted that the "Pradhan Mantri Mudra Yojana" was a one-of-a-kind initiative that intended on the strength and power of the poor, neo-middle, and middle - class to build a positive, productive, and value-based industrious culture in achieving economic progress and financial security also for the society's weakest members, including women. **(Vashishtha, 2021)** explored the significance of the "MUDRA Yojana" in reinventing "Financial Inclusion" in the digital age. As 48 percent of the total amount was approved under "Shishu", it was assumed that numerous "first-generation entrepreneurs" availed the advantage of "MUDRA Yojana". It was recognized that MUDRA had offered a tremendous chance to impact the lives of individuals all around the country, and that this would result in the creation of a platform that would fundamentally redefine the "Financial Inclusion" paradigm for the nation. **(Sakthi & Moshi, 2021)** explored the origin and operation of the "Pradhan Mantri Mudra Yojana" as well as its financial performance in supporting entrepreneurs from 2016-17 to 2018-19, employing the Topsis ("The Technique for Order of Preference by Similarity to Ideal Solution") Approach. It was discovered that the scheme has touched a large number of underprivileged groups, with 73.41 percent of account holders being women and 25.16 percent being new entrepreneurs. However, the northern states of the country showed substantially lower involvement in both account creation and credit sourcing. **(Maroor, 2021)** carried out an

empirical study on the awareness and exposure of different "Financial Inclusion" programs (i.e., "Pradhan Mantri Jan Dhan Yojana", "Pradhan Mantri Suraksha Bima Yojana", "Pradhan Mantri Jeevan Jyoti Bima Yojana", "Atal Pension Yojana", "Pradhan Mantri MUDRA Yojana") in the Mangaluru city, Karnataka. It was observed that, of the selected five financial inclusion programs, bank customers were more conscious of the PMJDY than the other four. In addition, PMMY loans were offered to small business units; the most common enterprises for which loans were procured were dry coconut businesses, tailoring shops, hotel businesses, fabric shops, fish storage, and others. **(Sahu et al., 2021)** investigated the effects of the Mudra loan on the commercial, social, and psychological empowerment of tribal women entrepreneurs in West Bengal, India. Despite the fact that 710 respondents were intended to be included in the sample, only 394 were judged credible by the analysis. The researchers employed the ordered logistic regression technique to find the factors influencing employability. " The Wilcoxon Sign test", a non-parametric test, was conducted in the pre-loan and post-loan phases of "PMMY" to assess changes in "women's empowerment" as a result of employability. According to the study, women's empowerment grew significantly after assigning out a certain amount of Mudra loans. As per the assessment, PMMY has contributed to improving women's livelihoods by providing income possibilities and allowing them to grow economically, morally, and emotionally. **(Poonam & Chhikara, 2022)** investigated the influence of MUDRA Yojana on "Women Empowerment" with a focus on Haryana. It examined trends in the substantial share of women beneficiaries on the grounds of both "Accounts Opened" and "Amount Sanctioned," concluding that women are the largest stakeholders of the scheme in India, accounting for 62-80 percent and 43-60 percent. In Haryana, the average growth of women beneficiaries was 49.31 percent in "Accounts Opened" and 61.31 percent in "Amount Sanctioned," indicating the scheme's commitment towards "Women Empowerment."

CONCLUSION

Following the completion of this research, it is reasonable to state that the "Pradhan Mantri MUDRA Yojana" is a step in the right direction by the government to include people excluded from formal economic amenities. Enabling and encouraging small and micro organizations would make a significant contribution to the economic growth of the nation, as these businesses perform a vital role in capital formation, exports, and GDP (Mutha R & Dankunwar, 2020). MUDRA has emerged to be a new finance avenue for micro-business units with considerations of up to Rs.10 lakhs. The current research on the Pradhan Mantri MUDRA Yojana are exclusively concerned with its contribution to "Women Employment", "Rural Development", the "Development of Micro and Small Enterprises", and "Financial Inclusion". It is believed that the Indian government launched the Mudra Bank Initiative under the "Pradhan Mantri Mudra Yojana" to provide additional funding to SMEs that employ a bunch of young, qualified, or brilliant professionals and entrepreneurial visionaries, including female entrepreneurs (Kempegowda M.K., 2021). MUDRA envisions formalizing the informals, and thereby supporting the unfunded. MUDRA Bank will not only address the financial needs of MSMEs but will also provide support and encouragement to a new generation of passionate people who want to pursue their ambitions of turning entrepreneurs (Basak, 2020). The MUDRA Yojna bridged the financial gap caused by non-funding or the lack of cash. It also raises the morale of "first-generation entrepreneurs" by offering economic assistance for the establishment and further expansion (Bhayana et al., 2020). The majority of the studies were based on secondary data; it is recommended that more in-depth studies be undertaken using primary data.

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Appendix

Table 1: Summary of the research papers discussed above

Author details	Title of the paper	Brief summary
Venkatachalam S, & Linda Mary Simon (2015)	Mudra bank to 'fund the unfunded' small entrepreneurs - A conceptual framework	MUDRA main role is to create relationship between creative people and successful clients and could be a gamechanging institutional innovation. Although Poor do need serviceable savings facilities on regular basis, but if their savings are fixed with the MUDRA and they have to borrow, the economics is upside down.
M Gowda, I. P., & Ramesh, H. N. (2015)	Role of MSMEs in India's Development Pradhan Mantri MUDRA Yojana-Serving Micro Units at the Cost of Lenders?	The study evaluated and presented the PMMY provisions, particularly MUDRA's role in organizing financial aid to micro-enterprises, surveyed 74percent of the recipients were women, and nearly 50percent of the total loan portfolios belonged to SCs, STs, and OBCs.
Shahid M., and Irshad M. (2016)	A DESCRIPTIVE STUDY ON PRADHAN MANTHRI MUDRA YOJANA (PMMY)	The study observed that the number of PMMY Loans Sanctioned and Disbursed increased from Rs. 137449.27 Crores, Rs. 132954.73 Crores to Rs. 65062.28 Crores, and 62749.30 Crores respectively from 2015-16 to 2016-17.
Chaudhary A. (2017)	Micro Unit Development and Refinance Agency (MUDRA): Concept , Offerings and Impact	The study establishes that MUDRA Yojana was specifically for NCSBS ("Non-Corporate Small Business Sector") and played an important part in encouraging such organizations to develop and flourish.
Agarwal, M., & Dwivedi, R. (2017)	Pradhan Mantri Mudra Yojna:A Critical Review	Based on the study, the PMJDY, or "Pradhan Mantri Jan Dhan Yojana," contributed 0.2 percent to the "MUDRA" scheme, and women entrepreneurs outnumbered men in relation to the disbursed amounts under the scheme.
Bijender, Chhikara K.S., (2017)	MUDRA: A Step to Rejuvenate MSMEs	The researchers concluded that in Haryana, the participants of the O.B.C. section held the broadest stake under "Shishu", i.e., 27 percent of the overall determined by the number of "Accounts opened".

John, J. S., Kabra, N., & Jose., S. M., (2018)	MUDRA Performance in Karnataka	The study claimed that when compared to "Shishu," the amount allocated for "Kishore" and "Tarun" increased season after season. The study is restricted to percentage and correlation analysis.
Mahajan, A. (2018)	An analysis of performance and impact of MUDRA Yojna under PMMY in the year 2016	Pursuant to the results of the study, 2.76 crore women received funding out of a total of 3.48 crore accounts, or a stunning 79 percent. MFIs contributed significantly to the financing of women under PMMY
Ibrahim P.A. (2018)	An empirical study on the role of MUDRA Yojana in financing micro enterprises	The researchers indicated that northern states' participation rates were lower than those of other states. 'Shishu' had the most accounts opened, while 'Tarun' had the fewest.
Haris M., Subash T. (2018)	An Innovative Approach to Small Industries: Pradhan Mantri Mudra Yojana (PMMY)	The study discussed the significance of MUDRA loans, PMMY products and services, and analyzed the performance of several small business units in the state of Kerala.
Verma, T. L. (2019)	PERFORMANCE EVALUATION OF MUDRA BANK (WITH SPECIAL REFERENCE TO STATE OF MADHYA PRADESH)	The study States that the whole MUDRA loan amount in Madhya Pradesh was reported to have climbed from Rs. 8096.74 Crore in FY 2015-16 to 10506.45 Crore in FY 2016-17. In the fiscal year 2017-18, the sum was raised to Rs. 14399.82 crore.
Vevek, S., Sivaprakkash, S., & Gopinath, R. (2019)	Mudra – A game changer in indian financial inclusion.	The study determined that the loan approved for "Shishu" was the highest from 2015 to 2018, accompanied by "Kishore" and "Tarun." People were apparently interested in the category "Shishu" followed by "Kishore" and "Tarun."
History, A., & Bank, M. (2019)	A Study on the Performance of Pradhan Mantri Mudra Yojana in India	The study asserted that MUDRA developed an ambition of "formalizing the informal" and further "funding the unfunded". Such steps would considerably boost the morale of our youthful, educated, and competent workforce.
Mahajan, Y. D. (2019)	A Study and Review of Pradhan Mantri Mudra Yojana (Pmmy) in the State of Maharashtra	The study stated that the existing societal underprivileged sectors (SC/ST/OBCs) enrolled in the PMMY campaign at a rate of 55percent in terms of loan accounts and 34percent in regards of loan amount permitted in Maharashtra.
Mayekar, J. (2019)	MUDRA BANK AND FINANCIAL INCLUSION	It was discovered that in 2015-16, the actual loan sanctioned for 'Shishu' was 94.2 Cr, but the actual disbursed amount was 89.83 Cr. In 2018-19, the sanctioned amount was Rs. 34.42 Cr, but the actual disbursed amount was Rs. 33.22 Cr. In Goa.
Punjab, J. (2020)	FINANCIAL INCLUSION THROUGH PRADHAN MANTRI MUDRA YOJANA (PMMY) IN RURAL DEVELOPMENT OF HIMACHAL PRADESH	It was reported that banks in Himachal Pradesh had disbursed MUDRA loans of Rs. 2,900.07 crores to 1,72,864 micro and small entrepreneurs, comprising Rs. 1220.91 crores belonging to 66,346 new micro-entrepreneurs.
Poonam (2020)	"Pradhan Mantri Mudra Yojana": An Accelerator for Female Entrepreneurialism	The study revealed that on a nationwide scale, there was a proportionate increase of about 18 percent in the case of both "Accounts Opened" and "Loan Amount Sanctioned" to Women; nevertheless, there is a 4 percent increase in "Loan Amount Sanctioned" and a 10 percent reduction in "Accounts Opened."
Basak, A. (2020)	Mudra Initiatives for Funding To Msme : a Big Step for Pushing Financial Inclusion	The study concluded that the CAGR of the no. of PMMY loan sanctioned under "Shishu", "Kishore", and "Tarun", respectively, was 16.07 percent, 47.24 percent, and 62.42 percent.
Kumar, V. (2020)	A comprehensive analysis of "Pradhan Mantri	The study established that the scheme's biggest distribution was recorded in southern India (30percent), although the east

	MUDRA Yojana" – Achievements and bottlenecks	was also notably targeted with a 25 percent share.
Singh, K., & Kumar, A. (2020)	Factors determining the success of pradhan mantri mudra yojana: A study of north india	The study discovered six factors of PMMY success, and these factors were considered committed for raising awareness of start-ups and job creators in the underserved areas because there was not any requirement for collateral.
Bhayana, G., Rashmi, & Kumar, R. (2020)	Role of Mudra Yojana in Entrepreneurship Development	The study discovered that the percentage rise in loan sanctioning is more than 25, and 31, respectively, and involvement of the depressed classes (SC/ST/OBCs) was at 55percent in terms of "loan accounts" and 34 in terms of the "loan amount sanctioned" in the top 10 regions.
Kandpal, A., & Grover, M. M. (2020)	Efficacy of Mudra Yojana of funding the unfunded on women empowerment	The study uncovered that the outstanding loan represented more than 81 percent of the total disbursement made in the three years after the scheme's commencement, with women beneficiaries accounting for 78 percent of the total outstanding obligations.
Vashishtha, S. (2021)	Reinventing Financial Inclusiveness in the Digital Era : an Investigation Into Mudra Yojna	The study recognized that MUDRA had offered a tremendous chance to impact the lives of individuals all around the country, and that this would result in the creation of a platform that would fundamentally redefine the "Financial Inclusion" paradigm for the nation.
Sakthi, T., & Moshi, A. A. M. (2021)	Financial Performance Assessment of Micro Unit Development and Refinance Agency (Mudra) Yojana using Topsis Approach	The study discovered that the scheme has touched a large number of underprivileged groups, with 73.41 percent of account holders being women and 25.16 percent being new entrepreneurs by employing the Topsis ("The Technique for Order of Preference by Similarity to Ideal Solution") Approach.
Maroor, J. P. A. I. (2021)	An Empirical Study of the Awareness and Access of Financial Inclusion Schemes in Mangaluru City , Karnataka.	The study explored that PMMY loans were offered to small business units; the most common enterprises for which loans were procured were dry coconut businesses, tailoring shops, hotel businesses, fabric shops, fish storage, and others.
Sahu, T. N., Agarwala, V., & Maity, S. (2021)	Effectiveness of microcredit in employment generation and livelihood transformation of tribal women entrepreneurs: evidence from PMMY	As per the assessment of the study, PMMY has contributed to improving women's livelihoods by providing income possibilities and allowing them to grow economically, morally, and emotionally
(Poonam & Chhikara K.S., 2022)	Impact of MUDRA Yojana on Women Empowerment in Haryana	The study stated that the average growth of women beneficiaries was 49.31 percent in "Accounts Opened" and 61.31 percent in "Amount Sanctioned," in Haryana, indicating the scheme's commitment towards "Women Empowerment."

A REVIEW ON CONCEPT OF ASTHMA AND DIAGNOSIS OF ASTHMA

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ABSTRACT

Asthma is a common chronic, non-communicable disease in children &adults. It produces episodic & persistent respiratory symptoms and airflow limitations. Asthma treatment is based on cycle of assessment, risk factors, comorbidities, side effects& patients satisfaction. Also it includes adjustment, avoidance of measures & pharmacological interventions i.e. Inhaled Corticosteroid (ICS) & combination of ICS with beta-2 long acting agonists inhaler's for adult patients. This article provides current literature &guideline for appropriate treatment of chronic asthma in both children and adults.

Keywords: Spirometry, Corticosteroid, lymphocytes, Airway

INTRODUCTION

Asthma is defined as a chronic inflammatory disease of the airways. Chronic inflammation is associated with airway hyper responsiveness (an exaggerated airway narrowing response to specific triggers such as virus, allergens, exercise), wheezing, shortness of breath, chest tightness, and / or recurrence of cough. Bringsepisodes, over time and intensity may change. [1,2]

With the help of NAEPP and GINA, most asthma patients are well controlled with conventional medications long-acting or short-acting B agonist Bronchodilator (LABA or SABA) or inhaled corticosteroid in combination with long-acting corticosteroid a muscarinic antagonist with occasional additions of leukotriene antagonists (LTRA).[3]

Severe asthma (SA) is defined as, asthma requiring treatment with high-dose ICS in addition, a second control drug and / or systemic corticosteroid to maintain asthma control, or those who remain uncontrolled despite the above drugs (if asthma worsens more than two a year) according to ATS and ERS. [4] Finally, although most cluster analyzes are performed in formal asthma studies, we assume that the clustering approach can be applied to electronic health record data (i.e., real-world data). As an intermediate step, our goal was to perform clustering on existing data from the South California Pediatric Health Study (CHS), a population-based cohort study. [5]

Asthma is a very common childhood illness that causes multiple hospitalizations increased medical expenses. If not treated promptly, asthma has a high mortality. Recruitment and activation of mast cells, macrophages, dendrite cells, neutrophils, eosinophils, T lymphocytes inflammatory and cellular infiltration of the airways. It type 2 Thelper cell (Th2) seems to have a measure its role in the activation of the resulting immune cascade underlying inflammation that can lead to long-term effects asthma reaction.[6]

Etiology: [7]

Asthma incorporates a variety of illnesses and has numerous heterogeneous phenotypes. The diagnosed elements which can be related to bronchial allergies are a genetic predisposition, particularly a non-public or own circle of relatives records of atopy (propensity to allergy, generally visible as eczema, hay fever, and bronchial allergies)

The standard etiology is complicated and nevertheless now no longer absolutely understood, in particular in regard to being cabin a position to mention which youngsters with pediatric bronchial allergies will keep on to have bronchial allergies as adults (up to 40% of youngsters have a wheeze, handiest 1% of adults have bronchial allergies), however it's far agreed that it's far a multifactorial pathology, prompted via way of means of each genetics and environmental exposure.

Triggers for bronchial allergies include: [8]

Viral respiratory tractinfection, Exercise, Gastro esophageal reflux disease Chronic sinusitis, Environmental allergens, Use of aspirin, beta-blockers, Tobacco smoke, Insects, plants, chemical fumes, Obesity,Emotional factors or stress etc.

Epidemiology:

Asthma is one of the maximum not unusual place chronic, noncommunicable diseases, and influences round 334 million humans worldwide.Asthma is a not unusual place pathology, affecting round 15% to 20% of human beings in advanced countries and round 2% to 4% in much less advanced countries.[9] It is notably greater not unusual place in youngsters. Up to 40% of youngsters may have a wheeze at a few points, which, if reversible

through beta-2 agonists, is named asthma, no matter lung feature tests. According to International Severe Asthma Registry (ISAR) TE asthma represent approximately 70% severe asthma cases. [10]

The worldwide occurrence of self-reported, doctor-identified bronchial allergies in adults is 4·3% (95% CI 4·2–4·4), with huge variant among countries. Prevalence is maximum in advanced countries—e.g., Australia (21·0%), and lowest in growing countries—e.g., China (0·2%).Greater variant is visible for bronchial allergies signs in youngsters, starting from 2·8% (Indonesia) to 37·6% (Costa Rica) in youngsters elderly 6–7 years, and from 3·4% (Albania) to 31·2% (Isle of Man) in youngsters elderly 13–14 years. [11]

This sample reverses throughout adolescence. In a prospective take a look at of 19-year-olds, 21% of these with bronchial allergies at 7 years of age had been in remission, 38% had periodic bronchial allergies, and 41% had continual bronchial allergies. Remission became much more likely in boys, however much less probable in women and sufferers with severe bronchial allergies or sensitization to furred animals. [12]

Pathophysiology: [13]

Asthma is a situation of acute, completely reversible airway infection, frequently following publicity to an environmental trigger. The pathological system starts with the inhalation of an irritant (e.g. Bloodless air) or an allergen (e.g., pollen), which then, because of bronchial hypersensitivity, ends in airway infection and an growth in mucus production. This ends in a considerable growth in airway resistance, that's maximum said on expiration.

Airway obstruction takes place because of the mixture of:

Inflammatory molecular infiltration.

Mucus hyper secretion with mucus plug formation.

Smooth muscle contraction.

These irreversible modifications might also additionally emerge as irreversible through the years because of ;

Basement membrane thickening, collagen deposition, and epithelial desquamation.

Airway reworking takes place in continual ailment with easy muscle hypertrophy and hyperplasia.

Sign and Symptoms: [14]

Asthma signs are non-specific, and encompass wheezing, shortness of breath, chest tightness, and cough.

The most feature bronchial allergies capabilities relate to the sample of signs, such as symptom nature, timing, triggers, and reaction to treatment (appendix). Therefore, careful records taking is critical to evaluate the opportunity that breathing signs are because of bronchial allergies instead of a differential analysis or comorbidity.

Physical exam might screen symptoms and symptoms of comorbidities, which include bronchiectasis (adults) and weight problems or, in atopic patients, eczema, or allergic rhinitis.

Types of Asthma: Two types of asthma, first is chronic and second is acute asthma.[15]

- Chronic asthma is usually classified as follows:
1. Intermittent
2. Mild persistent
3. Moderate persistent
4. Severe persistent

Intermittent asthma :	Mild persistent :	Moderate persistent :	Severe persistent :
Symptoms are mild and do not interfere with normal activities.	Symptoms occur three to six times a week.	Symptoms occur daily.	Symptoms occur throughout the day, every day, and severely limit daily activities.
Symptoms occur less than twice a week.	Nighttime symptoms occur three to four times a month.	Symptoms interfere with normal activities.	Nighttime symptoms occur frequently, sometimes every night.
Nighttime symptoms occur less than twice a month.	Asthma attacks affect daily activities.	Nighttime symptoms more than once per week but not every day.	Lung function tests are abnormal.
Asthma attacks are infrequent.	Lung function tests are normal when a person is not having an asthma attack.	Asthma attacks affect daily activities.	
Lung function tests are normal when a person is not having an asthma attack.		Lung function tests are abnormal.	

- **Acute asthma is classified as below:**

I. Acute severe asthma

II. Life-threatening asthma

III. Near-fatal asthma

Diagnosis of Asthma: [16]
The diagnosis of asthma involves through,

- Medical history,

- Physical examination and

- Objective assessments of lung function in those ≥6 years of age (spirometry preferred, both before and after bronchodilator) to document variable expiratory airflow.

Limitation and confirm the diagnosis (see Table 1). Broncho provocation challenge testing and assessing for markers of airway inflammation may also be helpful for diagnosing the disease, particularly when objective measurements of lung function are normal despite the presence of asthma symptoms.

- **Medical History:**
Important questions to ask when taking the medical history of patients with suspected asthma are summarized in Table 1

The diagnosis of asthma should be suspected in patients with recurrent cough, wheeze, chest tightness and/or shortness of breath. Symptoms that are variable, occur upon exposure to triggers such as allergens or irritants, that often worsen at night and that respond to appropriate asthma therapy are strongly suggestive of asthma. Alternative causes of suspected asthma symptoms should be excluded.

The prognosis of bronchial allergies in youngsters is frequently more difficult considering that episodic wheezing and cough are normally related to viral infections, and youngsters may be asymptomatic with regular bodily examinations among exacerbations. In addition, spirometry is frequently unreliable in sufferers below 6 years of age, although it may be done in a few youngsters as younger as 5 years. A beneficial technique of confirming the prognosis in younger youngsters is a tribulation of remedy (8–12 weeks of a every day ICS and a short-appearing bronchodilator as wanted for rescue medication). Marked clinical development for the duration of the remedy period, as reflectedthrough a discount in daylight hours or nocturnal signs and symptoms of bronchial allergies, a discount with inside the use of rescue bronchodilator medication, absence of acute care visits (e.g., someday medical doctor appointments or emergency room visits) And hospitalizations for bronchial allergies exacerbations, and the absence of rescue oral corticosteroids are all indicators.

That the every day ICS remedy is running and that a prognosis of bronchial allergies is likely.

Table 1 Key question to ask when taking the medical history of patients with suspected asthma

Asthma symptoms (cough, wheeze, increased work of breathing)?
Age of onset of symptoms?
Timing of symptoms (day vs. night)?
Is there a seasonal component to the worsening of symptoms?
Possible triggers (viral infections, animal exposures, pollens, tobacco smoke, emotion)?
Severity of symptoms (often reflected by unscheduled physician appointments at a walk-in clinic or emergency room, hospital admissions, and need for rescue oral corticosteroids)?
Past investigations including chest X-rays, spirometry, allergy testing, sweat chloride testing?
Other co-morbidities (e.g., food allergy, venom allergy)?
Current and past treatments? Duration of use? Reasons for discontinuation?
Barriers to treatment (cost of medication, proximity to health care providers)?
Exposure to second- and third-hand (i.e., the lingering smell of tobacco smoke on clothing or in vehicles) tobacco smoke?
Presence of household pets?
Impact of the symptoms on the patient/family quality of life (missed time from activities, school or work due to asthma symptoms)?

Assess for own circle of relatives or private records of atopic disease (especially allergic rhinitis)

- **Physical Examination :**

Given the range of bronchial allergies symptoms, the bodily exam of sufferers with suspected bronchial allergies can often be unremarkable. Physical findings can also additionally handiest be evident if the affected person is symptomatic. Therefore, the absence of bodily findings does now no longer exclude a analysis of bronchial allergies. The maximum not unusual place bizarre bodily findingsare a extended expiratory segment and wheezing on auscultation, which confirm the presence of airflowlimitation. Auscultating the chest earlier than and after bronchodilator remedy may be informative as well, with advanced breath sounds cited as soon as the small airways go through bronchodilation.

In pediatric patients, a scoring rubric called the Pediatric Respiratory Assessment Measure (PRAM) has been developed to assess a patient's acute asthma severity using a combination of scalene muscle contraction, suprasternal retractions, wheezing, air entry and oxygen saturation (see Table 2). This tool has been validated in children 0–17 years of age, and is most commonly used in acute care settings such as emergency departments, pediatric intensive care units and inpatient units.

Table 2 PRAM scoring table

Criterion	Descriptions	Score
O2 saturation (%)	≥95	0
	92–94	1
	<92	2
Suprasternal retraction	Absent	0
	Present	2
Scalene muscle contraction	Absent	0
	Present	2
Air entry [a]	Normal	0
	↓ at the base	1
	↓ at the apex and the base	2
	Minimal or absent	3
Wheezing b	Absent	0
	Expiratory only	1
	Inspiratory (±expiratory)	2
	Audible without stethoscope or silent chest (minimal or no air entry)	3

PRAM score: (max. 12)

Score	0-3	4-7	8-12
Severity	Mild	Moderate	Severe

- **Objective measurements to confirm variable expiratory airflow limitation :**
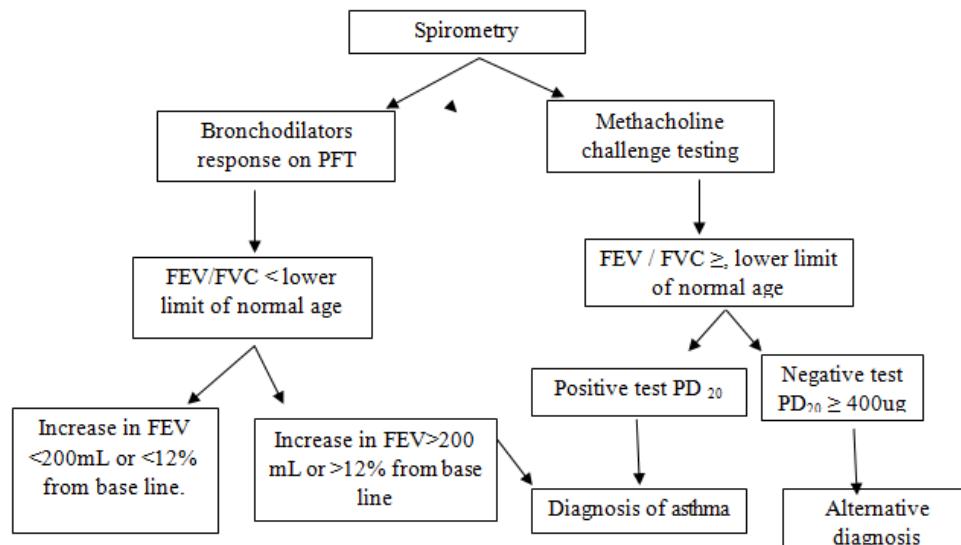
Spirometry measures airflow parameters such as the forced vital capacity (FVC, the maximum volume of air that can be exhaled) and the forced expiratory volume in 1 s (FEV1). Lung volumes are not measured with spirometry, and instead require full pulmonary function testing. The ratio of FEV 1 to FVC provides a measure of airflow obstruction. In the general population, the FEV1/FVC ratio is usually greater than 0.75–0.80 in adults, and 0.90 in children. Any values less than these suggest airflow limitation and support a diagnosis of asthma. Because of the variability of asthma symptoms, patients will not exhibit reversible airway obstruction at every visit and a negative spirometry result does not rule out a diagnosis of asthma. This is particularly true for children who experience symptoms predominantly with viral infections, or who are well controlled on asthma medications. Therefore, to increase sensitivity, spirometry should be repeated, particularly when patients are symptomatic.

Spirometry have to be done in accordance to standardized protocols (inclusive of the ones proposed through the American Thoracic Society) through skilled personnel.It is usually done in pulmonary function laboratories, however also can be done with inside the outpatient medical setting. During spirometry, the affected person is advised to take the inner most breath viable and then to exhale tough and speedy and as completely as viable into the mouthpiece of the spirometer for a complete of 6s. Calibration of the spirometer ought to be done daily.

Tests of Bronchial Hyper Reactivity:

If spirometry is normal, but symptoms and a history of indicate asthma, the direct airway to inhaled bronchoconstriction stimuli (eg,methacholine or Histamine) or indirect stimuli (eg, mannitol or exercise). Stimulation measures airway responsiveness.) Helps to confirm the diagnosis of asthma.

Tests of bronchial hyper reactivity should be conducted in accordance with standardized protocols in a pulmonary function laboratory or other facility equipped to manage acute bronchospasm. Bronchopovocation testing involves the patient inhaling increasing doses or concentrations of an inert stimulus until a given level of bronchoconstriction is achieved, typically a 20% fall in FEV1. An inhaled rapid-acting bronchodilator is then provided to reverse the obstruction. Test results are usually expressed as the provocative dose (PD) or provocative concentration (PC) of the provoking agent that causes the FEV1 to drop by 20% (the PD20 or PC20, respectively). For methacholine, mostpulmonary function laboratories use a PC20 value less than 4-8 mg/mL as the threshold for a positive result indicative of airway hyper reactivity, supporting a diagnosis of asthma. However, positive challenge tests are not specific to asthma and may occur with other conditions such as allergic rhinitis and chronic obstructive pulmonary disease (COPD). Therefore, tests of bronchial hyper reactivity may be most useful for ruling out asthma among individuals who are symptomatic.

✓ **Allergy Skin Testing :**

Allergy pores and skin prick (percutaneous) trying out is endorsed to perceive viable environmental allergic triggers of bronchial allergies, and is useful in identifying the bronchial allergies phenotype of the patient. Testing is normally completed the usage of the allergens applicable to the patient's geographic region. Although allergen-specific IgE checks that offer an in vitro degree of a patient's specific IgE tiers for specific allergens have been cautioned as an opportunity to pores and skin checks, those checks are much less sensitive, extra invasive (calls for venipuncture), and extra costly than pores and skin prick check. There isnot any minimal age at which pores and skin prick trying out can be completed.

✓ **Differential Diagnosis :**

Conditions that should be considered in the differential diagnosis of adults with suspected asthma may include: COPD, bronchitis, gastrointestinal reflux disease, recurrent respiratory infections, heart disease, and vocal cord dysfunction. Distinguishing asthma from COPD can be particularly difficult as some patients have features of both disorders. The term asthma and COPD overlap syndrome (ACOS), though not a single disease entity, has been adopted to describe these patients. A recent population-based cohort study conducted in Ontario suggests that the prevalence of concurrent asthma and COPD is increasing, particularly in women and young adults.

✓ **Clinical Presentation :** [17]

Symptoms of asthma are non specific and hence the diagnosis of asthma is very difficult. Different symptoms present at night and early morning i.e. wheezing, shortness of breath, cough etc. Respiratory symptoms vary over the time and intensity, which are worse at night and morning. One the other hand the presence of chronic sputum production, chest pain', isolated cough with no other respiratory symptoms decreases probability of asthma.

CONCLUSION

Inhaled corticosteroids are helpful for the chronic asthma treatment, which effectively influence lungs function & control asthma symptoms. Spirometry is very helpful for the diagnosis of asthma. The lack of head to head

comparison of biological medications in patients with severe asthma, additional data is required to confirm the diagnosis of asthma.

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SYNTHESIS AND CHARACTERIZATION OF SCHIFF BASESOF 4-FORMYL RESORCINOL

Dr. S. Maria Rayappan, Dhurairaj Satheesh and Kannan Parameswari

ABSTRACT

The Schiff bases were synthesised from 4-formyl resorcinol and various substituents of aromatic amine of some heterocyclic compounds under magnetic stirrer method .The synthesized Schiff bases were characterized by spectral techniques (H1 NMR 13C NMR & IR-Spectra.

Keywords: Schiff bases, Aldehyde and pyridine

INTRODUCTION

Schiff bases active against a wide range of organisms. Inorganic elements play vital role in biological medical processes and many organic compounds used in medicine do not have a purely organic mode of action.[1] Schiff base are the compound containing azomethinegroup (-HC=N-). They are condensation products of ketones (or) aldehydes with primary amines and were first reported by Hugo Schiff in 1864.[2] Formation of Schiff base generally takes place under acids catalysis or with heat. A Schiff base behaves as a Flexi-dentate ligand and commonly co-ordinates through the O atom of the de -pronated phenolic group and the Natom of azomethine group.[3] In Schiff base azomethine nitrogen and other donor atoms like oxygen play a vital role in co-ordination chemistry. Pyridine derivatives have been of great interest because of their role in natural and synthetic organic chemistry. Many products whichcontain a pyridine sub unit exhibit biological activity such as antimicrobial [4] and antituberculosis activity[5].Hence an attempt is made to study the interaction of reduced Schiffbases.

Aromatic aldehydes especially with an effective conjugation system, form stable Schiff bases, where as those aliphatic aldehydes are unstable and readily polymerize [6] Schiff base ligands with aldehydes are formed more readily than with ketone (carbonyl carbon).Schiff bases have very flexible and different structures. Their chemical and physical properties in various field such as preparative uses, identification, or protection and determination of aldehyde or ketones, purification of carbonyl and amino compounds or production of these compounds in complex or sensitive reactions have studied.

II. MATERIALS AND METHODS CHEMICALS

1.   2- amino benzamide[BTL-07]

2. 2-amino 3- hydoxy pyridine [LARICASTER (98%),6737-16867-03-1,F.W.110-12]

3.   4-amino 3,5-dichloro pyridine [Alpa Aesar (98+%), F.W. 163-01 EINECS]

4.   2-4 dihydroxy benzaldehyde (4- formyl resorcinol) [S4993851 004 (Merck Schuhardp) OHG, 85662 Hohenbrunn, Germany]

Solvent ;   Ethanol, commercial ethanol was distilled from suspended impurities. To this anhydrous calcium oxide was added and refluxed for about 2 hours, distilled at 78° C and collected in a receiver fitted with a calcium chloride guard tube.

Solubility Measurement. The individual components of the complex were having same solubility in organic solvent of ethanol. The experiments were carried out with organic solvent.

METHODS

Three new Schiff bases have been synthesized from condensation of 2-amino benzamide, 2-amino 3-hydroxy pyridine and 4-amino 3,5 dichloro pyridine along with 4- Formyl resorcinol to form new Schiff bases.[7]Fourier transform infrared (FTIR) spectra wereregistered on a SFL2022000415,IR spectra photometer using KBr discs. Proton nuclear magnetic resonance (1H NMR and 13C NMR) spectra were obtained at room temperature with Brooker Avance equipment internal standard in dimethyl sulphoxide (DMSO).

Synthesis Of 2-Amino Benzamide Schiff Base

2-Amino benzamide and 4-Formly resorcinol was taken in equal amount of ratio (1:1) in 10ml of ethanol and 5ml of Con. Hcl and then dissolved. The resulting mixture was left under reflux for 5 hours at 60 $^{\circ}$ C and the solid product formed and then dried.

Synthesis Of 2-Amino 3- Hydoxy Pyridine Schiff Base

The equivalent ratio of 2-amino 3- hydoxy pyridine was mixed with corresponding aldehyde in 10ml of ethanol and 5ml of Con.Hcl and 1 drop of Con.H2So4 and dissolved. The resulting mixture was left under reflux for 5-6 hours at 60°C,then the liquid product formed and then dried.

Synthesis Of 4-Amino 3,5-Dichloro Pyridine Schiff Base

The equivalent amount of ratio (1:1) 4-amino 3,5-dichloro pyridine along with corresponding aldehyde in 15ml of ethanol and 5ml of Con.Hcl was taken and dissolved the mixture. The resulting mixture was left under reflux for 5-6 hours at 60° C and the liquid product formed and then dried.

Results And Discussions [8]

The synthesis of Schiff's bases with different aromatic amines and specific aromatic aldehyde in ethanol as a solvent and catalyst (con HCl)) resulted in three new series of Schiff'sbases with the general formula RHC =N-R1. Here R1 =4-Formyl resorcinol and R1 = 2-Aminobenzamide, 2-Amino 3-hydroxy pyridine and 4-Amino 3-5-Dichloro pyridine were synthesizedand investigated by spectral methods of IR,1H NMR and 13C NMR.(scheme 1,2,3)

General Mechanism Of Schiff Base
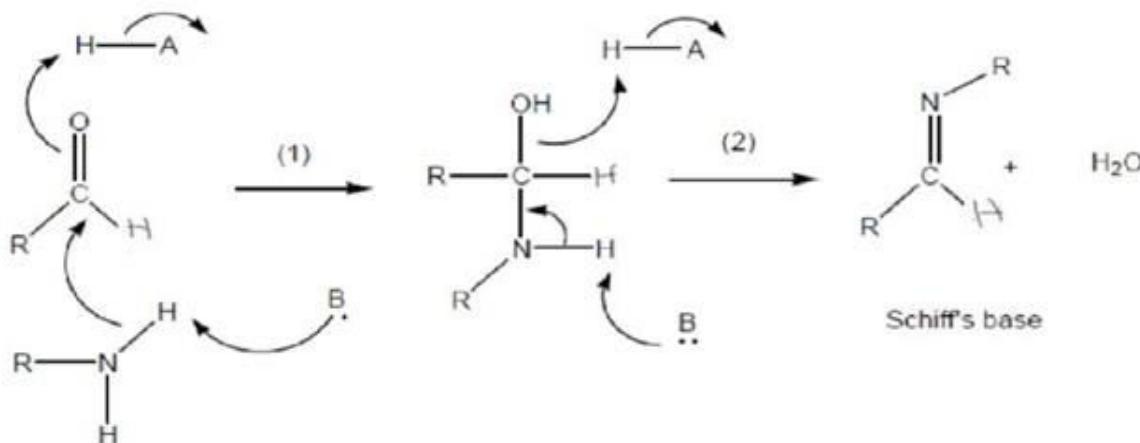
SCHEME- 1
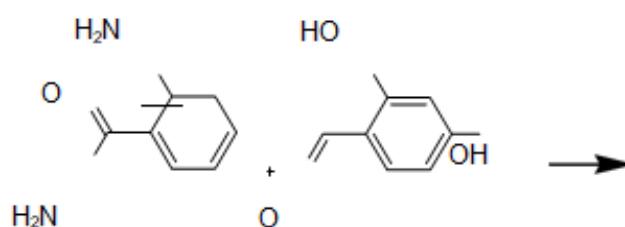
2- Aminobenzamide   2-4 - Dihydroxy benzaldehyde
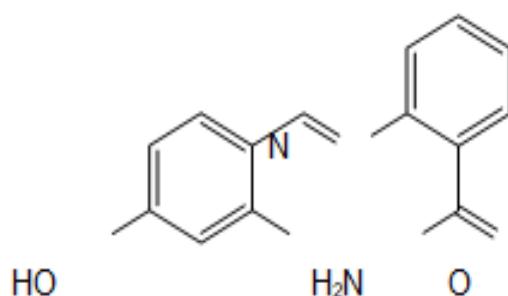
2-[2-4-Dihydroxy benzylidene-amino] benzamide

SCHEME-2

2-Amino-3-Hydroxy pyridine   2, 4-dihydroxy benzaldehyde

4-[3-Hydroxy pyridin-2-ylimino-methyl] benzene-1-3-diol

4-Amino-3-5-Dichloro pyridine   2-4-Di hydroxy benzaldehyde

4-[(3-5-Dichloro pyridin-4yl Imino)-methyl] benzene 1, 3 diol
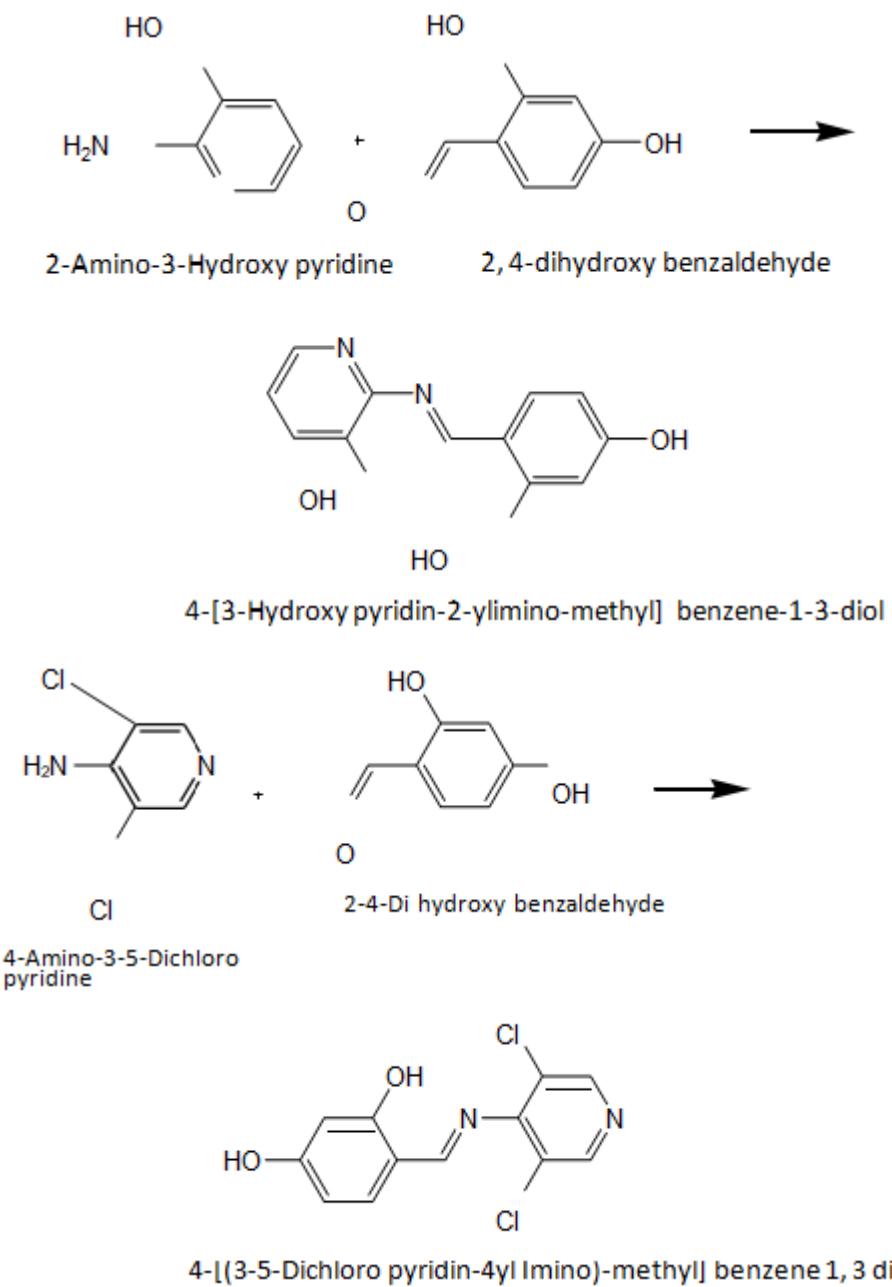
Table 1 Physical Data Of Schiff Bases With General Formula R1N=CHR2   [9]

S.NO	R1	R2	Ratio of reactants (R1 : R2)	Molecular formula	Yield(in %)	Physical state of compound	Solubility
1	2-Amino benzamide	4- Formyl resorcinol	1:1	**C14H12N2O3**	90.5	Yellowish brown solid	ethanol
2	2- Amino 3- hydroxy pyridine	4- Formyl resorcinol	1:1	**C12H10N2O2**	70	Brownishyellow semisolid	ethanol
3	4-Amino 3,5 dichloro pyridine	4- Formyl resorcinol	1:1	**C12H8Cl2NO2**	90	Brown solid	ethanol

R1 → 2-Amino benzamide, 2- Amino 3- hydroxy pyridine and 4-Amino 3,5 dichloropyridine

R2 → 4-Formyl resorcinol (2-4- Dihydroxy benzaldehyde)

Ir Spectra[14]

In this investigation FT-IR is effective tool to detect functional group for in ligand. The observed frequency of carbonyl and primary amine was disappearing. This clearly indicate that IR spectrum confirms the formation of Imines bond (N=CH) and absorption of carbonyl bond(C=O) the actual band for compounds (1,2,3) are assigned to stretching vibration of the Imines group at (N=CH) 1667.54,1662.72,1628.22 ($\tilde{v}$) cm^{-1} formed in the region of IR spectrum.it is more intense than (C=C) stretching bonds.

IR SPECTRUM ($\tilde{v}$) cm^{-1}

[10]

S.No	Name of the compounds	Ar-OH	Ar-CH	N=CH	C-N	C=C	RCONH2	C-Cl
1	2-[2,4 dihydroxy benzilidine- amino] benzamide	3190	3045	1667.54	1524	1405	1606	-
2	4-[3 hydroxy pyridin- 2ylimino-methyl]benzene 1,3 diol	3315	3182	1662.72	1575	1574	-	-
3	4-[3,5 dichloro pyridine 4- ylimino-methyl]benzene 1,3 diol	3383	3183	1628.22	2730	1506	-	724.5
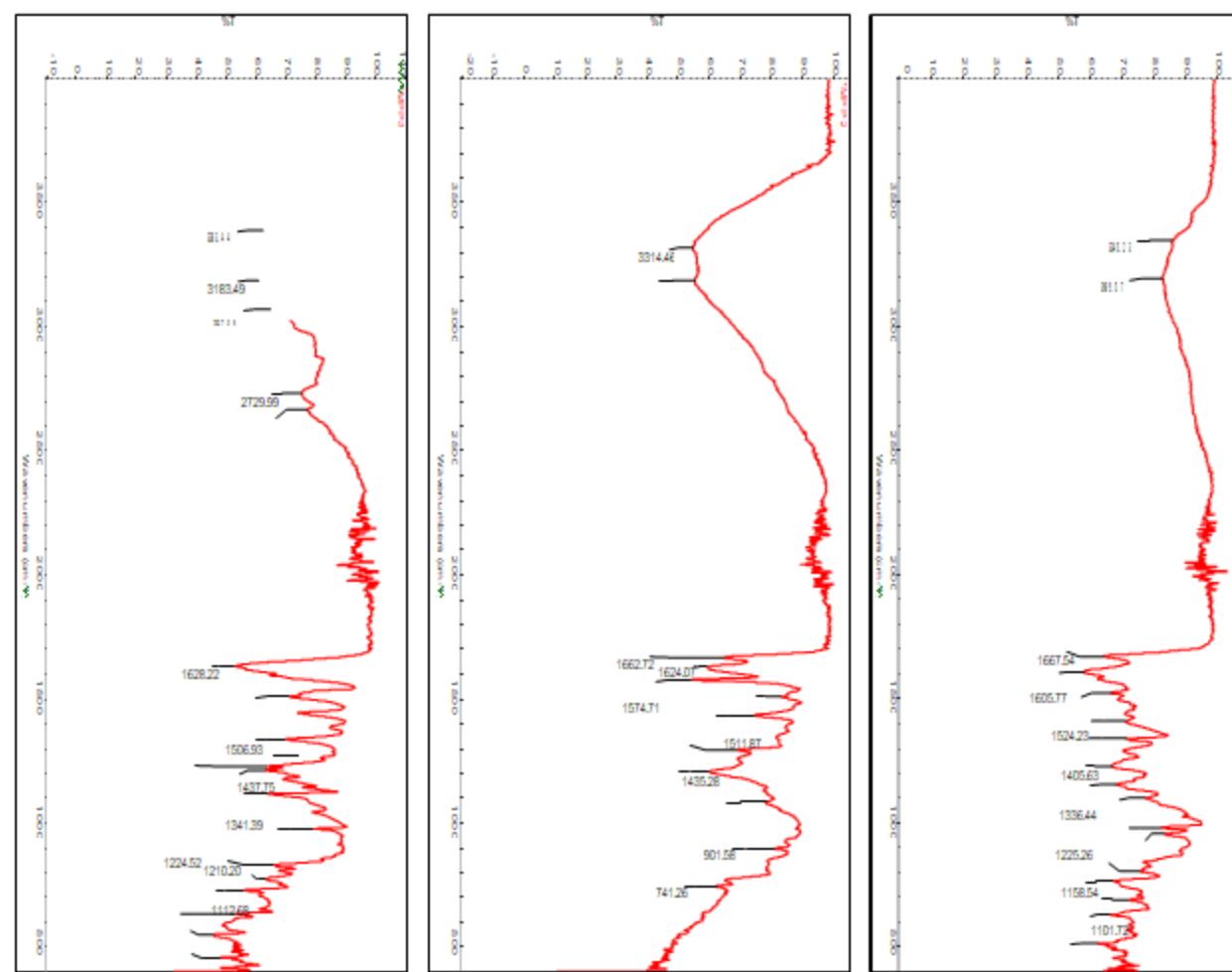
1h NMR Spectra

[13]The H^1 nuclear magnetic resonance (1H NMR) of 3 compounds 2-[2,4-dihydroxy benziline- Amino] benzamide, 4-[3-hydroxy pyridine-2ylimino-methyl]benzene 1,3-diol, 4- [3,5-dichloro pyridin-4ylimino methyl]benzene 1,3-diol were recorded on Bruker AVANCE(model) 400 MHz spectrometers. The solvent used was dimethyl sulfoxide (DMSO). The observed H^1 NMR signals of the above 3 compounds of aromatisation

with heterocyclic characterisation has presented below the figure (1H NMR of compound 1,2 and 3). The formation of Schiff bases were recognized through (N=CH) azomethine group. 1H NMR spectra for aromatic protons of compound 1 ($C_{14}H_{12}N_2O_3$) appear as multiplet signals in the region between 6.2 to 8.1 the sharp peak at 8.1 (N=CH) shows the formation of Schiff base (azomethine) followed by the compound 2 ($C_{12}H_{10}N_2O_2$) and compound 3 ($C_{12}H_8Cl_2N_2O_2$) alsoobserved the formation of the azomethine group in the region 7.9 and 8.5 through this[1]HNMRspectral studies .

^{1}H NMR data of compounds with general formula $R_1N=CHR_2$

Table No: 3   [11]

S.NO	Molecular Formula	CH	OH	N=CH	CONH2
1	**C14H12N2O3**	6.3 – 7.8(9H)	7.9 (2H)	8.1 (H)	6.2 (2H)
2	**C12H10N2O2**	3.5-6.7 (8H)	7.3- 7.6(3H)	7.9(H)	-
3	**C12H8Cl2N2O2**	6.3 -7.5(5H)	5.5 (2H)	8.5 (H)	-

$R_1 \rightarrow$ 2-Amino benzamide, 2- Amino 3- hydroxy pyridine and 4-Amino 3,5 dichloropyridine

$R_2 \rightarrow$ 4- Formyl resorcinol
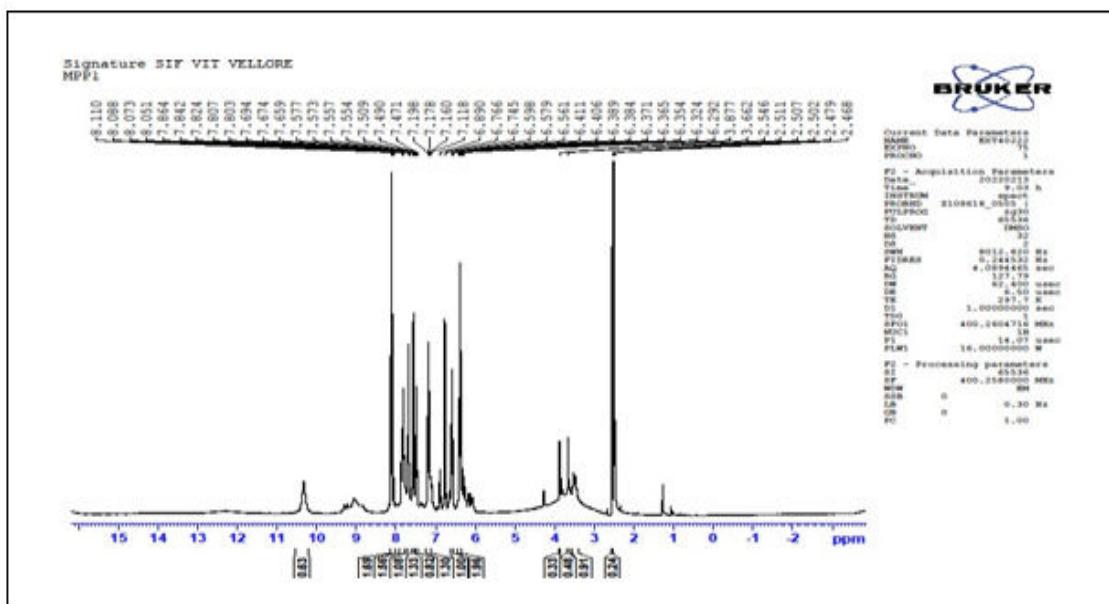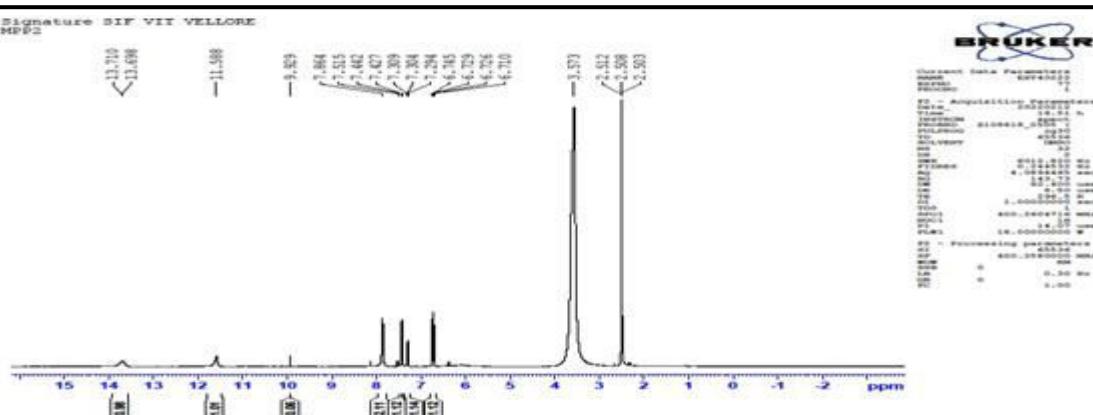
^{13}c NMR Spectra

[15]In the structures of Schiff bases were assigned by comparing the experimental chemical shifts with those calculated from the 13C NMR spectral studies. The 13C NMR has a broad peak the complexity in the spectrum further increases by overlap of multiplets due to the more number of one bond (C-H) coupling .The 13C-NMR spectral data of the Schiff basesare in accord with the proposed structures

^{13}C NMR data of compounds with general formula $R_1N=CHR_2$

Table No: 4   [12]

Compound number	1	2	3
Molecular formula	C14H12N2O3	C12H10N2O2	C12H8Cl2N2O2
R1			
C1	171.5	148.2	165.7
C2	154.6	112.8	109.2
C3	129.5	125.5	153.7
C4	126.5	142.9	102.7
C5	132.5	-	133.7
C6	125.5	-	
C7	126.7	-	-
R2			
C8	163.1	-	163.7
C9	115.4	-	115.6
C10	162.0	121.8	115.6
C11	103.8	-	138.3
C12	163.5	-	138.2
C13	108.1	-	138.2
C14	132.4	-	115.5

$R_1 \rightarrow$ 2-Amino benzamide, 2- Amino 3- hydroxy pyridine and 4-Amino 3,5 dichloropyridine

$R_2 \rightarrow$ 4- Formyl resorcinol
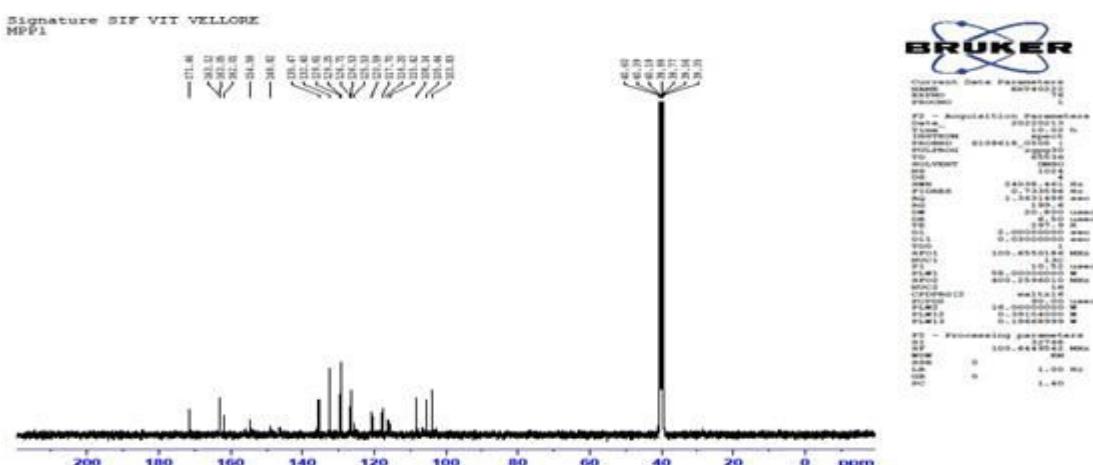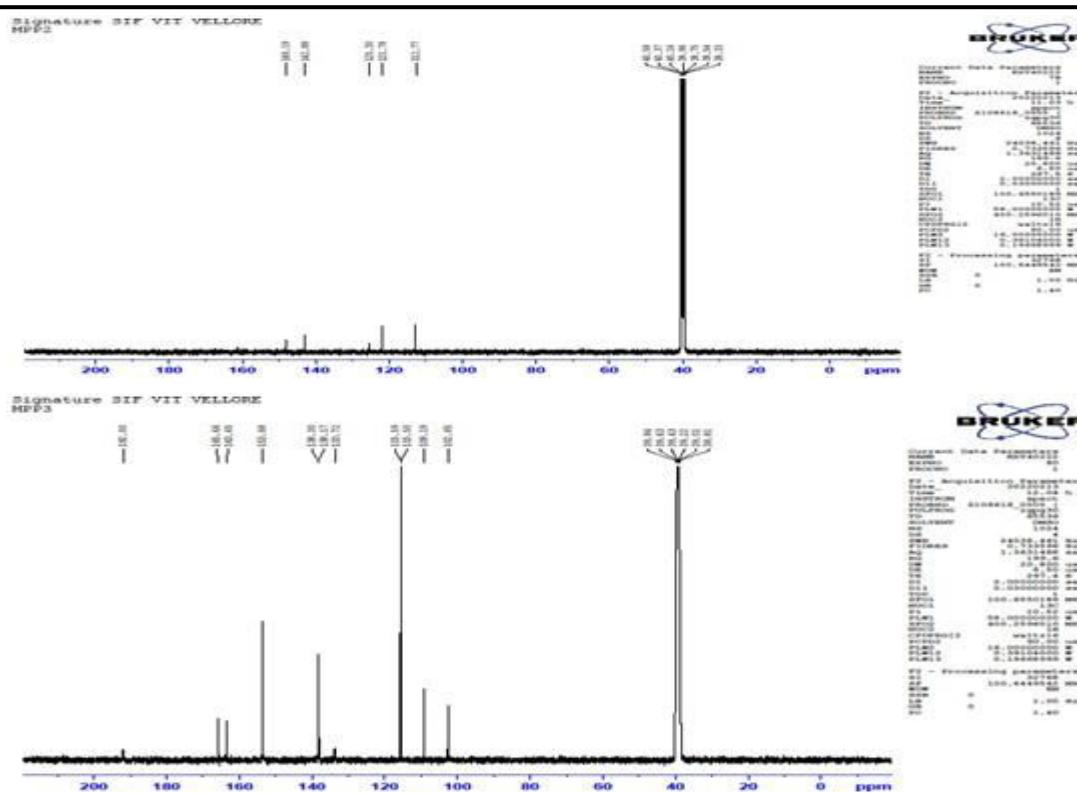
CONCLUSION

In this experiment we targeted on the synthetic path and spectral determination of IR, ^{1}H NMR and ^{13}C NMR. The typical , ^{1}H NMR and ^{13}C NMR spectral compounds of 2-[2,4 dihydroxy benzilidin-amino] benzamide , 4-[3 hydroxy pyridin-2ylimino-methyl]benzene 1,3diol, and 4-[3,5 dichloro pyridine 4-ylimino-methyl] benzene 1,3 diol were illustrated throughthis synthetic path by using various substituents of aromatic heterocyclic amines and aromaticaldehyde to form the Schiff bases.

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LEGAL FRAME WORK ON WAGES

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ABSTRACT

The problem of wage determination fixation and revision has been catching the attention of labour, management and government for its multi-dimensional significance. For labour, it is most pressing and persistent because it is the base of life for him and determinant of his standard of living and efficiency and that of his family. It is relevant to the employer and management because it is a major element of cost of production and share in his profit and entrepreneur. And finally, government is committed to strike a balance between the demand of social justice for all sections of the community and profit incentives to the capitalists in view of the directive principles of welfare an envisaged in the Constitution, economic development through various plans, as a custodian of reliefs, and benefits to those who deserve and reservoir of social security, social services and social insurance to the weaker, handicapped and working class of the people of the society. That is why wage has been a problem for being tackled by many committees, conferences and commissions etc.

Keywords: Constitution, management, government, wages.

I. INTRODUCTION

The most important and probably the most complicated problem in the sphere of labour-management relations is that of wages. Before state regulation the wages were usually determined by the employers in the absence of collective bargaining and workers had to work on those wages.

However, the general problem of wages can be conveniently studies under two sub-headings: (a) the amount or quantum of wages, and (b) the tender or payment of wages. Under the first sub-heading may be considered the topic of adequacy of wages and various concepts about the adequacy of wages such as minimum wage, fair wage and living wage. Under the second sub-heading may be considered topics like the mode of payment, the period of payment, the time of payment and deductions from payment of wages.

Among all the conditions of work, the most important factor to the welfare of workers is wages. Work and wages are interdependent thing. Workers' work determines their wages. Wages, in turn, determine the work and welfare of workers, the welfare of their families and also the welfare of the whole society. Wages must guarantee, therefore a fair and just return for the worker's work.

It is not unlikely that in an economically under-developed country where unemployment looms very large, employees and industrial work may be found willing to take employment on terms which do not amount to a minimum basic wage. But industrial adjudication will not recognize the employer's right to employ labour on terms below the terms of minimum basic wage. This no doubt, is an interference with the employer's right to hire labour, but social justice requires that the right should be controlled.

The common law right to wages flew from a contract to pay the workers. The contract must be express or implied but in absence of contract no right existed.' Under the modem industrial law wages are fixed statutorily and contract has yielded place to statute regulation, but in absence of latter, contract still governs the right of the parties.

II. HISTORICAL SETTING

In ancient India wages were bargaining between employer and the employee.' If wages were not so settled from before there were some standard methods of determining wages. Wages could be paid as per agreement at the outset, in the midst of the work or after the completion of the work.' Wages could be paid daily, fortnightly, monthly, quarterly, half-yearly or on completion of the work. Wages could be fixed according to time and work or according to both as agreed upon.6 Thus, the concept of piece rated and time rated wages had been fully evolved.

Shukracharya placed workmen in three categories, namely, skilled or specialised, semi-skilled and unskilled and said that their wage-rates should differ according to their level of skill and qualification." This categorisation of workmen with respect to the level of their skill and co-relati0n between the skill and wage had been thus satisfactorily established even at that distant time of the past in the century.

The wages were to be paid as per agreement. In case of difference between the employer and employee the question of rate or wage payment was to be determined with the aid of the witnesses. Further the principle of 'no work no pay' wages was also evolved by Kautilya. Lastly, payment of wages could not be postponed. Wages were to be paid as soon as they were due. Wages could not be forefeited.8 Agreed wages were to be paid all at once and not in installments.

In modern India wage is the return in cash or kind or partly in cash and partly in kind for the work done by the employee. It is the return for the labour, correlated to hours of work. paid holidays and fringe benefits. It is the pay-packet of the employee under related circumstances. Again wage rate could be monthly, weakly or hourly. This is known as time rate. There could be piece-rated wages as well when the wages are related to the quantum of work done or the quantum of output by the man they are known as piece-rated.

III. WAGE CONCEPT AND SOCIAL JUSTICE

The social justice under current is no where more vibrant or pulsating in our Industrial jurisprudence than in the matter of wage determination or Industrial workers. Wage policy relating to workmen is considered to be a complex and sensitive area of public policy. The relative status of workmen in the society, their commitment to industry and their attitude toward the management, their motivations towards productivity and their standard and way of life, are all conditioned by wages. It is accordingly not a purely economic policy in which the employer and the employee alone are interested. Besides the worker and the management, the consumer and the society at large. The states are also vitally interested and hence according to industrial jurisprudence no wage policy can even be applied in a vacuum in disregard of realities of the social and economic conditions in our country.

It was also said in Crown Aluminium Works v. Their Workmen, AIR 1958 SC 30that through social and economic justice is the ultimate ideal of industrial adjudication, its immediate object in a dispute involving wage structure is to settle it in a way that does justice to the interests of both labour and capital and establishes harmony between these and leads to their genuine and whole-hearted co-operation in the task of production. Thus change in wage structure detrimental to workers cannot be allowed except under compelling circumstances.

The wage structure is mainly based on ethical and social considerations. It was said in Standard Vacuum Refining Co. v. Its Workmen AIR 1961 SC 895 that while the financial position of the employer and the state of national economy have a say in this matter, the requirements of a workman living in a civilized and progressive society have also to be recognized. The socioeconomic aspect of the wage structure postulates that no employer can engage industrial labour unless he pays it. What may he regarded as the minimum basic wage. If he cannot pay such a wage he has no right to engage labour, and no justification for carrying on his industry.

The economists and sociologists have attempted to discover an acceptable general theory of wages that would explain in all circumstances how levels of wages and changes in wages are determined.

IV. MINIMUM WAGE, FAIR WAGE AND LIVING WAGE

The Committee on Fair Wages, in its report submitted to the Government of India in 1949, has attempted to bring out the difference between three levels of wages, viz., minimum wage, living wage and fair wage. But in reality the following terms have acquired importance in the matter of wage problems in the modern times, (a) Statutory Minimum Wage, (b) Bare or Basic Minimum Wage, (c) Minimum Wage, (d) Fair Wage, (e) Living Wage. and (t) Need-based Minimum Wage.

Broadly speaking wages have been classified into three categories viz., the minimum, fair and living wages. The National Commission on Labour (NCL) has also observed that the Industrial workers must get at least a minimum wage which should not only be a subsistence wage but "must provide for some measure of education, medical requirements and other similar amenities."

In nut-shell it can be stated here that at the bottom of the ladder, there is the minimum basic wage which the employer of any industrial labour must pay in order to be allowed to continue an industry. Above this is the fair wage, which may roughly be said to approximate to the need-based minimum in the sense of wage which is adequate to cover the normal needs of the average employee regarded as a human being in a civilised society. Above the fair wage is the 'living wage'-a wage which will maintain the workman in the highest state of industrial efficiency, which will enable him to provide his family with all the material things which are needed for their health and physical well-being, enough to enable him to quality to discharge his duties as a citizen.

The minimum wage is that lowest unquestionable limit of the basic wage which ought, in all events, be paid irrespective of the capacity of the industry to pay. If an industry cannot afford to pay the minimum, it deserves to be closed down. Even the availability of workmen at a lesser scale would not disturb the minimum. But in fixing a fair wage and a living wage, the capacity of the industry to bear the burden of the said wage scale is always relevant and worthy of consideration. It is also necessary to compare the establishment in question with other establishments engaged in the same trade in the region. The criteria for comparison, as regards the establishments concerned, would be their standing, the extent of the labour force employed by them the extent of their respective customers and the study of balance of the profits and losses incurred by them in the past few years. The employer's future capacity to pay has also to be taken into consideration because additional liability imposed on the employer by the new wage structure in order to anticipate whether he would be able to meet it for a reasonably long period in future.

V. WAGE STRUCTURE IN INDIA

The problem of wage structure with which industrial adjudication is concerned in modem democratic state like India involves in the ultimate analysis, ethical and social considerations. The concept of welfare state is based on notions of progressive social philosophy under which the old doctrine of laissez faire, has now been rendered obsolete. with the result that the rule of supply and demand, on which the employer was at liberty to hire the labourer on his own terms, no longer holds good.

Workers are no longer regarded as factors of production the price which has to be determined by the forces of demand and supply. The contract of employment has lost much of its significance and participation of labour in, the management of the industry has elevated them to the position of a partner. The productivity of labour, the bargaining capacity of the workers, legislative interference of the Government, rate of economic development, national income, cost of living, capacity of the industry to pay, requirements of social justice. employer's consumption and investment, his degree of monopoly, etc. now influence the wage policy in a welfare state and developing country like India.

VI. WAGE POLICIES

The basic principles which are accepted as axiomatic in wage policies are the need for living a basic minimum wage. The statutorily fixed minimum wages are not questioned even by courts. No industry which cannot pay a living wage to its workers has a right to exist.

It is unfortunate that even the Minimum Wage Act. 1948 of India does not specify what the minimum wages are, or even the principles on which they should be based. Even the I.L.O. has not made any satisfactory attempt at a definition except saying that the need to maintain a suitable standard of living should be kept in mind.

VII. WAGE DETERMINING PROCESS

The wages may be determined either by parties mutually or by the state if the former is not accomplished. The principal process of wage determination are: (a) Individual bargaining. (b) Management Administered Wages Determination (c) Collective Bargaining (d) Union Administered Wage Determination, and (e) Governmental Determination or Adjudication.

These processes may be divided into two parts. Firstly, the process of A non-governmental interference. and secondly, the process of governmental interference. The above mentioned process. i.e.. from 'a' to 'd' belong to the former category and 'e' belongs to the latter. The latter process indicates active role of state in wage fixation in a welfare state.

The wage fixation through governmental interference may be further sub-divided into, (a) judicatory process, and (b) non-adjudicatory process. The first process is adopted when a dispute has arisen of is apprehended and the state government makes reference to industrial count or tribunals to decide the dispute relating to wages. On the other hand, the second process is non-adjudicatory or statutory process may take one of the following terms: (i) Fixation of wages by legislation or notification as is done under the Minimum Wages Act, 1948, and (ii) Fixation of wages by Industrial Tribunals, Arbitration Board or Wage Board, as is done under the Industrial Disputes Act, 1947.

Generally the factors for the wage determining process are as follows: (a) The ability to pay, (b) supply and demand of labour. (c) the prevailing market rate, (d) the cost of living. (e) living wage. (f) productivity, (g) a trade union's bargaining power, (h) job requirements, and (i) psychological and sociological factors.

The study group for wage policy of NCL observed about the fixation of minimum rates of wages that "In determining the minimum wage that a unit must pay, three factors need to be taken into account. They are: (a) the need of the workers and their families, (b) capacity of pay, and (c) standard of living."

The-capacity of the industry to pay can mean one of the three things viz., (a) the capacity of a particular unit (marginal representative and average) to pay, (b) the capacity of the particular industry as a whole to pay; or (c) the capacity of all industries in the country to pay.

In fixation of minimum wages the financial capacity of industry of the employer is irrelevant consideration. But in fixation of fair wage or a living wage the capacity of the industry becomes an essential factor.

Fixation of wage structure is a more difficult task in industrial adjudication because a balance has to be struck between the demand of social justice and depletion which every increase in wage makes in profit. The Principle of region-cum-industry and capacity of industry to pay are however, dominant factors which must weight in evolving a wage structure.

VIII. UNIFORMITY IN SCALES OF WAGES

The Estimate Committees constituted by Parliament have from time to time, made observations in regard to the subject of uniformity in scales of wages. In its 120th Report made during 1960-61, the committee suggested that the government might review the scales of pay obtaining in all its undertakings and revise them with the object of introducing uniformity wherever possible. In its 54th Report. The Committee had also suggested uniformity in the classification of the staff in all public undertakings. But the government did not find it possible to suggest concrete scale of pay to be applicable to all industries in the face of conditions differing from region to region and industry to industry.

Again, the government seemed to be committed to the region~ cum-industry formula. Simply stated, this formula means that since labour and economic conditions vary from region to region and from industry to industry, the scales of pay may vary to suit these varying conditions. Accordingly, the wages, dearness allowance and other perquisites have to be in tune with those prevalent in the industry or the region. Even in like industries, the nature and responsibilities of staffs differ from undertaking to undertaking, depending upon the size, line of production etc. and pay scales of posts have to vary from undertaking to undertaking. The government was. therefore, of the view that while uniformity might be desirable, a measure of flexibility and autonomy was to be allowed necessarily for varying nature and activities of the undertakings. Hence. uniform classification of staff Whose nature and responsibility varied from undertaking to undertaking was not possible. On the region-cum-industry principle the labour also will have no complaint if their wages are similar to those in comparable concerns in the region.

IX. THE LAWS

In an economy where even minimum wages are not paid to the workers, the need to protect the wages earned by them has the greatest significance. The object of the Payment of Wages Act, 1936 is to regulate the payment of wages to certain classes of persons engaged in industry. The Act sought to remedy the unfair labour practices prevailing before the enactment of this Act. This Act also contains a social security measure. Though this Act was codified before the Constitution of India came into force, it has been amended from time to time in order to carry out the state policy contained in the directive principles of state policy. This Act has been enacted by the legislature for the purpose of ensuring regular payment of wages to small salary-holders so that they may be able to make their both ends meet. It ensures that such employees are paid their wages in a specified or particular form at regular determined intervals without unauthorized deductions, it prohibits the employers to delay or withhold payment of the amount earned by workmen beyond the period specified in the Act. This statute, therefore, calls for a benevolent or beneficial construction, a construction which should advance the remedy and suppress the mischief. Lastly, it may be stated that the whole scheme of the Act is to eradicate unfair labour practices relating to mode of payment. time of payment of wages and unauthorised deductions. The Act is specifically made provisions to provide safeguards to the employed persons from these malpractices prevalent before the enactment of this Act. It also contains provisions relating to machinery for enforcement of the different provisions of the Act.

Secondly, the most important enactment providing for statutory fixation of wage is the Minimum Wages Act, 1948. This Act was passed on March 15. 1948, just seven months after independence. It forms an epoch in the history of social security in India.

The object of the Act is to prevent exploitation of workers and for that purpose it aims at fixation of minimum wages which the employers must pay. The object of the Act is to prevent sweated labour and exploitation of labour. It has been observed by the Supreme Court of India that what the Act aims at is the statutory fixation of minimum wages with a view to obviate the chance of exploitation of labour. Thus the object of the Act is to do social justice to the workmen employed in the scheduled employments in order to provide them minimum rate of wages. The basic purpose of the Act is also to provide an equitable wage structure. Its secondary objective is

the establishment and maintenance of an equitable labour-cost structure i.e., an optimal balancing of conflicting personnel interests so that the satisfaction of employees and employers is maximized and conflicts minimized. This Act is in consonance with Article 43 of the Constitution of India providing for living wage. conditions of work, ensuring a decent standard of life, etc. The Act makes it imperative that minimum wages shall be paid to the workers in the schedule employments on the prescribed rates which after every five years will be revised by the appropriate government. Although the ideal of living wage as embodied in the directive principles of state policy could not be achieved so far due to poor economy of our country but the efforts are continued in this respect. In this way the Act contains an important social security measure.

The specific enactment to regulate wage in India is under this Act. The Act is limited in its operation to those industries in which labour is practically unorganized and working conditions are far enough material in hand, to publish its proposals for the fixation of wages orse than in organized industry, under the Act, the appropriate Government has either to appoint a committee to hold enquiries and to advice it in regard to the fixation of minimum rates of wages or, if it thinks that it has enough material on hand, to publish its proposals in the official Gazette and to invite objections. The appropriate government finally fixes the minimum rates of" wages on receipt of the recommendations of the committee or of objections from the public. There is no provision for any appeal. There is an Advisory Board in each state to co-ordinate the work of the various committees. There is also a Central Advisory Board to co-ordinate the work of the State Boards. Complaints of non-payment of the minimum rates of wages fixed by government may be taken to claims Authorities. Breaches of the Act are made punishable by Criminal Courts.

"The Ministry of Labour, Government of India is responsible for fixing or revising the minimum" wages under this Act in respect of those employments for which Central Government is the appropriate authority. State governments and Union Territories are authorised to fix for revise minimum wages in respect of other scheduled and subsequently added employments.

During the period July 1989 to July 1990, the minimum rates of Wages fixed earlier were revised in 207 employments and in l4 employments the minimum rates of wages were fixed for the first time. The Code on Wages, 2019 has deleted the first requirement for fixing a minimum wage—notification of scheduled employments. Fortunately, despite this serious and unwarranted omission, minimum wage can still be notified, but possibly inviting dilatory litigation. A serious concern is the "abdication of legislative function" when the law leaves the criteria for quantification of minimum wage to the rule-making authority. While the draft wage rules recognize the principles laid down by the 15th ILC and the Supreme Court's Reptakos judgment, but again these rules arbitrarily fix a ceiling on factoring house rent on an irrelevant criterion. For the first time, a floor wage is also provided, but the proposed wage level announced arbitrarily (200 per day) is so low that the floor level itself will become a downward drag on wages as a whole.

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TELEPRACTICE IN SPEECH LANGUAGE PATHOLOGY AND AUDIOLOGY

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ABSTRACT

Telepractice has emerged as a form of service delivery to assess and treat individuals with communication disorders. The present study surveyed speech-language pathologists and audiologists in India about the use of telepractice. Two hundred and five (N=205) speech-language pathologists and audiologists responded to a questionnaire, with 12.19% reporting their use of telepractice to deliver clinical services. Respondents also indicated an urgent shortage of professionals in India to deliver clinical services in speech-language pathology and audiology, and opined that these needs can be met via the use of telepractice. India is well known throughout the world for the advanced application of Information and Communication Technology (ICT), with 931.95 million telephone subscribers, over 900 million mobile phone users, and the second-largest mobile phone usage in the world. India has also experienced a tremendous rise in the number of internet users. Therefore, India is well poised to fully develop telepractice to overcome the barriers of distance and amplify the availability of speech-language pathology, audiology and other healthcare services. But first, the widespread use of telepractice throughout the nation will require an improved infrastructure (e.g., to uphold privacy and security); training for professionals; and telepractice policies. While very promising, the deployment of telepractice throughout India will require the attention of policy makers and government organizations.

Keywords: Audiology, India, Speech Language Pathology, Telehealth, Telepractice

1. INTRODUCTION

Innovation has led to technological advancements and the development of various forms of telecommunication systems. As a result of technological evolution, a large number of healthcare providers are employing telehealth. The term 'telemedicine' is used to describe the diagnostic and treatment services delivered over a distance by a physician, nurse, or related professional (Fong, Fong & Li, 2011)

Similarly, speech-language pathologists and audiologists are engaging in telepractice through use of online videoconferencing systems and other dedicated telecommunication systems to provide diagnostic and intervention services over geographical distances to a range of patients with communication disorders. Telepractice has been defined as "the application of telecommunications technology to deliver professional services at a distance by linking clinician to client, or clinician to clinician for assessment, intervention, and/or consultation" (ASHA, 2005a). Telepractice offers significant benefits, as it provides greater access to speech-language pathology and audiology services; improves access of services to clients with linguistic and cultural diversity; increases ease of collaboration among multi-disciplinary team members; and saves travel time with cost benefits for clients.

There is now considerable evidence to support the premise that service delivery through telepractice mayactually enhance the quality of care provided, and, ultimately, quality of life (McCue, Fairman, &Pramuka, 2010; Winters & Winters, 2004). Winters and Winters (2004) suggest that telepractice has the potential to optimize the timing, intensity, and sequencing of intervention, leading to the greatest functional outcome for the client. Twenty-five percent of studies that assessed clients' reactions to the use of telepractice reported favourable responses (Theodoros, 2011). It is also crucial to examine professionals' attitudes toward the use of telepractice. The American Speech-Language-Hearing Association (ASHA, 2002) conducted a survey on use of telepractice among audiologists and speech-language pathologists. ASHA reported that 11% of respondents delivered services using telepractice, and 43% expressed interest in using it in the future.

India has a population of 1.34 billion (http://www.mospi.gov.in), with 1.8% of total population estimated to have a disability (Rehabilitation Council of India, 2016). In contrast, the Indian Speech and Hearing Association (ISHA) (2015) estimates there are 2500 qualified speech-language pathologists and audiologists in India. These data indicate a very low ratio of potential service receivers to available service providers. Strategies are needed to meet the service demands of persons in India with communication disorders.

On the positive side, India is well known throughout the world for the advanced application of Information and Communication Technology (ICT). India has 931.95 million telephone subscribers, over 900 million mobile phone users, and the second-largest mobile phone usage in the world. There has also been a tremendous rise in the number of internet users in India. At this juncture, telepractice use in India could overcome the barriers posed by distance and amplify the availability of speech and language services throughout the nation.

Additional research is required to determine if telepractice can be a viable form of service delivery in India. In contrast to Western countries, there is dearth of research evidence concerning telepractice in India. There is no reported data to account for the number of clinicians providing telepractice, the type of consultation services delivered, resource materials available, legal policies and guidelines for clients and clinicians, or training for telepractice service delivery. Hence there is a pressing need to examine the scope of telepractice in the India and the perspectives of clinicians.

2. CURRENT USES IN SPEECH–LANGUAGE THERAPY

Telepractice can be a means for delivering speech therapy with various population groups, ranging from infants to adults, who have speech and communication disorders (e.g., voice disorders, aphasia, articulation, dysarthria, speech sound disorders; Grogan-Johnson et al., 2013; Keck &Doarn, 2014; Theodoros, 2011). Telepractice has also been used to deliver services to individuals who have hearing loss (Galvan, Case, & Todd Houston, 2014; Houston &Stredler-Brown, 2012) and other conditions that affect speech and communication (e.g., schizencephaly, Hall, Boisvert, Jellison, &Andianopoulos, 2014; velo-cardiofacial syndrome, Shprintzen& Golding-Kushner, 2012). Researchers have also employed telepractice to deliver services to individuals with autism spectrum disorder (ASD; Allen & Shane, 2014; Meadan et al., 2016).

In addition to its application with a variety of populations, telepractice has been applied in multiple contexts. For example, Allen and Shane (2014) conducted assessments on the communication abilities of children with autism via telepractice, providing preliminary evidence that communication assessment can be conducted via telepractice for these children. Telepractice also has been used to deliver services in actual intervention or therapy sessions (e.g., Grogan-Johnson et al., 2013; Theodoros, 2011). Finally, telepractice has been embraced as a tool for conversing with, providing consultation to, and providing training and supports to clients, caregivers, and other professionals (Anderson et al., 2014; Galvan et al., 2014; Hall et al., 2014; Meadan et al., 2016). Grogan-Johnson et al. (2013) compared the use of telepractice in the delivery of speech–language therapy services with traditional on-site services, and found no difference with the intervention outcomes between the two service delivery models.

When SLPs adopt telepractice as a medium for providing intervention, they may interact with their client in a variety of ways during the telepractice sessions. They may (a) provide intervention directly to clients by interacting with them via videoconference (e.g., Grogan-Johnson et al., 2013), (b) incorporate online tools and apps that have been created to help clients access the telepractice intervention(Mashima&Doarn, 2008), and/or (c) provide training and support to a caregiver who then works directly with the client(e.g., Meadan et al., 2016; Vismara, McCormick, Young,Nadhan, &Monlux, 2013; Wainer& Ingersoll, 2013).

3. CHALLENGES WITH TELEPRACTICE

Although these researchers have demonstrated increasingly diverse applications of telepractice in speech–language therapy, SLPs may encounter challenges when attempting to employ telepractice to provide direct intervention services to children. To engage in direct service using videoconferencing, the child must remain within view of the camera, direct his or her attention to the screen, and maintain that attention for the duration of the therapy session, which researchers have noted may be a struggle for children (Gibson et al., 2010; Grogan-Johnson et al., 2013). In addition, because the SLP is not in the same location, he or she cannot move throughout the environment with the child (Anderson et al., 2014) and may find it more difficult to effectively prompt the child (Grogan-Johnson et al., 2013; Keck &Doarn, 2014). The SLP may still need a skilled adult present with the child to assist with technical difficulties, loss of the child's attention, or safety issues (Hall et al., 2014; Tindall, 2013). In addition to these challenges to direct intervention via telepractice, some children may require adaptive equipment to access telepractice technologies (Grogan-Johnson et al., 2013), or they may have an aversive response to some equipment (e.g., headphones; Grogan-Johnson et al., 2013; Keck &Doarn, 2014). For younger children and/or individuals with complex communication needs, these challenges may be exacerbated. Thus, for telepractice to be an effective means of delivering intervention support to children who have communication disorders, adjustments to service delivery methods will likely be necessary. Training and coaching parents as interventionists to support their children's growth is one potential option that addresses these challenges.

4. OBJECTIVES

The present study aims to explore telepractice in India. Speech-language pathologists and audiologists across the country were asked to complete an internet-based survey. Specifically, the study objectives were: (a) to report the status of telepractice in speech-language pathology and audiology in India; and (b) to report and compare the opinions of speech-language pathologists and audiologists about telepractice in India.

5. METHOD

5.1 Phase I: Development of Questionnaire

A questionnaire was developed to gather responses from two groups. Group I consisted of speech-language pathologists and audiologists engaged in telepractice. Group II included speech-language pathologists and audiologists not engaged in telepractice. The questionnaire was divided into two sections. The first section contained questions to collect demographic details of the participants in Groups I and II. The second section contained questions to elicit information from Group I about service delivery through telepractice. Twenty closed ended questions were included to study the perspectives of speech-language pathologists and audiologists on telepractice. Questions addressed four content areas: perceptions of professionals about service delivery through telepractice; characteristics of telepractice service; training and research in telepractice; and policies and guidelines for telepractice.

The questionnaire also included a sub-section with four questions for Group II on awareness of telepractice in speech-language pathology and audiology. Four additional mandatory questions were also included to elicit responses from Group I and Group II regarding the availability of telepractice providers in their regions; accessibility of resources for telepractice; and legal guidelines and policies in telepractice. The questionnaire was validated by five telepractitioners in speech-language pathology and audiology.

5.2 Phase Ii: Administration of the Questionnaire

The sampling frame for the survey was approximately 2800 speech-language pathologists and audiologists registered with the Indian Speech and Hearing Association (ISHA). The questionnaire was configured with features of Google form and e-mailed to the registered ISHA members. All India Institute of Speech and Hearing Ethical Guidelines for Bio-Behavioural Research 2.1e and 2.4c were followed for the current study (Basavaraj, 2009). The e-mail included a letter of consent, objectives of the research, and the link to the survey questionnaire. Each participant was required to read an informed consent letter in which they agreed to the terms and conditions of the survey. Responses were collected over a period of three months, and kept confidential.

5.3 Phase Iii: Analyses of Responses

Participant responses were analysed by computing percentage values for the 20 questions. This was carried out separately for the overall responses of all participants (Groups I and II); for professionals engaged in telepractice (Group I); and professionals engaged in in-person service delivery (Group II). Further, a non-parametric statistical test (Test for equality of proportions) was employed for five questions (Q14, Q15, Q16, Q19, & Q20) to compare the opinions of professionals engaged in conventional in-person service delivery and service delivery through telepractice.

6. RESULTS

5.1 Demographics

A total of 205 speech-language pathologists and audiologists completed the survey, a response rate of 7%. Responses were received from different states across India. Among the professionals, 48% (N=83)) were speech-language pathologists; 18.04% (N=37) were audiologists and 41.46% (N= 85) were speech-language pathologists and audiologists. All were engaged in providing clinical services. Group II included 87.80% (N=180) of the respondents who reported providing in-person service delivery. Approximately 12.19% (N=25) of the respondents reported using telepractice to deliver clinical services and were included in Group-I.

Among the professionals engaged in telepractice (Group I), speech-language pathologists were more likely to deliver speech and language therapy services than audiologists. Figure 1 depicts the percentage of professionals engaged in delivery of services through telepractice. Furthermore, 40% (N=10) provided both speech-language pathology and audiology services through telepractice.

5.2 Perceptions of Professionals Engaged in in-Person Service Delivery

The perceptions of speech-language pathologists and audiologists engaged in in-person service delivery (Group II) were examined in the following areas.

• Awareness of telepractice

• Viability of service delivery

• Requirement of certification for telepractice

• Infrastructure required

It was found that 55% (N=172) of the professionals were aware of service delivery through telepractice. Ninety percent (N= 162) of the respondents perceived that telepractice can be a viable form of service delivery; 73.3 %(N=132) opined that the professional must be certified for telepractice; and 81.66% (N=147) stated that the infrastructure required for service delivery through telepractice is different from conventional in-person service delivery.

To an overwhelming degree, 92% (N =166) of participants were of the opinion that there is inadequate number of telepractice providers in their respective states in India. In addition, the survey revealed that 83.90% (N=151) of the professionals believed that sufficient resources are not available for telepractice. Most, 92.68% (N=167) were of the opinion that legal guidelines are needed for telepractice in India.

5.3 VIEWS OF TELEPRACTITIONERS IN SPEECH-LANGUAGE PATHOLOGY AND AUDIOLOGY

Only 12.19% (N=15) of the respondents reported using telepractice to deliver clinical services (Group I). Among the professionals engaged in telepractice, 48% (N=12) are speech-language pathologists and 12% (N=3) are audiologists. Within this group, 56% (N=14) of the professionals reported that they provide teletherapy services within India and 44% (N=11) provide services in other countries.

To compare opinions of Group I and Group II for the question regarding availability of telepractice providers in their respective states across India, the test for equality of proportions was carried out, using Smith's Statistical Package, version 1.0. This statistical test determines the difference between the population proportions. The test results suggest no significant difference between the opinions of Group I and II concerning the unavailability of telepractice service providers in their respective states in India (0.120, p> .05, |z| 1.55).

6 DISCUSSION

This article surveyed the opinions of speech-language pathologists and audiologists about telepractice in the Indian sub-continent. Results suggest that 95.55% (N=172) of speech-language pathologists and audiologists who provide in-person service delivery (Group II) were aware that telepractice can be a form of service delivery. However, only 12.19% (N=25) of the survey respondents are engaged in telepractice (Group I) in India. This is similar to the findings of a 2002 survey of speech-language pathologists in the United States (ASHA, 2002). In the current study, among the professionals engaged in telepractice (Group I), speech-language pathologists were more likely than audiologists to engage in tele-speech therapy. Most of the professionals surveyed agreed that telepractice can be a viable form of service delivery to assess and treat persons with communication disorders.

Clients in India have limited access to speech-language and audiology services, as there is a shortage of service providers (Rao &Yashaswini, 2017). Respondents in the current survey expressed that there is an urgent need to meet the demands of the individuals seeking services in their respective states across India. This could be made possible if professionals could engage in telepractice to offer clinical services in speech-language pathology and audiology.

Furthermore, professionals were of the opinion that the infrastructure required for telepractice is significantly different from conventional service delivery. Newer technology enables clinicians to use laptops and tablets along with low-cost web-based videoconferencing systems. Technology has greatly enhanced the audio and video hardware and software that enables clinicians to offer quality services to their clients in a cost-effectiveness manner. When an adequate technological infrastructure is provided (e.g., to improve the likelihood of a trouble-free videoconferencing session) telepractice can be affordable, flexible, and reliable. For India, this points to a pressing need to lay norms for technical infrastructure for telepractice service delivery.

Based on the results of this survey, service providers in India have primarily learned to implement telepractice through personal experience rather than formal training. Most professionals engaged in telepractice in India were of the opinion that formal training and certification are necessary for professionals who employ this service delivery model. Systematic and comprehensive training in telepractice will be crucial as the use of telepractice increases in the future.

The privacy and security of both clients and clinicians are of critical importance in telepractice. Survey respondents recognized that use of open, unencrypted platforms poses inherent risks to privacy and security. Thesoftware in public domains that are largely in current use by telepractitioners in India poses a serious threat to the privacy security of both clinicians and clients. There is an urgent need to employ secured, licensed services while engaging in service delivery through telepractice. There is also a compelling need to put forth legal guidelines and policies for safe and secure service delivery.

There is the need to examine an even greater number of factors critical to telepractice service delivery in India. The current survey is limited in scope. First, the number of respondents is relatively small, although it is the representative of the relatively few professionals engaged in telepractice in India. Second, the survey did not collect any information on the infrastructure available to telepractitioners, the resource materials used, or the challenges faced by the telepractitioners during their sessions.

In spite of these limitations, this survey suggests an opportunity to examine, reform, and even create new guidelines for telepractice in India. And most significantly, it points to the pressing need for technological support and training to enable professionals to offer quality services. The insight gained from this survey offers directions to improve service delivery through telepractice in a country that already is well known throughout the world for the advanced application of Information and Communication Technology (ICT).

The findings of the survey endorse the feasibility of providing speech-language and audiology services through telepractice. The results reflect the opinion of the professionals for whom telepractice is a plausible mode of service delivery. The extensive technology available to healthcare providers such as speech-language pathologists and audiologists, and their clients, should be used to its fullest extent to enable better quality care in settings and regions where the physical presence of expertise is unavailable.

7 CONCLUSION

Technology has greatly affected our lives in many ways, including how speech–language therapy services can be delivered. With the expansion of the Internet to geographically remote areas, onto smartphones, and into cellular data packages, accessing speech–language therapy services has become possible for many individuals and families who, heretofore, were underserved or not served at all. Through the use of videoconferencing and online training tools, telepractice has evolved as a viable alternative or supplemental means to performing speech–language therapy. However, there are challenges to using telepractice as a delivery medium for intervention.

The framework we have presented for translating on-site direct speech–language intervention services into parent training and coaching that can be used on-site or via telepractice has been used on a limited basis in telepractice contexts. As such, practitioners and researchers should continue to examine the framework's effectiveness for improving communication skills in children via telepractice. If SLPs attempt to incorporate telepractice into their service delivery, we encourage them to share their experience with the field, offering comments and critiques of the framework.

In addition to the preliminary nature of the framework, the following concerns remain as critical considerations when adopting telepractice: (a) the degree of rapport that can be established with a family via telepractice and itsimpact on outcomes is unknown (Murphy & Rodriguez- Manzanares, 2012), (b) the quality of services clients receive via telepractice in comparison with on-site requires further scrutiny (Cason et al., 2012; Olsen, Fiechtl, & Rule, 2012), and (c) the applicability of telepractice for professionals and/or parents who are "technophobes" or who have limited experience with technology needs to be determined (Vismara et al., 2013).

There are additional challenges related to creating an appropriate infrastructure for providing telepractice services, including issues around licensure, billing, and secure video connections. These challenges are beyond the scope of this article but are important to consider when incorporating telepractice into service delivery.

To alleviate some of the challenges inherent in providing speech–language intervention via telepractice, especially for young children, an SLP may choose to assume the role of trainer and coach for parents or caregivers, in addition to or in lieu of providing direct one-on-one intervention on-site with the child. We presented a framework for incorporating telepractice into speech–language therapy services for children by converting practices employed in on-site intervention into parent training and coaching programs. Capitalizing on three steps in the framework (i.e., identifying a target skill, identifying a target strategy, and creating parent-friendly procedures), SLPs can then teach and coach parents how to apply strategies to improve their children's communication skills. One fundamental advantage of training and coaching parents is that they become "24/7" interventionists because they are with their children in naturally occurring settings and routines throughout the day.

The framework we have described for transforming the strategies used in direct, on-site speech–language intervention into telepractice through the use of coaching and training parents is not without its drawbacks, in part because of the limited extent to which it has been applied and, thereby, the limited evidence for its efficacy. The more the framework is explored by practitioners and professionals, the more it can be examined for its effectiveness and the more the procedures can be refined and improved. Clearly, the degree to which telepractice affects professionals and clients is yet to be fully realized. By training and coaching parents through

telepractice, we hope that many more children with speech–language support needs and their families can access vital services. These services can enhance children's communication repertoires and, thereby, the child and family's quality of life.

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A REVIEW ON THE APPLICATION OF SOLAR ENERGY IN RURAL INDIA

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ABSTRACT

Sun has played a crucial part in the development of the human race. It is the main source of energy that sustains on the planet. Humans started exploiting energy from fossil fuels. However, there is a growing concern of damaging effects of use of fossil fuel; The utilisation of renewable energy was driven by the harmful effects, such as global warming and lack of availability of fossil fuels. The Sun is a major source of free energy and thus forms the primary source of renewable energy. The Sun gives out an estimate of 384.6 yotta watts of energy as sunlight (photons). Earth receives approx. 1000 W / m2 on the past that is perpendicular to the sun rays and this energy can be used to harness electricity especially in remote and rural area of India. Despite much research in utilizing this energy efficiently, the efficiency of the panels has been limited. This has been because the sun's position keeps changing during the day (east to west) and also during the seasons (North-south Movement). Thus only 40% of the available power is utilized and people opt for more solar panels to meet their demand. Solar tracking can overcome these obstacles and provide cheaper and more readily available energy to the inhabitants of rural India, thus one axis tracking systems and two axis tracking systems have been created for effective utilization of sun's rays and energy. Studies have shown an increase in efficiency of the solar power plant by 30-40% when using axis Tracking; with Double axis tracking giving the best efficiency results. This increase comes with further costs and increasing complexity of the solar system. Hence both the systems are available and can be used to enhance electrical penetration in rural India.

Keywords: Solar energy, solar tracker, renewable energy, solar energy

I. INTRODUCTION

This paper reviews the need to adopt solar energy in rural India to satisfy the electrical needs of the inhabitants and increase its efficiency using single and dual axis tracking systems.

Currently rural India does not have access to electricity. Rural electrification is extremely important especially in a country like India because it improves the overall societal structure and leads to the betterment of the rural societies since it will lead to better living conditions, better nutrition given the presence of refrigerators and protection from health hazards by mitigating the use of kerosene and candles.

However, installing large number of solar panels to obtain desirable output of electricity is very costly and highly unaffordable to be carried out throughout rural India. Although solar energy may be more cost efficient in the long term, the cost of installing a large number of solar panels in the short run can be very expensive. Hence, in order to reduce costs and number of solar panels used, maximisation of efficiency is necessary. The solar panels are most efficient when the sunlight falls perpendicularly on the photovoltaic cells [1]. There are several means of improving output of the system and a multitude of works are devoted to the different tracking systems that monitor the sun's positions over the course of the entire day [1-4]. These systems are either one axis tracking systems or two axis tracking systems.

One axis tracking systems are used to manipulate the moving of the solar panels in one direction either horizontal or vertical.

A dual or double axis tracking system controls the movement in the axis horizontal and vertical. This system increases the efficiency of the solar power plant even more than the sing axis tracking [5-7] and the system can be used anywhere in the world.

This increases the efficiency of a single panel and thus reduces the need for installation of large panels. Hence this drives down the cost and thus makes it easier and more accessible in rural India.

In contrast to the conventional methods of electricity production like firewood, non- renewable fuels like fossil fuels, and kerosene, Solar energy is less polluting and more environmentally friendly. Further, solar is a renewable form of power and also is cheaper in the long run, in contrast to the conventional sources. When contrasted to different sources of sustainable energy, like hydroelectricity, wind generated energy and geothermal energy, solar energy is more accessible and cost effective. Further, in a country like India it is freely available and solar panels can be installed in even the remotest areas. Hence it could be highly beneficial to install solar panels in order to electrify rural India.

II. SOLAR ENERGY

A. Definition of Solar Energy

Solar power is a form of energy that is renewable and can be harnessed from the photons in the sun's rays. It uses specialised photovoltaic cells to harness solar into usable forms of energy. The process of harnessing energy using a photovoltaic cell is that the high energy photons in the sun's radiation induct electrons to the higher state or level of energy generating a DC.

B. Application of Solar Energy in Rural India

Solar energy could be harnessed in rural India to serve several purposes. The generation of stable and affordable electricity could lead to improvement in the education system and literacy rate in the rural areas. As presented in the paper by Tarujyoti Buragohain, it is evident that there is a marked improvement in education because of the increase in electrical productivity due to installation of solar panels in rural India. [8]

Further solar panels can aid employment generation and reduce the costs of electricity in the rural areas. Using solar energy also reduces the dependence of inhabitants of rural India on non-renewable and costly sources of power generation like kerosene and fuels.
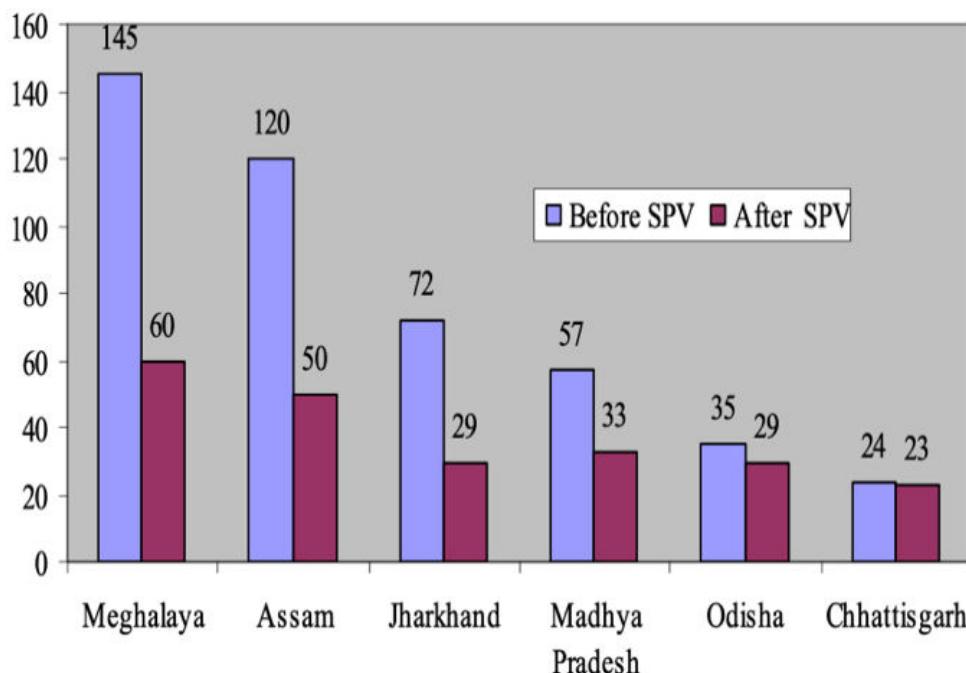
Figure 1: Monthly expenditure in Rs. Before and after SPV was installed

By connecting the rural India to the main electric grid, the rural parts of the country become connected and integrated with the rest of the country. In most of the remote Indian villages, the cost of installation of electrical transmission and communication can be very high, in that case an independent SPV can be used to generate electricity in these areas.

C. Challenges In Implementation of Solar Energy in Rural India

The high cost of solar panel installation can act as a hindrance to its installation in rural India. Although, the maintenance and running costs of solar panels are negligible, the initial installation can become very costly for governing institutions to install. As illustrated in a paper by P. Raman et al. the solar PV system has a high expenditure and the array can cost more than half of the cost and it has a PV array, battery bank that costs 11% of the cost, power distribution network that is 16% of the cost and power conditioning unit that is 20% of the cost. [9] This high expenditure can act as a major challenge to the implementation of solar energy in rural India.

Further, traditional stationary solar panels have low efficiency ranging from 4-40%. Hence, they may generate lesser electricity during cloudy or rainy days leading to reduced electrical output. This could also act as a potential hindrance to installation of solar panels, however, single axis, dual axis and floating solar panels discussed further in this paper could be installed in order to overcome the challenge posed by lower efficiency.

III. RURAL INDIA

For installation of solar power plants in Indian villages, the components that are needed are the solar panel, a battery, a charge controller, and an inverter.
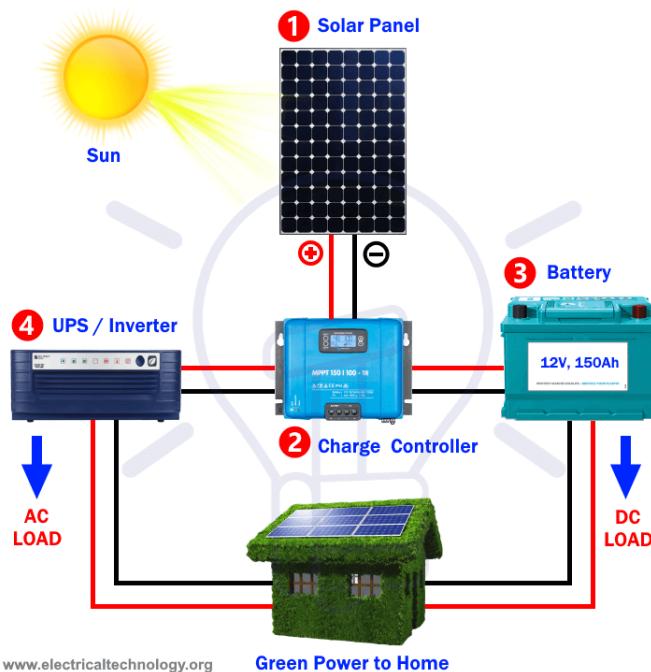
Figure 2: Components needed to implement solar energy in rural India.

Additionally, schemes for financing renewable and solar energy are being implemented in order to move away from non-renewable sources of energy and decentralise the electrical transmission unit. Further, these schemes aim at electrification of rural India and hence can incentivise and subsidise installation of solar energy in rural India. With rural electrification, the standard of living in rural India will improve and thus villages will be able to move towards being smart villages and harnessing electricity to solve several issues prevalent in rural India.

Figure 3: SDG goals for smart villages

Further, by embracing solar energy rural India can adopt sustainable and renewable like solar lamps, solar irons, solar irrigation pumps and solar battery chargers.
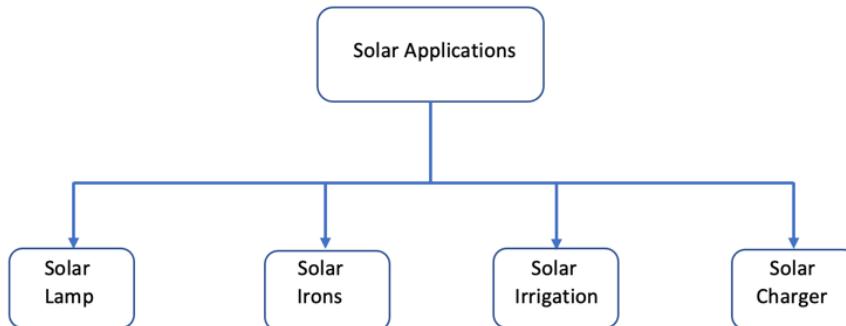
Figure 4: Applications of solar energy

IV. METHODOLOGY

SOLAR PANEL'S EFFICIENCY IS HIGHEST WHEN THE LIGHT FALLS PERPENDICULAR TO THE SOLAR CELLS [1]. THERE ARE VARIOUS WAYS TO INCREASE OUTPUT OF THE SYSTEM AND SEVERAL WORKS ARE DEVOTED TO THE SOLAR TRACKING SYSTEM [1-4]. THE SYSTEM IS A ONE AXIS TRACKING SYSTEM OR TWO AXIS TRACKING SYSTEM OR A FLOATING SOLAR PANEL.

A. Single Axis Tracking Mechanism

This mechanism is generally preferred in those areas where the change in direction of sun as per seasons is very limited; like the places in the tropical zone. Hence this system would be ideal for Indian villages since it both increases efficiency as compared to the traditional solar panels and is a lower cost alternative to the two axis tracking system.

The tracking system uses two LDR's, when the light intensity on both the LDR is same the system is in stable position. When the sun shifts moving East to West the light reaching the LDR's changes and can be calibrated by voltage dividers.

The microcontroller measures the change and gives the relative output to alter the orientation of the solar panel to the right direction i.e. the direction of the light source.

A simple Block diagram for the controller is depicted in the Fig 5.
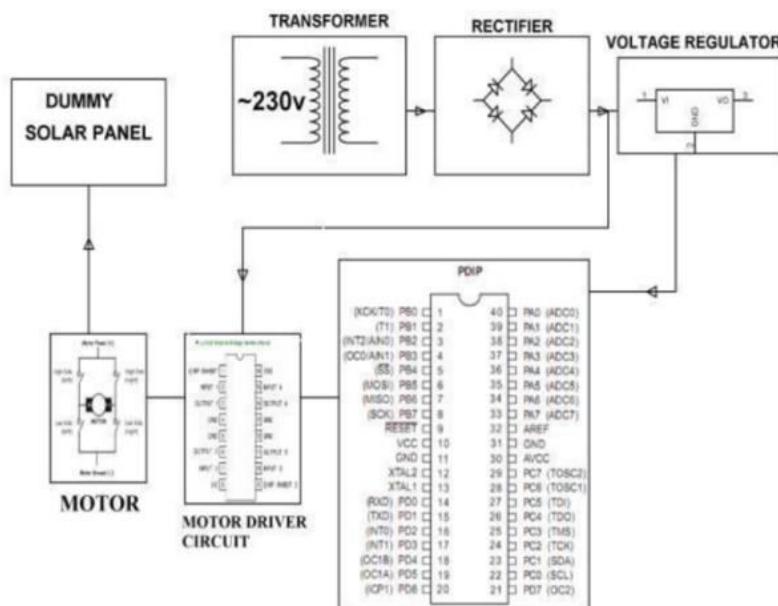
Figure 5: Electrical circuit for a one axis tracking system

This diagram shows the simple diagram of an experiment performed in Bhuvneshwar which had promising results generated by a one axis solar Tracking mechanism [6] improving efficiency over fixed solar panels. Hence this illustrates how this method can be used in rural India to overcome the issues of low efficiency.

B. Two Axis Tracking System

Two Axis tracking system has two axes of freedom. It focuses on the daily movement of the sun (from east to west) and seasonal movement of sun (North-South). This has more efficiency in contrast to the one axis tracking mechanism, but is also more expensive because of the increased number of LDRs used.

This is composed of four LDR's feeding to the microprocessor. The processor calculates the movement required and gives the output to the respective servo motor.

Both degree of freedom has their independent servo motor.

Figure 6 represents the flowchart is of two axis tracking system.
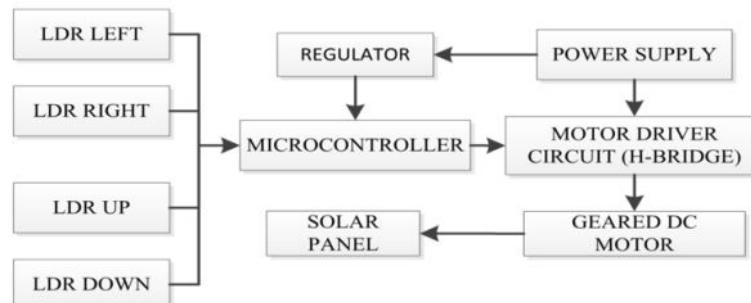
Figure 6

Experimental findings are one from experiment performed in Kalyan, Maharashtra [7] these found that the Dual Axis tracker has 24.78% more efficiency than the Single Axis tracker. Hence this system proves most efficient and will provide stable and continuous electricity and a field experiment has already been conducted showing the marked improvement in efficiency.
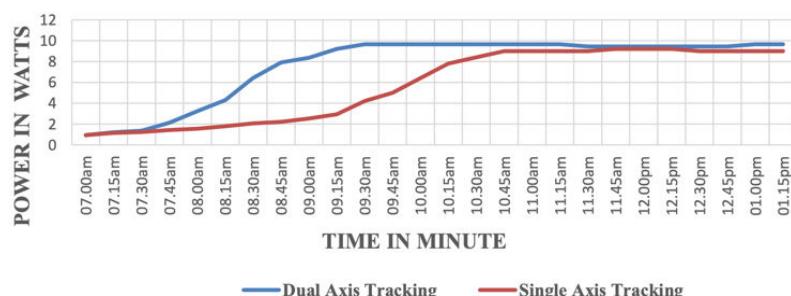
Figure 7: Comparison of power generated by both single and double axis solar trackers

C. Floating Solar Panels

Floating solar panels are panels installed over a water body attached to a buoyant substance. This could have potential applications in rural India since it helps in not compromising important land space since it built over a water body. Further, the efficiency of these solar panels is greater compared to the output of normal photovoltaic panels.
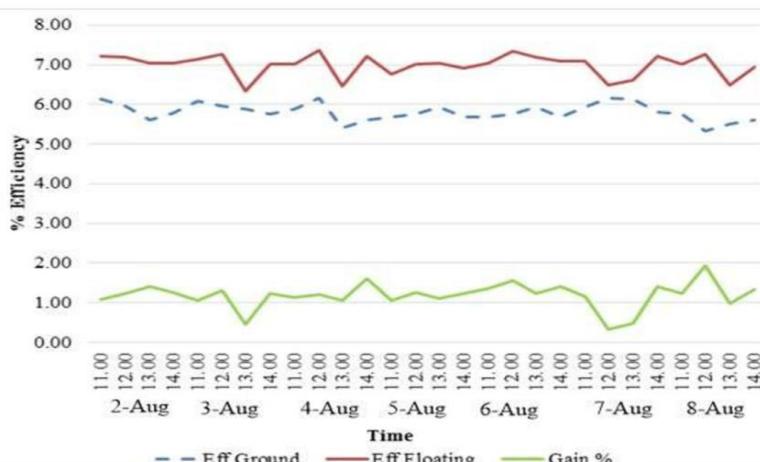
Figure 8: Efficiency of a normal solar panel vs. floating solar panels

Because of the high temperatures the regular solar panels face, their efficiency degrades over time, this is one feature that is overcome by the floating solar panels because the water below helps cool the solar panel and reduce temperatures.
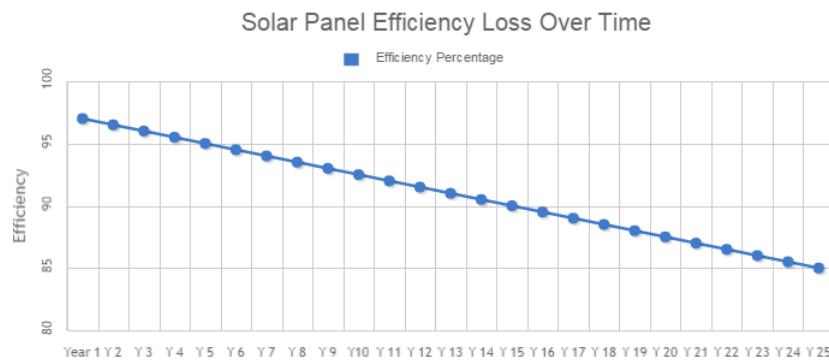
Figure 9: Efficiency loss over time of a regular solar pane

However, the floating solar panels are not as efficient as single or double axis tracking and the installation is more costly. Hence the feasibility of this alternative may be less feasible than the single and double axis tracking systems.

V. RELATED WORK

Falah Mustafa et al. presented their work on the implementation of the double axis solar panel with four tracking sensors in the city of Baghdad. They outlined their aim to increase efficiency of solar panels using LDRs and showed through their experiments that a 35% increase in energy gained from the double axis solar panel as compared to the stationary one was seen.

Hend Abd El-monem Salama et al. detailed in their paper the importance of the maximum power point tracking in optimisation of solar output, and explains the electrical circuit used to make a two-axis tracking mechanism which optimises solar output as depicted in the paper.

Lipika Nanda et al. detailed in their paper the methods to improve useful energy generated by photovoltaic cells making use of servo motors to track solar movements and increase electrical efficiency of solar energy.

Aditya Sawat et al. posited in their paper the need for reduction on conventional energy sources and the need of harnessing solar energy. The paper compares the difference in efficiency between the single and double axis tracking solar panels showing that double axis tracking systems have up to 25% more efficiency than the single axis tracking systems.

N. Othman et al. analysed in their paper the dual axis Arduino based solar panels. Here 5 LDRs were utilised to check the efficiency of such a solar panel on the efficiency of electrical output and concluded that there would be both a higher output voltage and current and thus a large power output will be obtained using a small solar panel.

Nurzhigit Kuttybay et al. presented in their paper an analysis of the efficiency of a smart solar tracking mechanism on the solar energy production. Hence these panels can adapt to conditions of cloudiness and adjust to weather patterns. This system is 18% more efficient than biaxial solar panels.

P. Raman et al. detailed in their paper the effects of rural electrification and its potential benefits in improving standard of living in villages and presents the opportunities and challenges of setting up solar panels in rural India.

Tarujyoti Buragohain discussed in her paper the benefits of installing solar panels and SPVs in rural India because these areas are cut off from the central electrical circuit of India.

VI. CONCLUSION

The overall output of solar panels can potentially be optimised by making us of double and dual axis solar panels in order to optimise electrical output. Hence, the increase in efficiency can be used to lower electrical costs per unit and make it more feasible for installation in rural India. The fixed stand-alone system can only generate optimum power during the afternoon when the sun is right above the panels. By the use of these tracking systems the annual power production can be raised by 40%. This can help meet the energy demands of the society and also reduce the CO_2 emissions. Alterations like these increase the complexity and cost of the solar plant.

Future research can be done to minimise the expense and complexity of this, additionally further raising the output of the solar plant. Like the research done by M.H.M. Sidek et al [8] where a GPS based two axis tracking mechanism was proposed. The system used Astronomical equations, GPS models and technology-based compass to get the location of the sun.

In future we can see more and more solar plants using the solar tracking system and taking the full benefit of the increased efficiency and reduce the CO_2 emissions on earth.

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MERCURY SELECTIVE SENSORS: A REVIEW

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ABSTRACT

A number of potentiometric sensors have been constructed based upon different kinds of ionophores viz. organic, nanomaterials, polymers, and inorganic substances. These sensors can be used to detect the presence of any hazardous metal ion in a real solution. One of them is Mercury metal ion which is extremely toxic to all the organisms if present in the body. It may pose many health hazards to the living system, particularly to the nervous system. This metal ion enters in the human body either orally along with food & water or inhaled with air or absorbed via skin. In this review, we have compiled the potentiometric sensors exclusively selective towards mercury metal ions, efficiently capable of detecting this metal ion. Thus these electrodes/sensors help in the removal of even traces of this dangerous ion. Various other characteristics of the sensing system have also been compiled in this article.

Keywords: Ionophores, Schiff's base, Mercury, Sensors.

INTRODUCTION

Potentiometric sensors have multiple applications in diverse sectors such as in medicinal, agricultural activities, various environmental monitoring, pharmaceutical field, and in industries as well [1]. These sensors have been used in the detection of various hazardous metal ions present in any form within our surroundings and can be toxic to both humans and animals [2]. Researchers are rigorously interested in the fields dealing with potentiometric sensors involving electrochemical methods because of multiple benefits [3]. Mercury and its main ore cinnabar (HgS) are having numerous applications in our day-to-day lifestyle [4-5]. But looking at other aspects saying that mercury is one of the most hazardous metal ions present in our environment either added naturally or as a man-made contaminant [6] and contamination due to this metal ion is a threat to public health as well as to environmental [7]. It can cause various health issues by affecting the nervous system, lungs, eyes, skin, and tissues, therefore its detection becomes necessary [8]. In this mini-review, we have provided updates on recent advances in the field of potentiometric sensors for mercury ions based upon various kinds of ionophores and their corresponding responses to various features.

LITERATURE

Different kinds of ionophores viz. organic, nanomaterials, polymers, and inorganic substances can be used with a variety of binders/adhesives to fabricate the different electrodes. A brief outline of these sensors are given in upcoming sections and detail of various associated and studied properties with these sensors are compiled in Table 1.

Schiff Base Encapsulated Electrodes: Some of the Schiff base encapsulated electrodes selectively sensitive to mercury ions and related properties are compared in Table 1. Hossein et al fabricated mercury ion selective electrode using PVC based upon bis[5-((4-nitrophenyl)azo salicylaldehyde)] [9]. Alharthi and his team designed, characterized, and then utilized the sensor prepared from 4-bromo-2-[(4-methoxyphenylimino)methyl]phenol using mixtures of adhesives in variable composition, but (PVC, 32; o-NPOE, 64.5; BMPMP, 2 and NaTPB, 1.5) composition give the best response [10]. An optical sensor based upon an 2-[(2-sulfanylphenyl)ethanimidoyl]phenol (L) embedded on agarose, a dextrin-cysteine-Schiff base, 8-aminoquinoline (Q) and thiophene-2-carboxaldehyde (T) is also showing characteristics to analyse mercury ion in solution [11-13]. N,N′-bis (5-bromo-2-hydroxybenzylidene)-2,2-dimethylpropane-1,3-diamine Schiff base ligand (L) was synthesized and the sensor was fabricated and then employed for ultra-trace determination of Hg2+ ion on cyclic and square wave anodic stripping voltammetric methods by Hashemi et al [14]. Lan XU et al have developed a sulfur Schiff's base 1-(2-hydroxy-1,2-diphenylethylidene)thiosemicarbazide PVC membrane sensor highly selective for Hg(II) ions [15].

Another Organic Compound as Sensor: A large number of organic compound-based sensors have been constructed and developed selective for mercury ions. 1,2-bis-(N'-benzoylthioureido)cyclohexane has been synthesized and then fabricated using a binder which was further found exclusively selective for mercury ion over other tested cations under study [16]. Mahajan and his co-workers prepared mercury selective electrodes by incorporating three different calix[4]arene derivatives [17]. A sensor based upon 2,6-bis(2-thienyl)pyridine molecular receptor (L) highly selective for mercury ion was designed by Egan et al [18]. A Dibenzodiazathia-18-crown-6-dione based membrane fabricated by PVC highly selective for mercury ions was prepared by Javanbakht et al [19]. A novel sensor prepared by using N,N-dimethylformamide-salicylacylhydrazone and

membrane fabricated by PVC adhesive particularly selective for mercury ions [20]. 2- benzoylamino-3-(4-chloro-phenyl)-thioacrylic acid S-(2-mercapto-4-methyl-phenyl) ester was synthesized and further used to construct PVC-membranes and then sensors highly selective for mercury in aqueous solutions by Bagheri and team [21]. A selective mercury electrode was prepared by using 2-mercaptobenzimidazole, 2-mercaptobenzothiazole, and hexathiacyclooctadecane carriers as an ionophore for the determination of Hg (II) ions in wastewater samples by Mazloum et al [22]. Jianquan Lu et al prepared a mercury ion selective electrode (ISE) based upon a calixarene derivative containing the thiazole azo group which is also highly selective for alkali, alkaline earth, and transition metal ions except for Ag+ ions [23]. Gismera et al developed A Hg (II) and Cu (II) ions selective carbon paste electrode by using tetraethyl thiuram disulfide as an ionophore which was auspiciously used in potentiometric titrations of the humic acids to find ou their complexing properties [24]. Singh et al prepared A Polystyrene-based membrane by using 2,3,4,9,10,11-dipyridine-3,10-diaza-1,5,8,12-tetrathiacyclotetradeca-2,9-diene with sodium tetraphenylborate and dibutyl phthalate as an anion excluder which gave best results in the ligand–polystyrene–DBP–STB ratio 1:4:1:1 and it was found extremely selective towards Hg (II) over rest other monovalent, divalent and trivalent cations [25]. Motlagh et al synthesized and then analyzed two bis-thioureas: 4,4 -bis-(3-phenylthiourea)diphenylmethane (L1) and 2-2-[10-[(E)-2-(aminocarbothioyl)hydrazono]-1,4-dihydroxy-9(10H)-anthracenyliden]-1 hydrazinecarbothioamide (L2) which can detect mercury ion in wastewater as real samples [26]. Bakhtiarzadeh and Ghani prepared an electrode based upon heterogeneous poly(Hg(II)-4- vinyl pyridine) and fabricated by plasticizer tris(2-ethyl hexyl) phosphate which is perfect for the potentiometric titrations of Hg (II) ions with iodide [27]. Mercury (II) selective electrode was constructed by using calix[2]thieno[2]pyrrole receptor which was also used as an indicator electrode in potentiometric titrations by Abbas et al [28]. Hassan and his co-workers constructed a sensor based upon ethyl-2-benzoyl-2-phenyl carbamoyl acetate as a novel nitrogen-containing sensing material and fabricated by PVC, showing the least interference towards Ag(I) and Fe(III) ions along with showing the maximum response for the detection of Hg(II) ions in some amalgam alloys [29].

Organic Polymeric Compounds: Here is a large number of sensors known that have been designed by using polymers and have shown a good selectivity for mercury ions. Hassan et al also developed two sensors highly selective for Hg(II) ions and constructed by the use of 5,5′- dithio-bis(2-nitrobenzoic acid) and tricyclazole as neutral carriers with PVC as a plasticizer which can further be used to detect the metal ions in hazardous wastes such as dental amalgam, mercury bulbs, and fluorescent lamps, etc [30]. Tyagi et al developed a PVC coated sensor based upon p-tert-butylcalix[4]arenethioether derivative using sodiumtetraphenylborate (NaTPB) as a solvent mediator and plasticizer was dibutylphthalate in the ratio of 45:9:460:310 (w/w%) (I:NaTPB:DBP: PVC) shows good performance for the determination of Hg(II) ions in various samples [31]. Gupta et al prepared sensors based upon 2-amino-6-purinethiol (I1) and 5-amino-1, 3, 4-thiadiazole-2-thiol (I2) used for detection of mercury ions in both environmental and biological samples in presence of surfactants [32]. Ayranci et al developed a sensor based upon a rhodamine-based monomer (RD-CZ) which shows excellent selectivity for Hg(II) ions compared with other ions Cd^{2+}, Cu^{2+} Zn^{2+}, Fe^{3+} in aqueous as well as biological samples [33]. Xiu Yu and all prepared a PVC membrane electrode based upon ionophore 3-[4-(dimethylamino)phenyl]-5-mercapto-1,5-diphenylpentanone which shows good selectivity towards Hg(II) ions over other the alkali, alkaline earth, and transition metal ions, it was also utilized as an indicator electrode for potentiometric titrations of mercury with iodide ions [34]. Puri et al synthesized a sensor by using ionophore 2,2,2,4,7-Pentaphenyl-5-o-tolyl-2,5-dihydro-[1,3,5,2]oxadiazaphosphepine coated with graphite electrode that shows good selectivity towards mercury ions with respect to alkali, alkaline earth metal and heavy metal ions preferably Ag (I) ions [35]. Karimi et al synthesized a Hg(II) ion-imprinted polymer coated on a multiwall carbon nanotube which was further used for the detection of trace amounts of mercury (II) ions in aqueous media, the composition of the electrode was in the ratio of graphite powder 66%, paraffin 24%, and Ion Imprinted Polymer Coated Multiwall Carbon Nanotube 11% (W/W) [36].

Nanomaterials as Sensors: Some of the sensors based upon nanoparticles that were used to detect the presence of mercury ions have also been described here. Ali and Mohamed prepared an electrode based upon active material 1,4-bis(6-bromohexyloxy)benzene, Multi-walled carbon nanotubes, and nano-silica modifiers were used to improve its response toward the detection of Hg(II) ions [37]. Shirzadmehr and all prepared a graphene nanosheets and 18 alumina nanoparticles composite sensor, an ion-imprinted polymer, and an ionic liquid was used for binding of the electrode which shows high selectivity to trace Hg(II) ions in various real samples [38]. A potentiometric sensor is prepared by using substituted thiourea-functionalized nanoporous silica as an active substance to monitor Hg(II) ions in wastewater and fish samples Javanbakht et al [39]. Khani et al developed a Multi-walled carbon nanotubes-ionic liquid-carbon paste electrode as a super selectivity sensor for the detection of mercury ions in dental amalgam and water samples [40]. Mejri and all developed a potentiometric sensor

composite with graphene nanosheets modified by using electropolymerization of curcumin on MnO_2-Gr nanosheets used for the monitoring of Hg(II) ions and fluoride and cyanide for the anions, it was auspiciously used for the analysis of spiked samples of tap water, river water, and petrochemical refinery wastewater [41]. Tadayon et al synthesized and used room temperature ionic liquid, 1-Butyl-3-methylimidazolium hexafluorophosphate, multi-walled carbon nanotubes (MWCNTs), alumina nanoparticles, and a synthetic macrocyclic diamide 7,10,13-triaza-1-thia-4,16-dioxa-6,14- dioxo-2,3;17,18-dinaphtho-cyclooctadiene to develop a potentiometric sensing system for instant quantitative analysis of mercury ions in environmental samples [42]. Khan and Paquiza were successful in developing a potentiometric detection system by employing a nanocomposite cation exchanger named Polyaniline–zirconium titanium phosphate as the primary moiety. This system was efficiently employed in the analysis of mercury ions in effluents and as an indicator electrode in complexation titrations [43]. Gupta et al prepared and then incorporated $(H_2NCHMeCH_2NH_2)(H_2O)_2HgCl_2$ (I) as an electroactive material to construct a membrane where the anion excluder is sodium tetraphenylborate, dibutylamine as a plasticizer on the support of PVC matrix were used in non-aqueous, media too for mercury ions estimation in the external solution. Interfering ions like Ag^+ and Cd^{2+} are also not going to affect the working efficiency of electrodes [44].

Table 1.5: Sensors selective for Hg (II) ions based on various ionophore

Sr. no.	Ionophore	Response Time(sec)	Linear Range (M)	Life Time (months)	Slope (mV/decade)	Detection limit	pH range	Reference no.
Ionophore: Schiff Base								
1.	Bis[5-((4-nitrophenyl) azo salicylaldehyde)] (BNAS)	<10	5.0×10^{-2} to 7.0×10^{-7}	3	30±1	-	1.0 to 3.5	9
2.	4-bromo-2-[(4-methoxyphenylimino)methyl]phenol (BMPMP)	<10	3.9×10^{-3} to 9.33×10^{-8}	-	29.74 ± 0.1	3.98×10^{-8}	2.0−9.0	10
3.	2-[(2-sulfanylphenyl)ethanimidoyl]phenol (L)	-	1×10^{-2} to 1×10^{-5}	-	-	1×10^{-6}	4.5	11
4.	Dextrin-cysteine-Schiff base	-	-	-	-	0.74nM	-	12
5.	Quinoline-thiophene	-	-	-	-	23.4 nM	-	13
6.	N,N′-bis (5-bromo-2-hydroxybenzylidene)-2,2-dimethylpropane-1,3-diamin	150	0.4 to 120 µg L−1			0.042 µg L^{-1}	2.0	14
7.	1-(2-hydroxy-1,2-diphenylethylidene)thiosemicarbazide (HDPET)	-	1.0×10^{-2} to 2.0×10^{-6} 325	-	-	-	2.0–5.0.	15
Ionophore: Organic compound								
8.	1,2-bis-(N'-benzoylthioureido)cyclohexane (BTCH)	50 - 100	10^{-1} to 10^{-5}	-	-	-	-	16
10.	calix[4]arene derivatives	<20	-	-	near-Nernstian slope	$\sim 10^{-6}$	$\sim$1.0–4.0	17
11.	2,6-bis(2-thienyl)pyridine molecular receptor (L)	-	330-413 nm	-	-	-	-	18
12.	Dibenzodiazathia-18-crown-6-dione	~10	1×10^{-2} to 8×10^{-6} mol dm-3	3	near-Nernstian slope	-	0.5–2.5	19
13.	N,N-dimethylformamide-	<30	8.0×10^{-2} to	2	29.6	$5.0 \times$	1–4	20

	salicylacylhydrazone (DMFAS)		6.2×10^{-7}			10^{-7}		
14.	2- benzoylamino-3-(4-chloro-phenyl)-thioacrylic acid S-(2-mercapto-4-methyl-phenyl) ester	-	3.0×10^{-2} to 2.0×10^{-7}	-	29 ± 1	5.0×10^{-8}	1.0-4.0	21
15.	2-mercaptobenzimidazole, 2-mercaptobenzothiazole, and hexathiacyclooctadecane carriers	20-100	4 to 5 decades of concentration	2	near-Nernstian slopes	6.0×10^{-7}	-	22
16.	Calixarene derivative containing a thiazole azo group	-	a) 5.0×10^{-2} to 7.5×10^{-6} b). 10^{-2} to 5.0×10^{-6}	-	a). 61.1 b). 28.7	-	a). 6.5 b). 4.0	23
17.	Tetraethyl thiuram disulfide	-	-	-	-	10^{-7}	-	24
18.	2,3,4,9,10,11-dipyridine-3,10-diaza-1,5,8,12-tetrathiacyclotetradeca-2,9-diene with sodium tetraphenyl borate (STB) and dibutyl phthalate (DBP)	18	-	4	30.0	-	2.5-5.0	25
19.	(L_1)-two bis-thioureas: 4,4 - bis-(3-phenylthiourea) diphenyl methane and (L_2)-3262-2-[10-[(E)-2-(aminocarbothioyl)hydrazono]-1,4-dihydroxy-9(10H)-anthracenyliden]-1 hydrazinecarbothioamide	-	1.0×10^{-2} to 1.0×10^{-7}	-	30.3	7.9×10^{-8}	1.5-4.0	26
20.	Poly(Hg(II)-4- vinyl pyridine)	<25	10^{-2} to 10^{-7}	4	30 ± 1	0.5×10^{-7}	3-4	27
21.	Calix[2]thieno[2]pyrrole	~20	10^{-2} to 10^{-6}	-	27.8	-	-	28
22.	Ethyl-2-benzoyl-2-phenylcarbamoyl acetate	-	10^{-3} to 10^{-6}	-	30	-	2.0-4.5	29
Ionophore: Polymer								
23.	5,5′- dithio-bis(2-nitrobenzoic acid) and tricyclazole	-	a).1.0×10^{-2} to 7.0×10^{-6} b).1.0×10^{-2} to 7.7×10^{-6}	-	a).30.0 b).29.7	a).5.0×10^{-6} b).5.6×10^{-6}	1.8-3.3	30
24.	p-tert-butylcalix[4]	~14	1.0×10^{-1} to 7.2×10^{-8}	7-9	29.50 ± 1.0	-	2.5-6.8	31
25.	2-amino-6-purinethiol (I1) and 5-amino-1, 3, 4-thiadiazole-2-thiol (I2)	~10	1.0×10^{-1} to 7.0×10^{-8}	~2	-	4.4×10^{-8}	-	32
26.	Rhodamine-based monomer	-	a) 9.77×10^{-8} b) 3.16×10^{-8} c) 1×10^{-7}	-	-	-	-	33
27.	4-(4-N,N-dimethylphenyl)-2,6-diphenylpyrilium tetrafluoroborate	-	1.0×10^{-3} to 1.0×10^{-8}	2	34	1.0×10^{-8}	2.5-7.0	34
28.	Oxadiazaphosphepine	<10	1.0×10^{-1} to 1.0×10^{-6}	-	29.39	7.24×10^{-7}	0.95 4.50	35
29.	Hg(II) ion imprinted	-	3.5×10^{-3} to	-	-	$6.3 \times$	-	36

	polymer		8.0×10^{-8}			10^{-8}		
Ionophore: Nanomaterials								
30.	1,4-bis(6-bromohexyloxy)benzene with (a) Multi-walled carbon nanotubes (MWCNTs) (b) Nanosilica modifiers	a) ~7 b) ~4	a) 1.0×10^{-1} to 1.0×10^{-7} b) 1.0×10^{-1} to 1.8×10^{-8}	a) 4 b) 3.5	a) 28.75 ± 0.46 b) 29.92 ± 0.15	a) 1.0×10^{-7} b) 1.8×10^{-8}	a) 3.0-7.5 b) 2.5-8.5	37
31.	Graphene nanosheets and 18 alumina nanoparticles	-	1.30×10^{-3} to 4.0×10^{-9}	-	29.72	1.95×10^{-9}	-	38
32.	Substituted thiourea-functionalized nano-porous silica	~35	1.0×10^{-1} to 1.0×10^{-7}	>9	28.4 ± 1.0	7.0×10^{-8}	-	39
33.	1-(2-ethoxyphenyl)-3-(3-nitrophenyl)triazene	~5	1.0×10^{-4} to 5.0×10^{-9}	2	$29.3 \pm (0.2)$	2.5×10^{-9}	2.0–4.3	40
34.	Curcumin-decorated manganese dioxide	-	-	-	-	19.2	-	41
35.	Alumina nanoparticles and a synthetic macrocyclic diamide '7,10,13-triaza-1-thia-4,16-dioxa-6,14-dioxo-2,3;17,18-dinaphtho-cyclooctadecane'	~10	2.01 to 2.01×10^{7} µg L^{-1}	>3	-	1.40 µg L^{-1}	2.5-4.5	42
36.	Nanocomposite cation exchanger Polyaniline–zirconium titanium phosphate	-	10^{-1} mol/m^3 to 10^{-10} mol/m^3	4	-	-	-	43
37.	$(H_2NCHMeCH_2NH_2)(H_2O)_2HgCl_2$ (I)	~10	1.25×10^{-5} to 1.0×10^{-1}	~4	25 ± 0.1	8.9×10^{-6}	6.6–9.3	44

CONCLUSION

From the above analysis it has been concluded that potentiometric sensors are having excellent applications in estimation of metal ion concentration. These sensors are based upon various kind of ionophores and can efficiently detect Mercury ions in real solution, from a very low to high concentration even in non-aqueous media, too. Their life time is also support their stability. Thus helpful in the removal of this hazardous ion from our daily consumable goods and have proven to be helpful to lead a safe environment and human lives as well.

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SURVEY ON WIRELESS POWER TRANSFER SYSTEM

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ABSTRACT
In order to transfer power, wireless power transfer systems rely on both electric and magnetic fields. When compared to traditional wireless power transfer, there are various advantages in terms of automation, safety, and neatness. It is meant to charge the system because it enables improved charging durability and system efficiency for applications such as wireless charging of laptops, pads, and other devices where Inductive power transfer is possible. The development of helical circular coils, as well as transformer guidelines for wireless power transfer systems, the efficiency of a system is primarily determined by the coupling coefficient between transmitter and receiver coils, as well as the quality factor of each coil. Hybrid modelling are some of the major trends which will be described in this article. In order to guarantee the safety of the end user, wireless charging for electric vehicles must undergo a thorough evaluation. Wireless charging for electric vehicles poses a number of safety concerns, including the risk of electric shock, magnetic field exposure, fire, and other problems. When it comes to charging electric vehicles (EVs), wireless charging is an important consideration.

Keywords: Wireless power transfer, wireless charging, Inductive Wireless Power Transfer System, Capacitive Wireless Power Transfer System

1. INTRODUCTION
The transmission of energy from one place to another place without using is called wireless power transmission. In general, for normal power transmission of losses that occur during the distribution of electrical power is major issue in power systems. In wireless power transmission the power can be transfer to near places and far places. Magnetic and inductive coupling Techniques that use resonant coupling in the near field are called near field techniques. Wireless power transmission depends upon both electric and magnetic fields. If the reactance of the inductor and capacitor are equal, the capacitor and inductor form a resonator and generate charge oscillations between them.

For an inductive resonant coupling, the performance of a wireless power transmission system is determined by the coupling efficiency and the quality factor (Q) of the coils (k). Resonator-based wireless power transmission is the basis for this concept. The time it takes to transfer energy is much shorter than the time it takes to lose it. It's also important to have a high level of efficiency. With a single dc power supply and inverter, Magnetic and electric fields transfer power from primary to secondary sides.

Wires are used everywhere in the world to transfer electricity from the power station to the rest of the world. Batteries and wires could be eliminated or greatly reduced with wireless power transfer technology. To avoid hazardous situations, wireless power transfer technology can be used to power electrical devices where wires are inconvenient. In the future, we should be able to use wireless power transfer technology to move power wirelessly from a power station to anywhere. Electricity generated by induction It's possible that transmission can provide a viable alternative to inefficient power transmission methods.

1.2 Need of Wireless Power Transfer System
Fossil fuels such as coal, petroleum, and diesel will be extinct in the future because they are not renewable. In the future, the transportation system will be constrained. As a result, when it comes to transportation, we opt for electric vehicles. Vehicle greenhouse gas emissions are rising as a result of current gasoline and petrol engine technology. In order to reduce greenhouse gas emissions, plug-in electric vehicles have been implemented. However, despite an increase in PEV use, there are some issues with batteries, such as slower charging rates and lower energy storage capacity due to smaller and heavier batteries. The development of electric vehicles (EVs) necessitates the development of new battery technology. PEVs' rapid growth was slowed by charging-related issues. The concept of Wireless Power Transfer (WPT) with optimization algorithms [9] can reduce battery issues, greenhouse gases, and magnetic field radiation. Because electric vehicles travel longer distances to recharge, many charging stations have been built alongside roads. As a result, larger batteries are no longer needed, and a lighter battery is used in their place. EVs can be charged wirelessly while parked at home, in an office parking lot, or on the road with a stationary IPT charging system. Electric vehicles can be charged using these IPT systems without the need for a charging station. Systems like these are both reliable and easy to use.

The IPT system is the most cost-effective when using the already-existing conventional transportation system. Power supplies and tracks are the most expensive parts, and the system's installation costs are also high. In order for these features and advantages of the system to be realised, there are some challenges that must be overcome in the design process. Over the last two decades, the IPT method has evolved from industrial applications to designs for both stationary and dynamic charging systems that can power electric vehicles. The IPT method of implementing EVs is preferable from the standpoint of sustainable energy.

1.3 Issues and Solutions

Some of the major issues of the inductive wireless power transfer include:

✓ Cost of system.

✓ Health hazard.

✓ Environmental issues.

The major solution that can be provided to overcome these issues is possible through the Dynamic wireless charging system which helps the various loads to charge during its state. And the requirement of standard level convertors is necessary as there exists different models of EVs. Resonant magnetic coupling operates with higher frequencies of IEEE standards.

Table 1: Survey on Wireless Power Transfer System

S.No	Title of the Paper	Description
1.	Resonant Inductive Coupling Wireless Power Transfer System Q-enhancement method [5]	Using a resonant inductive wireless power system is regarded to work when the power transfer distance exceeds the diameter of the coil, while it can be disabled when the distance is smaller than the diameter of the coil and still provides high efficiency.
2.	Hybrid Wireless Power Transfer [2]	Enhanced hybrid wireless power transmission (HWPT) system that combines inductive and capacitive power transfer with a single inverter and is designed to work over longer distances.
3.	The design of a magnetic link device for use in an inductive power transfer system [1]	The presentation described important parameters like primary, secondary, and mutual inductances, coupling factor, transferred power, and efficiency.
5.	Wireless Power Transmission Trends [6]	By transmitting electric power wireless, we can eliminate electric power losses and we can transfer power to places where we cannot use the wires. Wireless transmission is useful for powering electrical devices in situations where connecting wires would be inconvenient, dangerous, or not possible due to physical constraints. Using wireless power transfer technology, you can reduce the amount of electrical wire you use, which is typically made of copper or aluminium alloy. The metal that is used to manufacture electric wire will become extinct in the near future.
6.	An overview of wireless power transfer for the purpose of charging electric vehicles [7]	This paper examines WPT technologies from the perspective of electric vehicle recharging. Each technology's basic principle is explained, along with its potential and limitations for EV charging. The two techniques, coupled magnetic resonance and magnetic gear, are discussed in detail. Selected technological trends are discussed.
7.	Safety Considerations of Wireless charger for Electric Vehicles [4]	On-board wireless charging for electric vehicles is examined in this paper. The automotive industry and other organisations are working to improve technology, both in terms of performance and safety. This application is classified as hazardous due to the large area of electromagnetic field exposure between the supply and load primary coils and the high electrical power involved. The product or system must be designed to meet safety regulations. It is also necessary to meet customer expectations in terms of efficiency and charging cycle in order to receive a certification of safety. As part of the standard testing procedure, this should include testing for electric shock, electromagnetic field exposure level, and fire hazard. To evaluate near magnetic fields for an electric vehicle wireless charger system, this paper employs both simulation and experimentation, as demonstrated in the paper.

2. WIRELESS POWER TRANSFER SYSTEMS

2.1 Near-Field Wireless Power Transmission Systems:

The purpose of this article is to discuss the safety and performance requirements for wirelessly charging electric vehicles, as well as their implementation. The automotive industry and other organisations are constantly innovating and improving technology, not only in terms of performance, but also in terms of overall safety and security. As a result of the large area of electromagnetic field exposure between the supply and load primary coils, as well as the large amount of electrical power involved, this application has been classified as hazardous. The product or system must be designed in such a way that it complies with all applicable safety standards and regulations. To be certified in accordance with the safety standard, it is also necessary that the efficiency and charging cycle meet the expectations of the customer. In addition to electric shock, electromagnetic field exposure level, and fire hazard, the standard testing procedure should include the following elements: Both simulation and experimental tools are used to evaluate near magnetic fields for an electric vehicle wireless charger system [8, 10], as demonstrated in the current paper [8, 10].

2.2 Inductive Wireless Power Transfer Systems

Since the 1990s, there has been tremendous progress in inductive wireless power transmission technology, which is being used for stationary charging of mobile phones. This progress is based on work done in the 1990s for material handling applications. Despite the fact that ferrite cores are required for magnetic flux guidance and shielding, inductive WPT systems are expensive and cumbersome to manufacture. Due to the same reason, these systems must operate at frequencies below 100 kHz in order to avoid ferrite loss, which results in large coils and poor power transfer densities. Consequently, dynamic WPT requires a high-power capability, which makes it more expensive and has a lower power transfer density than static WPT due to the short amount of time the load spends passing over the charging coil.

2.3 Capacitive Wireless Power Transfer Systems

Due to the use of ferrites in inductive systems, they are unable to operate at higher frequencies, resulting in larger and more expensive systems. The use of capacitive WPT systems, as opposed to inductive systems, has several advantages over the latter due to the more concentrated nature of electric fields, which reduces the requirement for electromagnetic field shielding. Because of the extremely low capacitance between the power supply and the load, effective power transfer can only occur at high frequencies. As a result, system design becomes extremely difficult. With the recent availability of wide -band gap gallium nitride and silicon carbide power semiconductor devices that enable higher-frequency operation. The modern technologies like artificial intelligence, fuzzy logic [11. 12, 13, 14] can be used to develop the control strategies for WPT.

3. METHODS INVOLVED IN WPT CHARGING TECHNOLOGIES

3.1 Various Wireless Charging Technologies

Three major steps are required for wireless charging to work:

✓ Electrical energy is first converted into EMF exposure, and then the energy is transmitted through space. Losses that occur during the distribution of electrical power are a major concern in power systems for normal power transmission.

✓ It is possible to transfer electricity wirelessly to both nearby and faraway locations.

✓ As a result of the magnetic and inductive coupling, Techniques that use resonant coupling in the near field are called near field techniques.

✓ Electric and magnetic fields are necessary for wireless power transmission.

✓ At the same time, magnetic and electric fields transfer power from the primary side to the secondary side with a single dc power supply/inverter.

✓ Thirdly, the collection and conversion of power at the destination into electrical energy.

✓ The major part that is to is to be considered are the transmitting and receiving part of the system

Transmitter: It is also called the primary loop that creates the magnetic field around the conductor.

Receiver: It is also called the secondary loop that receives the voltage generated due to time variant magnetic flux.

Function of transmitter and receiver has a major role in charging process. Transmitter creates a magnetic field around the conductor and this field is received by the receiver which later converted to requirement level of power through a converter and sent to the battery. Then the charging of battery takes place. And the further classification of wireless charging methods are as follows:

Way of classifying wireless charging by different methods is:

✓ Inductive Coupling

✓ Resonant magnetic Inductive Coupling

3.2 Inductive Coupling:

IPT transmits power via magnetic induction rather than a medium. This voltage is generated by the secondary loop's time-varying magnetic flux and can be explained using laws like Lenz's and Faraday's (receiver).

A secondary loop (receiver) receives the voltage generated by the time-varying magnetic flux and connects the load to the circuit as the magnetic field around the conductor changes. To maximise efficiency, wireless power transfer allows the electronic devices that are part of the system to operate at a lower level of energy consumption.

If you have a cell phone or electric toothbrush, you can charge them wirelessly using inductive coupling. Pacemakers and electric cars can also be charged using this method.

Appliances, for example, may necessitate a high level of power. Coupled magnetic resonance, i.e. coupling at resonance, refers to systems in which only resonance is used to improve inductive power transfer.
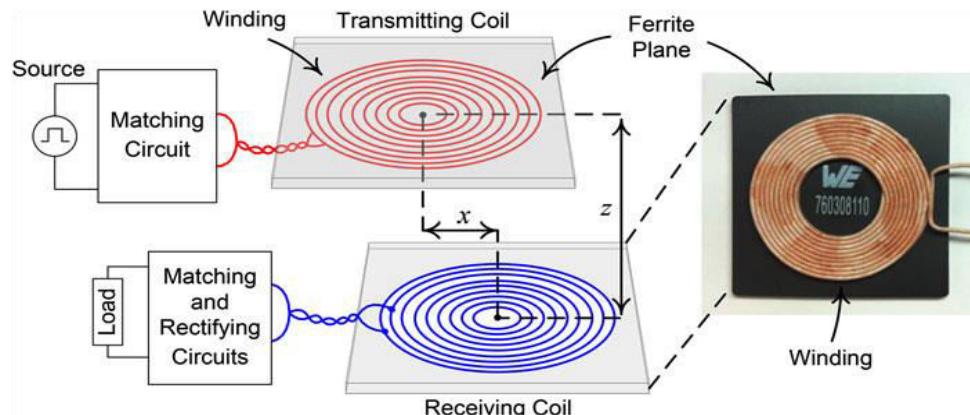
Fig-1. Inductive Coupling power transfer based wireless system

3.3 Resonant Magnetic Inductive Coupling:

Magnetic induction that resonates the coupled mode theory behind coupling technology allows for long-distance power transmission. In order to compensate and correct the power factor, magnetic resonance uses transmitting and receiving coils and capacitance. In order to maximise power transfer, this is done in a resonant condition where the power can be transmitted more efficiently. Resonance coupling and dynamic wireless charging of EVs are used by On Line Electric Vehicle (OLEV). Using magneto-plate wires also improves efficiency.
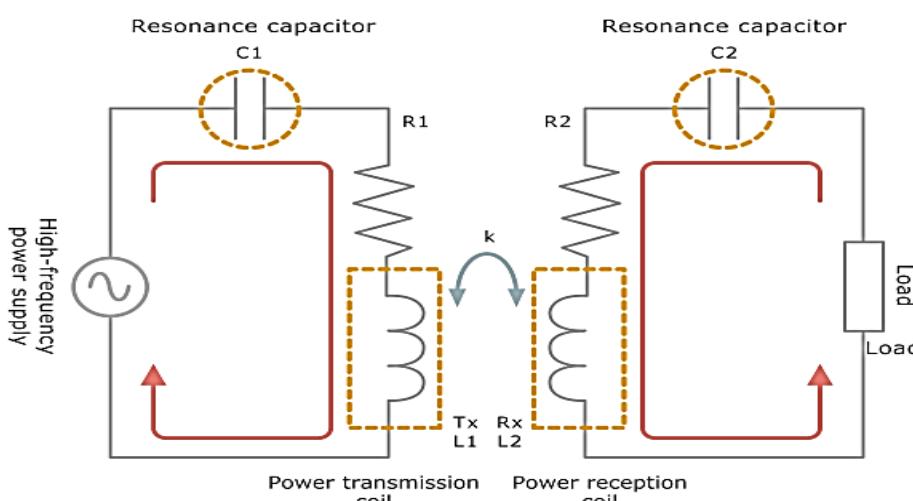
Fig-2. Resonant inductive Coupling power transfer based wireless system

4. SAFETY CONSIDERATION OF WPT SYSTEMS

Due to the risk of electric shock and fire from the high electrical power and public exposure to high magnetic fields, wireless charging systems have many advantages, but they also have significant safety concerns.

4.1 Electrical Shock

When charging an electric vehicle, a wireless charger must be capable of delivering at least 100kW and supplying higher voltages as well as higher currents. It is possible to have higher voltages across the primary and secondary coils than the voltage supplied by the power supply. Because of the higher flow of voltages in a magnetic coil, it is necessary to physically seal the coil in order to keep conductors away from people and animals under normal operating conditions in a variety of environments. A magnetic coil is used to accomplish this (for example, arctic cold, desert heat, extended periods of dry weather, immersion, seismic activity, etc.). As a result, standard electrical societies must establish standards to ensure that large power charging systems do not pose a hazard to the public, given that they can be permanently installed in the floor of a garage or parking space, or even on the road.

4.2 Fire Hazards

There is a chance that high power could cause a fire if there is a problem with the insulation or another electrical thing. If there are shorts, poor energy transfer or other problems that could cause a fire, electricians need to look for them. They also need to keep an eye on current flow and excessive heating to see if there are signs of problems. In order to figure out how well the charging coils work, it is important to look at the long-term resistance of the insulation materials that were used to build them. To keep things safe when the temperature is high, it is important to follow insulation standards. Standards for wireless charging for electric vehicles (EVs) are being worked on right now to make sure they are safe and work well. It's not just automobile manufacturers and other businesses who are working to improve and advance the technology. They're also working to make it safer. A large surface area means that the product or system must be made in a way that ensures it meets all safety rules. A product must meet the needs of the customer in terms of efficiency and charging cycle, as well as make sure that it is safe.

5. APPLICATIONS OF INDUCTIVE WIRELESS POWER TRANSMISSION

5.1 Medical devices

LVAD heart assist pumps, pacemakers, and infusion pumps all use wireless power transmission to get their electricity. Power can be delivered more efficiently to medical devices that are implanted in the body thanks to this technology. Additional benefits include a reduction in drivelines inserted into the body and surgery to replace primary batteries [15].

5.2 Electric vehicles

Electric and hybrid vehicles, including rechargeable hybrids, can be charged wirelessly. These systems deliver 3.3kw of power at a high level of efficiency over a distance of 20cm. Thanks to this new technology, electric vehicles can now be reliably and efficiently powered without the use of wires. It is expected that this will make electric vehicles more appealing to consumers because wireless charging will improve the charging experience of EV owners.

5.3 LED Lighting

Because of the use of wireless power transmission in LED (light emitting diode) lights, we can eliminate the need for batteries in under-cabinet task lighting and assist architectural lighting designers in creating products that appear to float in mid-air without the use of a power cord.

6. CONCLUSION

This article was written with the idea of inductive power transmission (IPT) and wireless power systems in mind. It gives an overview of the WPT components and their major research interests and findings. Among the major methods of dynamic wireless charging discussed are inductive and capacitive power transfer systems. We delve deeper into major technologies like high-efficiency inductive coupling and resonant magnetic inductive coupling-based wireless charging. Wireless charging of electric vehicles raises serious safety concerns. Significant safety concerns, such as electrical shock from potential fire hazards, are described in detail. To date, no other invention or discovery has offered more possibilities for transmitting power with minimal losses and greater ease than inductive wireless power transmission. If all conditions are met, we can expect its applications to perform miracles in the coming years.

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INTEGRATION OF IOT AND BLOCKCHAIN IN AGRICULTURE ECOSYSTEMS: A REVIEW

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ABSTRACT

Internet of Things (IoT) and Blockchain is an area of information and communication technology (ICT) that can impact modern agricultural processes, methods and practices. The integration of IoT and Blockchain is revolutionizing the production, processing, transportation, and delivery of agricultural products and food to end consumers. Internet of Things (IoT) involves interconnection of different heterogeneous devices that are linked together with diverse technologies generating big data which are processed and analyze for timely decision making. A lot of research work has been done on IoT in different domains including agriculture but research work on blockchain in Agriculture had been few until recent time. Blockchain is an emerging field of study that cut across a broad range of domains and applications outside of cryptocurrencies. It's already making big impact in domains such as finance, healthcare, industries etc. When IoT is combined with Blockchain in Agriculture the transformative power of Blockchain could revolutionize entire agriculture value chain from production to end consumers. This paper reviewed IoT and Blockchain integration on agriculture and suggest how this emerging technology combo can be leveraged to improve agricultural production and build trust and transparency in the entire agriculture value chain. The contribution of this paper is to improve agriculture value chain right from production to end consumers. This paper will also inspire more research work on IoT and Blockchain integration in Agriculture ecosystems for improved production, monitoring, food quality and safety as well as benefits to farmers and consumers.

Keywords: Internet of Things (IoT), Blockchain, Smart Agriculture, Supply chain, Ecosystem, Traceability

INTRODUCTION

IoT is defined as a network of networks, in which, typically, a massive number of objects, things, sensors, devices are connected through the information and communications infrastructure to provide value added services (Perera et al., 2015). IoT is a major technological revolution in information and communication technology with updated infrastructure and networks where all the connected devices are able to identify and communicate with each other (Singh D et al, 2014).

The focus of IoT in agriculture and farming is on automation of all the aspects of farming and agricultural methods to make the process more efficient and effective (Madushanki et al., 2019). IoT enables the vision of smart agriculture through real time data gathering, analyzing, processing, and allowing the improvement of overall farm management while helping the farmers to make more informed decisions (Mohammad et.al, 2022). IoT may aid farmers in gathering information about soil moisture, temperature, received sunshine, and other related parameters. (Gubbi et al., 2013).

Blockchain technology is an online platform which tracks and records transactions chronologically via distributed registers (shared ledgers). Transactions in the network may include such as receiving and sending cash payments for services and products, making reservations, booking hotel rooms or flights, signing contracts, and so on. In addition, blockchain technology allows you to track asset ownership if you lease it to a third party. In short valuable things can be leased, recorded, exchanged and tracked on the blockchain platform and their duplicate transactions records are shared at the same participating agent's time with in the network (Alphand et al., 2018). Blockchain is the evolutionary next step for smart agriculture. This technology has great potential for smart farming and allows data sharing, more transparent, safe and effective for smart farming (Sabir Hussain et al, 2020).

The integration of blockchain technology with IoT is another important contribution predicted to revolutionize the digital transformation of various domains (Makhdoom et al., 2018). Blockchain as a distributed ledger can be verified and deployed across several heterogeneous IoT networks. Integration of blockchain technology with IoT is another significant contribution to the digital transformation of various domains. By integrating with IoT, blockchain is projected to add $176 billion to the global economy by 2025 and $3 trillion by 2030 (Panarello et al., 2018).

This paper is structured into four sections. Section one is on background, section two is on methodology while section three is on IoT and Blockchain Integration in Agriculture review and section four is on Discussion and conclusion.

1. BACKGROUND

The world population projection of 9 billion by 2050 will require raising overall food production by 70% by 2050 and production in the developing countries will need to almost double (FAO, 2009). To meet this expected demand, agricultural products will require concerted effort that will improve efficiency in Agricultural process and methods leading to increase productivity in the entire agricultural chain.

Climate change has negatively impacted the agriculture eco-system causing heavy rains, droughts, floods, and abrupt weather conditions. These changes are creating threats to agriculture-related food security in the developing as well as the developed world. The climates related challenges faced by agriculture can be overcome by adopting smart agriculture using IoT devices, which can increase agriculture productions. (Khalid et al, 2020).

Covid-19 impact on agriculture too cannot be under estimated causing worldwide intermittent shortage of farm products. Agronomic producers also face growing concerns of the high cost of management, limited ability of crop monitoring, pressures to minimize environmental impact. (Wei Zhao et al, 2020). A potential solution to mitigate some of the issues are autonomous agricultural systems. These systems are hoped to reduce labor issues for the most dangerous and tedious agronomic tasks, improve efficiency, and reduce environmental impacts through better utilization of crop inputs. (Wei Zhao et al, 2020)

An estimated 690 million people are undernourished in 2019 which is about 60 million more than 2014. While most of the undernourished people live in Asia, Africa has the highest prevalence of undernourishment. (FAO, 2020). The implication of this is that to reduce undernourishment in Africa there is need to leverage on the capabilities of IoT to improved Agricultural production.

As IoT and Blockchain will continue to play a very big role in the entire agriculture ecosystem and value chain from production to end consumers we need to be asking the following questions:

- How is IoT and Blockchain integration impacting agriculture ecosystems

- How can we leverage on this impact in our agriculture value chain in Nigeria

- How do rural farmers in Nigeria benefit from IoT Blockchain integration

- What are the IoT and Blockchain integration challenges in Agriculture

- How do we manage IoT and blockchain integration challenges

- How do we use IoT and Blockchain integration to build transparency and trust in our Agriculture value chain

2. METHODOLOGY

In order to answer the questions raised in this review, over twenty journals and articles were sourced from different websites. These articles were mainly on Internet of Things (IoT) and Blockchain, IoT and Blockchain in Smart Agriculture, IoT and Block Chain in Agriculture Supply chain, Blockchain and IoT based food Traceability etc. The journals were critically reviewed to understand the concept of IoT and Blockchain, IoT and Blockchain integration in agriculture and supply chain with their various challenges and opportunities.

2.1 Internet of Things (Iot)

The Internet of Things (IoT) is a cutting-edge computing and networking technology that reflects the future. IoT systems are complex system consisting of devices, gateways, mobile technologies, appliances, web services, datastore, data analytics and many more depending on the type of IoT application. (Russell, 2016). IoT is defined as a network of networks, in which, typically, a massive number of objects, things, sensors, devices are connected through the information and communications infrastructure to provide value added services (Perera et al., 2015). The Internet of Things (IoT)has the potential to link billions of devices (smart objects). These smart objects can gather data and interact with other systems over the internet. IoT has evolved into a next generation technology with several agricultural applications (S. Nižetić et al., 2020).

2.2 Internet of Things (Iot) in Smart Agriculture

IoT is rapidly transforming agricultural ecosystem providing opportunities for precision farming, smart irrigation, livestock management, agriculture environment monitoring, smart Green house, better food quality and safety. Introduction of new innovative IoT solutions and technologies are shaping agricultural production with increase efficiency leading to increase yield, better quality output, cost effectiveness and sustainable environment. IoT application in agriculture depend on the use of sensors to generate big data on the agricultural environment. It discovers, analyses and deals with models built upon big data to make the development of agriculture more sustainable. (Dolci, 2017).

IoT applications can support farmers during crop planting, irrigation, crop processing, harvesting and postharvest, crop storage and transportation, and many other benefits in agricultural IoT systems. Soil moisture sensors, humidity sensors, leaf moisture sensors, solar radiation sensors, infrared light sensors, and rainfall predictors are among the field sensors used in IoT-based systems. In IoT scenarios, sensors can be installed in a variety of locations, including greenhouses, seed banks, cold rooms, agricultural machinery, transportation systems, and livestock, and the data collected can be processed in the cloud for monitoring and control (Sabir Awan et al., 2021).

2.3 Blockchain Technology

Blockchain is a distributed database where data can be recorded and shared via a decentralized computing network while also providing security and privacy, when the data is spread, only the owner who has the private key can make transactions. The other machines or computers on the network serve as validators. It safely records transactions between nodes in a public ledger without the need for a trusted third party (Pavithran et al., 2020).

2.3.1 Blockchain Process

Blockchain records transactions in block units, and every block includes the hash of the block history, hash of the current block, date, other details, and transactions for the block. When a sender node makes a transaction, it distributes it to the other nodes on the network. The receiving nodes verify the transaction and have proof of work. The node that succeeds in the proof of work will broadcast it to all the other nodes and connect the block to the chain. The transaction shall contain the public key of the recipient and shall be signed by the sender. Therefore, any other node will verify the validity of the transaction. Each block includes a hash of the previous block, which means that each block is connected to each other (Yadav et al., 2020).

Blockchain Distributed Ledger Technology (DLT) is Distributed, Immutable, Time-stamped, Programmable, Secure, Anonymous and Unanimous. These properties of blockchain may be the game changer in the food supply chain and also add accountability to the supply chain system by exchanging accurate data between supply chain stakeholders. Integration of IoT with blockchain will provide the overall visibility of food products across the supply chain. The major advantages of blockchain and IoT in the food supply chain are real-time monitoring and sensing of original food items from the origin which identify major bottlenecks.

2.4. Blockchain in Agriculture and Food Supply Chain

The Blockchain is playing transformative role in agriculture ecosystems such as crop and food production, controlling weather crisis and managing agricultural finances. This is shown in Fig.1. below.
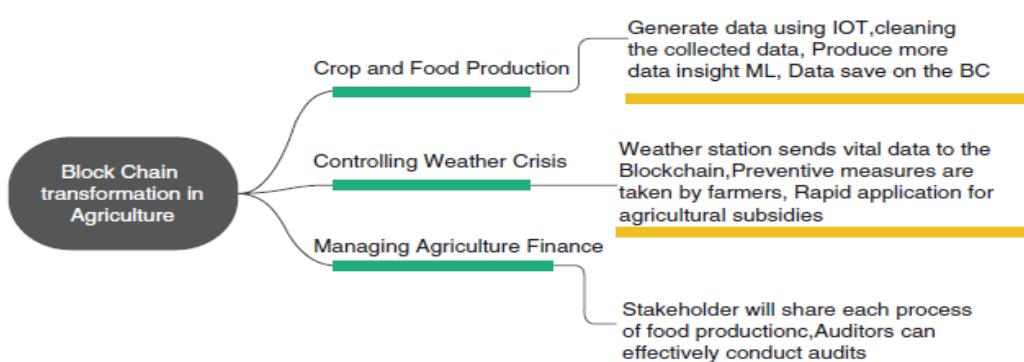
Fig.1. Blockchain Transformation. Source (M. Sandeep Kumar et al., 2021)

In agricultural products and food supply chain, blockchain is providing a digital database that monitors, tracks records, and processes digital and physical resources. Blockchain allows greater traceability and higher quality transactions. Blockchain can manage and integrate all procedures and dealings in real-time across the agricultural supply chain. Every transaction treated in a distributed manner may contain product specific attributes and transactions that will be added by players in the supply chain. The supply chain players can recognize and investigate the association of products along with all stages of the supply chain and zoological technology practices (fertilizers, feed, and veterinary services) (Clauson et al., 2018).

2.5 Iot Integration with the Blockchain

IoT becomes more efficient when it is combined with cloud computing, artificial intelligence, and machine learning (M. Nazari Jahantigh et al. 2020). Integration of blockchain technology with IoT is another significant contribution to the digital transformation of various domains. By integrating with IoT, blockchain it is projected to add $176 billion to the global economy by 2025 and $3 trillion by 2030 (Panarello et al., 2018).

The integration of IoT and Blockchain has the capability to fix the problem of food quality and safety by creating a distributed system and eliminating the third party participating in the system at the same time. By building customer confidence, IoT and blockchain technology could eradicate all concerns and fears from customers on food safety and quality. Each product has a digital identity in this framework, which stores information from the point of origin up to the end of the retailer (K. Pal and A.-U.-H. Yasar, 2020).

2.6. Iot and Blockchain Integration Challenges
As IoT and Blockchain integration in Agriculture continue to progress toward stabilization, there are some challenges that needs to be addressed to take full benefit of the combo technology. Some of these challenges according to (Mohamed Torky & Aboul Ella Hassanein, 2020) are:

Privacy And Security Challenges – The P2P design and time stamping-based transactions of blockchain make IoT networks more secure against a lot of attacks but blockchain-based IoT systems and networks still suffer from four major attacks: Denial of Services (DoS) attacks, Sybil Attacks, Eclipse Attacks, and Routing Attacks.

Privacy Preserving - This occurs because all IoT devices and participants are authenticated by their public key or a hash value with the blockchain. The anonymity is not ensured and, since all transactions are shared publicly, there is a likelihood for the attacker to analyze such transactions and infer the real identities of the IoT nodes.

Blockchain Size and Energy Consumption – Blockchain continuous transactions make it to grow rapidly with increase block size leading to larger download times and the need for a larger memory space for mining purposes. A lot of IoT devices storing large volumes of data that are not interesting to them leads to a waste of computational power and resources but this can be addressed by using lightweight blockchain or mini blockchain.

Storage Capacity and Scalability - In the context of IoT-based agricultural applications the scalability limitations are much difficult to address. Blockchain may appear to be not appropriate for IoT models. With IoT communication, IoT nodes can send gigabytes (GBs) of data in real-time. This attribute represents a solid barrier against the blockchain and IoT integration model.

Blockchain Forking - Forking occurs when two peers (i.e. miners) add two right blocks to the chain at the same time. All known blockchain protocols solve the forking problem with a simple rule: The longest chain of blocks is the right one.

Latency and Throughput - Due to developing many topologies of IoT networks, developing blockchain-based IoT networks requires rapid processing for a variety of transaction patterns per time unit. This represents a great challenge in IoT networks regarding throughput.

Multi-chain Management – There may be need for professionals and blockchain engineers to configure more than one blockchain platform for different purposes in an IoT network leading to more security, privacy, scalability, operability, and monitoring problems.

2.7. IOT and Blockchain Integration Opportunities
According to (David, 2019) some of the benefits farmers can derive from mobile blockchain applications include the following:

- Cryptocurrency Applications enable farmers to execute payment transactions with crop traders and receive real time remittances.

- Electronic Wallet APPs that enable farmer to store and manage their digital assets and money.

- Digital crop tracker apps to provide farmers updated information about the trade rates, cryptocurrency-based transactions, crop market dynamics and a portfolio of various agricultural variables.

- Retail APPs allowing its Farmer to execute payment transactions through digital currencies

- Smart Contracts or self-executable protocols APPs allow the farmer to detect any fraud or illegal operations regarding their digital crops or digital assets

In the area of food safety, according to (Tian, 2006) integrating blockchain with IoT provides the following benefits:

- Food tracking and monitoring management.

- Reducing the agri-food loses and logistic costs

- Detecting food fraud and verifying product information.

- Protecting agri-food safety information based on integrating RFID technology with blockchain and IoT

- Maintaining safety and quality of food products.

3.0. IOT and Blockchain Integration in Agriculture Review

In order to leverage on IoT and Blockchain integration for improved agriculture productivity which is the main focus of this review, five out of the over twenty articles sourced from different websites were selected for review based on the suitability of the topics, quality of the presented work, research contributions, recommendations and excellent writing. The summary of each paper is as follows:

Showkat, Ahmad Bhat et al., (2022). "Agriculture-Food Supply Chain Management Based on Blockchain and IOT: A Narrative on Enterprise Blockchain Interoperability" The study presents Agriculture Supply Chain Management using Blockchain and Internet of things architecture to address the storage and scalability optimization, interoperability, security and privacy issues and also classifying security threats with IoT infrastructure and provide possible available blockchain-based defense mechanisms. For this architecture to be effective it has to be built to use minimum computing power, memory, energy, and bandwidth, resource-efficient, appropriate, simple to implement, provide interoperability, and most importantly, trustworthy without the need for human participation. The limited sensors' capabilities and security elements which make ensuring Confidentiality, Integrity, and Availability difficult will need to be addressed.

Biswas, Milon et al., (2021). "BIOT: Blockchain based Smart Agriculture with Internet of Thing" The study proposed a model that combines AI, IoT, and Blockchain to develop a smart and futuristic agricultural system that provides farmers with a secure and open transaction approach to rich, new, and effective decision support that can specifically create the scope of greater agricultural process productivity and help farmers maximize their benefits. The model allows farmers to sell their crops to middlemen, agents, or firms in the quickest and most efficient manner possible, with no inconvenience or risk of fraud. This model will need to be subjected to rigorous test with large data set and different scenarios.

Mohamed Torky and Aboul Ella Hassanein (2020). "Integrating blockchain and the internet of things in precision agriculture: Analysis, opportunities, and challenges". The study proposed a novel blockchain models that can be used as solutions for major challenges in IoT-based precision agricultural systems. With these models, blockchain can be integrated with IoT for mitigating many challenges in internet of farms and crop overseeing, supply chain, food safety, land registration, and financial transaction between farmers with each other or between farmers and agricultural organizations as well as security and performance challenges in IoT based precision agricultural systems. The proposed models will need to be tested and validated before implementation in the agriculture value chain to earn the trust of the farmers.

Sabir, Awan et al., (2021). "IoT with Blockchain: A Futuristic Approach in Agriculture and Food Supply Chain". This study proposes a futuristic IoT with a blockchain smart model for agriculture and the food supply chain, which offers an innovative way for farmers to acquire information on crops and also address some of the existing issues on IoT-based agriculture systems such as centralized format, data security, manipulation, and single failure points. The study also proposes a novel energy-efficient clustering IoT-based agriculture protocol for lower energy consumption and network stability. Although this model according to the authors provide better result than its counterpart low-energy adoptive clustering hierarchy (LEACH) protocol in terms of network stability, energy consumption and network life, there is need to subject the model to larger dataset and rigorous test and validation.

Lin, Jun et al., (2018). "Blockchain and IoT based Food Traceability for Smart Agriculture." This study proposed a trusted, self-organized, open and ecological food traceability system based on blockchain and Internet of Things (IoT) technologies, which involves all parties of a smart agriculture ecosystem, even if they may not trust each other. The proposed system uses IoT devices to replace manual recording and verification as many as possible reducing human intervention to the system effectively. The author plan to use the smart contract technology in future to help the law-executor to find problems and process them timely. This need to be tested and validated with large data sets and scenarios.

4.0 DISCUSSION AND CONCLUSION

In this review IoT and Blockchain integration in Agriculture Ecosystem was explore from different authors. The paper was able to examine areas of agriculture ecosystem and food supply chain such as precision farming, crop production, weather monitoring, agricultural finances, agricultural product and food distribution, food quality and safety, agricultural product and food traceability where IoT and Blockchain integration is playing a major

role. The review shows that IoT and Blockchain integration in Agriculture ecosystem is still at infancy with some challenges which are being addressed. The opportunities currently offered by IoT and blockchain integration can significantly improve our agriculture if properly applied. IoT and Blockchain integration in Agriculture is still an emerging area and will require continuous attention of researchers in order to address some of the shortcomings of the existing models and fashion out a standard framework that will revolutionize Agriculture ecosystems building trust and transparency from production to final consumers.

In addition to current work in IoT and Blockchain integration, the following suggestion could add to existing body of knowledge in improving Agriculture production with IoT and Block chain integration.

- IoT devices are accessible by anyone from anywhere affecting sensitive data, confidentiality and privacy then specific standards or rules must be defined to avoid security and privacy violation.

- IoT and Blockchain integration model should use minimum computing power, memory, energy and bandwidth.

- IoT and Blockchain integration model should be resource-efficient, appropriate, simple to implement and provide interoperability.

- IoT and Block chain model should be transparent, trustworthy without any human intervention.

- Specific skills and expertise are critical factors in IoT and Blockchain integration. Lack of skill may slow down the adoption.

- Further research will be required in the IoT and Blockchain integration as they continue to be applied to different domains.

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ROUT OPTIMIZATION IN WIRELESS MICRO SENSOR NETWORKS BASED ON MULTIPATH ROUTING PROTOCOLS USING GENETIC ALGORITHM

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ABSTRACT

In this paper, we examine routing protocols with the shortest path in sensor networks. In doing this, we propose a genetic algorithm (GA)-based Ad Hoc On-Demand Multipath Distance Vector routing protocol (GA-AOMDV). We utilize a fitness function that optimizes routes based on the energy consumption in their nodes. We compare this algorithm with other existing ad hoc routing protocols including LEACH-GA, GA-AODV, AODV, DSR, EPAR, EBAR_BFS. Results prove that our protocol enhances the network performance in terms of packet delivery ratio, throughput, round trip time and energy consumption. GA-AOMDV protocol achieves average gain that is 7 to 22% over other protocols. Therefore, our protocol extends the network lifetime for data communications. we have proposed a genetic algorithm (GA) for energy-efficient based multipath routing in WSNs, for scheduling the data gathering of multipath nodes, which can significantly extend the lifetime of a relay node network. For WSN, where the global optimum can be determined, our GA based approach is always able to find the optimal solution. The performance evaluation of our proposed technique is carried out with respect to the heuristic search technique in WSN, called A-Star algorithm. Finally, the simulation clarifies the effectiveness of our proposed work over its comparatives in terms of networks lifetime, energy variance, average energy consumption, and packet delivery ratio.

Keywords: AODV, AOMDV, DSR, energy, genetic, optimization, performance, routing. sensors, network.

1. INTRODUCTION

The wireless sensor network (WSN) is a wireless network composed of a large number of fixed or mobile sensors in the form of self-organization and multi hop [1, 2]. This kind of network covers the information of sensing objects in the geographical area through collaborative sensing, collection, processing and transmission network and finally sends the information to the network owner. In the process of wireless sensor network processing, node energy consumption [3, 4] is an important problem to be considered. Since most of the nodes in wireless sensor networks work through batteries or collected energy, the energy of each node is usually limited. In addition, sensor networks usually work in a harsh environment, so the nodes in the network are prone to failure. Therefore, energy consumption and fault tolerance play an important role in the long-term operation of sensor networks [5]. People have made special research on these two aspects [6, 7].

In the process of message routing in wireless sensor networks, in order to improve fault tolerance, the multipath routing mechanism is usually used to replace the original single path routing mechanism [8, 9]. In multipath routing, packets can be routed through two or more paths, which can reduce the packet loss rate [10, 11]. In addition, multipath routing can reduce packet tampering or malicious attacks in the routing process and improve the security of data transmission [12, 13].

Aiming at the research of wireless sensor network routing, a multipath routing method based on next hop is proposed in [4]. The algorithm transmits messages according to the hierarchical structure of the loop in which the nodes are located and does not consider the energy consumption and multipath problem of the nodes. In [6], a fault-tolerant routing protocol is proposed, which includes error recovery and error detection. The cost function used in this method only depends on the distance between nodes, which may cause some nodes to run out of energy due to extra workload. Therefore, when the next hop route is selected, the energy utilization of sensor nodes will be unbalanced. In order to solve the problem of unbalanced energy consumption in wireless sensor networks, a multipath routing protocol based on three-dimensional space and regional coevolution was proposed in [7]. The protocol divides the one hop neighborhood space of a node into several subspaces through the region partition model and then selects the local optimal node of each subspace according to the region coevolution algorithm to determine the optimal next hop node. In addition, in [14], a multipath cost function model was proposed by comprehensively considering the statistical parameters of energy standardization between nodes, energy consumption on the path, total energy of nodes, and routing hops. Greedy algorithm minimizes the number of nodes in the path by selecting the next hop. However, the abovementioned two methods are not considered from the global optimal, and there is a local optimal problem. In [9], a multipath routing algorithm based on directional diffusion routing algorithm is proposed. The algorithm establishes multiple paths between the source node and the destination node and gives each path a certain selection

probability according to the three characteristic values of energy consumption, time delay, and bandwidth of the network link, so that the data are always transmitted in multiple paths and has better link performance. However, this method directly depends on the artificial definition of path probability, which is prone to errors [15].

In the field of multifactor wireless monitoring network, in order to transmit monitoring information efficiently, in [16], the design of multi- routing was optimized in the network, and it was proposed to use gradient-oriented heuristic information to guide the establishment of the routing path, so as to improve the energy efficiency of path establishment. This method is not suitable for general methods because it aims at problems in specific fields. For the demand of data aggregation query in wireless sensor networks, a clustering multipath routing algorithm in wireless sensor networks is proposed in [17]. This method takes into account the residual energy of the node, the deviation angle, the distance between the three in the process of wireless sensor network data transmission, the influence of time delay, the energy consumption in the multipath structure, and other factors. Based on all the neighbors of the sensor node, a comprehensive evaluation is made, but the method of how to obtain the multipath structure is not introduced.

To sum up, there is still a lack of a method to study the global optimal multipath routing from two aspects of fault tolerance [18] and energy consumption [19]. In order to solve this problem, this paper proposes a multipath routing method based on genetic algorithm to improve the fault tolerance of wireless sensor networks. In order to reduce the energy consumption of nodes in the routing process, this method considers the distance parameters between various types of nodes in the network and establishes an effective fitness function. These parameters include the distance between the sending node and the receiving node, the distance from the next hop to the base station, and the number of hops. Finally, the effectiveness of the routing method is verified by simulation analysis. The results show that the proposed routing method has a good effect.

This paper first introduces the problems to be studied and the research status quo, introduces the related concepts of the methods used in the second quarter and the multipath routing method based on genetic algorithm used in the third quarter, and the effectiveness of the method proposed in this paper is verified by experiments in the fourth quarter. Finally, the full text is summarized.

2. THE BASIC THEORY

2.1. Multipath Routing Method
Figure 1 shows a wireless sensor network with 1 base station and 9 relay nodes. There are two different paths for source node 1 in the network: 1 -> 4 -> 5 -> BS and 1 -> 2 -> 6 -> 9 -> BS. Apart from the source node and the destination node, these paths do not have a single middle node. These two paths are called two independent paths of the node.
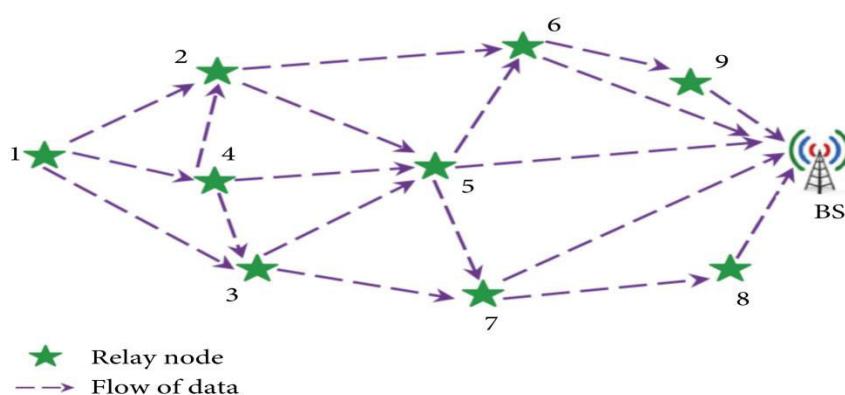
Figure 1: Wireless Sensor Network

2.2 Genetic Algorithm
Genetic Algorithm is a computational model that simulates natural selection and biological evolution in the process of biological evolution, and it is a way to search for optimal solutions. Genetic algorithms start by characterizing a population of possible solutions to a problem that consists of individuals encoded by genes. So, each individual can actually be thought of as a characteristic entity with a chromosome. The genetic algorithm follows the principle of survival of the fittest and survival of the fittest. After the initial population is generated, the genetic operator is used for combination crossover and mutation operation to generate the population with new solution set. This process will result in the solution set population such as the natural evolution of the epigenetic population more suitable for the solution of the problem than the previous generation (expressed by fitness function) and, thus, can be used as the approximate optimal solution of the problem.

The multipath routing problem in wireless sensor networks can be regarded as a genetic process. In addition, the energy consumption and fault tolerance of each network node should be considered when searching for a path to choose an optimal path, which can be realized by crossover and mutation operators in genetic algorithms.

The concept used in the wireless sensor network is defined as follows:

(1)$R = \{r1, r2, r3, ..., r_m\}$ expresses relay nodes in the wireless sensor network (WSN), which expresses the r_m base station node.

(2)Dist (r_i, r_j) defines the spatial distance between node r_i and r_j node .

(3)Range defines the relay node communication range

(4) Com CH (r_i) indicates a node where the relay node has a message exchange with the node (r_i). Com CH (r_i) can be expressed as follows:

Com CH $(r_i)=\{ r_j$ Dist$(r_i,r_j) \leq$ Range$\}$, $\qquad\qquad\qquad$ (1)

Where r_i and r_j belong to R. defines the communication range on the relay node.

(5)K represents the number of different paths in the network.

(6) Hop (r_i) represents the next hop from node r_i to the base station node. If r_i can communicate directly with the base station, then Hop$(r_i)=1$. Hop (r_i) is defined as follows:

Hop $(r_j) = \{1,$ Dist $(r_i,$ BS$)\leq$ Rang,$\}$

Where r_j , r_j and r_k belong to R.

(7)Falt (r_i, r_j) represents the sum of packets of all errors that occurred during the transmission from the node r_j to the node r_j .

(8)Engy (r_i, r_j) represents the sum of energy consumption on all nodes during the transmission from the node r_j to the node r_j .

2.4. Definition of the Cost Function

Since the routing algorithm proposed in this paper needs to generate a multipath with less energy consumption between all relay nodes and target nodes, the cost function on each path is firstly defined according to the distance between sending nodes and receiving nodes, the distance between the next hop to the base station, and the parameters of hops as follows:

Cost $(r_i, r_j)=\dfrac{\text{Flat}(ri, rj)+\text{Engy}(ri, rj)}{\text{Dist}(ri,rj)\times\text{Dist}(rj,BS)\times\text{Hop}(rj)}$ $\qquad\qquad$ (3)

Where Cost(r_i, r_j) represents the cost required for data transmission from node to node r,. The selection of the next hop node for any node r_j depends on the cost function, and the next hop node with the lowest cost is selected for routing.

In particular, if a node can communicate directly with the base station node, then the cost function can be directly expressed in the following form:

Cost $(r_i,$ BS$)=\dfrac{1}{\text{Dist}(ri,BS)}$ $\qquad\qquad\qquad$ (4)

3. MULTIPATH ROUTING METHOD BASED ON GENETIC ALGORITHM

The following is to introduce the multipath routing method based on genetic algorithm proposed in this paper.

First, chromosomes are used to represent relay nodes in the network, and the length of chromosomes represents the number of paths in the network. For a network with m relay nodes, the length of chromosomes in K multipaths is m × K. For example, for the example in Figure 1, there are nine relay nodes in the network, so if we want to generate two paths from different source nodes to base station nodes, then the length of chromosome is 18.On a chromosome, the location of each gene represents the location of a node in the network, such as gene 3 represents node 3 in the network. The value of the gene at each location represents the next hop node on the node corresponding to that location. In this way, each chromosome represents a sequence of successive nodes in the network, namely, a path corresponding to a solution in the wireless sensor network. A set of chromosomes is called the initial population. In the present method, a set of effective chromosomes is randomly generated as the initial population of the genetic algorithm. A chromosome is called a valid

chromosome if and only if all the paths in the chromosome have no rings and the gene value on the chromosome represents a valid next hop on the corresponding relay node.

The quality of the chromosome is judged by the fitness degree, and the fitness function representing the fitness is defined as follows:

$$\text{Max } (Z) = \sum \text{Cost}(i,j) \tag{5}$$

Where i,j denote the i-th and j-th relay node and Cost(i,j) denotes the cost of data transmission from node i to node j .

The fitness of the chromosomes is calculated by equation (4), and chromosomes with higher fitness are cross operated as the next-generation population. In the crossover operation, two parent chromosomes are selected and their genetic information is exchanged to generate two new child chromosomes. If the swapped child chromosome has a better fitness than the original parent chromosome, then the child chromosome is selected to replace the parent chromosome according to the crossover probability CP . Otherwise, the resulting chromosome is discarded at the probability 1-CP. The crossover probability is defined according to the fitness of the subchromosomes after exchange, and the higher the fitness, the greater the corresponding probability.

In this paper, binary crossover is adopted for evolution. This method first produces two random values (I,j), where i represents the position of i in the chromosome and j represents the position of m+j in the chromosome. $1 \leq i \leq m, m+1 \leq j \leq 2m$, where represents the number of relay nodes. Then, during the cross operation, the relay node probability CP corresponding to the position of i and the position of m+j is cross operated.

Finally, through the crossover and mutation operation in the process of genetic algorithm, the route selection in the process of routing is carried out according to the final chromosome obtained. Then, the multipath routing method considering energy consumption and fault tolerance is realized in wireless sensor network. In genetic algorithm, the crossover operation realizes the evolution from nodes in the path to highly adaptable nodes. The mutation operation realizes the evolution of nodes in the path to low-cost nodes and finally realizes the search for the optimal solution.

4. EXPERIMENTAL

4.1. Experiment Introduction
During the experiment, the hardware platform used was the Intel dual-core processor with 3 ghz CPU and 6 GB RAM, and the software platform was MATLAB simulation software based on Windows 8 and implemented based on C language.

An area of 150×150 square meter is firstly constructed as an application scenario of the wireless sensor network. The base station is located at the coordinate (75, 75). Other data used in the experiment come from the literature [20, 21]; that is, 10, 20, 30, 40, and 50 relay nodes are randomly generated in the network to form the network system. Each node has a random energy in the range of (0, 0.1). During the operation of the network, each node reduces energy at a fixed rate.

For the execution of genetic algorithm, the initial group of 100 chromosomes was studied, according to the number of nodes, each chromosome 10, 20, 30, 40, and 50 genes, and genes in each position value according to the length of the chromosome, respectively, from (0, 10), (0, 20), (0, 30, 40 (0), and (0, 50) within the scope of random generation. For cross operation, the roulette wheel selection model was adopted to select the top 8% of chromosomes with the best fitness for cross evolution. After completing the crossover operation, the uniform mutation operation (mutation probability set at 5%) is adopted to strengthen these chromosomes and conducted the multipath route lookup during the experiment.

4.2. Experimental Results and Analysis
The network system formed by 40 relay nodes is firstly selected to analyze the multipath routing scheme based on the genetic method in this paper. The experimental results are shown in Figure 2. In the figure, the X-axis and Y-axis, respectively, represent spatial positions, and the position of relay nodes in the grid is randomly generated. Through the algorithm proposed in this paper, two multipath routing solutions with the lowest energy consumption can be found out. In this routing scheme, the total energy consumption on the network node is 1.2 and 1.5, respectively, when the message can be delivered from the source node to the base station node. In addition, the data under the two path routing schemes can all be sent to the base station without causing data loss.
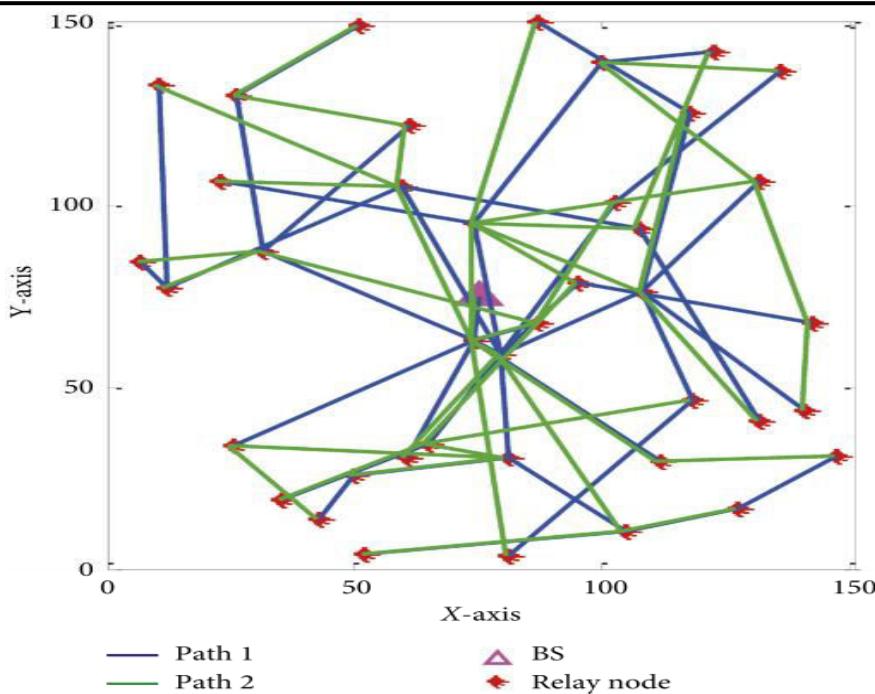
Figure 2: Multipath routing scheme based on the genetic method

In addition, various network systems with 10, 20, 30, 40, and 50 relay nodes randomly distributed in the network space are also analyzed and simulation experiments are carried out for the number of active nodes and node energy consumption in the network system with different number of relay nodes.

As can be seen from Figure 3, with the increase of round in various network systems, the number of active nodes in the network will decrease. In a network with more nodes, the rate of decline of active nodes is faster. This is because for each simulation step of a network run, the energy on each relay node decreases at the same rate as defined in advance. However, the more nodes there are, the more likely there will be nodes running out of energy in the network, resulting in a more rapid decline rate of active nodes in the whole network.
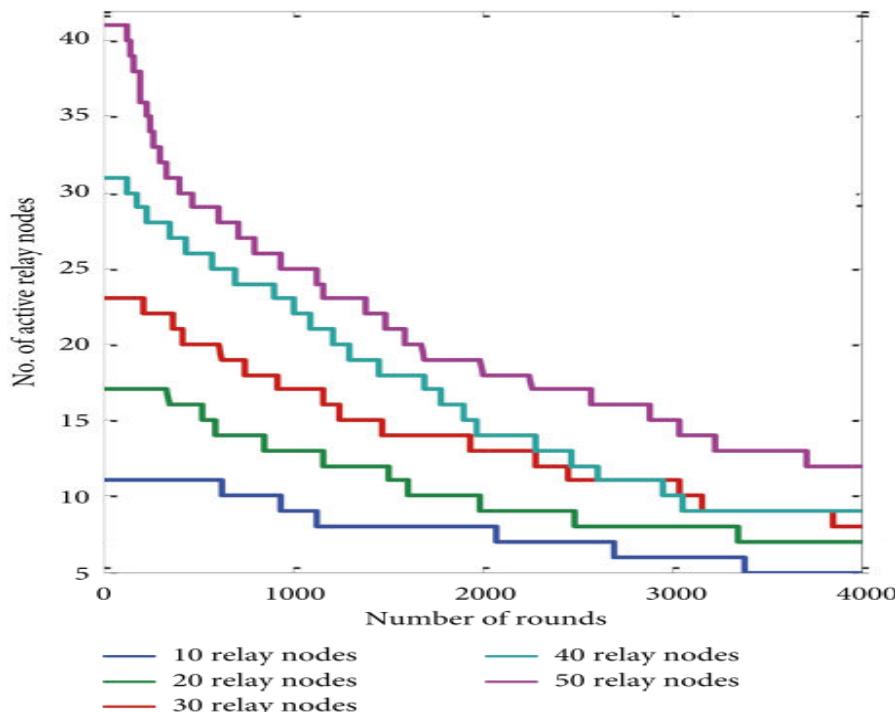
Figure 3: Number of Rounds Vs Number of Active nodes

The experimental results of energy consumption of nodes in the network are shown in Figure 4. As can be seen from the experimental results, with the increase of the number of simulation steps, the consumption of nodes in the network will increase. Moreover, in the whole experiment process, the network with more nodes consumes more total energy, which is consistent with the experimental results in Figure 3.
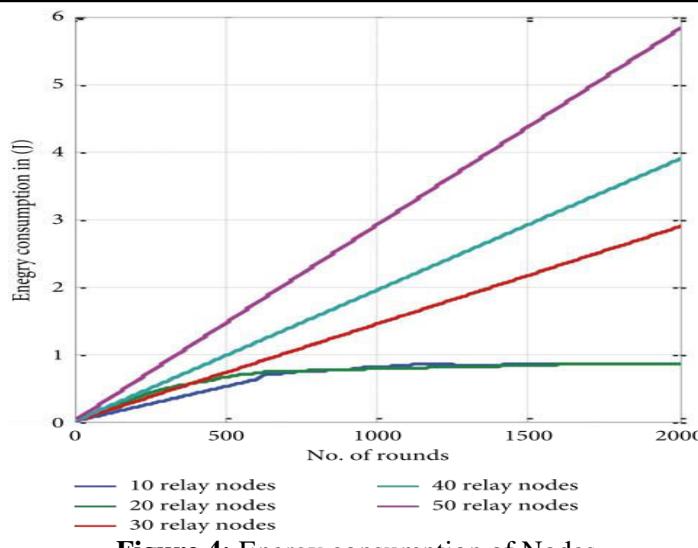
Figure 4: Energy consumption of Nodes

In addition, for network systems with 10 and 20 relay nodes in the network, the two types of systems tend to balance the capabilities consumed in the network after 500 simulation steps. This is because at this time, all nodes in the network have exhausted their energy, and thus, there is no more energy to be consumed in the whole network.

5. CONCLUSIONS AND FUTURE WORK

In this paper, Gada-Leach, Genetic Algorithm based Distance-Aware routing protocol is proposed in which cluster head selection is optimized by using genetic algorithm. The proposed approach is efficient as it include more number of parameters in fitness function for selecting better cluster heads and also introduction of intermediate node i.e. relay node reduces the distance between the cluster head and sink and eases the further communication between them. We have tested the GA routing algorithm in comparison with other techniques in different sensor network topologies. This performance degradation is reduced relatively compared to other algorithms through using the GA method that enhances as well the lifespan of the WSN in the presence of high ratio of faulty nodes. Those techniques paired with GA such as GA-AODV and GAGD improve as well the quality of the network.

Because there is a certain gap between theory and practice, the future work will be to verify whether the algorithm can also achieve the desired effect in practical application through experiments.

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INVESTIGATION OF MECHANICAL PROPERTIES OF ALOE VERA-RAMIE FIBERS REINFORCED WITH EPOXY HYBRID COMPOSITES

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ABSTRACT

In the scenario of exhaustible sources of fibers, there is a need for us to be future ready by studying natural fiber composites and replacing the fossil fuel fibers with natural fibers. Hybrid natural fiber composites have enlarged attention due to its light weight, low cost and low density with high strength to weight ratio and biodegradability. The substantial prominence among the structural materials has been concerned by the natural fibers. The fibers were treated with 5% NaoH and 5% Nacl solutions to take away the lignin content and to progress the adhesion property. In this study, the composite is fabricated by a hand layup process with different fiber orientations and also with different volume fractions. The composites are prepared with different proportions of aloe vera-ramie fibers, the test plates were prepared according to the ASTM standards. Various mechanical tests are conducted.

Keywords: Ramie fiber, Aloe vera fiber, Hybrid Composite, Hand Lay-Up, Mechanical Properties.

1. INTRODUCTION

Natural fiber composites are used to replace composites made of synthetic fibers of high cost due to their high strength, ease of availability and low cost. The properties of natural fiber composites depend on few factors. They are

- Type of fibers
- Fiber orientation
- Alkali treatment
- Matrix material
- Manufacturing process
- Curing time

In this work we concentrated on Ramie and Aloe-Vera fibers to reinforce Epoxy matrix. Below are few advantages of Natural fibers.

- Available abundantly in nature.
- Easy preparation.
- Eco friendly.
- Non exhaustible source.
- High strength to weight ratio.
- Low cost.

A composite material is composed of two or more micro or macro constituents that differ in chemical composition form and which are insoluble in each other. The most advanced and adaptable engineering material are composites. There is a present need for environmentally friendly, low cost materials without compromising the properties. The efforts are taken to develop new materials like composites, using natural fibers. Some of natural fibers like banana, cotton, coir, sisal, hemp, ramie, jute and bagasse have attracted the attention of scientists and technologist for application in consumer goods, low cost housing and other civil structures. Also those natural fiber composites possess better electrical resistance, good thermal and acoustic insulating properties are higher resistance to the fracture. These composites material are also used in an aerospace industry, automobile industry and other engineering applications.

2. LITERATURE REVIEW

P. Satish, R Keshvan [1] here the researchers investigated that the extensive use of natural hybrid composite in all almost all fields of engineering because of its advantage of having high strength, to weight ratio and

biodegradability. Also the investigation of thermal and mechanical properties of banana-kenaf, glass fiber reinforced with epoxy. Hand layup process with different fiber orientation along with different volume fractions is inculcated in the study. The results of the above combinations are evaluated and samples are prepared which are tested for different mechanical properties.Girish K G, Anil K C [2] investigates about the mechanical properties of jute and hemp reinforced epoxy and polyester hybrid composites were evaluated. The fibers are placed with matrix resin in different orientations 30^0, 45^0 and 90^0 by simple hand layup technique. In that he observed the better mechanical properties of his study was shown in 90^0orientation in both epoxy and polyester based composites. Diagonal inclination of the reinforcing fibers gives poor mechanical properties as observed in 30^0 and 45^0 orientations composites when compared to the 90^0 orientation.

R Bhoopathi et al. [3] investigates that the role of natural and man-made fibers reinforced hybrid composite materials are growing in a faster rate in the field of engineering and technology due to its favorable properties. Here the study of banana hemp glass fiber is done by using scanning electron microscopy to obtain the different mechanical properties and morphological characteristics.

Ashwani Kumar, Deepak Choudhary [4] investigates that the banana with epoxy laminate. He suggested that when banana fiber is bind with glass fiber will gives better results of the mechanical properties compare to his literature work. Also he explained that if the proportion of the fiber increases strength of the materials also increases.

Tara Sen, H N Jagannath Reddy [5] investigates that the natural fibers and he used only natural fibers for making a laminate. Hence is explained that better strength of the material besides the impact compare to the tensile and bending properties of other lignocellulose fibers.

Use of natural fiber composites are growing rapidly due to their potential to replace plastics at lower cost, high ease of availability and improved sustainability.

Padmanabhan et al. [6] investigated the dependence of mechanical properties on volume fraction and determined that high volume ratio fiber reinforcement had highest tensile strength whereas low volume ratio had highest impact value.

The Charpy test of woven arrangement of coir and aloe fibers showed that bidirectional mat arrangement has maximum performance and it was inferred from moisture absorption test that coir absorbs more moisture than aloe vera due to presence of micro voids [7].

The flexural and tensile properties of woven aloe and sisal reinforced epoxy composites were determined and it was found that hybridisation of fibers improved impact strength and alkali treatment of fibers enhanced its mechanical properties [8].

Table 1: Physical properties of materials used

	Aloe vera Fiber	Ramie Fiber
Density (g/cm^3)	1.48	1.5-1.56
Young's modulus (GPa)	30-70	60-128
Tensile Strength (MPa)	368-800	400-1000
Elongation at break (%)	1.6	1.2-3.8

3. EXTRACTION OF FIBERS

3.1.Aloe-Vera Fiber
Aloe-Vera fibers are very strong natural fibers obtained from Aloe-Vera, an evergreen plant which is available everywhere from domestic households to tropical rainforests. To extract the fibers from Aloe-Vera, the leaves are peeled and washed to remove the gel. The fibers are then extracted and dried.

Fig. 1 Extracted Aloe vera Fiber	**Fig. 2** Extracted Ramie Fiber

3.2 Ramie Fiber

Ramie is one of the oldest fiber plant and it is the king of natural fibers in the field of textile industries. Ramie is cultivated majorly in the china, hence it is well known as china grass. The plant will grows upto 12 to 15 feet high and diameter of the stem will be 12 to 15 mm based on the environmental circumstances. It can be easily blend with other materials due to it silky and lustrous mannerisms. These fibers are looks like whitish color also it doesnot change color when exposed to sunlight. Also repels the action of chemicals far improved than other fibers. These fibers are extracted using suitable process, the extracted fibers are shown in figure 3.

3.3. Chemical Treatment

The obtained fibers were treated chemically with NaoH and Nacl solution for the removal of lignin and pectin content. Firstly the Aloe vera fiber was taken and washed with distilled water having pH 7 is mixed with the 5% of NaoH solution which prepared after dissolving the NaoH pellets in the water. The same steps are repeated for the ramie fiber which is done separately for the removal of the lignin and pectin contents. The first stage of chemical treatment process is completed with the NaoH solution process. Now, the Nacl solution is prepared as 5% then the fibers are separately immersed in the Nacl solution and the external impurities like lignin and pectin were removed and the wet fibers were kept to dry at room temperature for 3 days.

4. Fabrication Method

For fabrication a hand lay-up technique were used to prepare the test component specimens. Inthis process firstly, treated fibers were taken and then cut into the required orientation and lengths of the fibers were maintained and the below table shows the type of samples which were fabricated where it contents the fiber and the weight and volume fraction of fibers as shown in below table 2.

Table 2: Types of test specimen samples prepared

Samples	Sequence of fiber arrangement	Orientation		Fiber content	
		Aloe vera	Ramie	Aloe vera	Ramie
S1	ARAR	V	V	55	45
S2	ARAR	H	H	45	55
S3	ARAR	45^0	45^0	60	40

In the hand lay-up process firstly, a layer of resin is applied and then according to the orientation the fibers are kept and again the resin is applied depending upon the requirement and orientation of the fiber the number of fiber layers are kept and molded. This prepared specimen was kept in woven at 100^0 C for 2 hours. The process is repeated for remaining samples.

5. Preparation of Specimens

The test components are fabricated separately, firstly the pre mould is prepared for a dimension of $300 \times 300 \times 3$ mm die was prepared and this plate is cut according to the dimensions of ASTM-D standards as shown in table 3.

Table 3: Standard dimensions of test specimens

Sample No.	Study	Specimen type and ASTM standard	Length (mm)	Width (mm)	Thickness (mm)
1	Tensile Test	Dog-bone D- 3039	250	25	3
2	Flexural Test	D-790	125	12.5	3

6. Composite Tests

6.1 Tensile Strength

According to the above ASTM table the tensile test specimen was prepared. ASTM D 3039 specimen is prepared and cut using the saw cutter and the dimension of tensile test specimen standard is shown in schematic form in figure 3and the test speed of 2 mm/min.
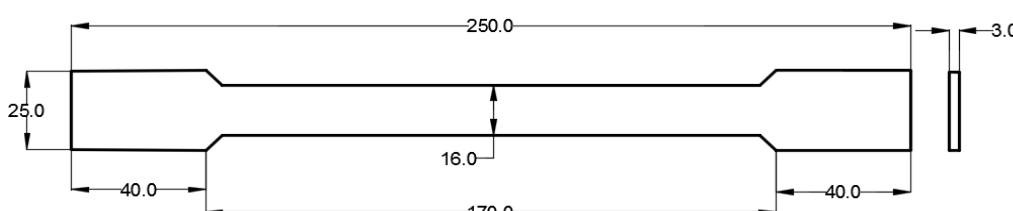
Fig. 3 Schematic diagram of tensile test specimen

6.2flexural Test
According to the ASTM D 790 the flexural test specimen was calculated the dimensions of the flexural test specimen. According to the ASTM standard the schematic diagram is shown in figure 4, and the feed rate of the CNC machine isb2 mm/min.
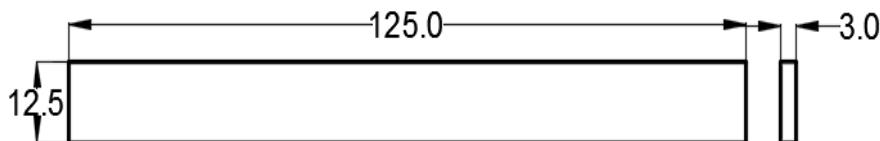
Fig. 4 Schematic diagram of flexural specimen

7.RESULTS AND DISCUSSION

7.1 Tensile Strength
The tensile test for Aloe and ramie epoxy hybrid composite was done and specimen is prepared for tensile test according to ASTM D 3039. The tensile strength, young's modulus and strain is determined with a load and the speed rate is 2mm/min. The results obtained from tensile test is shown in below table 4 and graph is plotted against stress v/s strain is shown in figure 5.
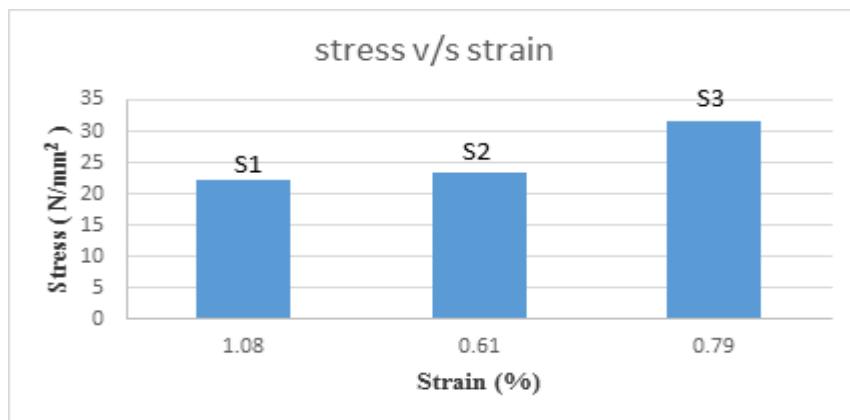
Fig. 5 Stress v/s Strain

7.2 Flexural Strength
According to the ASTM D 790 a hybrid composite laminate specimen was prepared to carry out the flexural test. From the test results the bending strength and maximum displacement was obtained and table 5 shows the result of 3 point bending test and the graph is plotted load v/s displacement is shown in figure 6.

Table 4 Results of Tensile Test   **Table 5** Results of Flexural Test

Samples	Peak Load (N)	Ultimate Tensile Strength (MPa)	Young's Modulus (MPa)	Samples	Maximum Displacement (mm)	Flexural Strength (MPa)
1	1667	22.23	1926.29	1	3.72	86.50
2	1750	23.33	3329.80	2	1.34	120.24
3	2372	31.63	3980.07	3	1.43	142.22
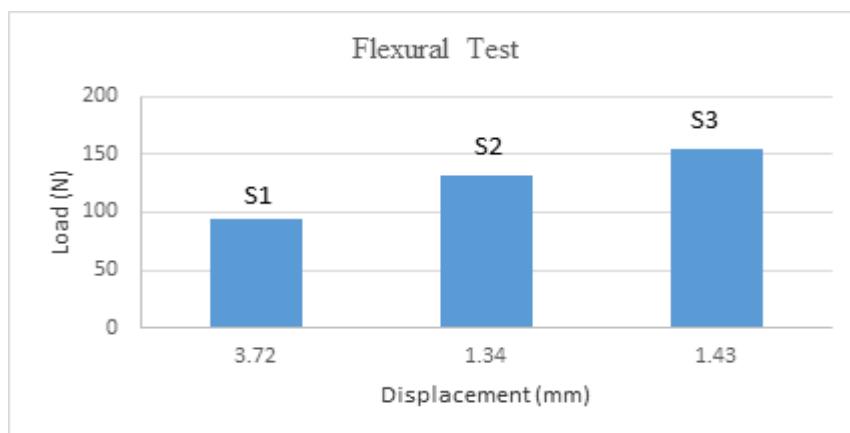
Fig. 6 Load v/s Displacement

8. CONCLUSION

The Tensile and Flexural of Ramie and Aloevera fiber composites are determined and the results are tabulated in tables 4 and 5. It is evident that the crisscross arrangement ie. 45° has higher flexural properties than the other two. Similarly the tensile strength and Youngs modulus are better than the horizontal and vertical layouts. So, this arrangement can be used in applications where flexural forces dominate. The applications include construction equipment, building panels, furniture etc. The Aloe vera - ramie epoxy hybrid composite was studied. In this study we concentrated on the base of orientations where we had done for 0^0, 90^0 and 45^0. The better results which was obtained was for the 45^0 orientation with a fiber content of 60%.

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TRAINING ON TRACHEOSTOMY CARE AT HOME- A FEASIBILITY STUDY TO EVALUATE THEEFFECT OF TRAINING ABOUT TRACHEOSTOMY CARE AMONG CAREGIVERS

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ABSTRACT

Introduction: *- Cancer is one of the major causes of mortality in India and the world. In India,Oral Cancer and Laryngeal cancer are the major public health concern, especially in the north Indian region, where it ranks among the top 3 types of cancer in the country. The contributing factor to this neoplastic disease is the consumption of tobacco material. Tracheostomy is one of the indispensable procedures which affords secure airway, pulmonary hygiene, and long- term stable mechanical ventilation for patients suffering from laryngeal cancer, in this patient there is more some complication such as loss of airway with resulting hypoxia, due to accidental decannulation, mucus plugging, bleeding, complication during tracheostomy suction or change need more attention and skill to handle the tracheostomy patients safely in hospital as well as in-home. Tracheostomy-related adverse events are preventable if the handling of tracheostomy is performed skillfully. Before discharge from the hospital caregivers of patients and patients with tracheostomy tube should be independent of their healthcare needs. Because of the extremely busy patient care delivery system, generally, a one-to-one imparting knowledge through demonstration regarding tracheostomy care and suctioning to the caregiver, such as how to handle these patients at home is very essential. The organization of a structured training program that is effective and easily understandable may play a key role toreduce the financial burden of caregivers.* ***Objective:*** *- assess the effectiveness of a structuredtraining program on tracheostomy care at home, assess existing knowledge and practices abouttracheostomy care at home, and find the association of knowledge and Practice scores with sociodemographic variables.* ***Methodology:*** *In this study, 30 caregivers of tracheostomy patients were recruited in the study. Where only 27 caregivers participated till the post-test of the study, 3 caregiver data were excluded due to the death of the patient. A validated self- Structured Knowledge Questionnaire was used for the collection of data Subjects were recruited by Non-probability purposive sampling techniques. A structured training was given followed by a pre-test.* ***Result*** *– The finding of the study reveals that the majority of subjects 59.3 % (16) had inadequate knowledge, 18.5 % (5) had a moderate level of knowledge and 22.2 % (6) had an adequate level of knowledge in pre-test about tracheostomy care in the home. After the structured training program, a majority of subjects 59.3 % (16) had a moderate level of knowledge and 22.2 % (6) had adequate knowledge, and 18.5 (5) had inadequate knowledge level. In the assessment of existing Practice level results indicate that the majority of subjects 51.9 % (14) had inadequate practical knowledge, 48.1 % (13) had a moderate level of practicalknowledge and none of them had an adequate level of practical knowledge about tracheostomy care in the home. After the structured training program, a majority of subjects 59.3 % (16) had a moderate level of practical knowledge and 33.3 % (9) had adequate knowledge, and 7.4 % had inadequate practical knowledge level. The pre-test mean knowledge score was 4.85 standard deviation was 2.12, and post-test mean knowledge score was 6.22 and the standard deviation was 1.62. In the paired t-test, the calculated t value was 2.65, which was higher thanthe critical (df 26) 2.05, which reflects that the teaching program, was effective among the caregivers. The pre-test mean practice score was 4.88 standard deviation was 1.76, the post- test mean practice score was 6.48 and the standard deviation was 1.53. In the paired t-test, thecalculated t value was 4.96, which was higher than the critical (df 26) 2.05, which reflects thatthe teaching program, was effective among the caregivers. In the Fisher Exact test calculated value of all socio-demographic variables was greater than the significant value (alpha value) of 0.05 which represents that there was no significant association between sociodemographic variables and knowledge as well as practice scores.* ***Discussion -*** *With regards to providing comfort to patients and caregivers about tracheostomy care in the home, study findings demonstrated a significant improvement in the knowledge and skill of caregivers which increases the quality of care at home. The finding of the study was consistent with previously published studies concerning tracheostomy care training programs.* ***Conclusion -****This study was a pilot initiative whose finding suggests the need for regular training for caregivers about tracheostomy care at home.*

Keywords: Tracheostomy care, Tracheostomy dressing, Tracheostomy suctioning,Tracheostomy tube cleaning.

INTRODUCTION

Cancer is one of the major causes of mortality in India and the world. Oral cancer is the 6th most common malignancy in the world. In India, Oral Cancer and Laryngeal cancer are the major public health concern, especially in the north region, where it ranks among the top 3 types of cancer in the country, it is common in people belonging to the low-income groups due to wide exposure to risk factors like consumption of tobacco products and insufficient access to healthcare facilities, causing a delay in reporting (1). A study report suggests, In India, approximately 77000 new cases and 52000 deaths are recorded annually, which are one-fourth of worldwide incidences (2). Oral cancer is significantly higher in India as compared to a western country and around 70% of the cases are reported in the advanced stages due to detection in the late phase. Based on the World Cancer Report'(2015), in India, by the year 2020, the prevalence of mouth cancer is 29.5%, tongue cancer 17.4%, and larynx cancer 15.5% are the sites expected to contribute maximum to the cancer burden (3). The contributing factor of this neoplastic disease is the consumption of tobacco material. Tracheostomy is one of the indispensable procedure which affords secure airway, pulmonary hygiene, and long-term stable mechanical ventilation for patients suffering from laryngeal cancer, in this patient there is more some complication such as loss of airway with resulting hypoxia, due to accidental decannulation, mucus plugging, bleeding, or complication during tracheostomy change need more attention and skill to handle the tracheostomy patient safely in hospital as well as in-home (4). Tracheostomy-related adverse events are preventable if the handling of tracheostomy is performed skillfully (4). Postoperatively tracheostomy patients encounter relatively high unfulfilled supportive care needs, and patient caregivers perceive numerous types of caregiving burdens. A person with low awareness about healthcare may find it difficult to comprehend and utilize information and instructions about tracheostomy dressing and suctioning, precautions, and regular follow-ups in written formats that contain unfamiliar abbreviations. Good management of care needs of a patient with a tracheostomy tube, both in the hospital setting and in the community setting, has a significant influence on the quality of life (5). Changes in health care and financial pressures have led to minimum hospitalization or stay in acute healthcare facilities (6), and as the number of tracheostomies being performed on an outpatient basis in minor and major operation theatre is increasing, more patients with tracheostomy tubes are being discharged from hospital (7). A patient, who is going to discharge from the hospital with a tracheostomy tube should be independent with their healthcare needs. The nurses working in the tracheostomy procedure area or recovery room need to consider the individual ability in light of the care of the patient with a tracheostomy tube and prevent complications of long-term tracheostomy. The process of patient home care after discharge from the hospital includes preventing infection, suctioning, humidification, nutrition, tube cleaning, tube changing, stoma care, and tracheostomy tie changing (8). Due to a very busy patient care delivery system, Generally imparting knowledge through demonstration about tracheostomy care and suctioning to the caregiver such as how to take care of these patients in the home is very essential. So, the need for a structured training program that is effective and easily understandable cannot be overemphasized. This study aims to assess the effectiveness of a training intervention on knowledge regarding home-based tracheostomy care of tracheostomy patients by caregivers after being discharged from the hospital, making them independent in the care of the patient in the home.

OBJECTIVE

- To assess the effectiveness of a structured training program on tracheostomy care at home.

- To assess existing knowledge and practices about tracheostomy care at home.

- To find the association of knowledge and Practice scores with sociodemographic variables.

MATERIAL AND METHOD

In this study, 30 caregivers of tracheostomy patients were recruited based on eligibility criteria, where out of 30 participants 27 subjects participated till the post-test of the study, 3 caregiver data were excluded due not participating in the post-test because of patient death.

A self Structured Knowledge Questionnaire was used for the collection of data Subjects were recruited by Non-probability purposive sampling techniques. A structured training was given followed by a pre-test, post-test was taken after 7-10 days of training, in the next follow-up of patients in the Outpatient department.

Result – The result of this investigation is categorized into 4 Sections-

1. Section – A - Socio-demographic profile in frequency and percentage

2. Section – B – Analysis of existing Knowledge and practices.

3. Section – C – Analysis of the effectiveness of structured teaching program

4. Section – C – Analysis of association of sociodemographic variable with knowledge and practice scores.

Section – A - Socio-demographic profile –

[N = 27]

S. No.	Socio-demographical Variables	Frequency	Percent
1.	**Age**		
1.1.	20-30 years	17	63.0
1.2.	31-40 years	3	11.1
1.3.	41-50 years	6	22.2
1.4.	51 - 60 years	1	3.7
2.	**Gender**		
2.1.	Male	23	85.2
2.2.	Female	4	14.8
3.	**Education level**		
3.1.	Graduate	14	51.9
3.2.	Post- Gradute	1	3.7
3.3.	Up to 10th	7	25.9
3.4.	Upto 12th	5	18.5
4.	**Marital Status**		
4.1.	Married	17	63.0
4.2.	Unmarried	10	37.0
5.	**Occupation**		
5.1.	Agriculture	7	25.9
5.2.	Govt Job	3	11.1
5.3.	Pvt Job	5	18.5
5.4.	Self Occupation	3	11.1
5.5.	Unemployed	9	33.3
6.	**Area of Living**		
6.1.	Rural	20	74.1
6.2.	Semi-Urban	2	7.4
6.3.	Urban	5	18.5
7.	**Family Types**		
7.1.	Joint	15	55.6
7.2.	Single	12	44.4
8.	**Family Monthly Income**		
8.1.	16000 – 30,000 Rs.	4	14.8
8.2.	Above 30,000 Rs.	1	3.7
8.3.	Below 15,000 Rs.	22	81.5
9.	**Distance from the tertiary care center**		
9.1.	1 - 10 km	2	7.4
9.2.	11- 50 km	7	25.9
9.3.	51 km - 100 km	5	18.5
9.4.	Above 100 km	13	48.1
10.	**Number of Children**		
10.1.	No child	12	44.4
10.2.	2 Child	7	25.9
10.3.	More than 02	6	22.2
10.4.	Single child	2	7.4

1. In this study, the majority of subjects, 63 % (17) belonged to the 20-40 year of age group, 22.2 % (6) were 41-50 year age people, 11.1 % (3) were 31-40 year of age group, and 3.7 % (1) subject belonged to 51-60 year of age group. 17

2. In terms of Gender, the majority of participants 85.2% (23) were female and 14.8 % (4) were male.

3. In terms of education majority of subjects, 51.9 % (14) were Graduate, 25.9% (7) up to10th pass, 18.5 % (5) up to 12th pass, and 3.7 % (1) was post-graduate.

4. In terms of the area of residence majority of subjects, 74.1 % (20) belonged to the rural area, 18.5 % (5) belonged to the urban area, and 7.4 % (2) belonged to the Semi-urbanarea.

5. On the subject of Occupation, the majority of participants 33.3 % (9) were Unemployed, 25.9 % (7) had Agriculture work, 11.1 (3) had govt job and an equal proportion t.e. 11.1 % (3) had Self Occupation, and 18.5 % (5) had a Pvt Job.

6. Regarding the number of Children majority of subjects, 44.4 % (12) had no Children, 25.9 % (7) had 2 children and 7.4 % (2) had 01 children, and 22.2 % (6) subjects had more than 2 children.

7. In terms of the marital status majority of subjects, 63 % (17) were married and 37% (10) were unmarried.

8. Regarding family income majority of 81.5 % (22) subjects had salaries below 15,000 Rs, 14.8 % (4) had between 16000- 30000 and only 3.7% (01) subjects had family income above 30, 000 Rs.

9. In terms of family structure majority of subjects, 55.6 % (15) had joint families and 44.4 % (12) had single-family structures.

10. In the matter distance from the Hospital majority of subjects, 48.1 % (13) lived ahead above 100 km, 25.9 % (7) lived 11- 50 km, 18.5 % (5) lived 51- 100 km, and 7.4 % (2)living 1-10 km ahead of the hospital.

Section – B - Analysis of Knowledge score -

In the assessment of existing knowledge (as shown in table 2) results indicate that majority ofsubjects 59.3 % (16) had inadequate knowledge, 18.5 % (5) had a moderate level of knowledgeand 22.2 % (6) had an adequate level of knowledge about tracheostomy care in the home.

After the structured training program, a majority of subjects 59.3 % (16) had a moderate levelof knowledge and 22.2 % (6) had adequate knowledge, and 18.5 (5) had inadequate knowledgelevel.

Table 2: Analysis of Level of Knowledge

Level of Knowledge	Pre-test		Post-test	
	Frequency	Percent	Frequency	Percent
Adequate	6	22.2	6	22.2
Moderate	5	18.5	16	59.3
Inadequate	16	59.3	5	18.5
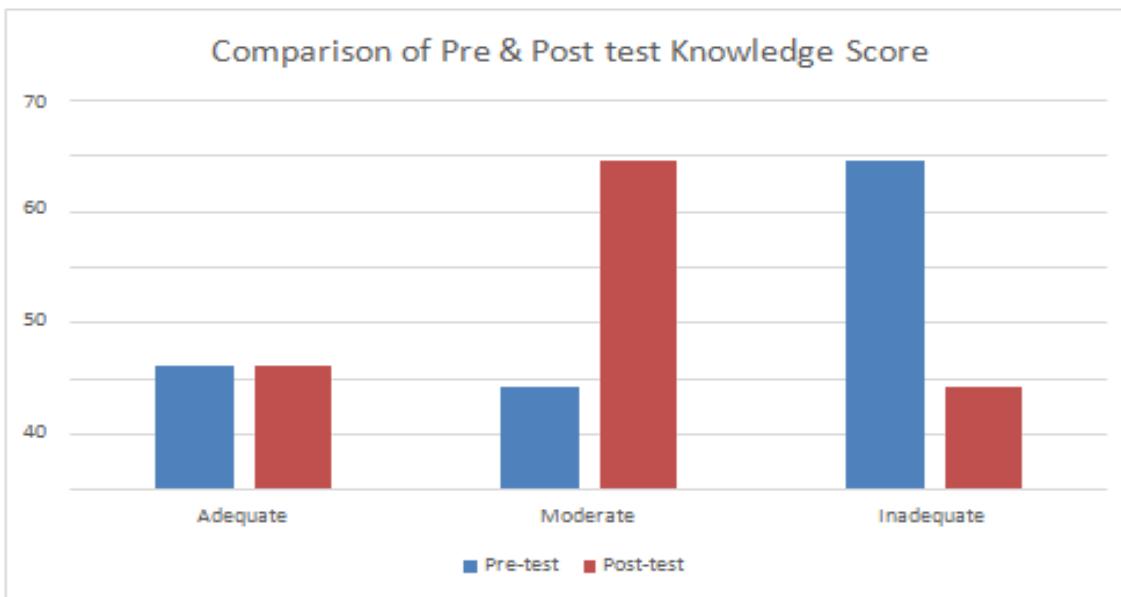
Figure 01: Comparison of Pre & Post Test Knowledge Score

In the assessment of existing Practice level (as shown in table 2) results indicate that majorityof subjects 51.9 % (14) had inadequate practical knowledge, 48.1 % (13) had a moderate levelof practical knowledge and none of them had an adequate level of practical knowledge about tracheostomy care in the home.

After the structured training program, a majority of subjects 59.3 % (16) had a moderate level of practical knowledge and 33.3 % (9) had adequate knowledge, and 7.4 % (2) had inadequatepractical knowledge level.

Table 3: Level of Knowledge in practice

Level of Knowledge	Pre-test		Post-test	
	Frequency	Percent	Frequency	Percent
Adequate	0	0	9	33.3
Moderate	13	48.1	16	59.3
Inadequate	14	51.9	2	7.4
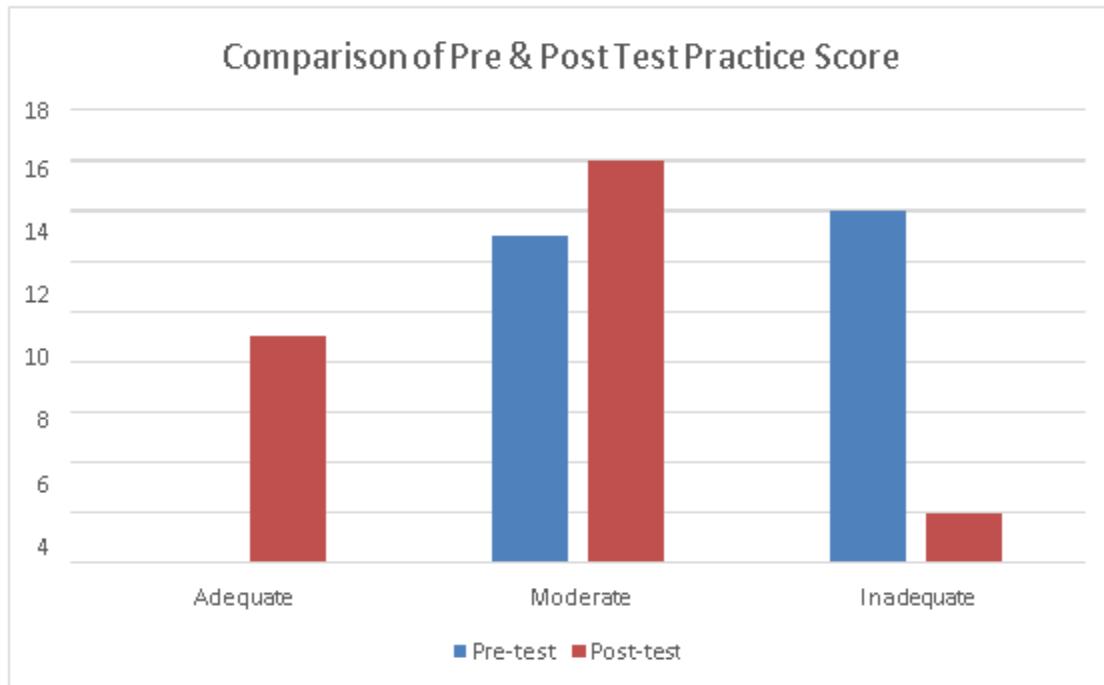
Figure 02: Comparison of Pre & Post Test Practice Score

Section -C – Analysis of Effectiveness of Training Program

The pre-test mean knowledge score was 4.85 standard deviation was 2.12, and post-test meanknowledge score was 6.22 and the standard deviation was 1.62.

In the paired t-test, the calculated t value was 2.65, which was higher than the critical (df 26) 2.05, which reflects that the teaching program, was effective among the caregivers.

Table 4: Effect of the teaching program in terms of Knowledge

(N=27)

Test	Mean	StdDev	Std Err	T	df	t-crit	95 % ConfidenceInterval	
							lower	upper
Pre-Test	4.85	2.12						
Post- Test	6.22	1.62		2.65	26	2.05	2.43	0.3
Difference	1.37	2.69	0.52					

Table 5: Effect of the teaching program in terms of Practice

(N=27)

Tset	Mean	Std Dev	Std Err	t	df	t-crit	95 % Confidence interval	
							lower	upper
Pre-Test	4.48	1.76						
Post-Test	6.48	1.53		4.96	26	2.05	2.83	s1.17
Difference	2	2.09	0.4					

The pre-test mean practice score was 4.88 standard deviation was 1.76, the post-test meanpractice score was 6.48 and the standard deviation was 1.53.

In the paired t-test, the calculated t value was 4.96, which was higher than the critical (df 26) 2.05, which reflects that the teaching program, was effective among the caregivers.

Section – D- Association between Knowledge Score and Sociodemographic Variable

In the Fisher Exact test (as Depicted in Table 6) calculated value of all socio-demographic variables was greater than the significant value (alpha value) of 0.05 which represents that there was no significant association between sociodemographic variables and knowledge score.

Table 6: Association of knowledge score with sociodemographic variables

(N=27)

S. No	Socio- demographic data	Pre-test		Post-test	
		Calculated Fisher's exact value	Significanceat 0.05	Calculated Fisher's exact value	Significanceat 0.05
1.	Age	0.48	> 0.05	0.8	> 0.05
2.	Gender	1.0	> 0.05	0.6	> 0.05
3.	Education	0.36	> 0.05	0.72	> 0.05
4.	Marital status	0.25	> 0.05	0.65	> 0.05
5.	Occupation	0.99	> 0.05	0.86	> 0.05
6.	Area of Living	1	> 0.05	0.09	> 0.05
7.	Type of Family	0.49	> 0.05	0.49	> 0.05
8.	Family MonthlyIncome	1	> 0.05	0.16	> 0.05
9.	Distance fromHospital	0.92	> 0.05	0.98	> 0.05
10.	No of Children	0.55	> 0.05	0.99	> 0.05

Association Between Practice Score and Sociodemographic Variable

In the Fisher Exact test (as Depicted in Table 7) calculated value of all socio-demographic variables was greater than the significant value (alpha value) 0.05 which represents that there was no significant association between sociodemographic variable and practice score.

Table 7: Association of knowledge score with sociodemographic variables

(N=27)

S. No	Socio-demographicdata	Pre-test		Post-test	
		Calculated Fisher's exact value	Significanceat 0.05	Calculated Fisher's exact value	Significanceat 0.05
1.	Age	0.78	> 0.05	0.41	> 0.05
2.	Gender	0.27	> 0.05	0.33	> 0.05
3.	Education	0.57	> 0.05	0.19	> 0.05
4.	Marital status	0.59	> 0.05	1	> 0.05
	Occupation	0.38	> 0.05	0.67	> 0.05
5.	Area of Living	0.65	> 0.05	0.25	> 0.05
6.	Type of Family	0.16	> 0.05	0.71	> 0.05
7.	Family Monthly Income	0.79	> 0.05	0.1	> 0.05
8.	Distance from Hospital	0.78	> 0.05	0.94	> 0.05
9	No of Children	0.83	> 0.05	0.33	> 0.05

DISCUSSION

The result of our study reflects the effectiveness of the training program targeted to caregiversof tracheostomy patients. Significant improvement in the mean objective knowledge scores was seen in all caregivers of tracheostomy patients. A caregiver of tracheostomy patients was required to learn about tracheostomy care at home to reduce frequent hospitalization of the patient as well cost burden of care and they may not have much awareness related totracheostomy due to novel things. With regards to providing comfort to patients related to tracheostomy care, results depicted significant improvement in the level of care at home. The results of this study are consistent with previously published research articles subjected to tracheostomy care education.

CONCLUSION

While This study was a pilot initiative for caregivers to reduce the burden of care and frequent hospitalization, the finding suggests the requirement of consistent tracheostomy education for caregivers of patients. We would like to propose that tracheostomy care is an unaware procedure for caregivers due to novel for them, tracheostomy training may be more beneficial if approached from a specialty-specific standpoint. Further study may be required in the large sample to determine whether subjects have applied their knowledge and skill to patient care at home, we observed evidence to pursue recurrent didactic or simulation sessions at our tertiary care center to establish sustained comfort and knowledge among non-surgical providers concerning tracheostomy care, which we believe will result in improved safety for patients living with a tracheostomy.

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COMPARISION OF CHALLENGES AND COPING STRATEGIESAMONG CRPF PERSONNEL AND THEIR WIVES WITH PRESCHOOL CHILDREN

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ABSTRACT

Challenge is a part of everyone's life and nobody can deny from it. Every family has its own shed, its own problems and its own challenges. Families with preschool children face some unique challenges. The big problem starts when one of the spouses is involved in a challenging occupation. More light is thrown on the struggles of work and family life which are faced by spouses. The objective of the present study was to assess and compare the challenges and coping strategies among CRPF personnel and their wives with preschool children. The study was conducted in three districts of Rajasthan, Ajmer, Jaipur and Sirohi (Mount Abu). 30 CRPF personnel (sub-officers) and their wives each were selected from the family with the preschool children from the expanding stage of family life cycle. Proportional sampling techniques were used for data collection. The PPFS-E scale and the coping strategies scale were developed and standardized. The survey method was used for data collection. The mean score, standard deviation and independent t test were used for data analysis. The results of the study revealed that most of the CRPF personnel faced more psychological, socio-emotional and financial challenges than their wives. Whereas, in the case of physical challenges, most of the wives faced more physical challenges than their counterpart. Significant differences were observed in psychological and socio-emotionalchallenges. As far as coping strategies are concerned, most of the wives of CRPF personnel reported more positive coping than their counterparts, while most of the CRPF personnel used more negative coping than their wives. Significant differences were observed in the use of positive coping for socio-emotional challenges. Significant difference was also observed in the use of negative coping for financial challenges. No significant differences were observed for the overall use of positive and negative coping.

Keywords: Physical, psychological, financial and socio-emotional challenges, Positive and negative coping Strategies, preschool children and CRPF personnel and their wives.

INTRODUCTION

Families with preschool children has a unique challenge. Arrival of a new member may change the entire scenario of the family and the phenomenon of the compromise and adjustment are started. The major problem begins when the any of spouse engaged in anykind of challenging profession.

In contemporary years, there have been changes in young families with preschool children caused by social, inter and intra-familial stratifications, degradation of traditional stereotypes of family relations, new attitudes to childrearing and education, one or two children policy and an increasing number of dual earner parents. Parent/s-child relationship during the preschool stage impacts the formation of the children's approach to the surroundings and to

Themselves, and it also affects the satisfaction within the parents also. The family is afoundation for shaping the individual's perception and ways of interaction with the surroundings. It is also an important fact that contemporary society faces tendencies inmodern parenting, which are characterized by the erosion of familiar stereotypes and traditional child care patterns, a growing number of different practices of family upbringing,a fast- developing market of goods and services connected with childrearing and education. Nowadays parenting takes place against the background of many contradictions (both conscious and unconscious), particularly between the growing importance of the values of self-realization and the everlasting value of parenthood (Polivanova, 2015). It should benoted that parent-child relationships include personal, age, gender and ethnic modes and role differentiation (Kirilenko, 2015).

Hence, the knowing the importance of the parenting and its impacts, this paper talks more about the parents which belongs to the Arm forces. Arm services is one of the important services in the Indian society. Person and their families with arm services has unique challenges. It is also a matter of concerned that family with preschool stage is one of the unique and challenging stage of any person. These two variables enhancing the challenges of the individuals, and individual and their families suffer at large. Ministry of home affairs (MHA, 2017), reported that majority of personnel conducted suicide, fratricide due to familial issues. It is also highlighted from the study that majority of personnel left CAPF (majority in CRPF), due to family issues, health issues and mental issues.

So far studies have been conducted on the occupational challenges of the personnel, but none of the study has been conducted on physical, psychological, financial and socio-emotional challenges and their coping strategies. It has been also cited from literature review that majority of personnel from different department has been taken for research study but most of the time their family has been ignored.

Thus, through this paper, researcher tried to mitigate this research gap and also tried to assess the different types of challenges which were faced by CRPF personnel and their wives and what types of coping strategies they used to overcome the challenges.

METHODOLOGY

Locale of the study- Present study was undertaken in three districts of Rajasthan i.e. Ajmer, Jaipur and Mount Abu.

Sample- 30 CRPF personnel (Sub ordinate officer) and 30 their wives each were taken from the families with preschool children.

IMAGE ISSUE

Scales- Two scales were developed and standardized. For assessing the physical, psychological, financial and socio-emotional challenges PPFS-E challenges scale and for assessing coping strategies Coping Strategies scale (positive coping and negative coping) were used. In PPFSE scale, there were four aspects to measure challenges i.e. physical challenges, psychological challenges, financial challenges and socio-emotional challenges. Five alternatives and scores were assigned for each alternative such as always (5), very often (4), sometimes (3), rarely (2) and never (1). Higher the score means higher the challenges.

Coping strategies scale: Coping strategies scale was divided into two level i.e positive coping and negative coping. 27 statements each were there in positive coping and negative coping. Three alternatives and scores were assigned for each alternative such as always (3), sometimes (2) and never (1).

Statistical Analysis- Mean, Standard Deviation and individual t-test were used.

Procedure of Data Collection- Head of Department of each office was contacted personally. A list of Sub-ordinate officers who lived with their wives and children were procured. Then preliminary proforma was applied for sample selection. Thereafter, background information proforma, PPFS-E Scale and Coping strategies scale were administered on the selected sample by survey methods. Subjects were assured for the confidentiality of their information. **Results**

Table 1: Comparison of challenges experienced by CRPF personnel and their wives with pre-school children

S. N.	Dimensions of challenges	CRPF personnel n=30		Wives n=30		't' value
		Mean	S.D.	Mean	S.D.	
1.	Physical Challenges	33.8	0.16	36.6	10.90	1.41 NS
2.	Psychological Challenges	65.1	19.84	51.9	21.56	2.47*
3.	Financial Challenges	34.2	9.05	32.1	9.43	0.88 NS
4.	Socio-Emotional Challenges	96.8	26.71	76.5	23.50	3.13*
	Overall Challenges	57.48	17.24	49.28	17.50	1.828 NS

*= significant at 5% level of significance

**= significant at 1% level of significance NS= Non Significant

Table 1 shows the comparative analysis of mean score, standard deviation and 't' value and significant differences between CRPF personnel and their wives for dimension wise challenges at preschool stage of expanding stage of family life cycle. It is clearly depicted from the data that mean value for the physical challenges of CRPF personnel (33.8) and their wives (36.6) are more or less same and no significant difference was found. As far as psychological challenges are concerned CRPF personnel got higher mean score (65.1) as compared to their wives (51.9) and significant difference is found. The main reason for this is the failure of CRPF personnel in maintaining stability between their duty at work place and duty towards their families. They find it difficult to maintain the balance between their new job and newly married life as they lack experience in these two domains. Wives of personnel' too experience less satisfaction with their married life and their roles and responsibilities within their families. For the financial challenges, mean value of CRPF personnel (34.2) and their wives (32.1) are more or less same and no significant difference is found. As far as socio-emotional

challenges are concerned, CRPF personnel got more mean value (96.8) as compared to their wives (76.5) which showed CRPF personnel faced more socio-emotional challenges as compared to their wives and significant difference is found. The reason may be that as men are usually introvert by nature and staying away from their kith and kin make it more difficult for them to express their feelings. They are always surrounded by their colleagues and in this professional surrounding they fail to establish their personal contact. Whereas wives experienced less socio-emotional challenges as women are extrovert, they canshare their emotions easily. Wives faced challenges as they have to handle their kids single handedly and due to less experience, they lack acquaintance with their husband's job also.

Table 2: Comparison of coping strategies used by respondents with pre-school children

n=60

Dimensions of challenges	Positive coping				Negative coping				
	CRPF Personnel		Wives		't' Value	CRPF Personnel		Wives		't' Value
	Mean	Sd	Mean	Sd		Mean	Sd	Mean	Sd	
Physical Challenges	56.03	8.93	57.33	12.07	0.47 NS	50.93	16.34	44.1	12.46	1.82 NS
Psychological Challenges	45.7	7.01	48.2	10.22	1.10 NS	46.2	10.7	42.36	9.97	1.44 NS
Financial Challenges	46.33	7.9	50.76	12.13	1.68 NS	48.56	6.8	53.43	10.94	**2.07***
Socio-Emotional Challenges	44.67	7.08	52.96	8.2	**4.19***	46.46	11.93	41.56	9.8	1.74 NS
Overallcoping	48.18	7.77	52.31	10.78	1.72	48.04	11.94	45.36	10.84	0.9 NS

*= significant at 5% level of significance

**=significant at 1% level of significanceNS= Non Significant

Indeed, wives of CRPF personnel tend to use positive coping strategies to manage stressors than CRPF personnel. CRPF personnel who responded to challenges with negative coping styles have higher levels of miserable and fretful indicators compared to their wives. Due to the strong association between these coping styles and negative effect, CRPF personnel who use these negative methods of coping might be at particular risk for higher levels of depression and anxiety symptoms compared to their wives who use these coping strategies less frequently. These differences in handling challenging situations can constitute a vulnerability that puts CRPF personnel at risk for suicidal ideation. Indeed, the rate of suicidal ideation and depression symptoms among CRPF personnel are alarming. This may be because of poor handling techniques of the stressful situations.

Table 2 shows gender differences in families with preschool children for their positive and negative coping. As positive coping is concerned, wives showed slightly higher mean value (57.33) as compared to CRPF personnel (56.03) and no significant difference was found for physical challenges. For psychological challenges, wives procured higher mean value (48.2) as compared to CRPF personnel (45.7) and there was no significant difference. For financial challenges, wives showed higher mean value (50.76) as compared to CRPF personnel (46.33) and no significant difference was found. For socio emotional challenges in positive coping, wives showed higher mean value (52.96) as compared to CRPF personnel (44.67) and significant difference was found. Due to long separation from family just after marriage both husbands and wives face trouble in their marriage. Especially for CRPF personnel, it was more difficult to manage newly formed families and newly recruited service. Wives are more expressive for their socio-emotional problems than their counterparts.

As far as negative coping is concerned, CRPF personnel showed higher mean value (50.93)as compared to their wives (44.1) and no significant difference was found for physical challenges. For psychological challenges, CRPF personnel showed higher mean value (46.2) as compared to their wives (42.36) and no significant difference was found. For financial challenges, wives showed higher mean value (53.43) as compared to CRPF personnel (48.56) and significant difference was found. Most of the CRPF personnel are worried about their future expenses as during preschool stage family responsibilities increase and due to new recruitment in the job, they do not get most of the benefits of the profession, as well as salary, is not at par to manage all family demands. They think about these problems but never shareit to anyone. They try to handle

their problem on their own. As far as socio-emotional challenges, CRPF personnel showed higher mean value (46.46) as compared to wives (41.56)and there was no significant difference.

As far as overall coping is concerned, wives of the CRPF personnel used more positive coping (mean value=52.31) as compared to their counterparts (mean value=48.18) and no significant difference found. With regards to negative coping, CRPF personnel at preschool stage used more negative coping (mean value=48.04) as compared to their wives (mean value=45.36) and no significant difference was found. Younger people also had more positive attitudes than older people, although they were more likely to consider that the challenges had negatively affected their relationships with others

SUMMARY AND CONCLUSION
CRPF personnel faced more challenges as compared to their wives. Due to work life imbalance, less job experience, less family experience, short time with spousal relationships, etc were the causes these challenges. However, it has been also seen in the study that CRPF personnel used more negative coping as compared to their wives which lead to them more challenges. Wives of the personnel used more positive coping.

Hence, it is concluded from the study that CRPF personnel faced more challenges and hence it is needed to intervene them in a proper manner.

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STUDY OF BRONCHIAL PATTERN OF GOAT LUNGS BY CORROSIONCASTING

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ABSTRACT

*Introduction: The corrosion casting technique by using resin is usual technique to demonstrate luminal patterns of bronchus, blood vessels, etc… in life science. A corrosion cast of a lung can give a detailed study of the bronchial patterns. Corrosion cast is done using various resin solutions. The aim of the present work is to study the bronchial tree pattern of a goat lung using corrosion casting method. **Materials and Methods:** Deflated lungs along with intact trachea of a goat were collected from the slaughterhouse. Commercially available rubber silicone has been injected into the lungs through the trachea so that the bronchial patterns can be easily appreciable. After complete filling, the specimen is kept undisturbed for the next 24–48 h. The tissue surrounding the cast is alone removed away and washed with plain water to remove the bloodstains. **Results:** After dissecting out the tissues using forceps, the cast was washed in plain water. According to the observation of the specimen, it is found that the trachea is branched into the right and left primary bronchi. The secondary bronchi are further branched to form the tertiary bronchi which resemble like fine bristles. In the right lung, it is observed that before the branching of primary bronchus from the trachea, it is known as the apical bronchus supplying the apical lobe of the right lung. **Conclusion:** Demonstration of bronchial pattern with its various branches is not easy without a corrosion casting preparation. This study can be a valuable teaching aid and museum specimen.*

Keywords: Bronchial tree, Goat lung, Rubber silicone

INTRODUCTION

A corrosion cast is a resin-made cast of the lumen of the passages in real organs.[1] Gross anatomy of the lungs can be studied easily with the wet specimen or a dry plastinated lung, but the bronchial patterns cannot be studied by handling a gross lung specimen.[2] The lung is the major organ in the respiratory system that is located near the heart. It is a very soft tissue enclosed within the pleural sac in the thorax.[3] They play an important role in gas exchange. Each lung is divided into many lobes where the right lung consists of four lobes and the left lung consists of two lobes.[2] In most of the vertebrates, there are two lungs, a right lung and a left lung where mostly the right lung is larger than the left lung. The lungs together usually weigh around 1.3 kg where the right one is heavier than the left one.[4] A corrosion cast of a lung can give a detailed study of the bronchial patterns. Corrosion cast is done using various resin solutions.

The most common resin solution used for cast preparations is rubber epoxy resin which makes the cast hard, firm, and brittle.[7] Hence, the resin implied in this study is rubber silicone. This resin has a unique advantage which can withstand extreme conditions at the same time keeps the cast softer.

MATERIALS AND METHODS

Deflated lungs along with intact trachea of a goat were collected from the slaughterhouse [Figure 1].[8] Commercially available rubber silicone has been injected into the lungs through the trachea so that the bronchial patterns can be easily appreciable. After complete filling [Figure 2], the specimen is kept undisturbed for the next 24–48 h. The tissue surrounding the cast is alone removed away and washed with plain water to remove the bloodstains.

Figure 1: Fresh goat lungs

Figure 2: Silicone has been injected

Figure 3: Dissected out cast with bronchial pattern and its branches
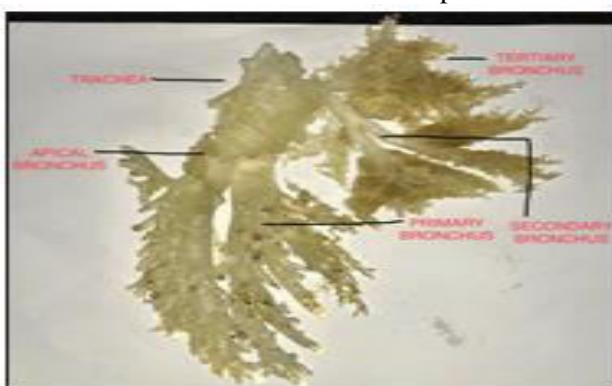
RESULTS

After dissecting out the tissues using forceps, the cast was washed in plain water. According to the observation of the specimen, it is found that the trachea is branched into the right and left primary bronchi.[5] The secondary bronchi are further branched to form the tertiary bronchi which resemble like fine bristles.[9] In the right lung, it is observed that before the branching of primary bronchus from the trachea, it is known as the apical bronchus supplying the apical lobe of the right lung [Figure 3].

DISCUSSION

Demonstration of bronchial tree pattern with its various branching is not that easy without a corrosion cast preparation.[1] With the help of such casts, the caliber of the lumen of trachea, primary bronchi, secondary bronchi, and tertiary bronchi is easily explained to the students.[2] The branching pattern varies for each animal; hence, it can be explained and differed only with the help of such corrosion casts.[10] Corrosion casting is done using various resin solutions. The most common resin solution used for cast preparation is an epoxy resin which makes the cast hard, firm, and brittle. Hence, the resin implied in this study is rubber silicone. This resin has a unique advantage which can withstand extreme conditions at the same time keeps the cast softer. Rubber silicone cast is more continuous and flexible; hence, the integrity of very fine branches could be maintained.[6] After dissecting out the tissues using forceps, the cast was washed in plain water. According to the observation of the specimen, it is found that the trachea is branched into the right and left primary bronchi. The secondary bronchi are further branched to form the tertiary bronchi which resemble like fine bristles.[5] In the right lung, it is observed that before the branching of primary bronchus from the trachea, it is known as the apical bronchus supplying the apical lobe of the right lung.[2,3] From the results, the study concluded that the compare to other casting materials rubber silicon resin may be good substance to study the patterns of luminal structures and it could be the best teaching aid in the field of life science and medicine to study branching pattern of luminal structures.

CONCLUSION

Demonstration of bronchial pattern with its various branches is not easy without a corrosion casting preparation. This study can be a valuable teaching aid and a museum specimen.

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EFFECTIVENESS OF VEDIC MATHEMATICS ON STUDENTS' ACHIEVEMENT

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ABSTRACT

Vedic mathematics is the name given to the ancient Indian system of mathematics that was rediscovered in the early 20th century from ancient Indian scripture namely Atharvaveda. Vedic Mathematics is found to be very effective and sound for mental calculations in mathematics. Sutras and sub sutras have beautiful and string tricks for fast and easy for mathematical calculations. In this article we explore and effectiveness of Vedic Mathematics on students' achievement. Vedic Mathematics provides more systematic, simplified, unified and faster than the conventional techniques. Thus, the Vedic mathematics approach is found highly effective for enhancing the student's achievement.

Keywords: Effectiveness, Vedic Mathematics, Achievement

INTRODUCTION

The language in which Vedas were composed became too old in the later Vedic period. As a result, the Vedanta's have emerged as an auxiliary in the field of Vedic studies. They are considered as science that help the people to understand and interpret the Vedas which are written centuries ago. The ancient Indian rishis have mentioned 16 sutras and 13 sub sutras in Sanskrit which enable us to solve all mathematical problems in easy 2 or 3 with less time and no pen and paper work.

Mathematics is a branch of science we use mathematics in our all endeavor's. Therefore, it becomes a part of our life our imagination to involve mathematics the education commission (1964 -1966) recommended mathematics as a compulsory subject for students at all school level. the national policy on education 1986. Has also considered the importance of mathematics in general education and suggest that mathematics should be visualized as the vehicle to train a child to you think reason analysis and articulate logically apart from Being a specific subject. But due to lack of understanding its essence and technique of teaching mathematics is now considered as a dry subject by many learners now yellow no source no interest in learning mathematics teacher is teaching and students are learning just for the sake of obtaining marks.

But in the way of teaching mathematics through Vedic Mathematics techniques again the learners very much interest they can solve the problem very much faster

Vedic Mathematics techniques helps all kind of students it is easiest gift for the slow learners the national policy of education (NPE-1986) stated " mathematics could be considered as a medium to train a child to develop his thinking capacity to develop his reasoning power and coherent logically"

So, mathematics should be shown as a way of thinking, an art or form of beauty, and as human achievement and it can be achieved easily through Vedic Mathematics as it not only helps in generating interest and concept clarity in students but also so stabilizing the knowledge for longer duration too.

Effectiveness

An output of specific review analyses (e.g the WASC educational effectiveness reviews or its reports on institutional effectiveness) that measure the quality of the achievement of a specific educational goal or the degree.

Vedic Mathematics

Vedic mathematics is the surname given to a supposedly ancient system of calculation which was" rediscovered" from the Vedas between 1911 and 1918 by Shri Bharathi Krishna tirthaji Maharaj (1884 to 1960). according to tirthaji , all of Vedic Mathematics is based on 16 sutras or word formulae. None of these sutras has even been found in Vedic literature, nor are its methods consistent with known mathematical knowledge from the Vedic era.

Vedic mathematics a set of supposedly ancient techniques that help even the most numerically challenged to conquer difficult sums, is surging in popularity in India. Vedic mathematics is useful for basic and complex mathematical operations. The methods provided in the book for basic mathematics are easy but powerful launch calculation on division, multiplications, addition and subtraction can be performed easily by using Vedic tricks and formulae. Vedic sutras and tricks provide beautiful and striking methods that is systematic than modern system of mathematics. Vedic Mathematics provides the integrated structure of mathematics that is

complementary, direct and easy. The Vedic systems allows children to use these principles to simplify a math problem to a level that they can master and build their "number sense" calculating in Vedic Mathematics is like playing mind game and results can be digging out very shortly like reading words. Vedic Mathematics will help the students in creative, interesting and intelligent way. It will support to take advantage in mathematics and logic that help our children to excel in the classroom and beyond. It can induce creativity in intelligent pupils, while helping slow learners grasp the basic concepts of mathematics. A wider use of Vedic Mathematics can undoubtedly generate interest in a subject that is generally dreaded by children.

ACHIEVEMENT

Now a day, tests on achievement have gained significant importance in measuring one's ability. An achievement test is used to measure nature and extent of students learning in a particular subject. different conditions and factors affect the achievement of a particular student in a particular field. Sometimes quite deserving students may not achieve as can be expected on the basis of their abilities. Students' interest in the field of endeavor, teachers' methodology of teaching, socio - economic conditions and family set up and some other psychological factors also affect students' performance directly or indirectly.

It is an exposition of his present level of performance. academic achievement is the core of the wider term "educational growth" which means growth in all aspects. it represents the amount of knowledge obtained by the students and different subjects of study. it encourages the students to work hard and helps them to know where they stand. Achievement is a source of joy and good feeling whereas a failure is a source of anger and frustration the unique, first and lasting responsibility of a school or other educational institution established by society promotes healthy academic growth and student development. academic achievement generally refers to the degree of achievement of competence acquired in specific subjects related to academic work. This sources what an individual has learned or acquired in a particular area.

With regard to the objective of, academic achievement has always been an important and essential center of educational research despite a varied statement.

The academic achievement of the student is the main concern and the most important objective of education. Not that other aspect of educational goals should be ignored, but the fact remains that academic achievement is the sole responsibility of all educational institutions established by society to promote a healthy student development (Good 1959)

Academic achievement depends on the various factors included in the student's context, the type of home, the type of learning and teaching will play a very important role in achievement. Heredity and social factors affect student achievement and play an important role.

The term academic achievement has been operationally defined as the sum of achievements in all subjects. This is obtained by adding the results obtained by the students in all subjects during the final examination.

It is closely related to the type of adjustment that the child can fill in the school where a number of learning experiences are provided, academic achievement indicates how the child can adopt and reach in school conditions in the terms of the various activities that are provided in the school to a normal degree of waiting. This results in the satisfaction of need, measured through various learning experiences, including curricular and co-curricular activities.

"Academic achievement refers to acquire knowledge or competencies developed in the academic subjects usually designated by the test results or by the marks awarded by the teacher or by both" (Good,1959)

CONCLUSION

With Vedic Mathematics, Mathematics can be learnt and mastered quickly and easily and it can be e and transformed into a fun and enjoyable subject. Vedic method of calculation enables faster calculations and students can solve more problems in less time. It also enables students to understand the numbers and their operations and relationships in an interesting manner and can be remembered for a long time. It also helps in many modern competitive exams where power test, logical reasoning, mathematical aptitude tests are used.

It can be concluded that the teacher should encourage the students to learn Vedic Mathematics. In the school curriculum, Vedic Mathematics should be included especially at the elementary level as a supplementary subject to mathematics and some period should be allotted for practice the tracks as a result students will actively engage in problem solving. The artistic abilities and talents of the students can also be developed by Vedic Mathematics it can undoubtedly create interest in mathematics among the students who have generally feared mathematics.

One can learn Vedic Mathematics from an early age and basic knowledge of multiplication table helps a student to better grasp of the subject when you to use Vedic Math's you use both your left and right brain hemisphere. the left side of the brain is the seat of language and processes in a logical and sequentially order. The right side is more visual and processes intuitively, holistically and randomly which boosts memory and concentration. Since you are doing calculations mentally without the use of pen or paper you are actually concentrating which develops the concentration abilities.

Thus, Vedic Mathematics is nothing but a few trips that helps in solving mathematical calculations quite easily. It is a unique technique of calculations that is based on simple principles and rules. Applying which, any kind of mathematical problems can be solved orally. More and more use of Vedic Mathematics can without any doubts generate interest in a subject that is generally dreaded by children.

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UNDERSTANDING STAFF MOTIVATION BY FOCUSING ON CONFRONTATION MANAGEMENT SKILLS AT SCHOOL ADMINISTRATION

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ABSTRACT

The study examined the ranked importance of motivational factors of staff at the schools in Batticaloa Educational zone in Batticaloa District Sri Lanka. The hand-delivered descriptive survey addressed ten motivating factors in the context of motivation theory. Findings suggest interesting work and good pay are keys to higher staff motivation through confrontation management skills at school. 10 I-AB schools from the total of 64 high performing schools were being selected from research area by Random Sampling Method where Principals, teachers, and non-academic staff have selected as the respondents of primary data collection to fill up the Questionnaire and also, secondary data (Documentary) would be utilized to ensure the primary data as supportive documents for the study of motivational theories in confrontation. The results showed in addition. Staff should learn and practice the various methods of conflict resolution. Superior and subordinates should start solving conflicts as it is the only way to ensure that conflicts are handled better in the future of organizations. And principals are carefully designed reward systems that include job enlargement, job enrichment, staff promotions, internal and external earnings, financial and motivation should be considered.

Keywords: Staff, Motivation, Confrontation Management skills

1. INTRODUCTION

At one time, employees (staff) were considered just another input into the production of goods and services. What perhaps changed this way of thinking about employees (staff) was research, referred to as the Hawthorne Studies, conducted by Elton Mayo from 1924 to 1932 (Dickson, 1973). This study found employees are not motivated solely by money and employee behavior is linked to their attitudes (Dickson, 1973). The Hawthorne Studies began the human relations approach to management, whereby the needs and motivation of employees become the primary focus of managers (Bedeian, 1993).

1.1 Hypothesis of the Study

Due to the causes of developing motivation in conflicts among work place and its effects on school developing. By understanding the types of motivation and principal can use appropriate motivation style through conflict resolution style. If a conflict is left unresolved, it may cause serious consequences.

1.2 Objectives of the Study

The main objective of the study is to find **Understanding staff Motivation in confrontation management at school** activities through the destructive impacts in school development and it may lead to violence and identify the connection of organization's (school's) effectiveness between staff satisfaction and leader's (principal's) conflict management. **The specific objectives are as follows;**

- To identify the motivation theories in workplace (schools) and apply for the conflicts arises by employee (staff) through review of documentaries.

- To evaluate, Difference of motivation Styles and its effectives by Appling organizational leaders.

- To call out the impacts of conflicts between staff and give awareness for suggestion to motivational development (school) development

1.3 Purpose of the Study

The purpose of this study was to describe the importance of certain factors in motivating focusing on confrontation staff at the selected schools at Batticaloa educational zone, Batticaloa district, Sri Lanka. Specifically, the study sought to describe the ranked importance of the following ten motivating factors: (a) job security, (b) sympathetic help with personal problems, (c) personal loyalty to employees, (d) interesting work, (e) good working conditions, (f) tactful discipline, (g) good wages, (h) promotions and growth in the organization, (i) feeling of being in on things, and (j) full appreciation of work done. A secondary purpose of the study was to compare the results of this study with the study results from other populations.

2. LITERATURE REVIEW

2.1 Motivation Theories

Understanding what motivated employees and how they were motivated was the focus of many researchers following the publication of the Hawthorne Study results (Terpstra, 1979). Five major approaches that have led to our understanding of motivation are Maslow's need-hierarchy theory, Herzberg's two- factor theory, Vroom's expectancy theory, Adams' equity theory, and Skinner's reinforcement theory.

According to Maslow, employees have five levels of needs (Maslow, 1943): physiological, safety, social, ego, and self- actualizing. Maslow argued that lower level needs had to be satisfied before the next higher level need would motivate employees. Herzberg's work categorized motivation into two factors: motivators and hygienes (Herzberg, Mausner, & Snyderman, 1959). Motivator or intrinsic factors, such as achievement and recognition, produce job satisfaction. Hygiene or extrinsic factors, such as pay and job security, produce job dissatisfaction.

Vroom's theory is based on the belief that employee effort will lead to performance and performance will lead to rewards (Vroom, 1964). Rewards may be either positive or negative. The more positive the reward the more likely the employee will be highly motivated. Conversely, the more negative the reward the less likely the employee will be motivated.

Adams' theory states that employees strive for equity between themselves and other workers. Equity is achieved when the ratio of employee outcomes over inputs is equal to other employee outcomes over inputs (Adams, 1965).

Skinner's theory simply states those employees' behaviors that lead to positive outcomes will be repeated and behaviors that lead to negative outcomes will not be repeated (Skinner, 1953). Managers should positively reinforce employee behaviors that lead to positive outcomes. Managers should negatively reinforce employee behavior that leads to negative outcomes.

2.2 Motivation Defined

Many contemporary authors have also defined the concept of motivation. Motivation has been defined as: the psychological process that gives behavior purpose and direction (Kreitner, 1995); a predisposition to behave in a purposive manner to achieve specific, unmet needs (Buford, Bedeian, & Lindner, 1995); an internal drive to satisfy an unsatisfied need (Higgins, 1994); and the will to achieve (Bedeian, 1993). For this paper, motivation is operationally defined as the inner force that drives individuals to accomplish personal and organizational goals.

2.3 The Role of Motivation

Why do we need motivated employees? The answer is survival (Smith, 1994). Motivated employees are needed in our rapidly changing workplaces. Motivated employees help organizations survive. Motivated employees are more productive. To be effective, managers need to understand what motivates employees within the context of the roles they perform. Of all the functions a manager performs, motivating employees is arguably the most complex. This is due, in part, to the fact that what motivates employees changes constantly (Bowen & Radhakrishna, 1991). For example, research suggests that as employees' income increases, money becomes less of a motivator (Kovach, 1987). Also, as employees get older, interesting work becomes more of a motivator.

3. METHODOLOGY

Data of evaluate, the conflict resolution theories which identified, How to apply between staff and organization (school) by managers (principals) have collected by Random Sampling method where selected managers and employees as a schools Principals, teachers and non-academic staff as the respondents of primary data collection to fill up through interview and questionnaire method to fill up data and the most important the previous researches and documentary evidence also as a secondary data have been utilized to ensure the topic and primary data as supportive for this study. 10 I-AB schools from the total of 64 schools are going to be selected by Random Sampling Method in research area. Based on the ratio of 5: 1, 180 teachers and 89 students' leaders have been chosen as sampling population. From the records, teachers, principal and non-academic staff and student's leaders would be selected as sample. As being higher number of teachers and students' leaders presented in the study location, random sampling would be carried out to select the sampling population. Both qualitative and quantitative methods have been used to analyses the results. Mostly, qualitative analysis has ensured as being principal, teachers, non-academic staff have been countered as the respondents of this study. From a review of literature, a survey questionnaire was developed to collect data for the study (Bowen & Radhakrishna, 1991; Harpaz, 1990; Kovach, 1987). Data was collected through use of a written questionnaire hand-delivered to participants. Questionnaires were filled out by participants and returned to an

intra-departmental mailbox. The questionnaire asked participants to rank the importance of ten factors that motivated them in doing their work: 1=most important . . . 10=least important. Face and content validity for the instrument were established using two administrative and professional staff at IAB schools Educational zone Batticaloa district, Sri Lanka. The instrument was pilot tested with three similarly situated staff within the schools. As a result of the pilot test, minor changes in word selection and instructions were made to the questionnaire.

4. DATA ANALYZES AND INTERPRETATION

4.1 Data Collection

4.1.1 Schools Information of Zonal Education – Batticaloa, Sri Lanka.

Table 4.1 "Schools Information of Batticaloa zone Sri Lanka"

Zonal Division	Types of school				Total
	I AB	IC	type II	type III	
Manmunai North	08	04	16	11	39
Eravur Pattu	01	03	03	02	09
Manmunai Pattu	01	03	04	08	16

(Zonal Education Office, Batticaloa - 2020)

According to the Table 4.1 : shows as included Schools Information of Batticaloa Zonal Education, Batticaloa District Sri Lanka" of the research area, it means total numbers of schools in the research area.

4.1.2 Details of School for Research Study

Table 4.2 "Details of school for research study"

Zonal Division	Number of school for selection	
	I AB schools	Sample schools
Manmunai North	08	08
Eravur Pattu	01	01
Manmunai Pattu	01	01

(Zonal Education Office, Batticaloa - 2020)

Note: According to the table 3.2**,** (Details of school for research study) **"**Situation was created to choose the schools which consists more number of staff as being the number of variables and factors are higher in this study. Through which, conflicts based on individual and managerial drawbacks have been collected as well. Therefore, I AB schools have more number of staffs and students where sampling population has been higher than the other schools. Random sampling method has encouraged to ensuring the possibilities of getting equal chances by individuals."

Table 4.2.1 "Selected internal sampling population"

Name of the School	Principal and vice-principal	Teachers	Non-Academic staff
A	03	76	12
B	06	85	12
C	06	110	18
D	06	126	18
E	06	90	15
F	03	72	15
G	06	107	18
H	03	76	15
I	03	65	13
J	03	59	8

(School Record and Zonal Education Office, 2019-2020)

Note: according to the Table 3.3, (School Record and Zonal Education Office, 2018-2019) "From the records, teachers, principal, vice-principal and non-academic staff have been selected as sample. As being higher number of teachers presented in the study location, random sampling has been carried out to select the sampling population."

4.3 Details of Sample

Table 4.3" final sample of elements"

Name of the School	Total No. of Teachers	Sample of Teachers	Total students' Leaders	Sample of students' Leaders
A	76	15	40	08
B	85	17	45	09
C	110	24	55	11
D	126	26	65	13
E	90	18	55	11
F	72	14	35	07
G	107	21	55	11
H	76	15	30	06
I	65	13	35	07
J	59	12	30	06

Note: according to the Table 3.4" final sample of elements" "Based on the ratio of 5: 1, 180 teachers and 89 students' leaders have been chosen as sampling population. Along with the sample, random sampling would continue to select the number of sample too."

4.4 Documentary Analysis

The ranked order of motivating factors were: (a) interesting work, (b) good wages, (c) full appreciation of work done, (d) job security, (e) good working conditions, (f) promotions and growth in the organization, (g) feeling of being in on things, (h) personal loyalty to employees, (i) tactful discipline, and (j) sympathetic help with personal problems.

A comparison of these results to Maslow's need-hierarchy theory provides some interesting insight into employee motivation. The number one ranked motivator, interesting work, is a self-actualizing factor. The number two ranked motivator, good wages, is a physiological factor. The number three ranked motivator, full appreciation of work done, is an esteem factor. The number four ranked motivator, job security, is a safety factor. Therefore, according to Maslow (1943), if managers wish to address the most important motivational factor of Centers' employees, interesting work, physiological, safety, social, and esteem factors must first be satisfied. If managers wished to address the second most important motivational factor of centers' employees, good pay, increased pay would suffice. Contrary to what Maslow's theory suggests, the range of motivational factors are mixed in this study. Maslow's conclusions that lower level motivational factors must be met before ascending to the next level were not confirmed by this study.

The following example compares the highest ranked motivational factor (interesting work) to Vroom's expectancy theory. Assume that a Centers employee just attended a staff meeting where he/she learned a major emphasis would be placed on seeking additional external program funds. Additionally, employees who are successful in securing funds will be given more opportunities to explore their own research and extension interests (interesting work). Employees who do not secure additional funds will be required to work on research and extension programs identified by the director. The employee realizes that the more research he/she does regarding funding sources and the more proposals he/she writes, the greater the likelihood he/she will receive external funding.

Because the state legislature has not increased appropriations to the centers for the next two years (funds for independent research and extension projects will be scaled back), the employee sees a direct relationship between performance (obtaining external funds) and rewards (independent research and Extension projects). Further, the employee went to work for the centers, in part, because of the opportunity to conduct independent research and extension projects. The employee will be motivated if he/she is successful in obtaining external funds and given the opportunity to conduct independent research and extension projects. On the other hand, motivation will be diminished if the employee is successful in obtaining external funds and the director denies the request to conduct independent research and Extension projects.

The following example compares the third highest ranked motivational factor (full appreciation of work done) to Adams's equity theory. If an employee at the centers feels that there is a lack of appreciation for work done, as being too low relative to another employee, an inequity may exist and the employee will be dis-motivated. Further, if all the employees at the centers feel that there is a lack of appreciation for work done, inequity may exist. Adams (1965) stated employees will attempt to restore equity through various means, some of which may

be counter- productive to organizational goals and objectives. For instance, employees who feel their work is not being appreciated may work less or undervalue the work of other employees.

This final example compares the two highest motivational factors to Herzberg's two-factor theory. The highest ranked motivator, interesting work, is a motivator factor. The second ranked motivator, good wages is a hygiene factor. Herzberg, Mausner, & Snyderman (1959) stated that to the degree that motivators are present in a job, motivation will occur. The absence of motivators does not lead to dissatisfaction. Further, they stated that to the degree that hygienes are absent from a job, dissatisfaction will occur. When present, hygienes prevent dissatisfaction, but do not lead to satisfaction. In our example, the lack of interesting work (motivator) for the centers' employees would not lead to dissatisfaction. Paying centers' employees' lower wages (hygiene) than what they believe to be fair may lead to job dissatisfaction. Conversely, employees will be motivated when they are doing interesting work and but will not necessarily be motivated by higher pay.

The discussion above, about the ranked importance of motivational factors as related to motivational theory, is only part of the picture. The other part is how these rankings compare with related research. A study of industrial employees, conducted by Kovach (1987), yielded the following ranked order of motivational factors: (a) interesting work, (b) full appreciation of work done, and (c) feeling of being in on things. Another study of employees, conducted by Harpaz (1990), yielded the following ranked order of motivational factors: (a) interesting work, (b) good wages, and (c) job security.

In this study and the two cited above, interesting work ranked as the most important motivational factor. Pay was not ranked as one of the most important motivational factors by Kovach (1987), but was ranked second in this research and by Harpaz (1990). Full appreciation of work done was not ranked as one of the most important motivational factors by Harpaz (1990), but was ranked second in this research and by Kovach (1987). The discrepancies in these research findings supports the idea that what motivates employees differs given the context in which the employee works. What is clear, however, is that employees rank interesting work as the most important motivational factor.

5. RESULTS AND DISCUSSION

The ranked importance of motivational factors of staff in conflicts at schools provides useful information for the principals and staff. Knowing how to use this information in motivating schools staff is complex. The strategy for motivating school staff depends on which motivation theories are used as a reference point. If Hertzberg's theory is followed, management should begin by focusing on pay and job security (hygiene factors) before focusing on interesting work and full appreciation of work done (motivator factors). If Adams' equity theory is followed, management should begin by focusing on areas where there may be perceived inequities (pay and full appreciation of work done) before focusing on interesting work and job security. If Vroom's theory is followed, management should begin by focusing on rewarding (pay and interesting work) employee effort in achieving organizational goals and objectives.

Regardless of which theory is followed, interesting work and employee pay appear to be important links to higher motivation of centers' employees. Options such as job enlargement, job enrichment, promotions, internal and external stipends, monetary, and non-monetary compensation should be considered. Job enlargement can be used (by managers) to make work more interesting (for employees) by increasing the number and variety of activities performed. Job enrichment can used to make work more interesting and increase pay by adding higher level responsibilities to a job and providing monetary compensation (raise or stipend) to employees for accepting this responsibility. These are just two examples of an infinite number of methods to increase motivation of employees at the centers. The key to motivating centers' employees is to know what motivates them and designing a motivation program based on those needs.

The results presented in this paper also have implications for the entire Cooperative Extension System. The effectiveness of Extension is dependent upon the motivation of its employees (Chesney, 1992; Buford, 1990; Smith, 1990). Knowing what motivates employees and incorporating this knowledge into the reward system will help Extension identify, recruit, employ, train, and retain a productive workforce. Motivating Extension employees requires both managers and employees working together (Buford, 1993). Extension employees must be willing to let managers know what motivates them, and managers must be willing to design reward systems that motivate employees. Survey results, like those presented here, are useful in helping Extension managers determine what motivates employees (Bowen & Radhakrishna, 1991). If properly designed reward systems are not implemented, however, employees will not be motivated.

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PERCEPTUAL UNDERSTANDING OF PSYCHOLOGICAL LEARNING FOR MEMORY AND RETENTION IN EDUCATION

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ABSTRACT

Education deals with modification of behaviour and Psychology studies the behaviour as it crows and evolves. Psychology is the science of behaviour and mind .It includes the study of conscious and unconscious phenomena. Learning capacity is creation of new information by the brain can be difficult especially. Memory system statistical patterns around us to Organized store incoming information. Memory allows brain to encode, store and retrieve information. Different areas of the brain effect different aspects of memory which helps the brain map surrounding.the teacher must have awaerness about different lerning theories and concept about the developmental stages of the student therefore, teacher trinee should be clearly studied about different types of learning theories with perceptual understanding. In order to increase the level of perceptual understanding in the learning theoriescertain leaning techniques is available. Learning still remains an activity or associated with an educational context. Learning randomly throughout, new experiences information from our perceptions .Learning involves more than thinking the whole personality senses, beliefs, values. Learning needs to meet personal recognizing and identifying such enables to evaluate. Learning opportunities should be linked previous experience. Learners should be encouraged to reflect have learnt and further their knowledge. Individual learning capacity varies considerably and depend not only ability also motivation and personality of own learning processes. Learning and memory are related concepts and acquisition of skill or knowledge. Memory involved processing amounts of information. Memory essential to all our lives without a past cannot operate in the present think about future. Learning is facilitated new existing knowledge structured the major concepts to use of meta cognitive strategies that monitor and cognitive processes. Learning is an adaptive function nervous system changes in relation in the environment measurable behaviours are learned rather than understand internal states as emotions. Memory is the recording,retention and retrieval of knowledge the clinical perspective. In regard to memory several distinctions made aspects of useful from the perceptive. Memory guide current behaviour basis of past experiences.

Keywords: Memory, Perceptual, Learning Process, Behaviourism, Psychological Learning,Retention

INTRODUCTION
Education and psychology are related intimately. As such both are inter-related and dependent. Learning is basic to human behaviour. It is a change that takes place through practice or experience. Learning is purposive. A child's learning school is closely linked up with its goals, purposes and satisfactions. The nature learning process help as in solving the problems related to the educational process. Memory denotes the ability or power of mind to retain and reproduced learning (Saravanakumar AR, Padmini Devi KR, (2012)). The power of ability helps in the process of memorization. Memory in general is an ability to remember things that happened short or long long time ago so, our mind has the power of retaining and reproducing the information (Saravanakumar AR, Padmini Devi KR, (2017)).

MEANING OF PSYCHOLOGY
Psychology is the scientific study of the mind and behaviour. Psychology is a multifaceted discipline and sub-fields of study such areas as human development health. Social international Conference on Cognitive, Psychological and Behavioural Perspectves in Education behaviour and cognitive processes. Psychology is the science of behaviour includes conscious and unconscious phenomena as well as feeling and thought an academic discipline.

Concept of Educational Psychology
Educational Psychology is defined as the defined as the branch of Psychology which is concerned with Psychological researches as applied to any or all aspects of educational processes and practices. It is in relation to problems like learning, teaching and training.

Meaning and Definition of Learning
Learning is the process of acquiring new or modifying existing knowledge. The ability learn by humans. Animals and some machines, there is also evidence for some kind of learning.

''A change in human disposition or capability that persists over a period of time and is not simply ascribable to processes of growth.'' -by Robert Gagne

''A process that leads to change which occurs as a result of experience and increases the potential of improved performance and future learning.'' -by Susan Ambrose

Types of Learning

Learning has been classified by psychologists in many ways depending upon the cognitive, affective and psycho motor domains like verbal learning , conceptual learning etc,Motor Learning The learning of all types motor skills may be included in this type of learning, riding a horse, driving a car, performing experiments handling various instruments are examples of such learning.

Perctual Learning

Child gets sensation through sense organ .While giving meaning to this sensation,perception takes place (Parimala Fathima M, Saravanakumar AR (2012)). It means thatobjects around him are meaningful to him and He Perceives Them.

Associative Learning

New concepts are associated or linked with the old concepts and knowledge to acquirelearning.

Conceptual Learning

A concept is a generalized idea about things, persons or events in the form of a mental image.

Sensory Motor Learning

Learning is a sensory motor process. Sensory motor learning is a coordinative activity of both sensory organs and physical activities by using arms, hands, fingers , legs , toes and body movements(Saravanakumar AR, Chollalingam KM, (2018]

Learning Styles

VARK stands for Visual, Aural, Read /Write and kinaesthetic sensory used for learning information.

Visual; [V]

This preference includes the information maps, chats. Circles and other devices, when a whiteboard is used diagram with meaningful symbols for relationship between things helpful for visual preference.

Aural/Auditory; [A]

This perceptual mode describe for information that is heard or spoken. Learners who have their main preference report learn best lectures, group discussion, e-mail and taking things.

Read /write [R]

This preference emphasizes text-based input and output reading and writing forms manuals reports and assignments.

Kinaesthetic [K]

Perceptual preference related to the use of experience and practice. It includes simulations, Videos and moves of 'real' things.

PSYCHOLOGY OF LEARNING

Psychology of learning is a theoretical science. Learning depends on experience may lead to long term changes in behaviour potential .Growth mindset is a student believes the effort their academic performance will improve in this style helps the student more motivated and invested in their learning.

Learning Process and Theoriesof Learning

Learning takes time and patience. A self directed learning process most powerful facilitating and inspiring individual group and organizational learning.

Carlton Reeve has written an excellent series of articles in play with learning coarse contrasts five main theories,

- ☐ Behaviourism

- ☐ Cognitive

- ☐ Constructivist

- ☐ Experimentation

- ☐ Social Learning

Meaning and Definition of Memory

Memory is the faculty of the brain which information is stored and retrieved and vital experiences of overtime purpose of influencing future action.

''Memory is the process of maintaining information over time.'' -Maltin [2005]

''Memory is the means by which we draw on our past experiences in order to use this information in the present.'' –Sternberg [1999]

Nature and Types of Memory

Information arriving from the environment is placed in our brain. Memorization takes place in terms of learning. Retention , Recall and Recognition. Memory processes differ,based on strong during of matters .Sense organs are the gate ways of knowledge. Memory stores are the capacity of the brain that records the learnt information through sensory receptors. The memory stores can be categorized based on the duration of storage of information such as short-term memory and long -term memory.

Short-Term Memory [STM]

A Memory store holds a limited amount for a information for a relatively short period .After that information will disappear unless rehearsal .So a limited-capacity store that can maintain unrehearsed information for about 20 seconds.

Long-Term Memory [LTM]

An apparently permanent and for practical purpose unlimited memory store can bet re mead as TLM. So, LTM is an unlimited capacity store that can hold information over period of time. LTM has two long term memory systems declarative memory and procedural Memory.

Semantic Memory

Semantic Memory is memory for meaning, including words , facts, theories and concept declarative knowledge .Semantic memory is thus based on general knowledge coupled with meaning interpretation, generalized rules, principles and formulae.

STAGES OF MEMORY

Memory Encoding: When information comes into memory system to be changed with it can be stored.

They are three main ways in which information can be encoded,

☐ Visual [picture]

☐ Acoustic [sound]

☐ Semantic [meaning]

Memory Storage: This information is stored how long the memory lasts for[duration]hoe much can be stored of any time.

Memory Retrieval: This refers to getting information our storage are unable to retrieve,participants go through the test in the order heard retrieve it into information.

The Relationship between Learning And Memory

The Relationship between learning and memory is incredibly very Intertwined. Learning pertains to securing skills and information (Saravanakumar AR, (2013)).Many great minds International Conference on Cognitive, Psychological and Behavioural Perspectives in Education have stated impossible individual to truly learn retain .The relationship is much nuanced and complex than many appear to be on the surface.

Retention and Memory

Retention depends on how the brain goes about coding it input 'Remembering what was previously been learned. It is this sense that the terms memory and remembering, in spite of their being noun and verb respectively are used synonymously- Wood and Marquis.

Memory involves the making of an impression by an experience, the retention of some record of this impression and the re-entry of this record into conciousness as recall and recognition. Memory is the retention of acquired skills or information.' Retention' and' Memory' are practically synonymous. Memory is retention of what has been learned.Basically, memory is the retention of contents, events or activities in some form by the individual.

Rentition is a power of retaining and ability to retain things in mind, specifically a preservation of the after effects of experience and learning that makes recall or recognition possible.Retention is the condition of retaining something.Learner may be able to memorize facts in the short-term, but how well is learner retention of those facts over the long-term.

PERCEPTUAL UNDERSTANDING
The terms refer to clearly understand the psychological learning or theories and it is nature and characteristics in clear way.

MEDIA INTEGRATION
Integration generally means combing parts so that work together or form a whole. In information technology. Integrated media is a new form of media content creation that cohesively integrate content and context across multiple platforms.Such as web,film,print,audio,live event etc,,,Media integration includes traditional content,storytelling and advertising.[FloralJeya.S, Saravanakumar.AR[2022], It provides real learning experience among the students and also enhance understanding and retention ability.

CONCLUSION
The present teacher trainees must be trained propertly and learned different kind of learning theories with proper understanding it will helpthem to become a good teacher in the society.the field of teacher education learning of psychological concept and theories of development is more important for the future teachers. The normal way of teaching is not sufficent for perceptual understanding learning theories in psychology among teacher trainees.Learning and memory share quite interesting parallels and without the brain bat learning and memory literal impossibilies while learning is an take place in the past, present and future memory to occurrences which have already passed. In other word on individual can learn any time. Information can only mentally processed and stored memory after learning.

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PERFORMANCE ANALYSIS OF OPTICAL TRANSMITTER WITH THE SINGLE MODE LASER

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ABSTRACT

During these days, optical fiber networks are widely used in telecommunication for transmitting the signal or information from one corner to another corner in the world. The efficiency of optical fiber networks deteriorates due to several limitations like attenuation, dispersion, non-linearities, fragility of fiber and other losses. So for the effective and successful communication it is important to reconsider about how optical signal is transmitted; what amount of this signal is transmitted and what distance is covered by the signal through the fiber. The non-return to zero technique based optical communication system with single channel over single mode fibre is investigated in this simulation process. On the basis of modulated outputs of NRZ technique, a comprehensive comparison is developed in terms of Quality factor and bit error rate (BER) , histogram and peak current of single mode laser to establish the merits and demerits of the network system in short as well as long haul optical transmission system. Finally, it is to be investigated the performance analysis of optical transmitter for the given fiber length with the effect of peak current of single mode laser improved by OptiSystem 19.0.

Keywords: Peak current, Single mode laser, Non return to zero, Quality factor, Bit error rate

1. INTRODUCTION

The optical transmission system on the basis of three basic components which are input devices (convert electrical signal into optical signal), transmission channel and the output devices (convert optical signal into electrical signal) we analysed its efficiency. loop control is major component used as a multiple optical fibre communication system. Another key component is single mode laser. These provide high bit rate data transmission over long distance with appropriate optical amplification. With two different options for the modulation format of the signal known as the RZ pulse generator and NRZ techniques we prefer NRZ techniques in optical fibre communication has been discussed by analysing the different peak current value of the single mode laser with using other parameters setting. The value of different parameters has been analysed such as quality factor, bit error rate, eye height for given input powers and the satisfactory outputs. Opti System Simulator Software is an advanced, innovative, rapidly developing and powerful software simulator tool for the design, testing and optimization of virtually any type of optical link in the physical layer of a broad spectrum of optical networks from ultra-long-haul system. It is an innovative optical communication system simulation package which was explored by opti Wave Company in order to meet the academic requirement of the system designers, optical communications engineers, researches.

In present year, our honourable Prime Minister Narendra Modi started **"PM Ghar Tak Fiber Yojna 2022"** in which Bharat Net Projects implemented in a phased manner to provide broadband Connectivity to all the Gram Panchayats (GPs) in the country through an optimal mix of media i.e. OFC/Radio/Satellite. As on 28.02.2022 total 5, 67, 941 km optical fiber cable (OFC) has been laid by Bharat Net Projects.

2. SIMULATION FOR THE OPTICAL TRANSMITTER

Now the basic design of optical transmitter NRZ (Non Return to Zero) format with single mode LASER as shown in the figure 1.

Pseudo-random bit sequence generator generates a stream of bits, and all the bits are applied on the NRZ pulse generator. NRZ pulse generator output is applied on the ideal single mode LASER and the output of the laser is applied on the pin photo diode The PIN photo-diode convert the light signal to electrical form, then amplified signal will pass through low pass Bessel filter. Properties of the low pass Bessel filter are carrier wavelength & lambda; =1550 nm and bandwidth = 4 x Bit rate.
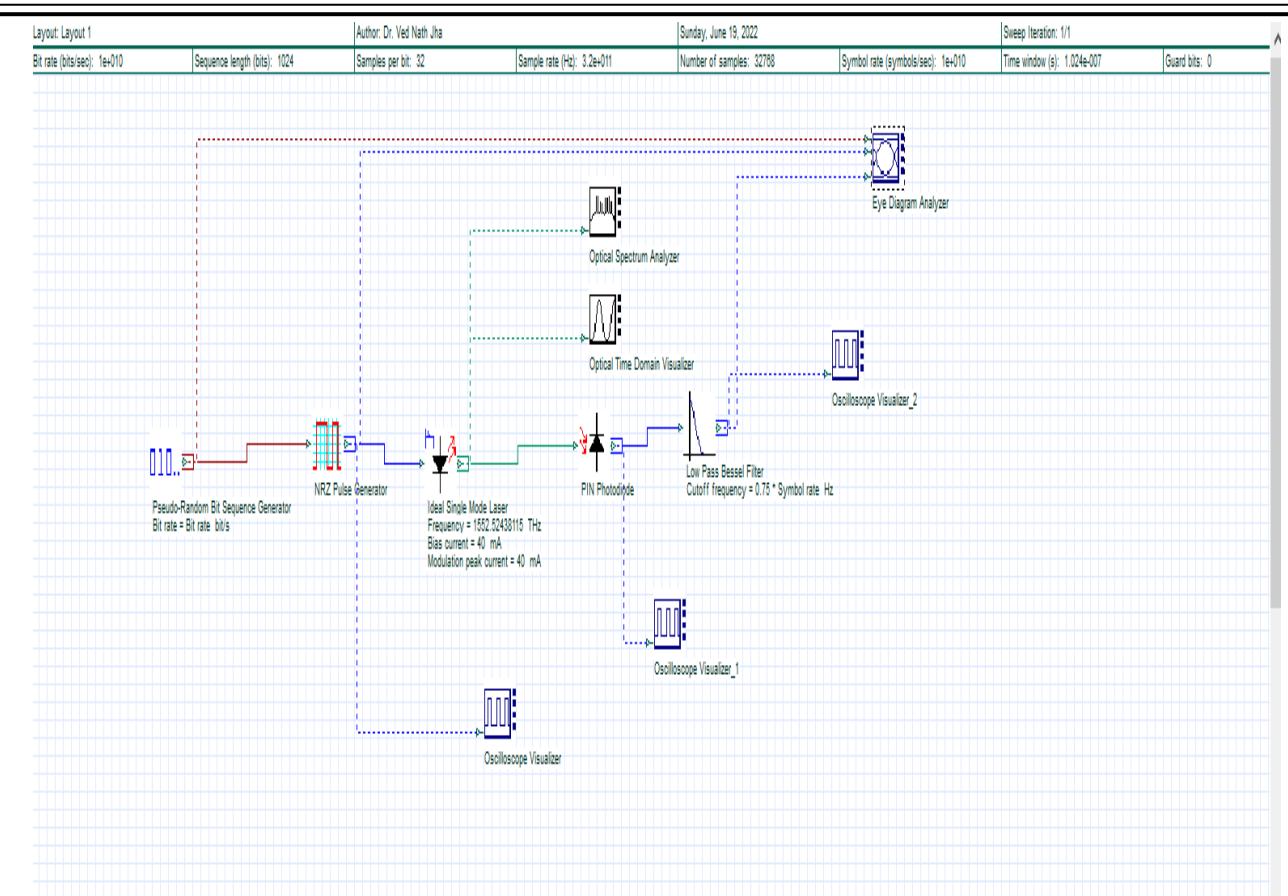
Figure 1: Design of optical transmitter with single mode LASER

3. SIMULATION RESULT AND EYE DIAGRAM ANALYSIS –

There are many different simulations conducted for different values of peak current of ideal single mode laser and we get the different values of Q-factor which are shown below in the different eye diagrams.
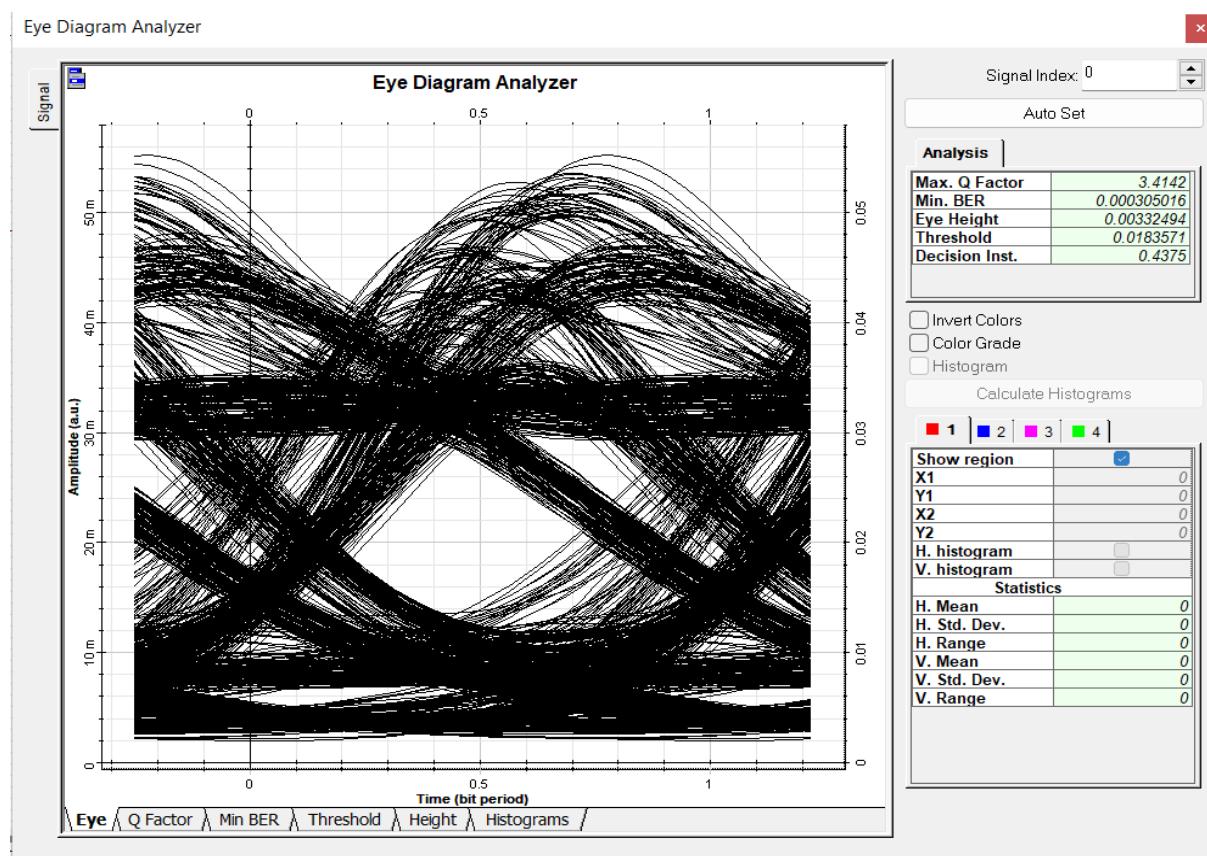

**Figure 2:** Eye diagram for the peak current of 20mA of single mode LASER
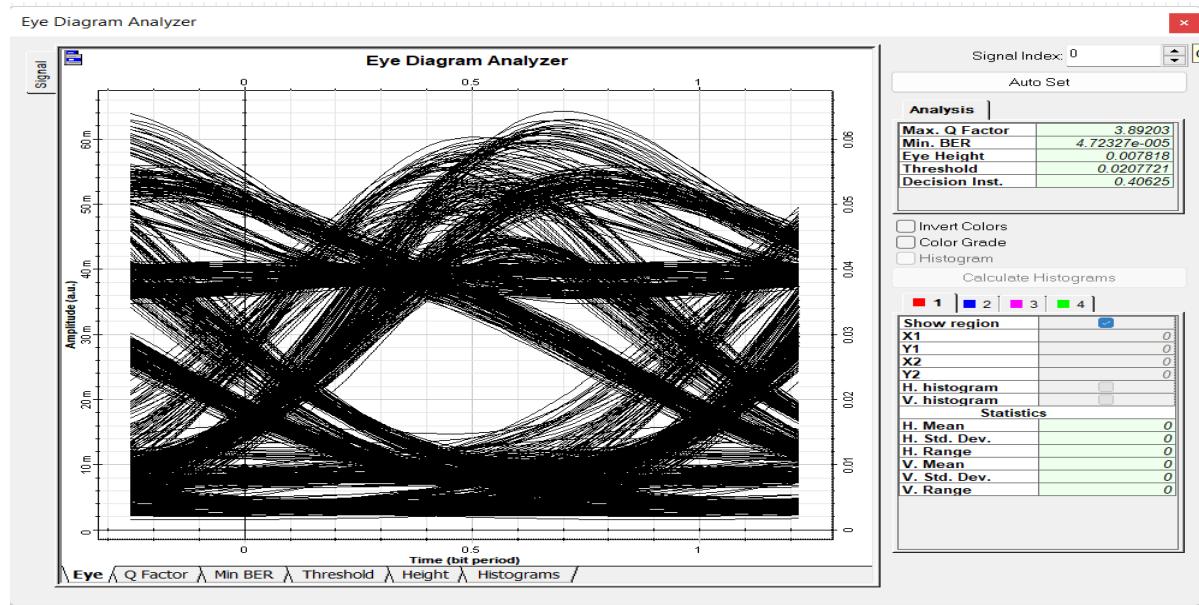
Figure 3: Eye diagram for the peak current of 25mA of single mode LASER
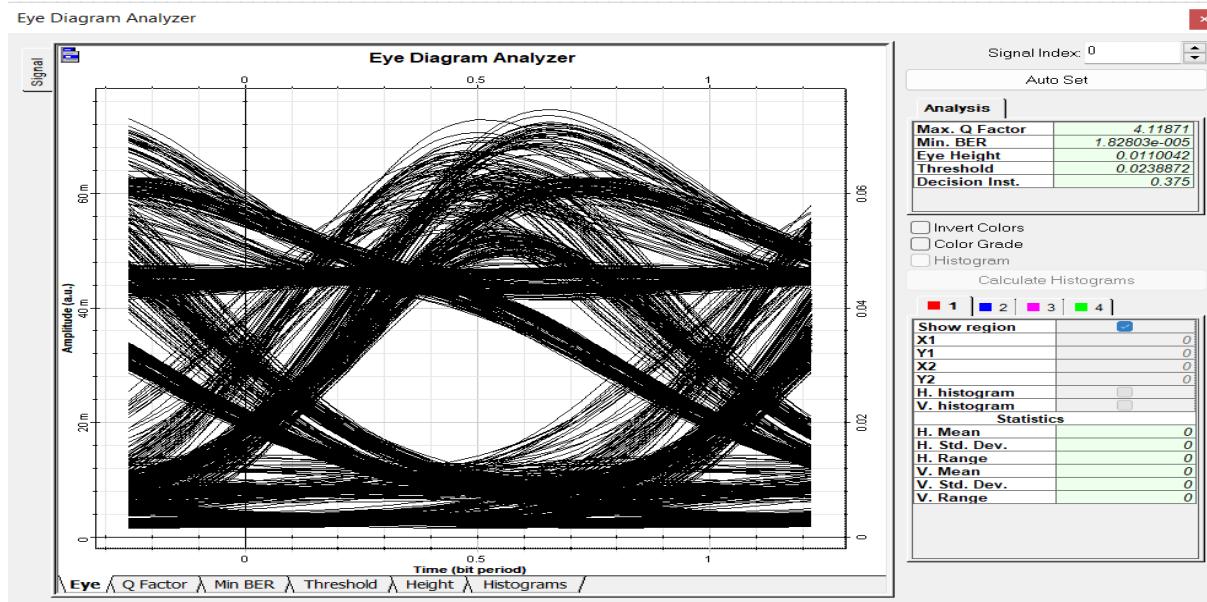
Figure 4: Eye diagram for the peak current of 30mA of single mode LASER
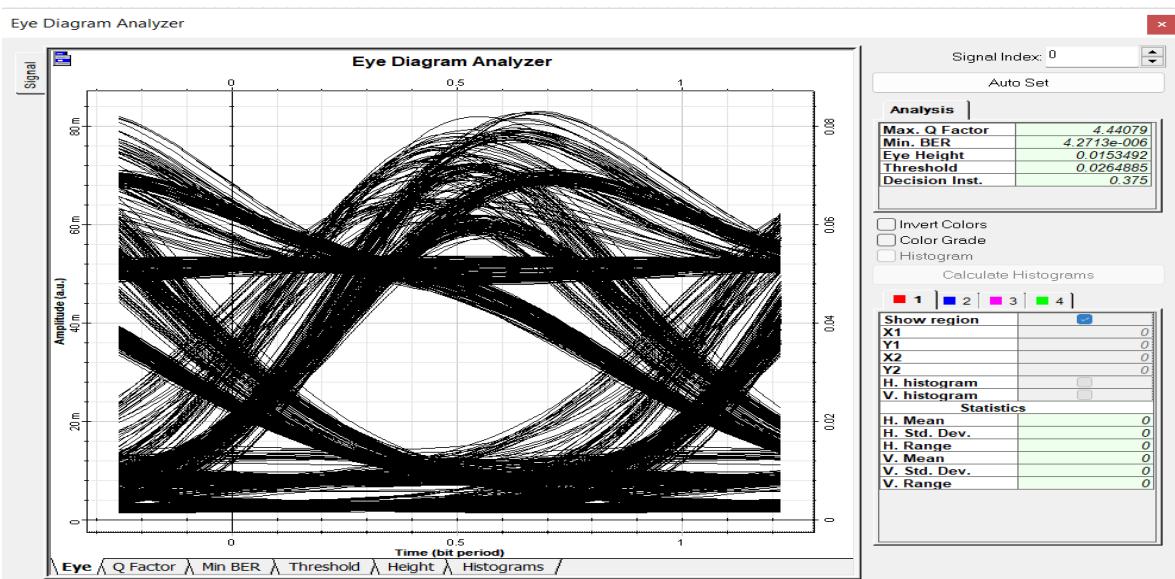
Figure 5: Eye diagram for the peak current of 35mA of single mode LASER
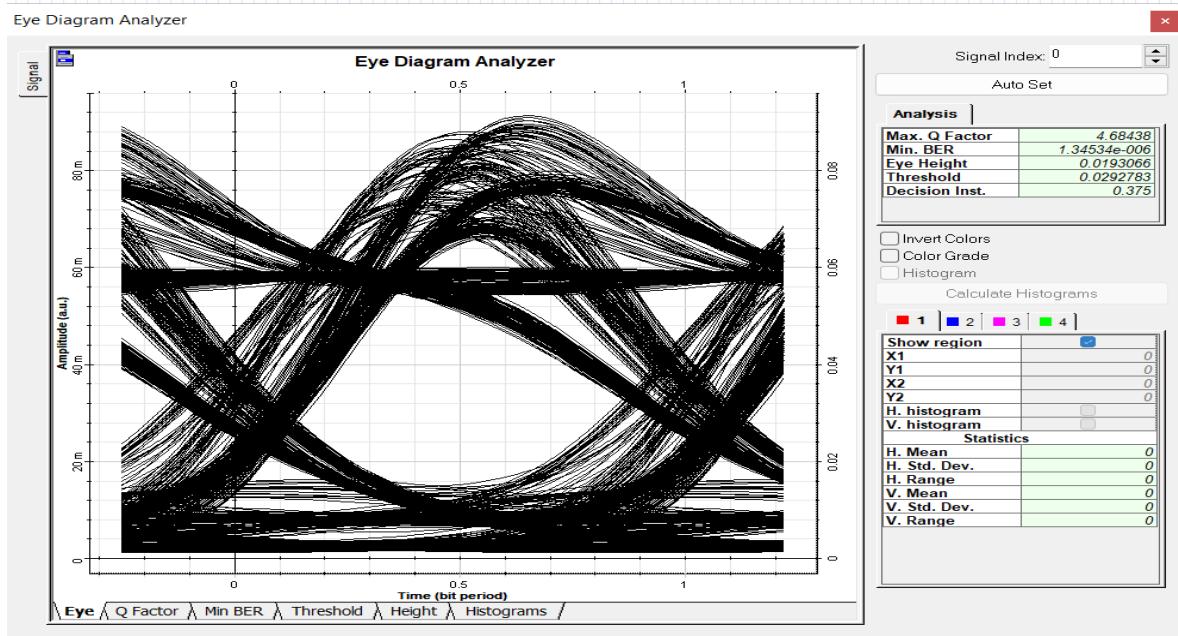
Figure 6: Eye diagram for the peak current of 40mA of single mode LASER
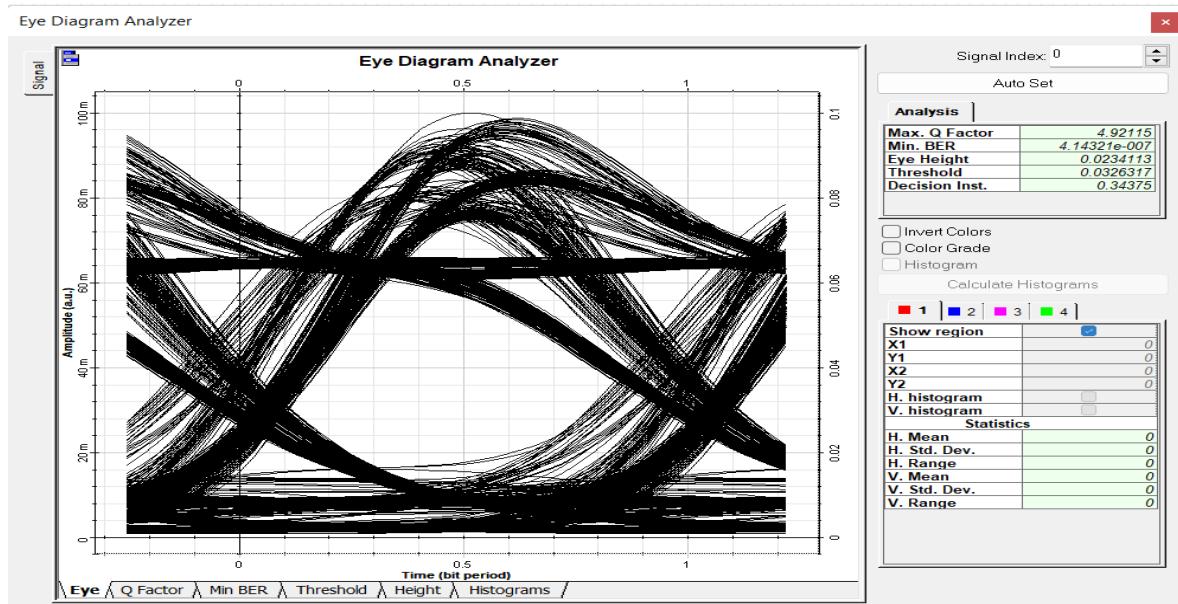

**Figure 7:** Eye diagram for the peak current of 45mA of single mode LASER
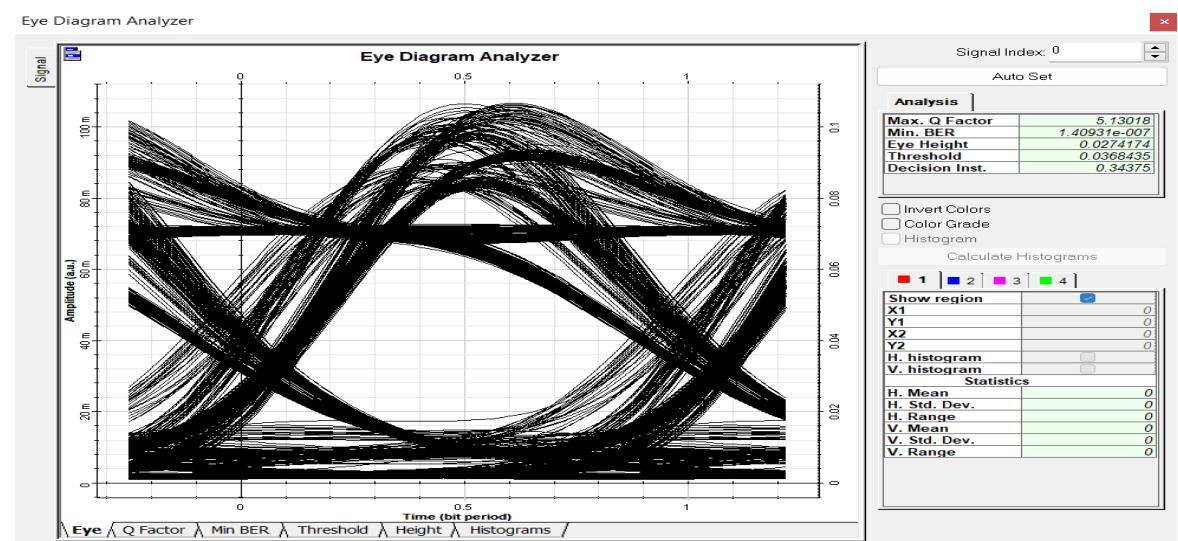
Figure 8: Eye diagram for the peak current of 50mA of single mode LASER

4. RESULT AND DISCUSSION

The simulation based on the varying peak current of single mode LASER from 20mA to 50mA with the up gradation of 5mA then we get the table-1 which shows the relation between peak current and Q-factor.

Table 1. Relation between peak current (I) and Q-factor

S.NO.	Peak Current(I) mA	Q-factor
1.	20	3.4142
2.	25	3.89203
3.	30	4.11871
4.	35	4.44079
5.	40	4.68438
6.	45	4.92115
7.	50	5.13018

5. CONCLUSION

In this research, we have established the relation between peak current of single mode laser and Quality factor of optical transmitter and result shown in different eye diagrams for each outcome.

So, for better performance of optical transmitter we increase the Quality factor of the system by increasing the peak current of single mode LASER.

Furthermore, this research will helpful to establish the better and stable optical transmission in this era of data demand and globalization.

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PREPARATION OF NEEM BARK EXTRACT CHARACTERISED BY DPPH SCAVENGING ASSAY FOR DETERMINING ANTIOXIDANT ACTIVITY AND CHEMICAL TESTS FOR IDENTIFYING ACTIVE CHEMICAL CONSTITUENTS

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ABSTRACT

In this research work Azadirachata indica bark extract was prepared by maceration process and solvent evaporation technique in two types of solvent water and methanol. After extraction, from 45 gm of Neem bark powder in 500 ml of methanol, 4gm of Methanolic neem bark extract powder and 45 gm of Neem bark powder in 500 ml of water 6 gm of aqueous neem bark extract powder were obtained. Antioxidant Activity was studied by DPPH (2, 2-diphenyl-1-picryl-hydrazyl-hydrate) scavenging assay of prepared physical mixture of methanolic and aqueous neem bark extract in 1:1 ratio. IC50 for 1:1 ratio of physical mixture of methanolic and aqueous neem bark extract was determined at 987.87 ± 4.98 µg/ml and standard ascorbic acid at 112.39 ± 0.69 µg/ml by DPPH scavenging assay. Chemical tests were done to confirm the structure for different chemical class of active constituents (saponins, steroids, terpenoids and tannins) in prepared Azadirachata indica bark extract and shown positive observation. Azadirachta indica (Family- Meliaceae) with its leaves and bark was authenticated from Department of Botany, Raiganj University, Raiganj, Uttardinajpur, West Bengal; Specimen Reference Number is SR/01 of AASM/H/300720211 dated on 2/04/2021. Objective of this study was to enhance value of neem plant in modern drug delivery system to formulate gel and therapeutics in wound healing.

Key words: Neem Bark Extract, DPPH scavenging Assay, Chemical Constituents.

INTRODUCTION

In Extraction process where menstrum as water and methanol and plant part neem bark were chosen for making extract preparation. Role of menstrum in extraction process helps to dissolve active constituents of plants. Surface area of neem bark extract was increased by size reduction process to obtain maximum amount of active constituents. Azadirachata indica was also known as neem, neem tree belongs to the mahogany family Meliaceae, the mahogany family consists of flowers in plant family of mostly trees and shrubs being shaped like straight-grained, reddish-brown timber of three tropical hardwood species which consisted of alkaloids, saponins, phenolic compounds that were active ingredients azadirachtin, nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salannin, quercetin etc. DPPH scavenging assay was widely accepted way to screen antioxidant activity of neem bark extract to determine *IC50 as how much the concentration of antioxidants was quantified the initial DPPH concentration by 50%. The lower IC50 quantified for the sample was measured as higher antioxidant activity.*

MATERIALS

Chemical Required:

Neem barks powder, Water, Methanol, Aluminium foil paper, Ethanol, Sodium Bi Carbonate, Neem Bark Extract, Chloroform, Sulphuric Acid, and Extract. 5% w/v Ferric Chloride. Chloroform, Sulphuric Acid, Neem Bark Extract. Physical Mixture of Methanolic neem bark extract and aqueous neem bark extract in 1:1 ratio.

Apparatus Required:

Cutting mill Laboratory grade, Weighing Balance, Filter paper, Beaker, Glass Rod, Hot Plate, Wide mouth plastic container, 50 ml pipette. 100 ml Beaker, Glass rod, Magnetic Stirrer, Digital Balance or electronic balance, White paper, Butter Paper, Universal pH indicator, thermometer, container, FT-IR , UV-Spectrophotometer (Microprocessor UV-VISIBLE Double Beam Spectrophotometer LI-270). For DPPH Scavenging Assay: Analytical balance, Citizen, USA (RRS/INS/DTL/01), Sonicator, LIFE CARE, India, RRS/INS/DTL/33, Cyclomixer, REMI,India, RRS/INS/DTL/15,Incubator,Bíovision,Índia,RRS/INS/MB/06, Micropipettes l000µl (RRS/INS/DTL/36) , l00µl (RRS/INS/DTL/37) , Gilson, India , 96 well Microtitre Plate, Tarsons, India and Automated microplate reader, Biotek, USA , RRS/INS/MB/05.

Method:

Preparation of Neem Bark Extract: (Reference No.1,2)

Synonym of Neem: Margosa, Neem, Mahaneem.

Biological Source: Azadirachta indica (Familiy- Meliaceae)

Geographical Source: Rajasthan in India, Asia, Africa and other tropical parts of the world.

Part used of Neem: Bark

**Image No.1** Neem Bark Powder.

Preparation of Methanolic Neem Bark Extract:

Menstrum: Methanol, **Plant tissue:** Neem barks powder, **Purpose:** To make extract.

Here below is the flow chart of Preparation for Methanolic neem bark extract:
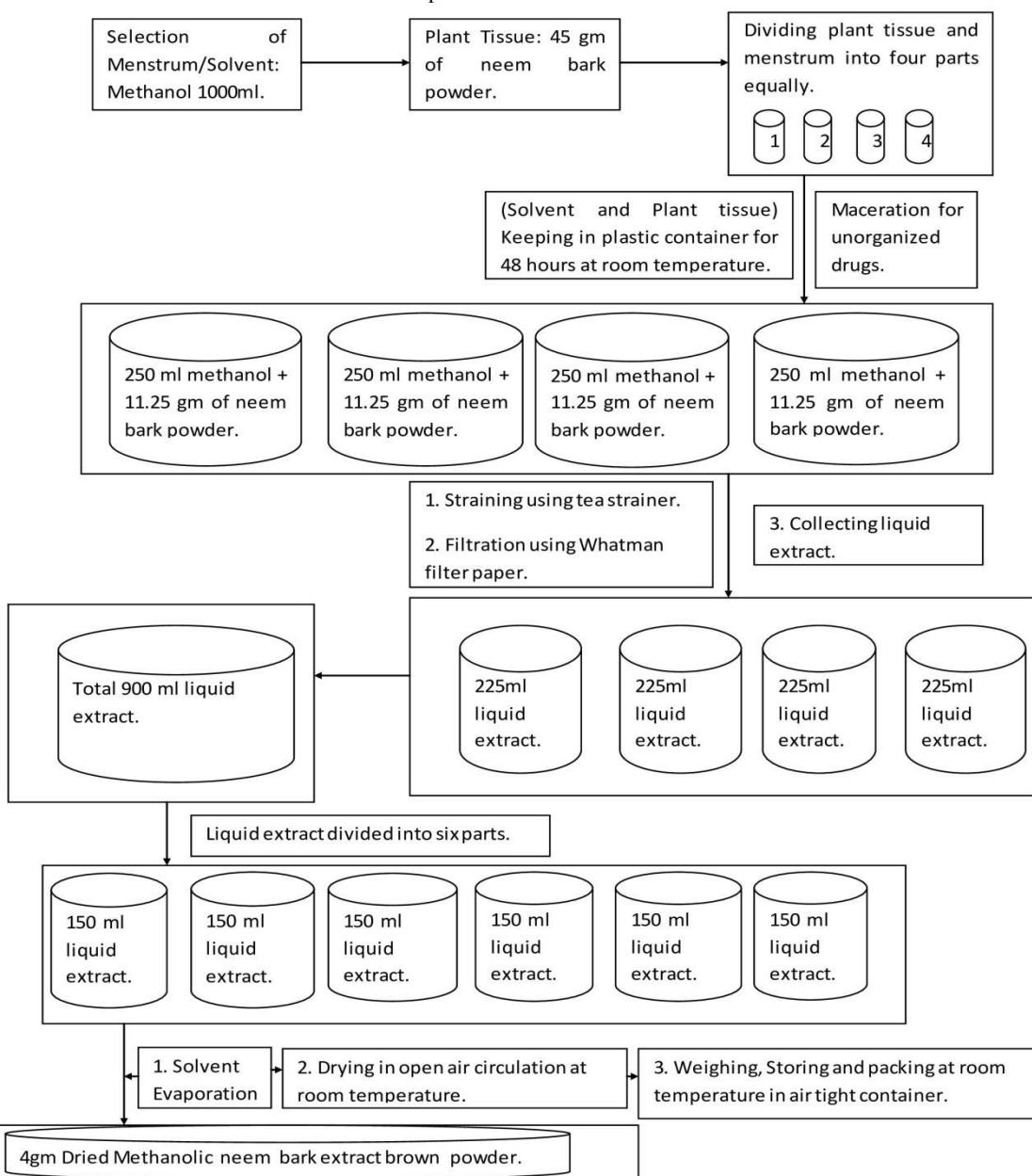
Image No.3: Preparation of Aqueous Neem Bark Extract:

Menstrum: Distilled Water, **Plant tissue:** Neem barks powder, **Purpose:** To make extract.

Here below is the flow chart of Preparation of Aqueous Neem Bark liquid extract:

Selection of Menstrum/Solvent: Quantity of Distilled water is 1000ml. → Plant Tissue: 45 gm of neem bark powder. → Dividing plant tissue and menstrum into four parts equally. [1] [2] [3] [4]

(Solvent and plant tissue) keeping in plastic container for 48 hours. at room temperature.

Maceration for unorganized drugs.

250 ml distilled water + 11.25 gm of neem bark powders.

250 ml distilled water + 11.25 gm of neem bark powders.

250 ml distilled water + 11.25 gm of neem bark powders.

250 ml distilled water + 11.25 gm of neem bark powders.

1. Straining using tea strainer.
2. Filtration using Whatman filter.

3. Collecting liquid extract.

Total 980 ml liquid extract. ← 245ml liquid extract. | 245ml liquid extract. | 245ml liquid extract. | 245ml liquid extract.

Liquid extract divided into five parts.

196 ml liquid extract. | 196 ml liquid extract. | 196 ml liquid extract. | 196 ml liquid extract. | 196 ml liquid extract.

1. Solvent Evaporation
2. Drying in open air circulation at room temperature.
3. Weighing, Storing and packing at room temperature in air tight container.

6gm Dried Aqueous neem bark extract black powder.

Image No.4

Image No.5 Methanolic Neem Bark Extract Powder.

Image No.6 Aqueous Neem Bark Extract black powder.

Determination of Antioxidant Activity by DPPH Scavenging assay: (Ref. No.4,5)

96 well microtiter plates were taken and 0.0l ml of different concentrations of test substance (mixture of aqueous and methanolic neem bark extract in 1:1 ratio) and standard (ascorbic acid) was added separately in the test and test blank wells. 0.0l ml of DMSO was taken as test sample and control blank. 0.2 ml of DPPH was added to the test and control whereas to the test blank and control blank 0.2ml of methanol was added in place of DPPH. Same procedure was repeated for standard by replacing test sample with standard. Test and control were performed in triplicates and test blank and control blank were conducted in singlet. The microtitre plate was incubated at 37 'C for 30 minutes. Absorbance was measured at 490 nm using microplate reader for both standard and test from 1000μg/ml - 62.5μg/ml concentration.

Chemical tests for chemical constituents of Neem Bark Extract: (Reference No.1)

Test for Saponins: In a test tube containing about 5ml of an Aqueous Neem Bark Extract and Methanolic Neem bark extract, a drop of Sodium Bi Carbonate solution was added. The test tube was shaken vigorously.

Test for steroids: (Salkowski Test.): 2 mg of dry extract was shaken with chloroform, to the chloroform layer sulphuric acid was added slowly by the sides of test tube.

Test for terpenoids: Powdered extract was treated with chloroform and few drops of Sulphuric Acid.

RESULT AND DISCUSSION:

Preparation of Neem Bark Extraect

Serial No.	Name of the product.	Total quantity of Neem Bark Powder taken to prepare extract in gm.	Total quantity of Menstrum used in ml.	Quantity of Extract Obtained.
1.	Methanolic Neem Bark Extract.	45	1000	4 gm.
2.	Aqueous Neem Bark Extract.	45	1000	6 gm.

Determination of Antioxidant Activity by DPPH scavenging assay

After performing antioxidant assay by DPPH method, following IC50 values for reference (ascorbic acid) and test substance (mixtures of methanolic and aqueous neem bark extract in 1:1 ratio) were obtained.

Chemical Tests for Neem Bark Extract:

Table No.1.

Serial No.	Test Substance.	Parameter.	IC50 $\mu g/ml$
1.	Mixtures of methanolic and aqueous neem bark extract in 1:1 ratio. (Test)	DPPH	987.87 ±4.98
2.	Ascorbic Acid (Standard)		112.39 ±0.69

Table No.2

Name of The Test.	Methanolic Neem Bark Extract.			Aqueous Neem Bark Extract.		
	Test for Saponins.	Test for Steroids.	Test for Terpenoids.	Test for Saponins.	Test for Steroids.	Test for Terpenoids.
Observation.	Formation of honey comb in upper layer was seen.	Formation of red color was seen.	Formation of red to yellow color was seen.	Formation of honey comb in upper layer was seen.	Formation of red color was seen.	Formation of red color was seen.
Result	Saponins present.	Steroids present.	Terpenoids present.	Saponins present.	Steroids present.	Terpenoids present.

CONCLUSION

Prepared neem bark extract was obtained from neem bark powder had shown mild antioxidant activity and confirmed by chemical test for chemical constituents of saponins , steroids and terpenoids.

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CORROSION, TRIBOLOGICAL AND MECHANICAL BEHAVIOR OF AL COMPOSITES WITH REINFORCED MATERIALS – A REVIEW

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ABSTRACT

The world is moving toward lighter materials in these days. The world is looking for materials with good performance in addition to light weight. The introduction of MMC has somehow led to a decline in the mechanical standards for acceptable performance, which include tensile strength, compressive stress, hardness, density, percent of elongation, impact, fatigue life, wear rate, coefficient of friction, etc. Al metal matrix composite performs well in this regard as well. Many researchers are now researching on hybrid composite materials. If more than one reinforcement is added to the matrix, the material is referred to as hybrid MMC. The material's mechanical and tribological qualities improved as a result of its introduction, and its production cost also dropped. This is why the automotive, defence, aerospace, and marine industries all use this material. This study provides a succinct overview of mechanical and tribological and corrosion research of hybrid composites made of Al alloys and reinforced with other components. This study looked into how adding reinforcement affected the material's various properties.

INTRODUCTION

The world of today is shifting toward more affordable, lightweight, and durable materials. This composite material was introduced to combat it. If at least two materials are combined via various techniques, the substance is referred to be a composite material. The material that is added to the base material is known as reinforcement, and the base material or the material with a higher volume percentage is known as the matrix. The composite material is referred to as metal matrix composite if the matrix is made of metal (MMC). There are many types of matrix accessible in the world, however due to its lightweight, good reflecting qualities, strength, impermeability, cost-effectiveness, and strong electrical and thermal properties, aluminium is seen to be an ideal matrix.

Metal matrix composites (MMCs) are composites where metals are utilised as the basis or matrix material and ceramics or organic compounds are added as reinforcement to improve the composite's qualities over those of the base metal. Due to their useful features and easy accessibility, MMCs such as aluminium matrix composites (AMCs), magnesium matrix composites, and copper matrix composites are currently in demand in a variety of applications including the automotive, aerospace, and electronics industries. The two types of MMCs that are most frequently utilised nowadays are aluminium matrix composites (AMCs) and hybrid aluminium matrix composites (HAMCs). Aluminum matrix composites are those types of composites that use nonmetals as reinforcements and aluminium or an aluminium alloy as the basis material (matrix). Reinforcements can be introduced in many forms, such as particles, whiskers, and fibres, and in weight percent or volume percent. Multiple reinforcements are added to the aluminium matrix in a hybrid aluminium matrix (HAMC). Due to their extremely high strength to weight ratio, superior wear resistance, high stiffness, higher fatigue resistance, controlled co-efficient of thermal expansion, better stability at high temperatures, and higher thermal and electrical conductivity compared to conventional metals and alloys, particles reinforced aluminium matrix composites are used in aerospace, automobile, and structural applications.

REVIEW OF LITERATURE

The impact of B4C and fly ash particles on the mechanical and tribological behavior of Al 359 composites has been explored by S. Mohankumar et al. (2019). Stir casting was used to create samples of Al359/B4C, fly ash reinforced composites, and fly ash particles. The samples underwent tensile strength, wear behaviour, and hardness testing. Due to the enhanced ceramic phase, the composites' hardness was higher than that of the base alloy. The friction coefficient decreased at 20 weight percent B4C and fly ash after increasing with higher B4C and fly ash percentages. According to the test results, the wear resistance of the composite materials the amount of B4C and fly ash particles grew, and the wear rate was noticeably lower for the composite material than it was for the matrix alloy. Under the various test settings of varying applied stress, five distinct wear mechanisms were discovered to be at work: wear grooves, abrasion, delamination, oxidation, and plastic deformation.

The corrosion and wear characteristics of Al-Mg-Si alloy matrix hybrid composites created with the use of rice husk ash (RHA) and silicon carbide (SiC) particles as reinforcements were examined, according to Kenneth Kanayo Alaneme et al. (2013). In order to prepare 5, 7.5, and 10 weight percent of the reinforcing phase using

Al Mg Si alloy as matrix, RHA and SiC were mixed in weight ratios of 0:1, 1:1, 1:3, 3:1, and 1:0. The wear behaviour of the composites was evaluated using coefficient of friction, while the corrosion behaviour was studied using open circuit corrosion potential (OCP) and potentio dynamic polarisation measurements. Scanning electron microscopy was used to identify the corrosion and wear mechanisms. The findings demonstrate that the influence of the reinforcing weight percent (5, 7.5, and 10 wt percent) utilised to create the Al-Mg-Si based composites on the corrosion behaviour of the composites in 3.5 percent NaCl solution was not constant. It was clear that in the majority of cases, the use of hybrid reinforcement of RHA and SiC increased the composites' resistance to corrosion in a solution of 3.5 percent NaCl. The main corrosion mechanism was determined to be preferential dissolution of the more anodic Al-Mg-Si alloy matrix near the Al-Mg-Si matrix/RHA/SiC particle interfaces. The hybrid composites' wear resistance and coefficient of friction were comparable to those of the Al-Mg-Si alloy matrix supplemented simply with SiC.

Through the use of galvanostatic and potentiodynamic polarisation techniques, Sai Krishna Padmata et al. (2022) investigated the anodic behaviour of pre-oxidized and non-oxidized CuAl-based anodes (Cu10Al and Cu9.8Al2Mn) in KF-AlF3-Al2O3 melts. The alloy compositions underwent a brief (8 h) galvanostatic polarisation at 800 °C with an applied current density of 0.4 A/cm2, then the alloys underwent a brief (8 h) oxidation process at 700 °C. Sweep rates of 0.01 V/s were used to record the potentiodynamic curves. After the experiment, SEM observation was done on the anode to analyse the phases of the scales generated on the alloys. XRD examination was done on frozen melt samples obtained on the surface of the anode. All of the anode materials maintained a constant potential (in relation to Al/AlF3) of 2.30 to 2.50 V. The information obtained through potentiodynamic polarisation was used to calculate the anodes' corrosion rates. When compared to anodes without pre-oxidation treatment, pre-oxidized anodes have a low corrosion rate.

K.G. Manjunatha and M. Sravanthi (2018) The corrosion behaviour of Al 7075 metal matrix composites (MMCs) reinforced with silicon carbide (SiC) and graphite as cast and heat-treated was investigated in acid chloride, acid sulphate, acid nitrate, and neutral chloride medium at room temperature for 24 hours by weight loss method for 7 days. The corrosion rate was determined based on density calculated by the use of rule of mixture formulae, and graphs were plotted with the assistance of origin-8 software by plotting corrosion. The studies have shown that the corrosion rate of Al-7075 metal matrix composites is lower in heat-treated specimens compared to as-cast specimens. It has also been noted that the corrosion rate is lower in neutral chloride medium compared to other acid mediums in both the as-casted and heat-treated Al-7075 metal matrix composites.

According to H.M. Zakaria (2014), numerous Al/SiC MMCs with varying SiC particle average sizes, generally 11, 6, and 3 μm, and volume fractions up to 15 vol. percent were made using the traditional powder metallurgy (PM) approach. Al/SiC metal matrix composites (MMCs)' microstructural and corrosion behaviour were examined in relation to the size and volume percent of SiC particles. According to the findings, Al/SiC MMCs had a higher density than pure Al matrix. Static immersion corrosion experiments performed on Al/SiC MMCs in 3.5 weight percent NaCl aqueous solution at various temperatures revealed that the Al/SiC MMCs exhibit greater corrosion resistance than the pure Al matrix at ambient temperature. The corrosion rate of the Al/SiC MMCs is decreased by decreasing the size of the SiC particles and/or increasing the volume fraction of the SiC particulates. In contrast, the Al/SiC composites showed faster rates of corrosion than the pure Al matrix at 50 °C and 75 °C.

Yaya Zheng, Binghui Luo, Zhenhai Bai, Juan Wang, and Yuan Yin (2017) state that they used hardness tests, scanning electron microscopy (SEM), potentiodynamic polarisation measurements, and high-resolution transmission electron microscopy to examine the effects of Si addition on the precipitation hardening behaviour and evolution of intergranular corrosion (IGC) of Al-Mg-Si alloys (HRTEM). By increasing the density of the β" (Mg5Si6) phase within the grains, an increase in the Si content significantly raised the peak hardness of the Al-Mg-Si alloys. MgSi particles, Si particles, Al-Fe-Mn-Si intermetallics, and the precipitate-free zone were the microstructures that had an impact on the IGC performance (PFZ). The Al-Mg-Si alloys' large electrochemical potential difference between the MgSi particles and solute-depleted zones was primarily blamed for their susceptibility to IGC. Due mostly to an increase in the MgSi precipitates at the grain boundaries, more Si improved the alloys' IGC susceptibility.

According to Suresh Gudipudi's experimentation in 2020, adding more B4C to an AA6061-B4C composite system is not necessarily the best option for enhancing characteristics due of problems with integration, distribution, and interfacial wetting during stir-casting. In this situation, ultrasonication is seen as a possible substitute to obtain the benefits of microstructural modifications, which in turn increase the characteristics. Individual B4C distribution and microstructure refinement were attained at 4wt% B4C in the study. At 4 weight

percent B4C, the enhanced specific ultimate and compressive strengths were measured at 36.32 and 43.92 percent, respectively, while the improved specific Vicker's and Brinell hardness were measured at 53.41 and 50.89 percent, respectively.

In this study, Chong Li, Xiangfa Liu, and Yuying Wu investigate the refinement and modification performance of the Al-3P master alloy on main Mg_2Si in Al-12.67Mg-10.33Si alloys. According to the experimental findings, adding 3% of Al-3P master alloy to Al-Mg-Si alloys will produce the best results. Primary Mg_2Si particulates' morphologies shift from dendritic to polygonal shape, and their typical diameters drop from ~100 to~20μm. From 252 to 275MPa, the ultimate tensile strength also rises. Additionally, this research specified the technological conditions for melt treating; the treatment temperature is 850 C, and the holding period is 30 min. According to EPMA findings, AlP particles serve as the principal Mg_2Si nucleus.

Researchers Rahul Gupta, Tarun Nanda, and O. P. Pandey (2021) examined the dry sliding wear behaviour of stir-cast aluminium matrix composites (AMCs), which contain ceramic particles as reinforcement and LM13 alloy as the matrix. Synthetic ceramic particles (B4C) and natural ceramic particles were employed individually as reinforcement materials in ceramic structures (ilmenite). Optical micrographs of the matrix material revealed homogeneous dispersion of the reinforced particles. The morphology of eutectic silicon was transformed to a globular type by the addition of reinforced particles, which also reduced the grain size. B4C reinforced composites (BRCs) demonstrated the greatest improvement in AMC hardness. Because of the strong matrix-reinforcement interfacial bonding brought on by the emergence of interfacial compounds, ilmenite reinforced composites (IRCs) demonstrated the greatest coefficient of friction reduction values. Comparing composites to basic alloys, the dry sliding wear behaviour of composites was greatly improved. High dislocation density was observed around filler particles in BRCs due to the low density and high hardness of B4C particles. The limited thermal conductivity of ilmenite particles, on the other hand, led to early oxidation and the development of a tribo-layer on the surface of IRCs. Consequently, despite the fact that the mechanisms at play were extremely different, both types of reinforcements improved the wear characteristics of AMCs. In order to produce wear-resistant composites, low-cost ilmenite particles can be utilised as a substitute to expensive B4C particles as fillers.

Friction stir processing was employed by N. Subramani, R. Hardass, R. Krishnan, N. Manikandan, and A. Baskaran (2021) to create an aluminum-based hybrid composite (FSP). Aluminium alloys are widely utilised in the maritime, concrete, transportation, and aircraft industries due to their excellent strength-to-weight ratio. Friction stir processing was used to create friction strengthened metal matrix composites (PRMMC), which are composed of A6061 and its reinforcements B4C and SiCp particles (FSP). Hardness testing and optical microscopy were utilised to characterise the samples. According to the findings, the uniform distribution of SiCp/B4C elements in the A6061 matrix through the FSP method and subsequent heat treatment can improve the mechanical properties of samples. Therefore, pretending the mechanical performance of a prepared new specimen is very important to assess the protection of the plate.

According to Dr. Sumathy Muniamuthu et al. (2016), aluminium alloys are used extensively in the aerospace and automotive industries because of their high strength to low weight ratio, as well as their favourable mechanical characteristics, which include superior corrosion and wear resistance as well as low thermal expansion when compared to other metals. The major goal of their research was to better understand how processing of the alumina particle (Al2O3) as reinforced in aluminium matrix affected the mechanical properties of metal matrix composites (MMC) based on aluminium, such as impact strength and hardness. The alloy 7075 aluminium, in which aluminium serves as the basic element, was selected as the matrix alloy. There have been four alternative weight ratios of Al2O3 to aluminium matrix proposed for the task (weight fractions are 2 percent, 4 percent, 6 percent and 8 percent). Additionally, stir casting setup and heat treatment were required for the preparation of the metal matrix composite.

The wear behaviour of a unique combination of aluminium 7075 reinforced with boron carbide (B4C) in nano form was discussed by T.H. Manjunatha, Yadavalli Basavaraj, and V. Venkata Ramana in 2021. These composite materials are widely used today to meet a variety of industrial applications, particularly where the alloy's weight, mechanical capabilities, and wear characteristics have a big impact on the final product. Base metal Aluminium 7075 reinforced with B4C in nano form in varying weight percentages was used in the study (3 to 12 percent). The examples were created using a stir casting procedure in accordance with ASTM standards, and pin on disc testing was used to assess how they would behave under wear. To optimise the process parameters for the scenario, the taguchi method was used. In order to study the effects on wear, the process takes into account four factors and four levels, as well as the composition of nano B4C, which is 3 percent, 6 percent, 9 percent, and 12 percent. In addition, load variations in steps are 10, 20, 30, and 40 N, and

the speeds chosen are 100, 200, 300, and 400 rpm, respectively. Post experimentation analysis done after the experiment showed that the presence of nano B4C particles significantly reduced wear on the samples.

CONCLUSION

Hardness, impact, tensile strength and compression strength increased due to addition of reinforcement material to the base material. These value also increased further increase in weight percentages of B4C. But due to increase in weight percentages these value decreased in case of SiC. Due to increase in temperature, % of Elongation increases but tensile strength and compression strength decreases at high temperature in both the cases because of supplementary slip systems. The wear resistance of the composite materials the amount of B4C and fly ash particles grew, and the wear rate was noticeably lower for the composite material than it was for the matrix alloy. Under the various test settings of varying applied stress, five distinct wear mechanisms were discovered to be at work: wear grooves, abrasion, delamination, oxidation, and plastic deformation. The corrosion rate of the Al/SiC MMCs is decreased by decreasing the size of the SiC particles and/or increasing the volume fraction of the SiC particulates. In contrast, the Al/SiC composites showed faster rates of corrosion than the pure Al matrix at 50 °C and 75 °C. It has also been noted that the corrosion rate is lower in neutral chloride medium compared to other acid mediums in both the as-casted and heat-treated Al-7075 metal matrix composites.

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STOCK MARKET LINKAGES AND CAUSAL RELATIONSHIPS: EMPIRICAL INVESTIGATION OF EM7 ECONOMIES

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ABSTRACT

Diffusion of information in the present era has become very fast, whether it is related to natural phenomena or human activities. Due to the technological advancement and fast face globalisation and liberalisation, events happening in financial markets are no exception, especially due to electronic stock exchanges and free flow of capital and financial information across borders. The present study aims to examine return patterns and find inter linkages/integration among the stock markets of seven largest emerging economies popularly known as EM7 (India, China, Russia, Brazil, Indonesia, Mexico and Turkey) by examining the monthly return data from Jan 2010 to Dec 2019. The study used descriptive analysis, correlation analysis, regression analysis and causality test to attain its objectives. The results indicate that EM7 stock markets are not interlinked, suggesting markets are quite segmented and there is scope for fund managers and both international and domestic investors to reap the advantages of portfolio diversification and mitigate the risks associated with their investments.

Keywords: Causality, correlation, EM7, integration, portfolio diversification, stock markets

1. INTRODUCTION

One of the most impressive technical developments in the most 20 years has been the stunning reduction in the time it takes to diffuse information around the world and the huge growth in the associated market for information (Petraki & Zalewska, 2009). The diffusion of the information is becoming so fast and accurate that within the blink of eye, the information whether related to natural phenomena or human activities happening in one part of the world is transmitted to the other part of the world. The events in the financial markets are no exception, particularly due to the emergence of the electronic stock exchanges in almost every part of the world. Today due to the concepts of the globalisation and liberalisation and introduction of new technologies and financial instruments, the stock markets around the world behave or work like a one integrated market. Markets around the world are integrated and interconnecting due to the effects of globalisation on international economic activities at very fast pace (Kumar, et.al, 2019).

Antoniou et al (2007, as cited in Ahmed, 2014) argues that international financial crisis, in the recent periods caused by localalised crisis such as collapse of Russian bond market, Asian financial crisis, the more recently US financial crisis have made it important to understand the stock market integration. The area of stock market integration has been a topic of great interest among the researchers; particularly in case of development countries (see for example Kasa 1992; Kim & Wadhwani, 1990; Eun &Shim, 1989; Liu & Pan 1997; Taylor & Tonks, 1989). The study of the existence of inter linkages among international capital markets has serious implications for portfolio diversification as well as macroeconomic policies of individual countries (Suchismita Bose, 2005). Due to the free flow of capital across borders investors today hold securities of different multinational companies across different parts of the world to reap the benefits of diversification in mitigating various risks associated with the investments. The diversification policy will pay only in case of segmented or less correlated capital markets as Kasa, 1992 stated that, if share markets share a common trend, there will be no long term gains to international diversification. Where as if markets are segmented, the asset pricing relationships varies across countries & returns would be determined by domestic risk factors (Hedi, 2006). Much of the empirical literature on stock markets integration is hovered around development block of the world. As put by Sing & Sing, 2016), post 2008 US financial crisis period is marked by increasing capital flows to the emerging markets due to unconventional monetary policy initiatives undertaken in major emerging markets. Emerging markets provide portfolio and fund managers a new way to enrich and optimise their portfolios, and as they grow and become mature, they are expected to become more sensitive to the volatility of other stock markets.

In light of the above discussion the present study aims to explore inter linkages among seven largest emerging economies namely India, China, Russia, Brazil, Indonesia, Mexico and Turkey, as reported by the World Bank report (2018). The rest of the paper is organised as follows .Section 2 gives brief overview of EM7 economies. Section 3 gives the review of the relevant literature on stock market integration. Section 4 presents the methodology and data description. Section 5 presents empirical results and discussion and followed by the conclusion and references.

2. BRIEF OVERVIEW OF EM7 ECONOMIES:-

As per the world bank report 2018, Global economic prospectus; the turning of the Tide 61-78, the seven largest emerging economies are Brazil, china, India Russia, Indonesia, Mexico and turkey collectively called EM7 economies. These economies compose 25% of Global GDP and 50% of world population. The report further says that the role of EM7 has grown rapidly since 2010 and accounted for more than 50% of Global growth, 18% of Global FDI and 19% of Global trade. On the production side EM7 command dominance among the various commodities across the world. India is the largest producer of cotton and second largest producer of fertilisers. China has dominance over coal production being the largest coal producer of the world among other metals and rice. Russia is the 3rd largest producer of oil and 2nd in terms of natural gas and aluminium. Brazil is the largest producer of sugar and coffee and has good lead in the soya bean products and bauxite. Mexico being the largest producer of silver while Indonesia dominates world in terms of tin palm oil and rubber production. On the consumption side also EM7 commands dominant share in global consumption aginst G7 in coal, precious metals, base metals and most food items like rice, wheat and soya bean (World Bank report).

Given their sixe and integration, growth in EM7 could have significant cross boarder spill over and one percentage point increase in EM7 growth is associated with 0.9 percentage point increase in growth in other emerging and frontier markets and 0.6 percentage point increase in world growth at the end of 3 years (Huidrom, Kose & Ohnsorge, 2017). Keeping in view the development the development and growth potential of the group, there is need to understand the level of market segmentation among these emerging economies. Further these economies are on the top of the list of international investors and fund managers community given their enormous growth potential and more specially for reaping the diversification benefits by shifting their capital base from developed economies to emerging economies. Assessing the level of, market integration among these emerging economies will assist global investors and portfolio managers in diversifying their portfolio investment among these emerging economies. Further policy makers and regulatory authorities in these countries could get insights about their policy response against global financial risks and economic crisis.

3. REVIEW OF LITERATURE

A number of studies have been conducted to examine inter linkages between different stock markets of different countries by using different methodologies.

Kasa(1992) studied the stock markets of developed countries of US, Japan, Germany, and Canada and documented that there s common stochastic trend among the stock markets of these countries and are perfectly correlated in the long run.

Using cointegration and causality analysis, Roca & Selvanathan (2001) accessed weekly data of Australia and three south Asian countries namely Singapore, Taiwan and Hong Kong for examining the integration among them. They however failed to find any short run and long run linkages among the stock returns of these countries.

Ratanapakoran and Sharma (2002) conducted a detailed study of 42 markets across different geographical regions of US, Europe, Asia Pacific, Latin America and Middle East. Dividing his study into pre and during Asian Crisis, he argued that there are no long run relationships for the pre crisis period while during the cross period all the stock markets were more integrated both in long run and short run. Chen, Firth and Rui (2002), studied Latin American markets of Argentina, Brazil, Colombia, Chile, Venezuela and Mexico to find interdependences among them. The sample period for the study was 1995 to 2000. The results of the study indicated that there is cointegration among the markets which means there is long run association among the stock markets, thus limiting the scope for diversifying risks among these markets.

Lim et al (2003) confirmed ASEAN markets are highly integrated which limits the diversification benefits among those markets.

Suchismita Bose (2003), investigated the linkages or integration of Indian stock market with that of US and Asian markets. Indian stock market was found to be highly correlated with majority of the sample countries except Japan and US. They argued that integration of Indian stock market increased to a good extent particularly after structural reforms of 1991.

Lamba (2005), examined long run relationship among south Asian stock markets of India, Pakistan and Sri Lanka and developed equity markets of us, us and Japan. The study found Indian stock markets are influenced by developed markets while Pakistan and Sri Lankan markets are segmented which means these markets are not influenced by the developed markets. He concluded that South Asian markets developing interdependencies at a slow pace.

Yang et al (2006) documented that stock market integration changes over time in terms of both degree and nature. He examined the impact of Russian financial crisis of 1998 on the stock market linkages among USA, Germany and other European markets and concluded that integration among the markets has augmented after the crisis. Hassan et al (2008), argued that Karachi stock exchange is independent with that of UK, USA, Germany, Italy, France, Japan, Canada and Australia and hence offers diversification opportunities to the investors of those developed countries.

Kucukcolak (2008) examined daily data to explore integration of Turkish stock market with stock indices of Germany, France and Greece. By using cointegration technique, he concluded that Turkish market is not integrated with that of Germany and France; however Turkish and Greece markets were found to be interlinked.

Sharma and Bodla(2011), using VAR and Causality analysis documented the absence of any conintegraton among the stock markets of India , Pakistan and Srilanka.Taneja (2012), stated that emerging stock markets like India are greatly influenced by developed stock markets particularly US, both in direction and movement.

Ahmad, (2014) used cointegration technique and found no evidence f integration among money market and exchange rate markets of US and Pakistan.

Prakash and Kumar (2014) investigated the presence of dynamic linkages among SAARC countries and global economy. The study however found presence of long run and short run interdependence among the markets which limits the scope of diversification among these markets.

Singh & Singh (2016) examined dynamic linkages between the stock markets of US and BRIC by dividing study into different time frames of pre, during, and post crisis period of 2007. The study found common stochastic found only during pre and post crisis period, however crisis and full sample results were marked b the absence of any co-movement among the markets.

Panda and Nanda (2017), examined interdependence among seventeen stock markets of western Europe over a weekly data and found that almost 58% of stock markets are interlinked and negated any diversification benefits.

Singh and Shrivastav (2017) found weak evidence of financial integration among Indian and Australian stock markets.

Kumar et al (2019) studied inter-linkages among various key stock markets of world including both developing and developed stock markets. The study used Johenson cointegration technique and found very insignificant indications of cointegration among the sample markets. The study concluded that world stock markets do not share a common stochastic trend and are driven by country specific factors.

From the above literature it is evident that there are conflicting results regarding the level of integration among the various stock exchanges of the world, particularly the developing ones. Therefore present will attempt to fill that gap.

4. RESEARCH METHODOLOGY

I. Data Description

The present study attempts to explore return linkages or financial market integration among EM7 economies namely India, china, Brazil, Russia, Indonesia, Turkey and Mexico. The study will use time series data covering a period of ten years starting from Ist Jan 2010 to 31Dec 2019. The data consists of the monthly closing prices of the major stock indices of the sample countries. We selected one stock exchange from each country as a representative of the stock market of that country. The stock index and the source of the data for each country are presented in table 1.

Table 1

Country	Stock exchange	Stock index	Source
India	Bombay stock exchange	SENSEX	Yahoo finance
China	Shanghai stock exchange	SSE Composite	Yahoo finance
Russia	Moscow exchange	MOEX	Yahoo finance
Brazil	Brasil sao Paulo exchange	IBOVESPA	Yahoo finance
Indonesia	Indonesia stock exchange	JCI	Yahoo finance
Mexico	Mexican stock exchange	IPC Mexico	Yahoo finance
Turkey	Istanbul stock exchange	BIST 100	Yahoo finance

The data will be converted into log return series for subsequent analysis by using the following formula:

Rt= log(pt)-log(pt-1)*100

Where ,

Rt=log return

Pt= closing price of the current month

Pt-1= closing price of the previous month

Log return for each country will be denoted as LRIN(India), LRCH(China), LRBR(Brazil), LRRU(Russia), LRIND(Indonesia), LRMX(Mexico) and LRTR(Turkey)

ii. Econometric Techniques:

a) Descriptive statistics: In order to get the idea about the basic characteristics of the data, descriptive statistics are generated for all the indices in their levels. It will provide important information on risk and return pattern among the markets and more importantly the normality check through Jerque bera statistic to see whether observations are normally distributed or not.

b) Unit root test: Before proceeding forward for further analysis, it is necessary for the time series data to be stationary, because non stationary data will tend to produce spurious and non reliable results, if not dealt with. In order to confirm whether the data is stationary or not two formal tests namely ADF and PP tests are performed. ADF test is developed by Dickey and Fuller (1979). The test works on the hypothesis that the series contains a unit root i.e. Series is non stationary where alternative hypothesis is that series is stationary. If the calculated test statistic is less than the critical value, the null hypothesis is rejected and stationary of the data is confirmed. In case the null hypothesis is accepted, the series will be differenced d times in order to make it stationary which is also referred to as order as integration where d >1. The PP test is developed by Peter C.B Philiips and Pierre Perron (1988). Since ADF test assumes that dependent variable has no autocorrelation, PP takes lags of the variable to absorb any sort of dynamic structure present in the dependent variable ensuring that is no autocorrelation. The PP can work with serially correlated error terms and can handle heteroskedasticity. This test corrects test statistics by changing the t-ratio of the coefficient, making serial correlation useless. The test works on the same hypothesis as ADF test. Further analysis will be carried on stationary data.

c) Correlation analysis: Correlation analysis is performed to see any kind of inter linkages among the stock returns of the sample countries. The study uses Karl Pearson's co-efficient of correlation. Correlation matrix is drawn to analyse any association or co movement among the indices of the developing economies. Correlation on the other hand, does not reveal anything about the cause-and-effect relationship.

d) Regression analysis: Multiple regression analysis is performed by regressing each stock index return on other indices to see which country's stock returns are influenced by other stock returns or impact the stock returns of other countries. In other words regression analysis will help to determine whether the returns of a particular index of a country are significantly determined by other countries of the study. For the purpose, each stock index will be treated as dependent variables and other six indices as independent variables. Seven regression models are determined for seven countries under the study as where each model or regression equation models the returns of one country as dependent variable and remaining six as dependant variable.

e) Granger causality Test: Granger Causality test was proposed by Clive Granger in 1969. The test is used to determine whether a prior event or occurrence causes a subsequent occurrence of a different variable. Unlike regression, the test evaluates the ability to predict future values of a time series from previous values of another series. The test is used to study causation or lead lag relationship among the variables. If the current value of Y can be described by past values of X, including past values of Y, then X is said to be the granger cause of Y. In other words, including previous X values can help forecast Y more accurately. To better predict Y, a VAR model includes not only the previous values of Y but also the past values of X. For example in case of two variables X and Y, following regression model is applied to run Granger Causality Test-

$$Y_t = a_0 + a_1 Y_{t-1} + ... + a_p Y_{t-p} + b_1 X_{t-1} + ... + b_p X_{t-p} + u_t \qquad (1)$$

$$X_t = c_0 + c_1 X_{t-1} + ... + c_p X_{t-p} + d_1 Y_{t-1} + ... + d_p Y_{t-p} + v_t \qquad (2)$$

In case of equation 1, null hypothesis is $b_1 = b_2 = ... = b_p = 0$, which means X does not granger cause Y. In case of equation 2, null hypothesis is $d_1 = d_2 = ... = d_p = 0$, which means y does not granger cause X. In each case, a rejection of the null implies there is Granger causality. On the basis of causality test, three types of results can be obtained-unidirectional causality, bidirectional causality and independence (no causality)

5. EMPIRICAL FINDINGS

Table 2: Descriptive statistics of return series of EM7

	LRIN	LRCH	LRBR	LRRU	LRIND	LRMX	LRTR
Mean	0.007773	0.007922	0.004718	0.006416	0.006368	0.002276	0.006210
Median	0.005209	0.004287	0.006066	0.010602	0.011786	0.005118	0.007274
Maximum	0.110416	0.187024	0.156724	0.165326	0.127592	0.076310	0.131277
Minimum	-0.112451	-0.256814	-0.126210	-0.123421	-0.094395	-0.119174	-0.143907
Std. Dev.	0.042833	0.062764	0.056106	0.046696	0.039133	0.033930	0.063013
Skewness	-0.085847	-0.282129	0.062973	-0.189463	-0.543313	-0.382651	-0.104474
Kurtosis	3.025219	5.500225	2.893088	3.437920	3.533987	3.409648	2.251596
Jarque Bera	0.149319	32.57384	0.135325	3.868792	7.268408	4.191912	2.993681
Probability	0.928060	0.000000	0.934576	0.144512	0.026405	0.122953	0.223836
Coefficient of variation	5.510485	7.922747	11.891901	7.278055	6.145258	14.90773	10.14702

Table 2 shows the descriptive statistics of the return series of EM7 countries. The average monthly return of India is 0.77%, China 0.79%, Brazil 0.47%, Russia 0.64%, Indonesia 0.63%, Mexico 0.022% and Turkey 0.62%. Shanghai stock exchange is having highest monthly return while Mexican stock exchange has least monthly return. We also calculated coefficient of variation to get better picture of risk or volatility associated with returns of different stock exchanges. The coefficient of variation is a useful statistic for assessing the degree of variation between two data series, even if the means are radically different. It indicates the ratio of the standard deviation to the mean. The better the risk-return trade-off, the lower the standard deviation to mean return ratio. Coefficient of variation is minimum(5.510) in case of India which means returns of India are more stable among EM7 while coefficient of variation is maximum for Mexico(14.90) which means returns of Mexico are more volatile among the group. China has attained both maximum and minimum return in a particular month during the study period. As per Jerque Bera normality test, returns of India, Brazil, Russia, Mexico and Turkey are normally distributed during the study period except china and Indonesia.

I. Unit Root Results

Table 3: Unit root test of return series of EM7

| Country	ADF test (trend & intercept)		PP test (trend &intercept)	
	Level (p value)	Difference (p value)	Level (p value)	Difference (p value)
LRIN	0.0000	-	0.0000	-
LRCH	0.0000	-	0.0001	-
LRBR	0.0000	-	0.0000	-
LRIND	0.0001	-	0.0002	-
LRRU	0.0000	-	0.0000	-
LRTR	0.0002	-	0.0000	-
LRMX	0.0000	-	0.0001	-

Fig. 1. Graphcal view of EM7 returns
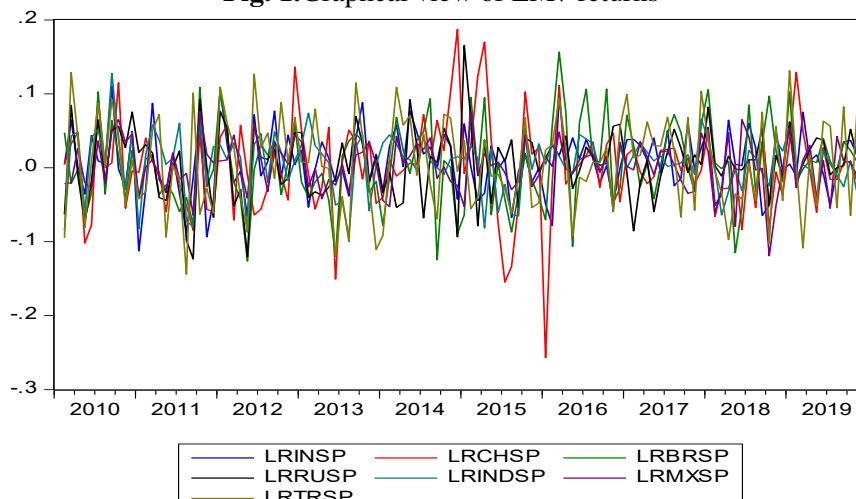
Table 3 and figure 1 indicates both formal testing and visual inspection of stationarity of data series. Since p value of all the return series of EM7 are less than 0.05 at level data, thus rejecting null hypothesis of presence of unit root in the data which in turn indicates that data is stationary at level. Further visual inspection of the figure 1 also depicts that data is of stationary nature. So there is no need to difference the data.

II. Correlation Analysis

Table 4: Correlation matrix of stock returns of EM7

Correlation	LRIN	LRCH	LRBR	LRRU	LRIND	LRMX	LRTR
LRIN	1.000000						
LRCH	0.193485	1.000000					
LRBR	0.347925	0.365317	1.000000				
LRRU	0.349300	0.161342	0.377126	1.000000			
LRIND	0.458598	0.219700	0.302881	0.282588	1.000000		
LRMX	0.374494	0.208444	0.423563	0.323738	0.381282	1.000000	
LRTR	0.382673	0.247055	0.379575	0.287781	0.443805	0.279367	1.000000

Table 4 represents the correlation matrix of monthly stock returns of EM7 countries. Construction of correlation coefficients is the simplest method or approach for analysing the inter linkages between stock markets. From the table it can be depicted that correlation among EM7 economies is low , lending less support to the theory of integration among stock returns of the sample countries. Indian and Indonesian stock returns have maximum correlation while least correlation is found between Chinese and Russian stock returns. Correlation between returns of EM7 economies is low except between (Brazil, Mexico), (Indonesia, India) and (Indonesia, Turkey), which are moderately correlated. Overall results suggest that EM7 stock markets are quite segmented which means that there is room for global diversification opportunities in EM7 due to the relatively low correlations among them.

Iii. Regression Analysis

Table 5: Regression analysis of EM7 returns

Dependant Variable	Independent Variable						
	LRIN	LRCH	LRBR	LRRU	LRIND	LRMX	LRTR
LRIN	-	0.9074	0.2836	**0.0506***	**0.0045***	0.1321	0.1348
LRCH	0.9074	-	**0.0081***	0.9316	0.4709	0.3598	0.7603
LRBR	0.2836	**0.0081***	-	0.0342	0.9215	**0.0077***	0.0551
LRRU	0.0506	0.9316	**0.0342***	-	0.6059	0.4189	0.2101
LRIND	**0.0045***	0.4709	0.9215	0.6059	-	**0.0407***	**0.0030***
LRMX	0.1348	0.7603	**0.0077***	0.2101	**0.0407***	-	0.9792
LRTR	0.1321	0.3598	0.0551	0.4189	**0.0030***	0.9792	-

*represents significant coefficients

Table 5 represents the regression analysis of the monthly stock returns. We have run seven regression equations, modelling the returns of each country as a function of returns of other countries to examine whether the returns of a particular country are significantly determined by the returns of other countries. From the table it can be seen that Russian and Indonesian stock returns are having significant impact on Indian returns. Brazilian returns are having significant impact on Chinese returns. Chinese and Mexican are having significant coefficient for determining Brazilian returns. Brazilian returns significantly impact Russian stock returns. Indian, Brazilian, and Turkish stock returns seem to have significant impact on Indonesian returns. In case of Mexico only brazil and Indonesia are significant while in case of Turkey only Indonesian returns are significantly affecting its returns.. From the regression analysis it can be seen that more than 2/3rd of the coefficients are insignificant, indicating that markets are segmented and there is scope for diversification.

Iv. Causality Analysis:-

Table 6: Pair Wise Granger Causality Test of EM7 returns

Null hypothesis	P value	Result
LRCH does not Granger Cause LRIN	0.6255	Independence
LRIN does not Granger Cause LRCH	0.2367	
LRBR does not Granger Cause LRIN	0.9353	Independence
LRIN does not Granger Cause LRBR	0.6405	

LRRUdoes not Granger Cause LRIN LRIN does not Granger Cause LRRU	0.0022 0.2877	**Unidirectional**
LRIND does not Granger Cause LRIN LRIN does not Granger Cause LRIND	0.0203 0.0424	**Bi-directional**
LRMX does not Granger Cause LRIN LRIN does not Granger Cause LRMX	0.0578 0.0403	**Bi-directional**
LRTR does not Granger Cause LRIN LRIN does not Granger Cause LRTR	0.5338 0.3392	Independence
LRBR does not Granger Cause LRCH LRCH does not Granger Cause LRBR	0.0244 0.0456	**Bi-directional**
LRRU does not Granger Cause LRCH LRCH does not Granger Cause LRRU	0.6373 0.7471	Independence
LRIND does not Granger Cause LRCH LRCH does not Granger Cause LRIND	0.7635 0.6143	Independence
LRMX does not Granger Cause LRCH LRCH does not Granger Cause LRMX	0.6622 0.8295	Independence
LRTR does not Granger Cause LRCH LRCH does not Granger Cause LRTR	0.1712 0.5323	Independence
LRRU does not Granger Cause LRBR LRBR does not Granger Cause LRRU	0.9196 0.7255	Independence
LRIND does not Granger Cause LRBR LRBR does not Granger Cause LRIND	0.9872 0.8766	Independence
LRMX does not Granger Cause LRBR LRBR does not Granger Cause LRMX	0.4329 0.1402	Independence
LRTR does not Granger Cause LRBR LRBR does not Granger Cause LRTR	0.0804 0.7090	Independence
LRIND does not Granger Cause LRRU LRRU does not Granger Cause LRIND	0.1868 0.6659	Independence
LRMXSP does not Granger Cause LRRU LRRUSP does not Granger Cause LRMX	0.4772 0.9514	Independence
LRTR does not Granger Cause LRRU LRRUS does not Granger Cause LRTR	0.8700 0.1637	Independence
LRMXSP does not Granger Cause LRIND LRINDSP does not Granger Cause LRMX	0.3254 0.9065	Independence
LRTR does not Granger Cause LRIND LRIND does not Granger Cause LRTR	0.0422 0.0511	**Bi-directional**
LRTR does not Granger Cause LRMX LRMX does not Granger Cause LRTR	0.2071 0.6804	Independence

Table 6 presents the presents the results of pair wise granger causality analysis of the returns of EM7 countries. By looking at the P values of granger causality test, it can be seen that there is Bidirectional causal linkages among the stock returns of (India, Indonesia), (Brazil, China), (Mexico, India) and (Turkey, Indonesia). This indicates that investors of these countries have limited scope for diversification between these countries because returns in one country are caused or causing the returns of other countries. The results further indicate that there is unidirectional causality running Russian stock returns to Indian stock returns. However more than 75% of the pairs show insignificant coefficients which negates any kind of linkages among the return patterns of these countries. The results of granger causality test substantiate the results of correlation and regression analysis that there is scope for portfolio diversification among EM7 countries.

6. CONCLUSION

The study is part of the larger issue of growing interdependencies among stock markets across globe. Stock prices are seen to be heading in the same direction throughout global markets. It's also worth noting that the degree of market correlation varies across time and regions. In line with this narrative, the present study aims to find inter linkages among the seven largest emerging economies of the world namely India, China, Brazil, Russia, Indonesia, Turkey and Mexico. The study uses correlation, regression and causality techniques to check inter linkages among the returns of EM7 countries for the period between Jan 2010 to Dec 2019.

From the results we conclude that monthly returns among the EM7 countries range from 0.22% to 0.79% with China having maximum return and Mexico with the least return. We also found that Indian stock market provides stable return among the group with least volatility while Mexico has the highest volatility among the group. Return series of all the countries were found to be stationary at level. Correlation analysis revealed low correlation coefficients among the stock returns of the sample countries indicating that returns of these countries do not show much of the co movement which signals that investors among these countries can reap the benefits of diversification. Regression coefficients were also found to be insignificant in most of the cases, lending support to the segmentation of the markets. We further checked the short run causal linkages among the returns of the EM7 countries. Pair wise granger causality test indicates that more than 75% of the coefficients were insignificant, nullifying causal linkages among returns of the EM7 countries. However bidirectional causality was found between some markets - (India, Indonesia), (Brazil, China), (Mexico, India) and (Turkey, Indonesia), suggesting these markets are integrated. Further unidirectional causality was found to be running from Russian stock returns to Indian stock returns. Various reforms in the India like flexible exchange rate system, free flow of FDI among various sectors, make in India initiative etc have helped in the integration of Indian stock markets with the rest of the world.

The results of the study will provide useful insights to international fund managers and global and domestic investors among EM7 countries for managing their portfolio across borders. Overall the results suggest that there is scope for reaping the benefits of portfolio diversification and mitigate the risks associated with investment and stock markets. Further the results of the study will help the policy makers and regulatory authorities of these countries in determining the policy response against global financial crisis due to the 'contagion effect' like the current Covid pandemic which wreaked havoc globally in terms of financial losses besides human loss. The future direction in the research may involve including both emerging and developed markets and find inter-linkages there in.

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ASSOCIATION BETWEEN ADAPTABILITY AND MARITAL ADJUSTMENT OF DRUG ADDICTS

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ABSTRACT

Young adulthood is a important developmental period involving vital role changes in multiple domain, including education, workplace, and interpersonal relationship with family and society (Costa & McCrae, 2000). Drug addiction among adults has taken the shape in India. When a person face up to stress, it starts with the stressful events which involve the perception and then response to threatening and challenging situations e.g. interpersonal conflict, conflict between the life partner's, loss of a relationship. Adaptability is important in understanding the increasing role of maladaptive behaviors such as drug addiction (Meaney, Brake & Gratton, 2002).

The paper is descriptive in nature and based on primary data gathered from various de-addiction centers and hospitals of Ajmer city. The study will be able to give association between adaptability and marital adjustment so anyone can make a positive difference through individual or collective efforts and strengthen the fight against drug addiction.

Keywords: Adaptability, Drug, Family, Environment.

INTRODUCTION

Adaptability dimension of personality refers to the ability to make appropriate responses to changed or changing circumstances. It involves a collection of various other personality dimensions consisting of emotional maturity, uninhibited behavior, trustworthiness, self-assurance, strong will power, social preciseness and following self image. Adaptability is important in understanding the increasing role of maladaptive behaviors such as drug addiction (Meaney, Brake & Gratton, 2002).

Drug abuse had became a worldwide threat. No part of the world is free from the blight of drug addiction. Drug abuse had emerged as a serious concern, unfavorably affecting the physical and socio-economic health of the country. It has enormous occurrence on public health across diverse sections of society. The epidemic of drug abuse in all generation had assumed startling dimensions in India. The stress and strain of the modern-day life has render the individual more vulnerable to the problem of drug abuse (National Centre For Drug Abuse Prevention, 2020).

Addiction to drugs not only affects the individual but also the family and society at large level. Marital adjustment is the character evaluation of a married couple's relationship. These included interpersonal tensions, dyadic cohesion, troublesome dyadic differences and satisfaction. The effects of drug addiction in husbands may lead to turbulence in marital life. Lack of understanding, impulsive behavior of the husbands, and irresponsibility in family matters can often lead to pitiable quality of a couple's relationship. Person with alcohol dependence suffer from crime and accident, , interpersonal disturbances, maladjustment and marital disharmony at home and work place. According to many researches addicts came from families where there is a communication gap between the couples and less harmonious.

MATERIAL AND METHODS

This chapter focuses on various aspects of conducting the research scientifically. The steps adopted by the researcher, tools and techniques used, have been appropriately described along with the logic behind them.

The study was undertaken to identify the association between adaptability and marital adjustment of drug addicts.

Methodology followed to meet the objectives has been described in the chapter under following sections:

3.1 Locale of the study: - The present study was conducted in various type of de-addiction centers located within the municipal limits of Ajmer city.

3.2 Sample selection and size of the sample: - The study was conducted on 100 male drug addicts within the age group of 19-55 years. The subjects were into Drug addicts who are availing the services in de-addiction canters since last 2 years.

3.3 Tool and their description:-The Tool on Environmental Variables Influencing Drug Addiction was developed by the investigator to assess the marital adjustment and Multi Dimensional Assessment of Personality was developed by the Sanjay Vohra (2011) to assess the adaptability personality dimension.

3.4 Procedure of Data Collection:-After the selection of the appropriate sample of 100 respondents (from Ajmer City), developed tools will be administered to accomplish the objectives.

3.5 Analysis of Data:-Data will be coded, tabulated and subjected to suitable statistical analysis as per the objectives of the study.

RESULTS AND DISCUSSION

The table depicted regarding the categories of adaptability dimension of personality. From the study it can be concluded that only 4% of the respondents showed low adaptability, which means ability to respond to changes was low in the sample. However 79% of the respondents showed average Adaptability, which means their ability to accept changing circumstances found to be average. High adaptability in 17% of the sample reflects that they are capable of accepting and changing according to the demands of the environment.

Figure: 4.2 Adaptability Dimension of Personality:
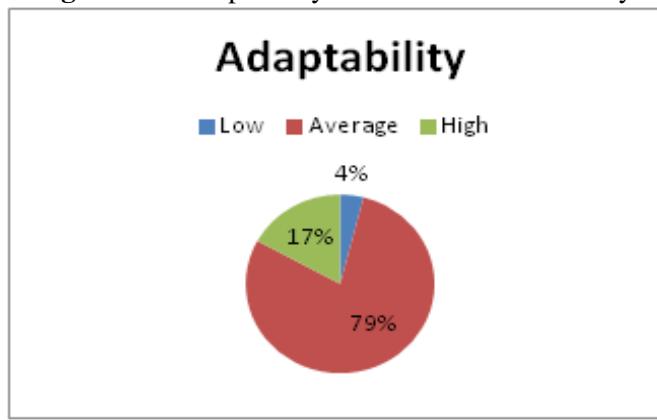
	Dimension Category	Frequency	Percent
1.	Low	4	4
2.	Average	79	79
3.	High	17	17
4.	Total	100	100

Table and Figure No. 4.1 provide the details regarding percentage distribution for the adaptability dimension of personality of adult male.

Table No. 4.2 show percentage distribution for the marital adjustment of drug addicts

S. No.	Selected Variables	Always	Sometimes	Never
1.	Marital Adjustment	53	9	38

The findings of the study revealed that the marital adjustment in the respondents had been shown 53 percent mean they engaged in outside interest together and they would like to go outside in leisure time. Only 38 percent subjects confirmed that disagreements arose and they never expected changes in behavior of life partner's. Remaining 9 percent respondents had average marital adjustment.

Table No. 4.3: envisaged the details regarding association between the adaptability and marital adjustment

Adaptability	Marital Adjustment			
	Low	Moderate	High	Total
Low	-	3	1	4
Moderate	-	51	28	79
High	-	10	7	17
Total		64	36	100
Chi-square Value .418			**P= .811 No Significant**	

According to Ivashchenko, Berus, Zhuravlev & Myamlin, (2009) adaptability is considered to be a key source of mental resources. Individuals with a high level of adaptability can reserve more psychological resources than individuals with a low level of adaptability.

CONCLUSION

In the present study it can be concluded that there were no association between the adaptability and marital adjustment of the drug addicts because the p- value (2.811) was greater than 0.05.

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IMPACT OF E-BANKING ON FINANCIAL PERFORMANCE WITH REFERENCE TO INDIAN PRIVATE SECTOR BANK: (A CASE STUDY OF HDFC BANK)

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ABSTRACT

Banking is not only restricted to the geographical boundaries of bank branches. The Indian banking sector continues to quick grip digitalisation that assisted by the future technologies as well as more government policy related to technology. Government of India has taken several ways to promote and encourage the digital payment mechanism in recent period. Digital payments are of various types as well as modes. This includes the use of demerit of credit cards, internet banking, mobile carriage services, digital payment apps, U.P.I, unshaped fresh service data, banks pre-payment & mobile banking etc. By 2025, digital deals in India could be worth$ 1 trillion annually, with four out of every five deals being made digitally. This paper aims to study the Impact of digitalisation on the financial performance of HDFC Bank with respect to Profitability & Liquidity ratios. HDFC Bank was taken as sample size for the study, it includes data of Electronic payment growth on year wise and ratios on profitability and liquidity was also collected from a few websites, company annual reports, Articles, RBI website and etc. Electronic Payments Growth was the independent variable. All the statistical computations were performed using SPSS. Study found that there is no change in profitability and liquidity ratios in reference to HDFC Bank.

Keywords: E-banking, Bank, Profitability, Liquidity & Performance

INTRODUCTION

In present era of digitalisation, it is a process by which changes are adapting either in many existing or developing technological capabilities by business firms in accordance to changes made through internal as well as business process for the purpose of getting better customer base ,services and experiences in an effective and efficient manner. Digital Banking has been treated as more efficient as well as ease of channel because of enhancement in technological capabilities across the globe.

Banking is not only restricted to the geographical boundaries of bank branches.The Indian banking sector continues to quick grip digitalisation that assisted by the future technologies as well as more government policy related to technology. Government of India has taken several ways to promote and encourage the digital payment mechanism in recent period. The main objective of the government is to create a digital important economy such as paperless, faceless and cashless as element of the digital India mission.Digital payments are of various types as well as modes. This includes the use of demerit of credit cards, internet banking, mobile carriage services, digital payment apps, U.P.I, unshaped fresh service data, banks pre-payment &monile banking etc. By 2025, digital deals in India could be worth$ 1 trillion annually, with four out of every five deals being made digitally. Though the bulk of digital deals in value terms(82.8 per cent) are reckoned for by RTGS deals, retail element of digital deals(banning RTGS guests and interbank deals) witnessed a volume growth of59.3 per cent during 2018- 19, as against50.8 per cent growth in the former time.

REVIEW OF LITERATURE

Khairina,N.(2022) this paper focus on how the banking and fiscal diligence maintained their performance during the covid- 19 led recessions through digitalization. I use descriptive statistics approach and retrogression analysis to dissect how digital metamorphosis help to maintain business performance during a epidemic. Researcher used the retrogression analysis to estimate the effect of a epidemic on banks' fiscal performance and how digital deals may help to maintain banks' performance. The retrogression estimation result shows that epidemic conditions associated with-0.177 points drop in ROA while digital structure may not have relations with banks ' ROA. Further, the volume of digital deals is associated with the increase of bank's return on asset(ROA) as much as 10.

Joseph M, Ben-Caleb E, Dike Wozuru J, Uche T A and Onwubiko O.C (2021) This study was conducted to examine the impact of electronic banking on thefinancial performance of Nigerian deposit big shot banks. The data for the study was attained from the Central Bank of Nigeria's Statistical Bulletin and the National Bureau of Statistics ' Statistical Bulletin for colorful times, as well as from published fiscal statements of the banks under study. Anex-post facto exploration design was used and a normalcy test was carried out to establish the virtuousness of the data; descriptive statistics and a multi co linearity test were conducted in which the independent variables were set up good. Retrogression was espoused to test two suppositions. It was set up that

ATM has a positive and significant association with Earning EPS and ROA; POS and NEFT significantly affect ROA only, while WEB has an insignificant impact on both EPS and ROA

Winasis, Shinta&Djumarno, &Riyanto, Setyo&Ariyanto, Eny.(2020) Digital metamorphosis in Indonesian Banking assiduity is now in progress. The need for conversion is essential and has come a top precedence for companies in order to be more nimble in the fleetly changing and evolving request. Changes that do are abecedarian, disruptive and veritably dynamic. The end of this paper was to increase the mindfulness of banking assiduity companies about the pitfalls that they may face in connection with radical changes that do during the metamorphosis process. Grounded on the check results, it's suggested that farther exploration discusses the effect of other variables that may have effect during radical changes similar as tone- efficacity, work stress, leadership climate, hand engagement and job satisfaction.

Ogutu, M &Fatoki, O & Isola, & Kenya, N(2019) The aim of this study was to examine the effect of electronic banking on monetary performance of listed commercial banks in Kenya. The study employed quantitative investigation design using panel data analysis. The targeted population of the study was the 11 listed commercial banks in Kenya. Secondary data was wrested from CBK banking administrative reports and published yearly reports of banks. The data was recorded on data collection spreads. Both descriptive and inferable statistics were used. The study set up that there was strong positive relationship between mobile banking, agency banking, ATM banking and online banking and monetary performance of listed marketable banks in Kenya. monetary performance of marketable banks and m- banking were forcefully and approvingly identified.

Banerjee S(2018) The study focuses on impact and significance of cashless policy in India. According to Government of India the cashless policy will increase employment, reduce cash related thievery thereby reducing threat of carrying cash. Cashless policy will also reduce cash related corruption and attract further foreign investors to the country. Study reveals that the benefits of this move have now started trickling in with further and further people switching to digital modes of entering and making payment.

Anbalagan, Gurunathan.(2017) The study explore the data about new fiscal time in India has seen a energy growth in the banking sector with the development of inventions like Unified Payments Interface(UPI), relinquishment of pall technology …etc. the Banking challenges of changing requirements and client's perceptivity, new regulations and creating further technological inventions for guests in the banks. Currently we've E-Banking system along with currency notes. India's financial system can produce a new instrument along with liquidity and safety. The Indian banking sector where introduced appearance of the card, preface of Electronic Clearing Service (ECS) in 1990's, EFT, RTGS, NEF, mobile banking, online banking are the colorful inventions in banking. This paper highpoints out the new technological changes in Indian banking sector.

NEED OF THE STUDY
The banking industry is going through a period of quick change to meet competition, challenges of technology and the demand of end user. all right technology is a critical differentiator in the performance of banks. Product creation and development according to the requisites of individual clients is the current buzzword. In such an environment, banks across India are gradually taking up Technology to drive their overall profitability. Digitalisation facilitates an increase in growth of advances but increases costs due to keep and other fixed costs.

Objectives: To study the Impact of digitalisation on the financial performance of HDFC Bank with respect to Profitability & Liquidity ratios.

Research Methodology : HDFC Bank was taken as sample size for the study, it includes data of Electronic payment growth on year wise and ratios on profitability and liquidity was also collected from a few websites, company annual reports, Articles, RBI website and etc. Electronic Payments Growth was the independent variable. All the statistical computations were performed using SPSS.

DATA ANALYSIS AND INTERPRETATION

Table-1 Financial Highlights of Bank of Baroda

Year	Net Interest Income	Net Profit	Total Assets
2018	40095	17487	106393
2019	48243	21078	124454
2020	56189	26257	153051
2021	64879	31116	174687
2022	72009	36962	206853

Table-2 Change in Organisational performance ratio and E.P.G

Year	Net Interest Margin	Return On Assets	Advance Growth	Current Ratio	Capital Adequacy	Electronic Payment Growth
2018	8.36	16.45	80.8	.50	14.84	28.94
2019	8.61	14.16	83.9	.40	17.14	42.48
2020	8.32	15.38	85.2	.80	18.54	60.68
2021	7.34	15.28	82.01	1.30	18.78	72.93
2022	6.72	15.41	85.18	1.50	18.92	54.85

Table-3 regression between Organisational performance ratio and E.P.G

	R Square	Constant	Electronic Payments Growth	Sig.
Net Interest Margin	28.00	139.39	1.714	.359
R.O.A	7.5	86.33	.486	.655
Advance growth	12.5	-202.38	.639	.560
Current ratio	50.0	29.76	.127	.181
Capital Adequacy Ratio	80.9	-103.9	0.38	.09

FINDINGS OF ANALYSIS

1. Net Interest Margin is positive correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Net Interest Margin & EPG.

2. Return on Assets is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Return on Assets & EPG.

3. Advance Growth is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Advance Growth & EPG.

4. Current Ratio is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Current Ratio & EPG.

5. Capital Adequacy Ratio is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Capital Adequacy Ratio & EPG.

FINDINGS OF STUDY

1. Net Interest Margin is positive correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Net Interest Margin & EPG.

2. Return on Assets is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Return on Assets & EPG.

3. Advance Growth is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Advance Growth & EPG.

4. Current Ratio is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Current Ratio & EPG.

5. Capital Adequacy Ratio is negative correlated with Electronic Payments Growth, thus regression are not statistically significant which shows that null hypothesis is accepted but alternative hypothesis is rejected . There is no changes arise in Capital Adequacy Ratio & EPG.

CONCLUSION

In the development of Indian Economy, Banking sector plays a very important and crucial role. With the use of technology there had been an increase in penetration, productivity and efficiency. Banking is an integral part of

financial activity today and digital banking in India is highly advanced. The study focused on the Banking technology impact on financial performance of public and private banking sector.. Product innovation and development according to the needs of individual customers is the current buzzword. In such an environment, banks across India are increasingly adopting Technology to drive their overall profitability. Digitalisation facilitates an increase in growth of advances but increases costs due to maintenance and other fixed costs.

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MULTILAYER OROMUCOSAL FILM: ASPECTS AND PROSPECTS IN BUCCAL DRUG DELIVERY

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ABSTRACT

Buccal or transmucosal or oromucosal route of drug delivery is highly advantageous for a number of therapeutic molecules of low- or high molecular weight as well as for proteins, peptides, hormones. Soluble mucoadhesive buccal films have been marketed for pain management in terminally ill cancer patients and for maintenance treatment of opioid dependence. Continuous efforts are being made to incorporate antimicrobials, antihypertensives, non-steroidal anti-inflammatory agents, local anesthetics in buccal films for both systemic and local action. However, most of the films are of monolayer type which lead to multidirectional drug release, resulting in suboptimal therapy and precipitation of side/adverse effects. Therefore, transition from mono- to bi- and multi-layer oromucosal films is being observed recently. The main characteristic feature and advantage of multilayer film is uni- or bidirectional drug release depending on the composition, type and dissolvability of the polymers used for backing layer, nature of mucoadhesive layer and presence or absence of dissolvable drug matrix or reservoir. In addition to their ability to circumvent hepatic first-pass metabolism, multilayer films offer site specificity, prolonged duration of action, better bioavailability and safer pharmacokinetic profile. The review article focusses on various aspects and prospects of multilayer oromucosal films as a novel concept in buccal drug delivery for local and/or systemic effect. It also highlights the challenges that are to be encountered during scale-up to commercial production and also provides directions for further progress.

Keywords: Bilayer film, buccal route, mucoadhesive, multilayer film, oromucosal

1. INTRODUCTION

Apart from oral or parenteral route of drug delivery, one of the most potent route for delivery of drugs is via the buccal route. Buccal drug delivery is also known as peroral drug delivery. In case of some chronic disorders, when continuous delivery of active substance becomes necessary, buccal drug delivery is one of the preferred routes. Drug absorption into the systemic circulation occurs through the highly vascularized oral mucosa via the internal jugular vein. Buccal delivery route is most suited for drugs which suffer from extensive hepatic first pass metabolism and for drugs for which pre systemic elimination should be avoided (Jacob *et al.* 2021). Buccal dosage forms are versatile as they are effective for both local and systemic action. The dosage forms include medicated gums, sprays, orodispersible films, patches, buccoadhesive tablets, etc. (Arune *et al.* 2016). Among various buccal dosage forms, buccal films have proven to be the most suitable ones due to their high patient compliance and easy applicability. As the film is designed to adhere to the buccal mucosa for prolonged duration, it is expected to undergo hydration, swelling and release drug in a controlled manner and exhibit satisfactory bioavailability. An ideal buccal film should be non-toxic, non-irritant, pleasant in taste or preferably tasteless, possess optimum elasticity, mechanical strength, mucoadhesiveness and should be capable of enduring tongue movement during talking, drinking and swallowing of food. There are several parameters for evaluation of mucoadhesive buccal films such as determination of tensile strength, thickness, tear resistance property, folding endurance, moisture content, residence time, mucoadhesive property, permeation efficiency, drug release profile (Nair *et al.* 2013).

As the drug from the film passes through/across the oral mucosa, it is also known as transmucosal film or oromucosal film. Oromucosal films have been fabricated to incorporate drugs such as bupropion (Almeida *et al.* 2015), calcitonin (Cui *et al.* 2002a), ciclopirox (Gajdošová *et al.* 2021), diltiazem hydrochloride (Winarti *et al.* 2021), moxifloxacin (Li *et al.* 2021), clotrimazole (Potaś *et al.* 2021), meloxicam (Zaman *et al.* 2018), verapamil hydrochloride (Singh et al. 2014), and many more. When degradation/metabolism and low absorption hampers the bioavailability of hydrophilic high molecular weight drugs such as insulin and other protein and peptides through oral route, buccal route of delivery becomes the most suitable option.. There are certain potential advantages and benefits of using buccal films (Madhavi *et al.* 2013) over other dosage forms which include

a. As a film, it possesses larger surface area that favors better and faster systemic absorption of the active pharmaceutical ingredient, leading to better bioavailability.

b. Precision of dose is greater than some of the conventional oral dosage forms.

c. Unlike tablets, oromucosal films do not require chewing or swallowing, facilitating better patient compliance for pediatric, geriatric population and for patients who have difficulty in swallowing or have a nauseating tendency.

d. Oromucosal film enhances bioavailability by bypassing hepatic first pass metabolism and reaching systemic circulation through the jugular vein. Moreover, the enzymatic activity is less than in nasal, rectal, and intestinal mucosa.

e. Due to easy application, self administration is possible. Additionally, administration does not require any water.

f. Tailor-made controlled drug release profile can be achieved by altering the composition and thickness of the polymeric film in a desired manner.

g. Permeation enhancers, pH modifiers, enzyme inhibitors, etc. can be incorporated for significant improvement in drug permeation.

h. Oromucosal films are versatile as they can be designed for unidirectional or multidirectional drug release.

Buccal films have gained considerable popularity since their entry into the market and attempts are being constantly taken to incorporate new molecules at investigational stage. Literature is abundant with research studies and review articles on buccal drug delivery and oromucosal films. However, in recent times, multilayer oromucosal films are being fabricated as an advancement over monolayer oromucosal buccal films. No comprehensive article is available till date encompassing various aspects, benefits, applications and challenges of multilayer oromucosal films. This review article has been designed to provide an overview on multilayer oromucosal films, starting with discussion on salient features of buccal route, history and types of single and multilayer oromucosal films, components and manufacturing process of bilayer and multilayer films with suitable examples, mechanism of drug release, challenges and future scope.

2. BACKGROUND
Buccal or oromucosal films were initially monolayer in nature. Depending on the type of the polymer employed, it can be fast dissolving, orodispersible, or mucoadhesive and designed for adhering on to oral/buccal mucosa. The therapeutic moiety diffuses out of the film, is transported across the buccal mucosa and finally reaches systemic circulation. Among the different types of the films, the mucoadhesive films are supposed to release drugs in a controlled manner. However, in single layer films, it was not possible to control the direction of flow of the drug; meaning a drug desired for local action in the buccal mucosa could travel to the gastro intestinal tract or vice versa. This kind of movement of the drug is known as multi-directional movement. For a drug to be site specific and for release to occur in controlled manner, multidirectional release is not acceptable. Disadvantages (Preis *et al.* 2014) of the single layer oromucosal films may be enumerated as follows

a. Multidirectional drug absorption.

b. Lack of site specificity and hence, less bioavailability of drug in the desired site of action.

c. Only single therapeutic molecule can be incorporated and hence combination formulation is not possible.

d. Risk of side/adverse effects due to release of drug at improper site.

e. Less accurate dosing.

To tackle these challenges and make the oromucosal films more efficient, strategies have been adopted to develop bilayer and multilayer oromucosal films.

3. BILAYER AND MULTILAYER OROMUCOSAL FILM: A NOVEL CONCEPT

3.1 Bilayer Oromucosal Film
Bilayer oromucosal films are designed to incorporate either more than one active pharmaceutical ingredient with entirely different release mechanisms in double layer polymeric film or to achieve dual release profile from two separate films for the same molecule. Bilayer films are gaining popularity in recent times owing to their advantages. In bilayer films, a backing layer is used, the purpose of which is to make the release of the drug unidirectional, either to buccal region for local action or to systemic circulation for systemic action. Hydrogel film formers are preferred as rate-controlling layer as their rate of hydration and subsequent swelling is governed entirely by nature and concentration of the hydrophilic polymer/s selected (Alopaeus *et al.* 2020). Bilayer oromucosal films differ from single layer oromucosal films in their way of application. As the bilayer films possess a backing layer, the film needs to be attached/adhered to the desired site of administration in such

a way that the backing layer faces opposite direction to that of the surface of application/adhesion. In that way, the medicated layer gets exposed only to the desired site of administration. The backing layer is resistant to any hydrolytic/enzymatic degradation or dissolution and is impermeable to drug. It is to be manually removed from the buccal cavity after use. In case of dual-release bilayer buccal films, the two separate layers are distinctive in their nature, as one layer facilitates instant or immediate release (IR) and may be termed as basal layer and the second layer is known as sustained release (SR) layer or apical layer (Zaman *et al.* 2018).

Several examples of bilayer buccal films can be found in the literature. Singh *et al.* (Singh *et al.*, 2013) developed verapamil-based bilayer buccal films, used to treat arrhythmia. Backing layers were composed of combination of ethyl cellulose and cellulose acetate butyrate. Hydroxypropylmethyl cellulose (HPMC K15M and HPMC K 100M), polyvinyl alcohol (PVA), polyethylene oxide (PEO) were used as mucoadhesive matrix layer. Polyethylene glycol (PEG 400), propylene glycol (PG), glycerol or di-n-butyl phthalate (DBP) were used as plasticizer; sodium glycocholate (SG) and menthol were used as permeation enhancers. It was found that the formulation containing HPMC K15M and PEO 303 in 2:1 ratio exhibited optimum sustained release profile. The formulation demonstrated cumulative percentage drug release of more than 90% in 10h. The film was found to possess satisfactory mucoadhesive strength (223±20 g) and residence time was found to be 390±3.67 minutes.

Bilayer films have been developed experimentally for drugs with completely different release mechanisms as in the case of tizanidine HCl-meloxicam loaded bilayer films (Zaman *et al*., 2018). Tizanidine is myotonolytic agets used in the treatment of spasticity and meloxicam is a non-steroidal anti-inflammatory drug used in the treatment of pain disorders. Tizanidine release occurred in sustained manner while meloxicam-containing layer was the immediate release layer for instant pain relief. HPMC K15M was used as a backing layer, glycerol and PEG 400 were used as plasticizer, HPMC E15 was used as a film forming agent, and Tween 80 was used as surfactant. Meloxicam showed a release of about 101.21% drug in 20 mins during in vitro dissolution studies, while Tizanidine showed 87.86% release in 8h. Average half life ($t_{1/2}$) recorded for this film was 9.7 hours. A constant tmax of 6 hours was recorded, compared to tmax of 2.5 hours in case of standard oral solution. First order release kinetics was followed for meloxicam release from immediate release layer. In case of sustained release layer, non-Fickian diffusion was observed for tizanidine.

Hydrogels have also been employed in bilayer oromucosal films. In a study conducted by Alves *et al.* (Alves *et al.*, 2020) buccal film containing lidocaine HCl, N-acetyl-L-cysteine and benzydamine HCl have been fabricated for the treatment of mucosal ulcers. Benzydamine HCl acts as a local anesthetic and N-acetyl-L-cysteine acts as a salivary antioxidant and fluidizer. Basal layer contained lidocaine HCl that ensured blockage of local sodium channel tissues and its release occurred instantly, the apical layer contained N-acetyl-L-cysteine and benzydamine HCl. Chitosan was used as a hydrogel forming agent and swelling agent. Sodium CMC and HPMC were used to form the backing layer. Propylene glycol was used as a plasticizer. Retention time for N-acetyl-L-cysteine was found to be 2.99±0.02 minutes, for lidocaine HCl it was 14.63±1.1 minutes, and for benzydamine HCl it was found to be 16.42±0.04 minutes. In case of in vitro dissolution studies, lidocaine HCl and benzydamine HCl followed Hopfenberg mathematical model and showed correlation coefficient or R^2 values of 0.91427 and 0.96600 respectively. For N-acetyl-L-cysteine, it followed Korsmeyer-Peppas model with a correlation coefficient value of 0.94873.

In another study on tizanidine-piroxicam loaded bilayer buccal film, piroxicam was incorporated into immediate release layer composed of blend of HPMC(15 cps) and PVP K 30 whereas tizanidine was the active ingredient of sustained release layer composed of PVP K90 and sodium alginate and either of the polymers such as HPMC K 4M, HPMC K 15M, chitosan or Carbopol 934P. The optimised formulation containing PVP K 90, sodium alginate and Carbopol in a particular ratio in the sustained release layer exhibited 99% drug release in 6 h whereas >99% piroxicam was released in 15 mins. Addition of Carbopol produced significant improvement in folding endurance and mechanical properties of the film as well as facilitated optimum hydration and swelling of the film (Begum *et al.* 2021).

Oral mucosa being the most prominent untested site for vaccine immunization strategy, Cui *et al.* (Cui *et al.*, 2002b) developed and tested bilayer film for immunization via the buccal route on rabbits to deliver plasmid DNA-expressing β-galactosidase as a model protein antigen. Noveon AA1 or Polycarbophil was used as a mucoadhesive polymer and backing layer. Eudragit S-100, an anionic pH sensitive co-polymer was used as a hydrogel forming polymer. Dentsply® Utility Wax was used as an impermeable backing layer. The formulation containing Noveoun and Eudragit in 3:1 ratio showed the best adhesion time of more than 150 minutes. Gel electrophoresis data exhibited release of about 80 % of plasmid DNA in supercoiled form within 2 hours. Immunization studies revealed IgG titers in sera in all the test rabbits.

Examples of marketed bilayer buccal products are Belbuca® and Onsolis®, both developed using Bioerodible Mucoadhesive (BEMA) technology. Belbuca® is a bilayer buccal film containing buprenorphine, a partial opioid antagonist, used for treatment of severe pain. The mean absolute bioavailability of buprenorphine from the film was found to be 65% (https://www.accessdata.fda.gov/drugsatfda_docs/label/2015/207932s000lbl.pdf). Onsolis® is also a similar type of soluble bilayer buccal film containing fentanyl, an agent for treatment of breakthrough pain in cancer patients who are above 18 years old and tolerant to opioid therapy for underlying persistent cancer pain.On buccal application of the film, the absolute bioavailability of fentanyl was found to be 71% (https://www.accessdata.fda.gov/drugsatfda_docs/label/2011/022266s008lbl.pdf). Bunavail® is a rectangular buccal film indicated for maintenance therapy and contains buprenorphine and naloxone. It dissolves completely after application and patients are advised not to drink or eat or manipulate film when it is in place in buccal mucosa. The film exhibited different bioavailability profile of the incorporated drugs compared to the corresponding tablet (https:// www.accessdata.fda.gov/ drugsatfda_docs/ label/2016/ 205637s011lbl.pdf). FDA agreed to review resubmission of NDA for diazepam buccal soluble film for treatment of acute uncontrolled seizures in patients with refractory epilepsy on stable regimens of antiepileptic drugs (https://www.empr.com/home/news/drugs-in-the-pipeline/buccal-film-formulation-of-diazepam-to-get-fda-review/)

3.2 Multilayer Oromucosal Film

Multilayer oromucosal films are similar in concept with the bilayer films, with the main difference being that it has multiple layers of drugs and polymers instead of only two layers. This enhances the action of the films further than that of bilayer films. Multilayer oromucosal films have better pharmacokinetic profile compared to other oromucosal films. Incorporation of drug in multilayer films may improve drug solubility in an aqueous environment, protect proteins/peptides from harsh internal environment and may enable specific targeting to improve therapeutic efficacy or reduce side effects. From commercial perspective, the films may be designed to extend patent lifetime, which may help the industry to thrive in the market for longer period. However, due to their complex manufacturing process, the films have limited marketability (Haynie *et al.* 2012).

Different formulations of multilayer films are available in literature. Multilayer films can be classified according to their composition and dissolvability of different layers which results in different release mechanisms. The first type of multilayer film is composed of dissolvable drug matrix coated by mucoadhesive layer that adheres to buccal mucosal surface. The drug diffusing out of the matrix is exposed to the entire buccal region and is highly suitable for treatment of local conditions such as oral mucositis. The second type of multilayer film consists of insoluble backing layer that allows only unidirectional flow of the drug. The backing layer thus needs to be removed. In the third category of multilayer film, the backing layer gets dissolved in the oral cavity. This type of film has relatively shorter duration of action and is also suited for both local and systemic action (Lindert *et al.* 2017).

Smart, pH-responsive multilayer films of cationic chitosan and anionic pectin were developed for controlled delivery of clotrimazole. Pectin was employed in order to provide rapid onset of antifungal activity on immediate dissolution of the pectin component. Chitosan was responsible for sustained delivery of the drug.

In another novel study, nanofiber-based mucoadhesive films were formulated. It consisted of electrospun nanofibrous reservoir layer, a mucoadhesive film layer, and a protective backing layer. The films were tested for trans-/intramucosal and lymph-node delivery of PLGA-PEG nanoparticles in a porcine model. This system could be adopted for immunization and development of 'printed vaccine technology' (Mašek *et al.* 2017).

4. DESIGN AND CHARACTERISTICS OF MULTILAYER FILM

4.1 Components of Multilayer Film

Multilayer films are composed of different components, among them the two most prominent ones are active pharmaceutical ingredients and polymers. Other ingredients include permeation enhancers such as sodium glycocholate and menthol, masking agents, and fillers. Among the polymers, there are different kinds which are classified according to their mechanism of action. Cellulose and their derivatives such as HPMC, HPC, HEC, ethyl cellulose etc. are used as backing layers. Eudragit, collagen, agarose, hyaluronic acid, poly(organophosphazenes), chitosan, chondroitin sulfate, Carbomer, xanthan gum, calcium alginate, etc. are used as hydrogel forming polyelectrolyte polymers for entrapment of drug.

Various polymeric components of buccal film in general are enlisted in Table 1.

Table 1. Classification of polymers used in oromucosal films

Component	Name of the polymer/ excipient	Relevant properties	Drugs incorporated	Reference
Backing layer forming polymers	Ethyl cellulose	Hydrophobic, inert	Bupropion, Diltiazem, DOPA*, Verapamil	(Almeida *et al.* 2015), (Winarti *et al.* 2021), (Hu *et al.* 2021), (Singh *et al.* 2014)
	Cellulose acetate butyrate	Amorphous and thermoplastic	Verapamil	(Singh *et al.* 2014)
	Hydroxypropyl methyl cellulose (HPMC)	Non-ionic, swellable, mucoadhesive	Bupropion, Diltiazem, Furosemide, Benzydamine HCl, Tizanidine, Meloxicam, Verapamil	(Almeida *et al.* 2015), (Winarti *et al.* 2021), (Alopaeus *et al.* 2020), (Alves *et al.* 2020), (Zaman *et al.* 2018), (Singh *et al.* 2014)
	Poly (DL-lactide)	Forms biodegradable micromatrices	DOPA*, Benzydamine, Tolfenamic acid, Betahistine	(Hu *et al.* 2021), (Alves *et al.* 2020), (Pilicheva *et al.* 2022)
	Carbopol	Hydrophilic, swellable	Lidocaine	(Preis *et al.* 2014)
	Sodium Carboxymethyl cellulose (CMC)	Anionic, highly swellable, highly mucoadhesive	Bupropion, Lidocaine, Benzydamine HCl	(Almeida *et al.* 2015), (Preis *et al.* 2014), (Alves *et al.* 2020)
	Hydroxypropyl cellulose (HPC)	Non-ionic, swellable, moderately mucoadhesive	Lidocaine	(Preis *et al.* 2014)
	Hydroxyethyl cellulose (HEC)	Non-ionic, highly swellable	Lidocaine, Meloxicam	(Preis *et al.* 2014), (Zaman *et al.* 2018)
	Polycarbophil	Non-ionic, moderately swellable, highly mucoadhesive	Calcitonin, Plasmid DNA	(Cui *et al.* 2002a,b)
	Polyacrylic acid	Rapid and highly swellable, highly mucoadhesive	Lidocaine	(Preis *et al.* 2014)
Polyelectrolyte polymers	Polyethylene oxide (PEO)	Crystalline, thermoplastic, non-ionic, hydrophilic	Verapamil, Ciclopirox, Paclitaxel, Imiquimode	(Singh *et al.* 2014), (Gajdošová *et al.* 2021), (Park *et al.* 2018), (Lindert *et al.* 2017)
	Casein	Lyophilic colloid, amphoteric	Tolfenamic acid, Betahistine	(Pilicheva *et al.* 2022)
	Chitosan	Biodegradable, hydrophilic, mucoadhesive	Bupropion, Diltiazem, Lidocaine, Benzydamine HCl, Tolfenamic acid, Betahistine, Clotrimazole	(Almeida *et al.* 2015), (Winarti *et al.* 2021), (Preis *et al.* 2014), (Alves *et al.* 2020), (Pilicheva *et al.* 2022), (Potaś *et al.* 2021)
	Sodium alginate	Hydrophilic, biocompatible,	Chlorhexidine, Sildenafil	(Lindert *et al.* 2017), (Tian *et al.* 2019)
	Eudragit	Cationic,	Calcitonin, Diltiazem,	(Cui *et al.* 2002a),

		mucoadhesive,	Plasmid DNA, Ciclopirox	(Winarti *et al.* 2021), (Cui *et al.* 2002-b), (Gajdošová *et al.* 2021)
	Hyaluronic acid	Hydrophilic, viscoelastic	Paclitaxel, Insulin	(Park *et al.* 2018)
	Chondroitin sulfate	Flexible polymer	Vancomycin	(Park *et al.* 2018)
	Carbomer	Hydrophilic, mild acidic, low swellability	Enalapril, Glimepiride	(Tian *et al.* 2019)

(*DOPA = dihydroxyphenylalanine)

4.2 Methods of fabrication
Traditionally, buccal films are prepared by solvent/ film casting method and hot melt extrusion method. In case of multilayer oromucosal film, double casting, pasting and layer-by-layer methods are employed.

4.2.1 Double casting
This technique follows the development of layers directly on top of each other without any need for assembling. After preparation and drying of the first layer, other layers are either casted on it, sprayed, poured or freeze-dried. Problems encountered include compatibility issues between the different polymers used in various layers, difference in solubility of the polymers, in their drying times which may lead to stability issues, deviation from ideal physicomechanical properties or phase transition between the boundaries of the individual layers. The technique may be adapted to continuous batch manufacturing with slight modifications and scale-up is feasible. (Lindert *et al.* 2017).

4.2.2 Pasting
'Pasting' is a simple method for manufacturing of bilayer films. In this process, a solvent is used as a binder and two different layers are pasted on one another using the binder. Moisture may also play the role of a binder and can bind two layers. This simple two step process adds flexibility in manufacturing of film. However, scale up is challenging using this method in comparison to the double casting method (Lindert *et al.* 2017).

4.2.3 Layer-by-layer (LbL) method
LbL method is very suitable for fabrication of multilayer oromucosal films of any dimensions and for thermolabile drugs as there is no need of application of high temperature at any step. The polymers in different layers may interact via electrostatic interactions, hydrogen bonds, covalent bonds, and bio-specific interactions (Park *et al.* 2018).

In majority of the cases, polymers used in the multilayer films are often oppositely charged polyelectrolytes. Several approaches are taken to incorporate drug in the film. In some cases, the drug is hydrophobic and is incorporated into hydrogels in the form of small crystals where the hydrogel acts as the drug reservoir. Another approach is via grafting of drugs into the polymers which should have some degree of porosity to entrap drugs.

The process of film assembly follows adsorption of polycation in a polyanionic surface until all the binding sites are saturated. The electrostatic interaction controls the adsorption and also limits it. In this process, soluble complexes are formed between oppositely charged polyelectrolytes resulting in change of charge on the film surface. The film acts as a diffusive barrier. Kim *et al.* reported adsorption of negatively charged micelles onto polycations. Drugs were incorporated into the micelles from where delivery was achieved. However, films composed of polymers interacting by hydrogen bonds show noncovalent interaction and are relatively unstable.

4.3 Mechanism of drug release/drug diffusion from multilayer oromucosal film
Typical multilayer oromucosal film for systemic drug delivery involves drug-impermeable backing polymeric layer, drug reservoir and mucoadhesive polymeric layer for adhesion to buccal mucosa. Hydration of the film is a prerequisite for mucoadhesive dosage forms when the polymeric chains undergo relaxation and disentanglement, thereby promoting interpenetration of the mucin component of the buccal mucosa, adhesion to the mucosal surface followed by optimum swelling so as to facilitate drug diffusion out of the film. Drug release kinetics from buccal patches is governed by physicochemical properties of the active pharmaceutical ingredient as well as the polymers/ film formers and swelling pattern and kinetics of the film. Rate and extent of swelling is crucial as it controls the rate of erosion of the film and hence its residence time in the buccal mucosa. Judicious selection of the polymeric material may have a profound influence on the drug's solubility as well as absorption behavior. In most of the reported studies, drug release has been found to follow zero-order kinetics or Higuchi model where drug diffusion occurred via non-Fickian diffusion (He *et al.* 2021). For drug

molecules with high aqueous solubility, drug release from the hydrated and swollen polymeric film is characterized by formation of interpenetrating network of multiple channels and pores. Formation of voids is postulated to improve further mucoadhesion by increasing interpenetration into mucin. This particular phenomenon is not observed for poorly water-soluble drugs entrapped in buccal film. Gradual drug diffusion from multilayer films helps in achieving controlled drug release profile (Pilicheva *et al.* 2022). Literature review reveals biphasic drug release profile characterized by initial burst phenomenon followed by sustained release profile for the experimentally studied duration. In multilayer film, release of the active therapeutic moiety from primary layer has been observed to be influenced by presence of a therapeutic adjuvant in the secondary layer as reported in the studies on release of moxifloxacin from bilayer film containing antibacterial agent in addition to clove oil for treatment of oral periodontitis. Release of clove oil was designed to occur instantaneously for pain relief by immediate dissolution of the polymer layer. However, hydrophobic clove oil restricted influx of the saliva into the primary layer containing moxifloxacin thereby controlling the drug release over prolonged duration for better therapeutic benefit (Li *et al.* 2021).

5. CHALLENGES AND FUTURE PERSPECTIVE

Manufacturing of multilayer oromucosal buccal films is possible on small scale by the previously described double casting, pasting and layer-by-layer methods. However, scale-up of these techniques is not a viable option for large scale manufacturing of films for commercial purpose. Since, there are no compendial specifications with respect to physicomechanical parameters for multilayer films, it becomes challenging to establish quality control parameters for the final product and it becomes the sole responsibility of the manufacturer to set the limits. However, lack of regulatory control also provides freedom and flexibility to manufacturers to produce films of superior quality with excellent in vivo performance. Moreover, it is difficult to achieve high drug entrapment efficiency and controlled drug release in reservoir type mucoadhesive layer of bilayer buccal film. Layer-by-layer technique is quite novel for manufacturing of multilayer films but its high cost precludes its widespread application for commercial purpose (Lindert *et al.* 2017).

Programmable multi-functional and customized buccal patches may be fabricated by employing a multi-material direct-ink-write 3D printing technique on well-known cellulosic polymers such as HPMC or methyl cellulose to produce flexible films with mesh-like geometries and hence optimum stretchability as well as tailor-made drug permeation profile. The innovative technique holds promise for patient-compliant, personalized buccal drug delivery in future (He *et al.* 2021).

6. CONCLUSION

Buccal drug delivery is a promising route for delivery of a wide range of active pharmaceutical ingredients and is highly suitable for pediatric and geriatric population and for patients who have problems in swallowing. Among its various advantages, the most remarkable one is its ability to bypass hepatic first-pass metabolism. However, most of the initial buccal mucoadhesive films were designed as monolayers which resulted in multidirectional drug release. This problem could be successfully overcome by bilayer or multilayer oromucosal films where the film consisted of two or more layers composed of different blends of polymers to impart tailor-made drug release/permeation profile as also satisfactory mechanical properties and desired degree of mucodhesion. But the manufacturing techniques for multilayer films suffer from demerits of high cost and scale-up issues. Moreover, drug entrapment efficiency was also found go be low although the bioavailability profile was significantly improved with respect to monolayer buccal film. Thus, multilayer oromucosal films have great potential and significant advancements may be made to utilize their maximum benefits in near future.

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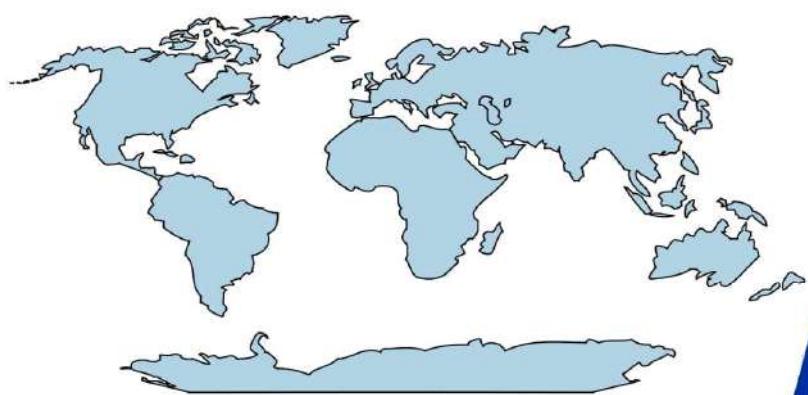
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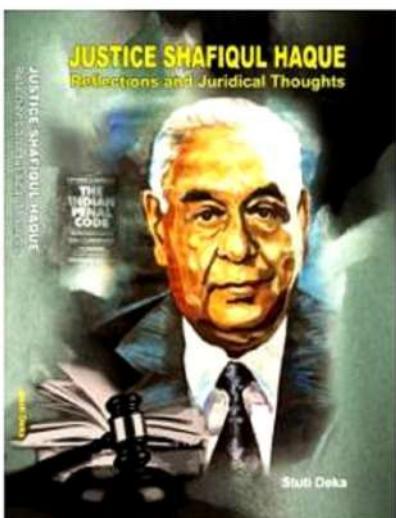
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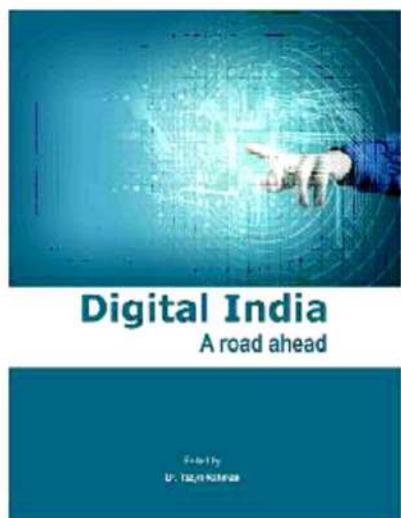
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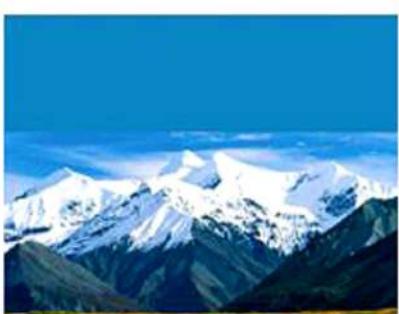
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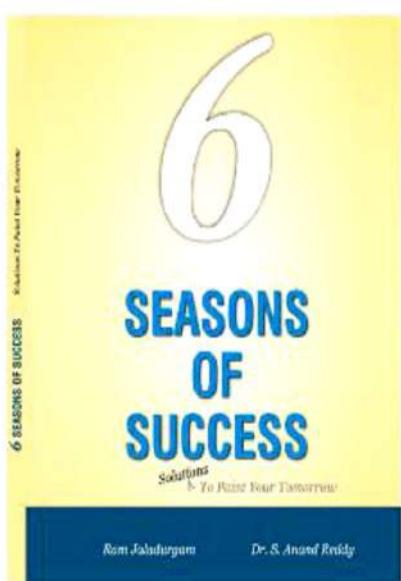
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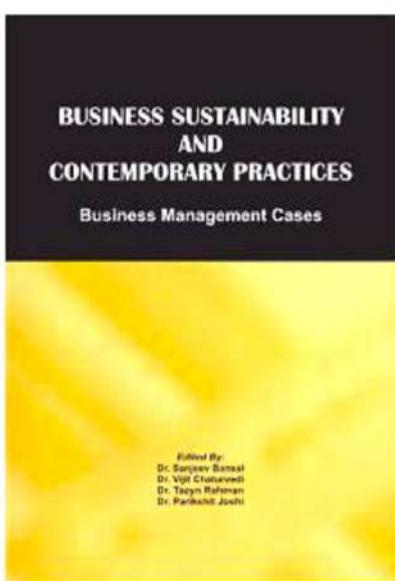
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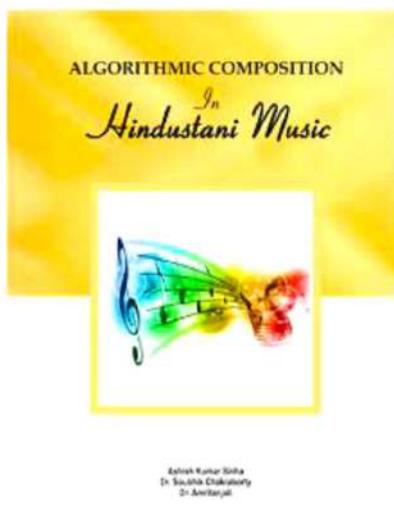
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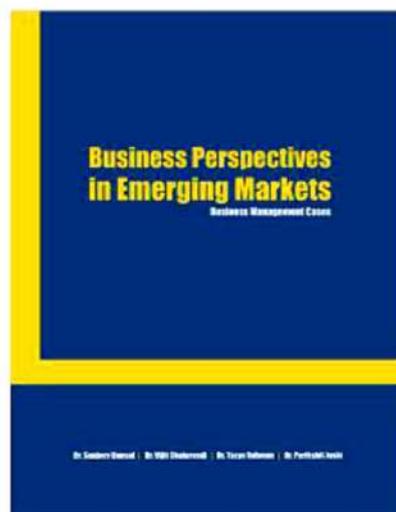
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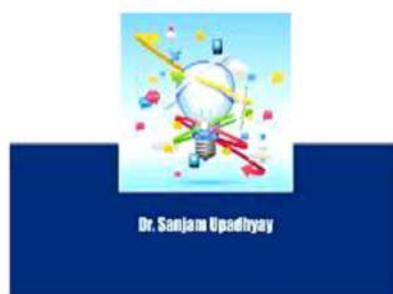
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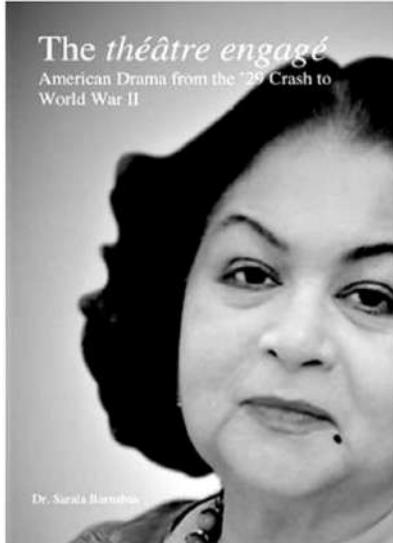
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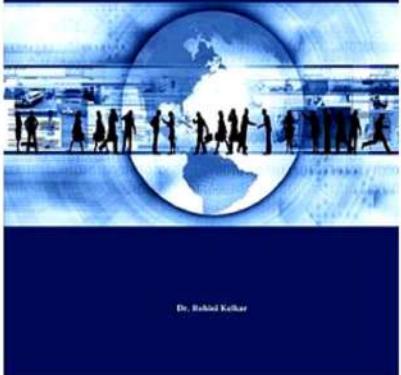
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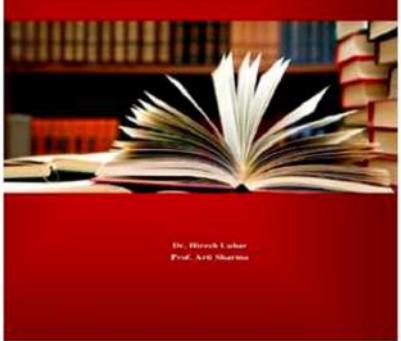
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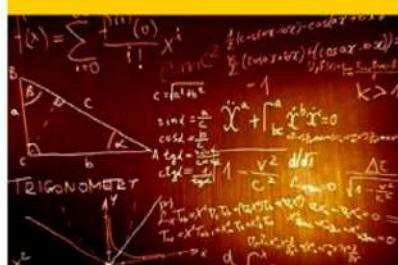
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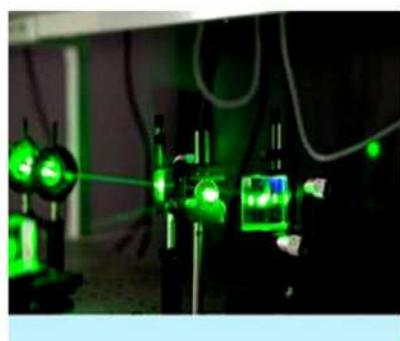
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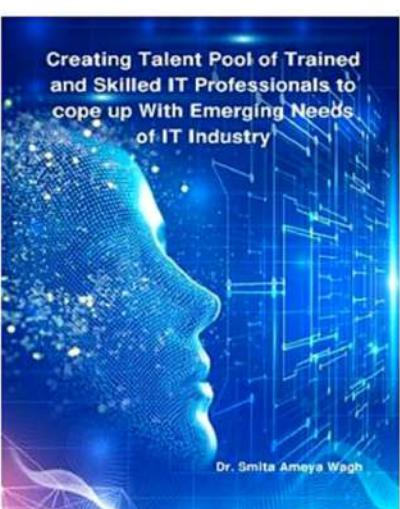
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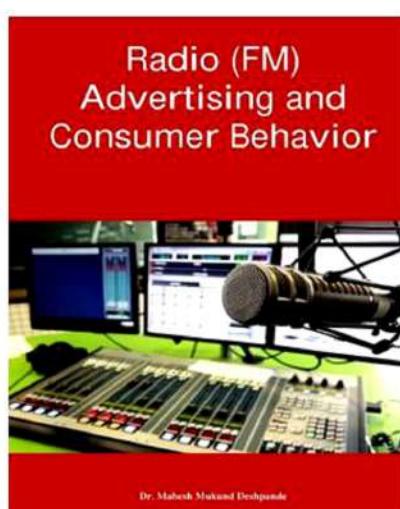
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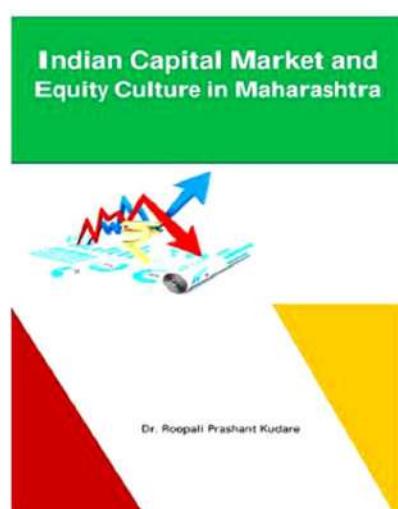
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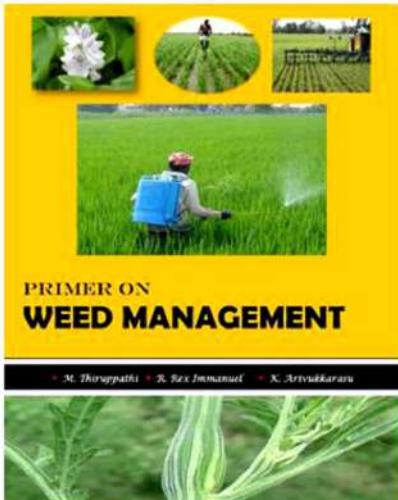
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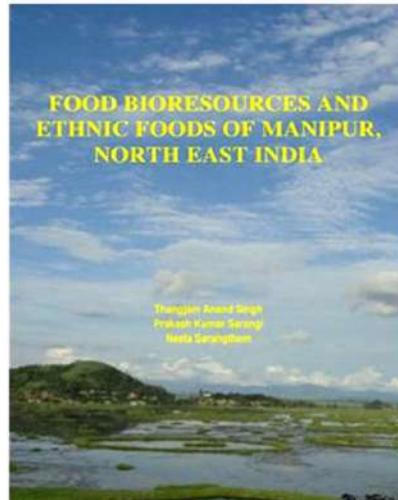
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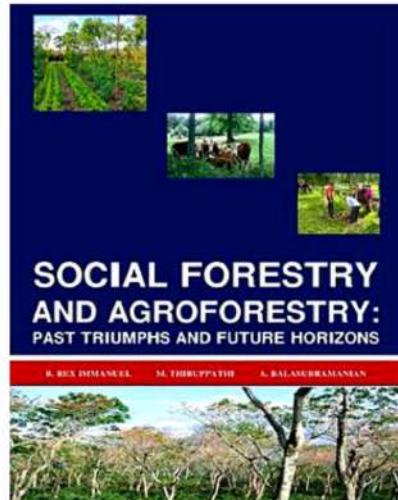
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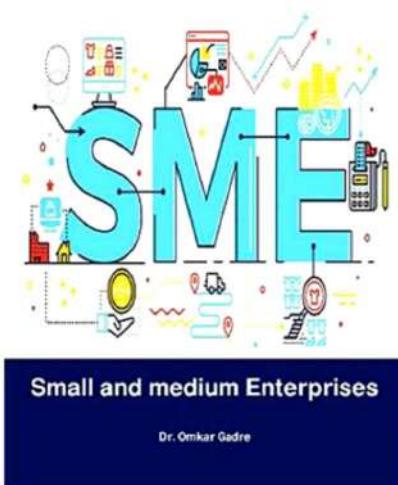
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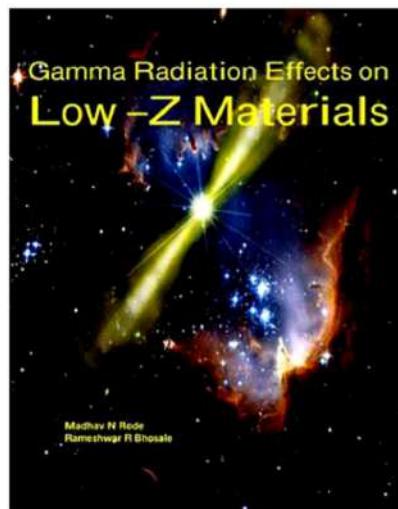
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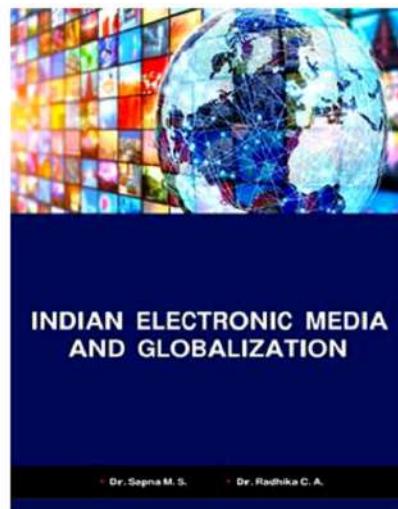
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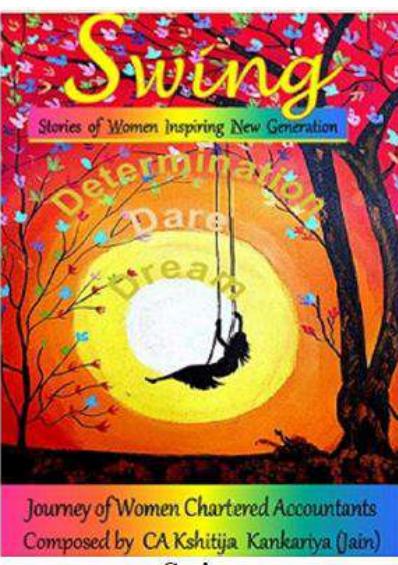
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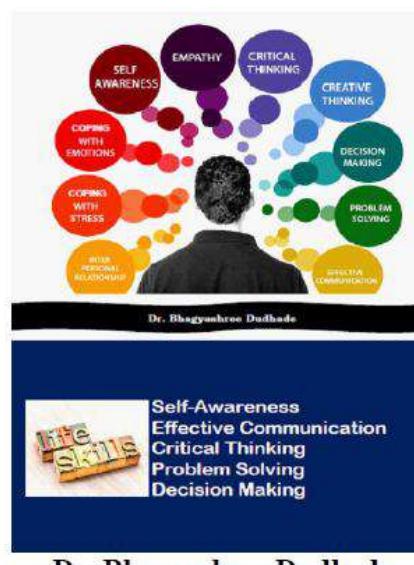
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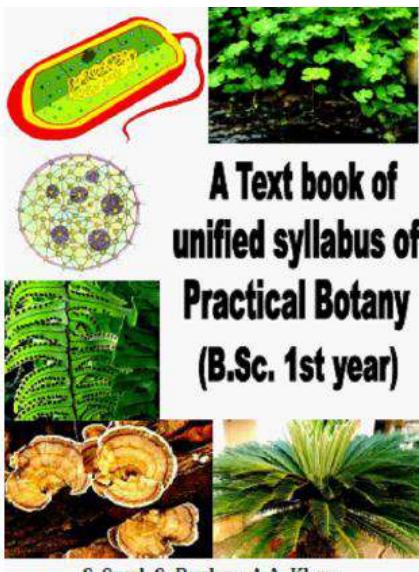
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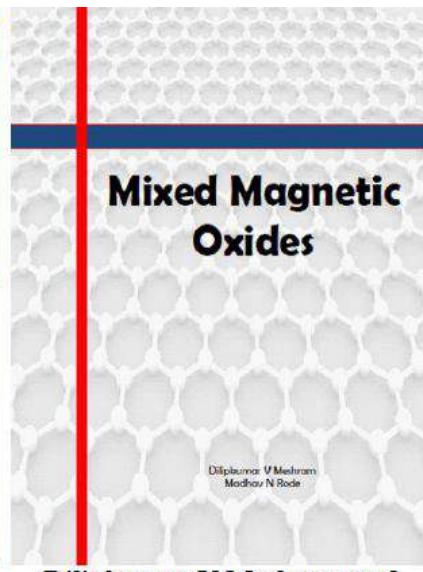
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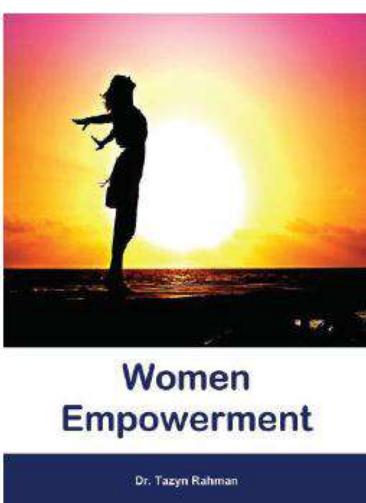
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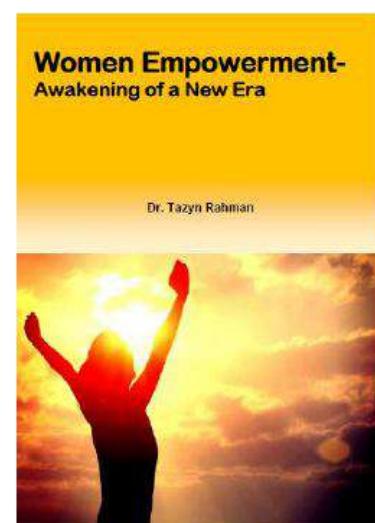
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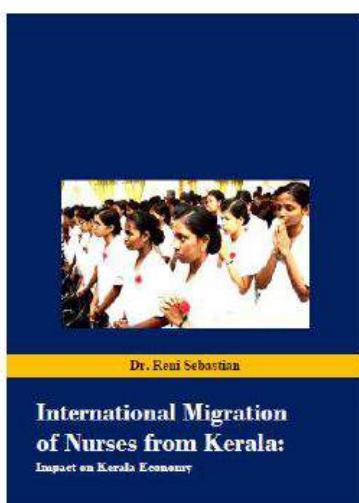
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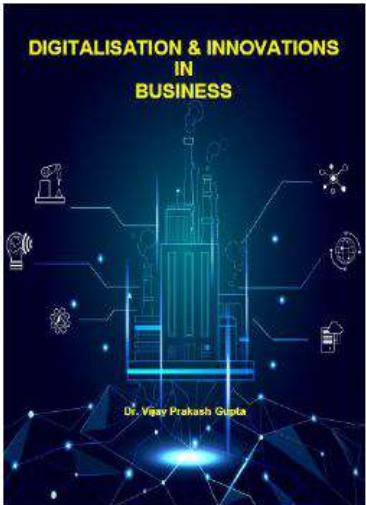
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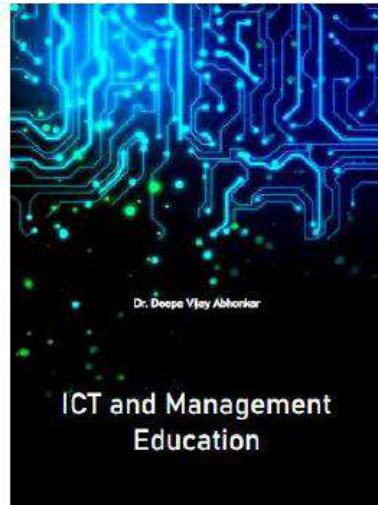
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