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**EFFICIENCY AND DIRECTIONAL RETURNS TO SCALE OF INDIAN BANKS**

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**ABSTRACT**

*In a developing economy like India, service sector plays a major role. Within service sector, banking sector is perhaps the prime. Banks need to be efficient and have to use their resources optimally. The study tries to determine the efficiency levels and returns to scale of all the public and private sector banks using Data Envelopment Analysis (DEA). Returns to scale has three directions: Increasing Returns to scale, Constant Returns to scale and Diminishing Returns to scale. The study attempts to assess the returns to scale of public and private sector banks. For this purpose, the study considers three inputs i.e. Total expenses, Total assets and Compensation of employees and two outputs viz. Total income and Return on assets. The findings revealed Indian Bank to be technical efficient in public sector category and Tamilnad Mercantile Bank in private sector category. Most of the banks are operating at constant returns to scale both in case of public and private sector banks.*

*Keywords: Banking, Returns to scale, Efficiency, Data Envelopment Analysis (DEA)*

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**INTRODUCTION**

Banking sector is an important component of the service sector of the country. Banks play a vital role in any economy as they meet the financial needs of all the sections of society. The role of the banks is important because the environment (economic & financial) in which the banking sector operates is changing continuously. The importance of the banking sector is premised on the basis of that banks are considered to be the foremost channel of savings and allocations of credits in an economy. (Ariccia and Marquez, 2004). The banking industry is highly competitive, with banks not only competing amongst each other; but also with non-banks and other financial institutions (Kaynak et al., 1991). Unless a bank can extend its product quality beyond the core service with additional and potential service features and value, it is unlikely to gain a sustainable competitive advantage (Chang et al., 1997). Moreover, the focus of the Govt. of India is to attain Make in India by involving rural India through banking industry, which further gives the scope to the banks to improve. Management of a bank is always concerned about the proper utilization of inputs to get the desired combination of outputs, through the right channel of operations (Saha and Ravisankar, 2000). In the financial institutions' environment, efficiency depicts the degree of utilization of different resources: human, physical and financial resources and evaluation of these resources will be very important during any disturbance in the setting (Saha and Ravisankar, 2000). Assessing the efficiency of banks is a powerful means of evaluating performance of banks, and the performance of markets and whole economies. In economics, efficiency is all about making the best use of the scant resources among competing ends so that economic and social welfare is maximised over time. The banks are facing financial problems such as non-performing assets (NPAs), financial crisis which makes it vital to study efficiency and returns to scale of Indian banks. Technical efficiency relates to how much output can be obtained from a given input, such as a worker or a machine, or a specific combination of inputs. Maximum technical efficiency occurs when output is maximised from a given quantity of inputs and the bank has scale efficiency when it operates in the range of constant returns to scale (CRS).

**OBJECTIVES OF THE STUDY**

1. To find the technical efficiency and scale efficiency of the public and private sector banks for 2011-16.
2. To assess the directional returns to scale of the public and private sector banks for 2011-16.

**PERIOD OF STUDY AND DATA COLLECTION**

The period of this study covers the years 2011–2016 and the data used has been taken from the Prowess Database (CMIE) published by Center for Monitoring Enterprises. The scope of the present study is restricted to twenty six public sector banks and nineteen private sector banks.

**REVIEW OF STUDIES**

Bhattacharya et al. (1997) used DEA to measure the productive efficiency of Indian commercial banks in the late 1980s and early 1990s in order to examine the impact of liberalizing policy measures taken in the 1980s, on the performance of various categories of banks. They found that the Indian public sector banks were the best



performing banks, as the banking sector was overwhelmingly dominated by the public sector banks, while the new private sector banks were yet to emerge fully in the Indian banking scenario. Bhattacharya et al., (1997) using DEA, measured technical efficiency of 70 banks in the period 1986-91. The results revealed that the public sector banks had the highest efficiency among the three categories, with foreign and private banks having much lower efficiencies. However, public sector banks showed a decline in efficiency after 1987, private banks showed no change and foreign banks showed a sharp rise in efficiency. Das (1997) studied technical, allocative and scale efficiency of different public sector banks for the period 1990-1996 using DEA approach. The study found decline in overall efficiency over time, decline in technical efficiency with slight improvement in allocative efficiency. The State Bank of India was found to be more efficient than other public sector banks. Seiford and Zhu (1999) discussed the determination of returns to scale (RTS) in data envelopment analysis (DEA). Three basic RTS methods and their modifications were reviewed and the equivalence between these different RTS methods was presented. The effect of multiple optimal DEA solutions on the RTS estimation was studied. It was shown that possible alternate optimal solutions only affect the estimation of RTS on DMUs which should be classified as constant returns to scale (CRS). Modifications to the original RTS methods were developed to avoid the effects of multiple optimal DEA solutions on the RTS estimation. The advantages and disadvantages of these alternative RTS methods were presented so that a proper RTS method could be selected within the context of different applications.

Sathye (2001) compared productive efficiency of publicly owned, privately owned and foreign owned banks operational in India in the year 1997-1998 and reported that private sector commercial banks as a group was paradoxically lower than the efficiency of public sector and foreign banks. Ataullah and Le (2002) used both ratio analysis and non - parametric cost efficiency methods to study cost efficiency and profitability of the three groups of bank ownership in India and Pakistan in the pre and post financial liberalisation era of 1990-1992. They found that although the three groups of banks improved their cost efficiency in the post deregulation period, the improved efficiency of privately owned and foreign owned banks was more noticeable than that of the publicly owned banks. Sathye (2002) measured the productive efficiency of banks in India using DEA approach. The efficiency scores for three groups of banks that were, publicly owned, privately owned, and foreign owned, were measured. The study tried to explain the performance variation among different groups of the banks. Two inputs namely interest expenses and non-interest expenses and two outputs, namely net interest income and non-interest income were used. A second DEA analysis was run with deposits and staff numbers as input and output respectively, to show how efficiency scores differ when inputs and outputs were changed. Their results suggested that foreign banks were in higher efficiency quartile than public and private sector banks. There were inefficiencies in the use of inputs among public sector and private sector banks.

Galagedera and Edirisuriya (2005) investigated the efficiency and productivity in a sample of Indian commercial banks over the period 1995-2002 using the DEA technique and productivity change using Malmquist productivity index. The results revealed that there had been no significant growth in productivity during the sample period. When analyzed separately, the public sector banks revealed a modest growth in productivity that appeared to have been brought about by technological change. The private sector banks indicated no growth. Mahesh and Rajeev (2009) examined the changes in productive efficiency of Indian commercial banks for the post reform period 1985-2004. They found that deregulation had significant impact on all three types of efficiency measures. Public sector banks as a group ranked first in all the three efficiency measures showing that, as opposed to the general perception, these banks were doing better than their private counterparts. Private banks, however, had shown marked improvement during the post-liberalization period in terms of all three types of efficiency measures. Kumar and Charles (2012) analysed the performance of Indian banks using DEA. The performance was measured in terms of technical efficiency, returns-to-scale, and Malmquist productivity index for a sample of 33 banks, consisting of 19 public sector and 14 private sector banks during the period 1995-96 to 2009-10. The findings revealed that the public sector banks were doing better than the private sector banks in terms of (i) technical efficiency since 2003-04 and (ii) scale efficiency from 2000-01 onwards.

Wang (2013) examined the causal effects of bank size on banks' survival, asset quality and leverage. Two forces drive these effects: increasing returns to scale derived from banks' expertise and competition. The first enabled bigger banks to survive competition better, have higher asset quality and be more leveraged. It drives banks into a race for expansion. This race toughened competition between banks, which edges out small banks and may worsen all banks' asset quality. Consequently, the banking industry would be dominated by a small number of highly leveraged banks. The study found that financial intermediation arises endogenously and co-exists with direct finance. Singh and Gupta (2013) gave a comparative analysis of the technical efficiency of top Indian banks during 2007-2011. The study used DEA for evaluating the relative efficiency of top public, private

and foreign banks in India. The study showed that the levels of input and output variables in efficiency measurement had changed significantly during this period and banks had improved their relative efficiency score over the period of time. Alrabei (2013) examined the effect of profitability on the performance of Indian (State Bank of India) banks and Jordan (Cairo Amman Bank) Banks for the period 2006-07 to 2010-11. Using t-test, the study found that the State Bank of India should try to control the cost of services rendered to increase the gross profit, and the Cairo Amman Bank should try to increase the number of branches at the global level. Sharma and Sharma (2016) studied the X-efficiency of Indian commercial banks for the post financial crisis period i.e. 2007-14 and also identified important determinants of service quality of efficient banks. The findings showed that Indian public sector banks had larger network but the percent of efficient private sector banks was more than the public sector banks. As regards service quality dimensions, on the basis of customers' perceptions and expectations both reliability and empathy dimensions were found to be important.

## DISCUSSION OF RESULTS

Data envelopment analysis (DEA) is a non-parametric method of measuring efficiency of a decision-making unit (DMU) such as bank/firm. Several mathematical programming DEA models have been proposed in the literature. In the present study, CCR (named after its developers, Charnes, Cooper and Rhodes, 1978) and BCC (named after its developers, Banker, Charnes and Cooper, 1984) models to obtain efficiency measures corresponding to the assumptions of CRS and VRS, respectively have been used. The efficiency measures obtained from CCR model are popularly known as overall technical efficiency (OTE) scores and are confounded by scale efficiencies. The efficiency measures obtained from BCC model are popularly known as pure technical efficiency (PTE) scores and devoid of scale efficiency (SE) effects. Scale efficiency (SE) for each DMU can be obtained by a ratio of OTE score to PTE score (i.e.  $SE = OTE/PTE$ ).

The present study has been devoted to analyze technical and scale efficiency to have a comprehensive view of banks performance. For this purpose three inputs have been considered. These are: Total expenses, Total assets and Compensation of employees. Total income and Return on assets are the two outputs used in the study.

**Table - 1: Descriptive statistic of various variables of public and private sector banks**

Descriptive Statistics					
Sub Panel: A Public Sector Banks					
	N	Minimum	Maximum	Mean	Std. Deviation
Total Expenses (Million Rs.)	26	51770.06	1092999.12	185064.46	202986.94
Total Assets (Million Rs.)	26	211813.82	15440485.20	2544142.35	2971033.05
Compensation of Employees (Million Rs.)	26	6123.88	173964.04	21907.38	32411.98
Returns on Assets (Percentage)	26	-0.03	1.31	0.75	0.25
Total Income (Million Rs.)	26	55766.84	1201267.14	202059.59	223962.02
Sub Panel: B Private Sector Banks					
Total Expenses (Million Rs.)	19	2998.20	354207.52	72137.95	100423.45
Total Assets (Million Rs.)	19	44510.86	5254403.94	1124595.54	1502371.37
Compensation of Employees (Million Rs.)	19	429.28	33338.96	7558.71	9979.19
Returns on Assets (Percentage)	19	-0.77	1.78	1.13	0.70
Total Income (Million Rs.)	19	3531.64	421762.66	84384.83	120160.86

Table 1 shows the descriptive statistic of the inputs and outputs used to analyze the efficiency scores of public and private sector banks during 2011-16. During this time period, public sector average expenses and average assets have been Rs. 185064.46 million and Rs 2544142.35 million respectively. These average total expenses and average total assets of public sector banks have been found to be 2.5 times and 2 times respectively higher than the private sector banks. Also, average income and average compensation of employees is 2.5 times and 2.5 times respectively higher than private sector banks. But private sector banks have better average returns of assets (1.13 percent) than public sector banks (0.75) during this period.

Table 2 and 3 show the efficiency of 26 public and 19 private sector banks for the period 2011-16 using input oriented model of DEA. Table 2 depicts the technical efficiency scores and scale efficiency scores of the public sector banks. As shown in the table, Indian Bank, Corporation Bank, and Central Bank of India are found to be technical efficient with highest scores under the Constant Returns Scale Model (CRS).

It is evident that other banks i.e. Allahabad Bank (0.98), Andhra Bank (0.99), Bank of India (0.96), Bank of Maharashtra (0.93), Canara Bank (0.99), Indian Overseas Bank (0.94), Oriental Bank of Commerce (0.99),

Punjab and Sind Bank (0.99), Punjab National Bank (0.99), State Bank of India (0.97), State Bank of Patiala (0.98), Syndicate Bank (0.96), UCO Bank (0.96), Union Bank of India (0.96), United Bank of India (0.90) and Vijaya Bank (0.95) are relatively inefficient. In other words, these banks can increase the level of output by 1.2%, 1.1%, 1.4%, 1.7%, 1.1%, 1.6%, 1.1%, 1.1%, 1.1%, 1.3%, 1.2%, 1.4%, 1.4%, 1.4%, 10.0% and 5.0% respectively with the same level of input. United Bank of India is found to be the most inefficient bank. 9 out of 26 banks have been judged as technical efficient as shown in Table 2. A bank is considered as scale efficient if its output scale efficiency score is one. 14 out of 26 banks are scale efficient as their output scale efficiency score is equal to 1 and these are operating in the range of constant returns to scale (CRS). Therefore it is clear from the above table that commonly 9 banks are both technical and scale efficient.

Further, whether the banks are operating in an area of increasing or decreasing returns to scale can be checked by running an additional DEA problem with Non Increasing Return to Scale (NIRS). Out of 26 banks, only 7 banks are performing under increasing returns to scale, 5 are performing under decreasing returns to scale and the remaining 14 are operating under constant returns to scale. On the basis of scale efficiency, State Bank of India is highly inefficient bank and relatively underperforming by 3.0 percent

**Table - 2: Technical efficiency and Scale efficiency of public sector banks during 2011-16**

Banks	Technical Efficiency	Benchmarks	Scale Efficiency	Returns to Scale
Allahabad Bank	0.98	7 (0.05) 8 (0.26) 11 (0.88)	1.00	CRS
Andhra Bank	0.99	7 (0.03) 8 (0.36) 11 (0.46)	1.00	IRS
Bank of Baroda	1.00	6	1.00	CRS
Bank of India	0.96	3 (0.33) 8 (0.61) 11 (0.98)	0.99	DRS
Bank of Maharashtra	0.93	7 (0.01) 11 (0.65)	0.98	IRS
Canara Bank	0.99	7 (0.03) 8 (0.93) 11 (1.50)	0.99	DRS
Central Bank of India	1.00	12	1.00	CRS
Corporation Bank	1.00	13	1.00	CRS
Dena Bank	1.00	3	1.00	CRS
IDBI Bank	1.00	0	1.00	CRS
Indian Bank	1.00	17	1.00	CRS
Indian Overseas Bank	0.94	7 (0.04) 8 (0.39) 11 (0.93)	1.00	CRS
Oriental Bank of Commerce	0.99	7 (0.09) 8 (0.82) 11 (0.23)	1.00	CRS
Punjab & Sind Bank	0.99	7 (0.00) 8 (0.18) 19 (0.72)	0.99	IRS
Punjab National Bank	0.99	3 (0.04) 11 (2.85)	0.99	DRS
State Bank of Bikaner & Jaipur	1.00	0	1.00	CRS
State Bank of Hyderabad	1.00	7 (0.06) 8 (0.15) 9 (0.02) 11 (0.60)	1.00	CRS
State Bank of India	0.97	3 (0.13) 11 (8.89)	0.97	DRS
State Bank of Mysore	1.00	1	1.00	CRS
State Bank of Patiala	0.98	7 (0.06) 8 (0.21) 9 (0.21) 11 (0.23)	0.99	IRS
State Bank of Travancore	0.98	7 (0.04) 8 (0.04) 9 (0.57) 11 (0.15)	0.99	IRS
Syndicate Bank	0.96	3 (0.07) 11 (1.04)	1.00	CRS
UCO Bank	0.96	3 (0.01) 8 (0.56) 11 (0.54)	1.00	CRS
Union Bank of India	0.96	3 (0.01) 8 (0.17) 11 (1.59)	0.99	DRS
United Bank of India	0.90	7 (0.04) 11 (0.62)	0.99	IRS
Vijaya Bank	0.95	7 (0.00) 8 (0.23) 11 (0.39)	0.98	IRS

Table 3 depicts the technical efficiency scores and scale efficiency scores of the 19 private sector banks. As shown in the table, Tamilnad Mercantile Bank, Nainital Bank and HDFC Bank are found to be technical efficient with highest scores under the Constant Returns Scale Model (CRS). It is evident that other banks i.e. Catholic Syrian Bank (0.86), Dhanlaxmi Bank (0.81), Federal Bank (0.96), ING Vysya Bank (0.94), Indusind Bank (0.98), Karnataka Bank (0.91), KarurVysya Bank (0.97), Kotak Mahindra Bank (0.99), Lakshmi Vilas Bank (0.89), Ratnakar Bank (0.92) and South Indian Bank (0.94) are relatively inefficient. In other words, these banks can increase the level of output by 14.0%, 19.0%, 4.0%, 6.0%, 2.0%, 9.0%, 3.0%, 1.0%, 11.0%, 8.0% and 6.0% respectively with the same level of input. Dhanlaxmi Bank is found to be the most inefficient bank.

**Table - 3: Technical efficiency and Scale efficiency of private sector banks during 2011-16**

Banks	Technical Efficiency	Benchmarks	Scale Efficiency	Returns to Scale
Axis Bank	1.00	6	1.00	CRS
Catholic Syrian Bank	0.86	6 (0.02) 18 (0.14)	1.00	IRS

City Union Bank	1.00	0	1.00	CRS
Dhanlaxmi Bank	0.81	6 (0.02) 18 (0.17)	1.00	CRS
Federal Bank	0.96	1 (0.06) 6 (0.09) 15 (0.21) 18 (0.44)	1.00	CRS
HDFC Bank	1.00	8	1.00	CRS
ICICI Bank	1.00	2	1.00	CRS
ING Vysya Bank	0.94	6 (0.11) 15 (0.29) 18 (0.25)	1.00	CRS
Indusind Bank	0.98	1 (0.14) 15 (0.02) 18 (0.69) 19 (0.16)	0.98	DRS
Jammu & Kashmir Bank	1.00	7 (0.12) 15 (0.82)	1.00	CRS
Karnataka Bank	0.91	1 (0.06) 6 (0.03) 18 (0.30)	1.00	CRS
KarurVysya Bank	0.97	1 (0.05) 15 (0.34) 18 (0.24) 19 (0.22)	1.00	CRS
Kotak Mahindra Bank	0.99	6 (0.16) 15 (0.32) 18 (0.66)	0.99	DRS
Lakshmi Vilas Bank	0.89	1 (0.04) 6 (0.00) 15 (0.05) 18 (0.26)	0.97	IRS
Nainital Bank	1.00	9	1.00	CRS
Ratnakar Bank	0.92	7 (0.01) 15 (0.53)	1.00	CRS
South Indian Bank	0.94	1 (0.07) 6 (0.05) 15 (0.44) 18 (0.10)	1.00	CRS
Tamilnad Mercantile Bank	1.00	10	1.00	CRS
Yes Bank	1.00	2	1.00	CRS

8 out of 19 banks have been judged as technical efficient whereas 15 out of 19 banks are scale efficient as shown in Table 3. Therefore it is clear from the above table that commonly 8 banks are both technical and scale efficient. Out of 19 banks, only 2 banks are performing under increasing returns to scale, 2 are performing under decreasing returns to scale and the remaining 15 are operating under constant returns to scale. On the basis of scale efficiency, Lakshmi Vilas Bank is highly inefficient bank and relatively underperforming by 3.0 percent. On the basis of technical efficiency 09 public sector banks and 08 private sector banks are found to be efficient as shown in Table 4. The number of public sector banks and private sector banks which are scale efficient are 15 and 16 respectively. In case of public sector banks, most of the banks are operating at constant returns to scale and very few are operating at decreasing returns to scale. As compared to public sector banks, in case of private sector banks 15 banks are operating at constant returns to scale and 02 each are operating at increasing and decreasing returns to scale.

**Table 4: Compilation of efficiency on the basis of Technical Efficiency, scale Efficiency and Returns to Scale**

Parameter	Public Sector Banks	Private Sector Banks
Technical Efficient	09	08
Scale Efficient	15	16
Constant Returns to Scale	14	15
Increasing Returns to Scale	07	02
Decreasing Returns to Scale	05	02

## CONCLUSION

After liberalization, globalization and privatization banks cannot afford to be inefficient. They need to be highly efficient. Data Envelopment Analysis (DEA) helps to compute the level of efficiencies considering different inputs and outputs. The paper investigated about the technical and scale efficiency of twenty six public and nineteen private sector banks. The empirical observations obtained through Charnes, Cooper and Rhodes (CCR) and Banker, Charnes, Cooper (BCC) model illustrate and analyze inter-temporal, comparison in terms of technical efficiency and scale efficiency between public and private sector banks in India for the period 2011 to 2016. The results show Indian Bank to be technical efficient in public sector category and Tamilnad Mercantile Bank in private sector category. As regards scale efficiency State Bank of India and Lakshmi Vilas Bank are found to be highly inefficient in public and private sector categories respectively. Most of the banks are operating at constant returns to scale both in case of public and private sector banks.

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**SOCIO-ECONOMIC STATUS OF TRADITIONAL FISHERMEN COMMUNITY IN THE VEMBAR COASTAL VILLAGE OF TUTICORIN DISTRICT, TAMILNADU, INDIA****R. J. Rathees<sup>1</sup> and V. Ramadas<sup>2</sup>**Research Scholar<sup>1</sup>, and Assistant Professor<sup>2</sup>, P.G & Research Department of Zoology, Raja Doraisingam Govt. Arts College, Sivagangai**ABSTRACT**

Fisheries play a vital role in ensuring the livelihood of a large number of people belonging to the economically weaker sections of the population of Tamilnadu. The percapita fish consumptions of Tamilnadu is about 9.8 kg per anum. Tamilnadu with its unique marine ecosystem having Bay of Bengal on the East, flanked by Indian Ocean and Arabian Sea on the South and West with 1,076 km long coastline, contributes 12.62% of the country's marine fish production. Marine fisheries contribute to food security and provide direct employment to over 1.5 million fisher people besides others indirectly dependent on the sector. Along with maximum fish production, the fisheries development should aim at improving the nutritional level of people and the socio-economic condition of the fishermen.

An investigation on utilization of marine resources and socio-economic status of fishermen community was carried out in the Vembar village, Vilathikulam Taluk, Thoothukudi district, Tamilnadu. Information pertaining to gender, age group, religion, Fishermen id card details, Family card details, residential status, house patterns, basic amenities, educational status, employment status, crafts details, fishing gear details, ownership of crafts and gears details, investment, loan details, income, welfare schemes, etc was collected from all families of the Vembar village by interviewing the heads of households.

The Socio- economic condition of marine fishermen and their attitude towards development schemes will serve as background information which is vital for implementing new technological and policies.

**Keywords:** Utilization of marine fishery resources, Socio-economic status, fishermen community

**1. INTRODUCTION**

The fisheries sector contributes to the national income, exports, food and nutritional security and employment generation. It is a principal source of livelihood for a large section of the economically underprivileged population of the country, especially people living in the coastal areas. India has immense potential for developing and producing a variety of sea foods, highly sought after throughout the world, directly leading to a huge amount of export in this field. It forms more than 70% of sea food all over the world (Anon, 2011). Tamilnadu is the southernmost state in India, has a long and glorious tradition of marine fisheries activities. It has a coastal length of 1076 km (13% of the country's coastline), 0.19 million square kilo meter of Exclusive Economic Zone (EEZ) and a continental shelf of about 41,412 sq.km. It is also one of the leading states in marine fish production, third industrialized and the most urbanized state in the country. Ports, fishing harbours and a variety of coastal industries like nuclear thermal power plants, refineries, fertilizer, marine chemicals, etc., are situated all along the coast of Tamilnadu. Demands for fishes in recent years has been growing, not only because of the increasing needs of the growing population especially from developing countries; it is also as a nutritious and functional food (Mohamed Rabeek Raja and Ramdas, 2014 and Seennivasan and Ramdas, 2014).

**2.0. MATERIALS AND METHODS****2.1. Description of the Study Area**

Among the 23 coastal districts of Tamilnadu, Tuticorin district was selected for the study. Vembar village is a hamlet under the jurisdiction of Vembar panchayat, Vilathikulam Taluk in Tuticorin district of Tamilnadu and located at 38Km North East to Tuticorin has been selected for a detailed socio economic survey. It is one of the fishing villages with daily landings, located in the coastal area with Latitude: 9.100 and Longitude: 78.367 of Thoothukudi district, Tamilnadu, India (Fig.1a and Fig 1b).

**2.2. Geographical Position****Fig.1a: Map Showing the location of Vembar**



**Fig.1b: Satellite picture of the study area**

### 1.1. METHODS

Based on the preliminary investigation of Gulf of Mannar, Vembar village has been selected for a detailed socio – economic survey. Information pertaining to gender, age group, religion, residential status, house patterns, basic amenities, educational status, employment status, income and welfare schemes, etc was collected from all families of the Vembar village by interviewing the heads of households. Local enumerators from the fishermen community were engaged for data collection to ensure maximum accuracy (Islam and Elachi, 1993, and Narayankumar et al., 2000). The data were collected from 1720 families in the period of 2015 in Vembar village only. The data were collected through a well-structured and pre tested interview schedule with a personal enquiry. The fisher folk populations are presented in the Table 1.

### 2.0. RESULTS AND DISCUSSION

#### 2.1. Gender-wise and Age-wise Composition of fishermen population

The children and adults were recorded as 3720 & 3745 from 1720 families during the years 2015. The average family size was recorded as 4.3 in during the study period. The data obtained were also indicated that, male members were slightly more when compared to female (Table – 1 & Fig.2a).

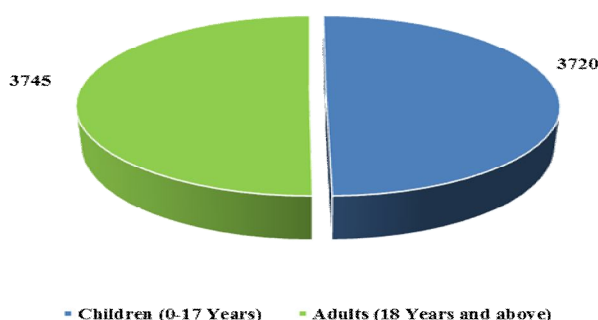
The analysis of age-wise composition of fishermen population have indicated that, during the year 2015 the individuals in the age group of 21- 40 years were more (1525) and followed by 41-60 (1145), 0-20 (1010), and above 60 years (265). It has been inferred that, 35% fishing workers engaged in various fishing activities belonged to the age groups of 21-40 years and 31% of the fishing workers engaged in fishing activities belonged to the age groups of 41-60 years respectively. (Table – 2 & Fig.2b).

Mostly, the adults were getting involved in the fishing and allied activities whereas; female adults were not regularly involved in such activities. Even though, the percentage of working class people (21-40 years & 41-60 years) was observed as 35% and 31%, the enhancement in the economic status of the fishermen population was not noticed in the village, this may be due to lack of basic facilities in the village. Similar studies have carried out reported by Panikkar and Alagarraja, (1993) and Thomson et.al, (1993).

**Table-1: Fishermen population in Vembar during the period January – 2015 to December - 2015**

S. No.	Age group of Fishermen population	January – 2015 to December - 2015				
		M	%	F	%	T
1	Children (0-17 Years)	1824	46	1986	54	<b>3720</b>
2	Adults (18 Years and above)	2121	54	1624	46	<b>3745</b>
3	Total Population	3945	53	3520	47	<b>7465</b>
Total Number of Families		<b>1720</b>				
Family size/Person per house (Average)		<b>4.3</b>				

NB: M- Male, F- Female, T- Total Population.

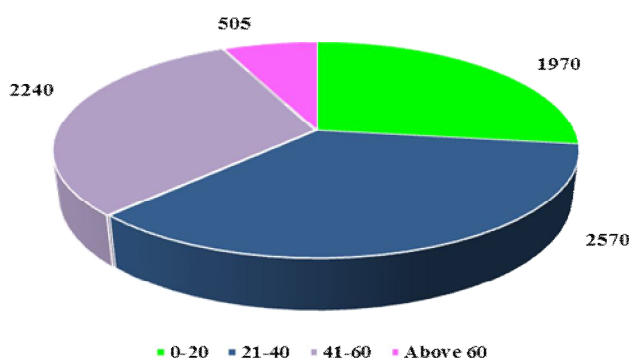
**Figure-2a-Age group of Fishermen**



**Table-2: Marine fishermen by Age Group in Vembar during the period from January – 2015 to December - 2015**

S. No.	Age Group in Class Intervals (Years)	January – 2015 to December - 2015					
		M	%	F	%	T	%
1	0-20	1010	26	960	27	1970	26
2	21-40	1525	39	1225	35	2570	37
3	41-60	1145	29	1095	31	2240	30
4	Above 60	265	7	240	7	505	7
<b>Total Population</b>		<b>3945</b>	<b>53</b>	<b>3520</b>	<b>47</b>	<b>7465</b>	<b>100</b>

NB: M- Male, F- Female, T- Total Population.

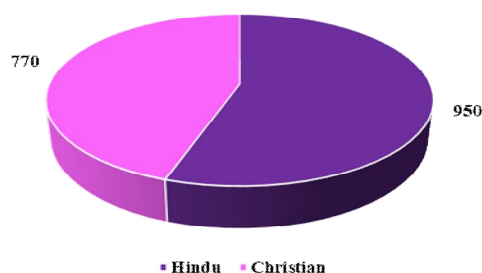
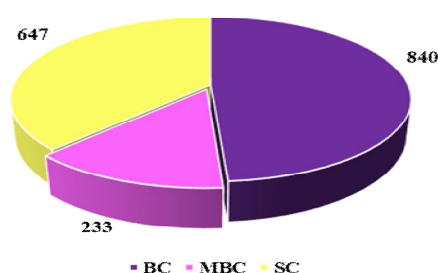
**Figure 2b-Marine Fishermen by Age Group****1.1. RELIGION AND COMMUNITY-WISE DISTRIBUTION OF THE FISHERMEN POPULATION**

The religion and community system is an important indicator of socio-economic conditions of fishermen community. The data collected during the study period have indicated that, 55.2 % of the fishermen were belong to Hindu and 45% were Christians and 49% the fishermen population were belong to backward community and 38% were belong to scheduled community and 14% belong to most backward community. (Table -3 and Fig.3a & 3b).

**Table-3: Family – wise details of Religion and Community of fishermen population in Vembar during the period from January – 2015 to December – 2015**

S. No.	Religion and Community of fishermen population	January – 2015 to December – 2015	
<b>Religion</b>		<b>No.</b>	<b>%</b>
1	Hindu	950	55.2
2	Christian	770	45
3	Muslim	0	0
<b>COMMUNITY</b>			
4	FC	0	0
5	BC	840	49
6	MBC	233	14
7	SC	647	38
8	ST	0	0
<b>Total Number of Families</b>		<b>1720</b>	

NB: FC- Forward Caste, BC-Backward Caste, MBC- Most Backward Caste

**Figure 3a-Religion of fishermen****Fig 3b-Community of fishermen**

## 1.2. RESIDENTIAL STATUS OF FISHERMEN POPULATION

A total of 1720 houses were recorded during the years 2015. Ownership of the house is one of the indicators of socio-economic conditions of fishermen. During the study period of 2015, it was observed that, out of the 1720 respondent families, 51% families have got own houses. Out of own houses, 9% houses were constructed by the Central and State Government (both free houses and Tsunami houses). (Table-4a & Fig.4). Out of the total number of 1720 houses, thatched houses, little roofed, concrete houses, and the titled houses were recorded as 50%, 24%, 19% and 6% respectively Likewise, the houses of fishermen with more than three rooms (a small living room, a bed room and a kitchen) were found as very less (2%) whereas, about 5% houses have three rooms (a small living room, a bed room and a kitchen) and remaining 93% have two rooms (a living room and a bed room). (Table-4b)

Above 51% of fishermen population have own houses in this fishing village. Only 0.6% of them have recorded to possess more than three rooms. Majority of the houses of fishermen family were small in size with lesser number of rooms which implied their economic status. These results were in agreement with the research reports of Panikkar and Alagarraja (1981).

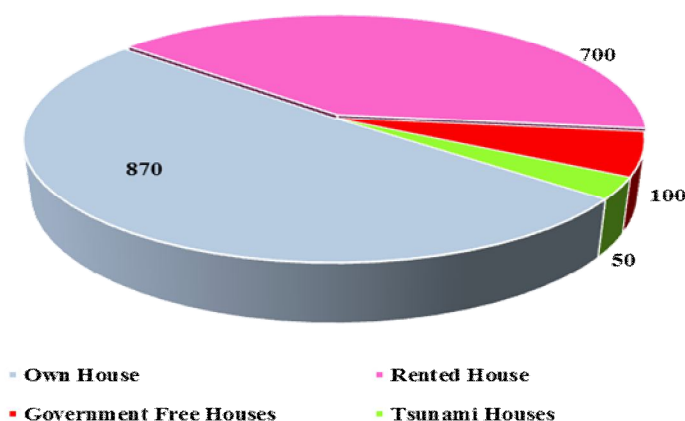
**Table-4a: Housing Facilities of fishermen in Vembar during the period from January – 2015 to December – 2015.**

S. No.	Residential Status	January – 2015 to December – 2015	
		No.	%
1	Own House(including Free and Tsunami Houses)	870	51
2	Rented House	700	41
3	Government Free Houses (out of own house)	100	6
4	Tsunami Houses (out of own house)	50	3
<b>Total Houses</b>		<b>1720</b>	

**Table-4b: Type and infrastructure of houses of fishermen in Vembar during the period from January – 2015 to December - 2015**

S. No.	Residential Status Houses on the basis of Types of Roofs & Number of Rooms	January – 2015 to December - 2015	
		No.	%
Houses on the basis of Types of Roofs.			
1	Thatched	860	50
2	Litter Roofed	420	24
3	Titled	110	6
4	Concrete (including Govt. free houses&Tsunami houses)	330	19
Total No. of Houses		1720	100
Houses on the basis of Number of Rooms (Concrete Houses only)			
5	Houses With 2 Rooms	310	93
6	Houses With 3 Rooms	15	5
7	Houses With More than 3 Rooms	5	2
Total No. of Houses		330	

**Fig 4-Housing Facilities of Fishermen**



**1.3. BASIC AMENITIES (ELECTRIFICATION, SANITARY FACILITY AND DRINKING WATER FACILITY)**

Almost all the fishermen houses were electrified as per the data recorded during the study period (Table - 5). The data collected during the year 2015 have indicated that, out of 1720, 1050 (61 %) houses were provided with toilet facilities. The remaining families were using common toilet provided by the Government of Tamil Nadu and open defecation was also noticed. Besides, the data recorded have also inferred that, 1.7% of families were using bore well water for household works; remaining 98% of the households in this village were using public water taps in the streets of the village provided by the Government of Tamil Nadu (Table - 5).

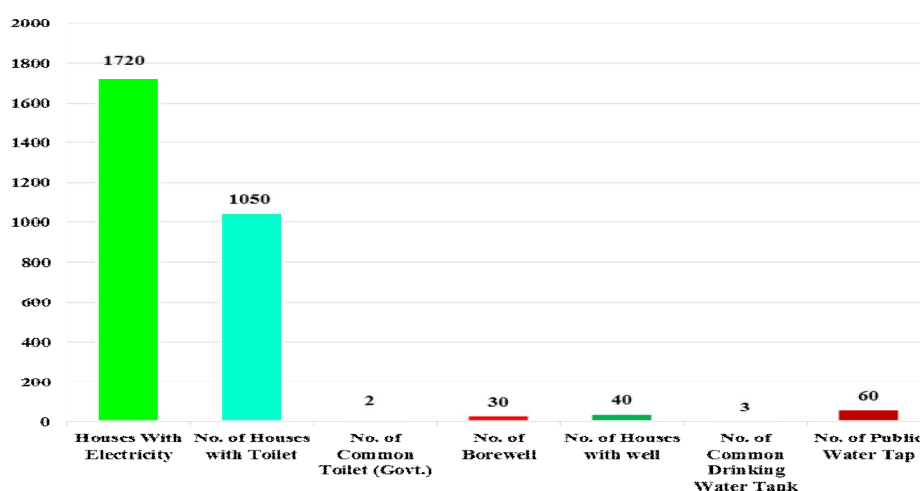
The houses with electricity connection are also one of the indicators of the level of economic conditions of the fishermen. It is obvious that almost all the fishermen houses were electrified. The data collected in the study area during the study period have indicated that, out of 1720 houses, only 1050 houses were provided with toilet facilities. Whereas, 39% fishermen families were using common toilet provided by the Government of Tamil Nadu. Moreover, the lack of toilet facility caused many health problems to fisherfoks in the village which in turn caused considerable economic loss. The reports of Panikkar and Alagaraja (1981) and Seenivasan & Ramdas (2014) were in agreement with the present study.

The data obtained during the study periods has indicated that, the percentage of people using well water and bore-well water for drinking purpose was very meager and 96% households were using public water taps provided by the Government of Tamil Nadu in the streets of the village. The presence of basic amenities in this village will also contribute to the health of the fishermen and which seemed to be the indicator of their economic status.

**Table-5: Basic Amenities available in Vembar during the period from January – 2015 to December - 2015.**

S.No.	Basic Amenities	January – 2015 to December – 2015	
		No.	%
1	Houses With Electricity	1720	100
2	No. of Houses with Toilet	1050	61
3	No. of Common Toilet (Govt.)	2	0.11
4	No. of Borewell	30	1.7
5	No. of Houses with well	40	2.3
6	No. of Common Drinking Water	3	0.17
7	No. of Public Water Tap	60	3.4
<b>Total No. of Houses</b>		<b>1720</b>	

**Fig 5-Basic Amenities available in Vembar**

**1.4. EDUCATIONAL STATUS OF FISHERMEN POPULATION**

Illiteracy was the main reason for any problem in any society. The data collected regarding the educational status of fishermen population in this fishing village during the year 2015 have clearly indicated that, nearly 88% of the respondents were literates and remaining were belonging to illiterate (7%) and below 5 years (5%)

categories (Table – 6a & Fig.6). It was observed that the fishermen populations have a positive attitude towards education. Even though, 88% were literates, large numbers of fishery workers were in the lower educational categories out of 88% literates, 35% of the respondents have studied primary level of education and 36% were studied at middle school level. H.Sc qualified (4%) and Graduates (3%) were lesser in numbers.(Table-6b).

Thus, the educational status has been observed as very low which forms the major barrier to improve their economic status. Besides, their poor economic condition, they could not provide financial support to their child education. And the results were corroborating with the reports of Seenivasan and Ramdas (2014).

**Table-6a: Educational Status of fishermen in Vembar during the period from January – 2015 to December - 2015.**

S. No.	Educational Status	January – 2015 to December - 2015			
		M	F	T	%
1	Total Literate	3650	2930	6580	88
2	Illiterate	175	340	515	7
3	<5 Years	120	250	370	5
<b>Total Population</b>		<b>3945</b>	<b>3520</b>	<b>7465</b>	<b>100</b>

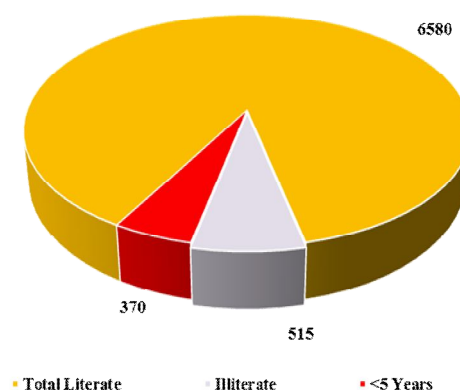
NB: M- Male, F- Female, T- Total Population.

**Table-6b: Levels of Educational Status of fishermen in Vembar during the period from January – 2015 to December - 2015.**

S. No.	Educational Status	January – 2015 to December - 2015			
		M	F	T	%
1	Primary School	1209	1070	2279	35
2	Middle School	1513	879	2392	36
3	High School	680	717	1397	21
4	HSC	113	130	243	4
5	Graduate	90	79	169	3
6	Technical	45	55	100	1
<b>Total Literate</b>		<b>3650</b>	<b>2930</b>	<b>6580</b>	<b>100</b>

NB: M- Male, F- Female, T- Population. Primary Education - upto Standard -V, Middle-Upto Standard - VIII, High School- upto standard X, H.Sc.,- Standard XII, Graduation - Degree, Technical Education- (Diploma& Engineering Degree)

**Fig 6-Educational Status of Fishermen**



### 1.5. EMPLOYMENT STATUS OF FISHERMEN POPULATION

The data obtained in this regard during the year 2015 have showed that, out of 7465 fishermen in Vembar 7322 (98%) were employed and 143(2%) were unemployed. Out of 7322 employed individuals 3896 (99%) were men and 3426 (97%) were women (Table – 7a & Fig.7). Among the 7322 employed respondents, 86% were engaged in marine fishing related activities like fish-vending, wholesale trade of dried and fresh fish, net making, and fish processing and coir-retting, 4% were self employed and 6% were coolie. Majority of the fishing workers were not having any subsidiary occupation. (Table-7b). The results were in agreement with the results of Kamal Kumar Datta et.al., (1989).

The data recorded indicated that, the majority of the fishermen family members were unemployed and greater part of the fishing workers in this village was not having any subsidiary occupation. They do not earn any income for their households apart from fishing activities. Majority of the women of fisherfok families in this village were involved mostly in household works and they were not regularly involved in fishery activities except in fish vending and hence there has been no remarkable improvement in the economic status was noticed in this fishing village.

**Table-7a: Employment Status of fishermen Families in Vembar during the period from January – 2015 to December - 2015.**

S. No.	Employment Status	January – 2015 to December – 2015					
		M	%	F	%	T	%
1	Total Employed	3896	99	3426	97	7322	98
2	Unemployed	49	1	94	3	143	2
<b>Total Population</b>		<b>3945</b>	<b>100</b>	<b>3520</b>	<b>100</b>	<b>7465</b>	<b>100</b>

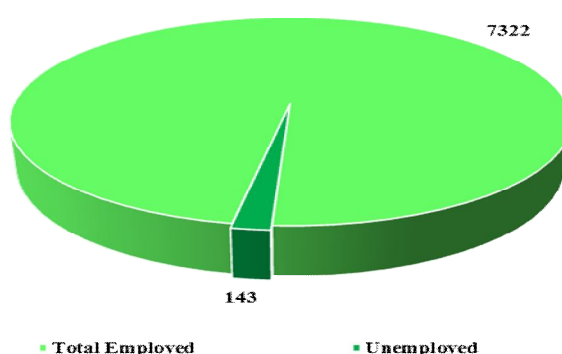
NB: M- Male, F- Female, T- Total Population.

**Table-7b: Occupational status of Employment Status of fishermen Families in Vembar during the period from January – 2015 to December - 2015.**

S. No.	Employment Status	January – 2015 to December – 2015			
		M	F	T	%
1	Marine Fishing	2900	0	2900	40
2	Fresh Fish Trade	100	450	550	8
3	Dried Fish Trade	30	370	400	5
4	Processing / Curing	116	399	515	7
5	Net Making / Repairing	100	329	429	6
6	Govt. Employee	120	340	460	6
7	Private Employee	250	745	995	14
8	Self Employee	120	320	440	6
9	Employee in Abroad	10	13	23	0.3
10	Coolie	150	460	610	8
11	<b>Total Employed</b>	<b>3896</b>	<b>3426</b>	<b>7322</b>	<b>98</b>
12	<b>Total Unemployed</b>	<b>49</b>	<b>94</b>	<b>143</b>	<b>2</b>
13	<b>Total Population</b>	<b>3945</b>	<b>3520</b>	<b>7465</b>	<b>100</b>

NB: M- Male, F- Female, T- Total Population

**Fig 7-Employment Status of Fishermen**



## 1.6. EARNING MEMBERS AND ANNUAL INCOME RANGE OF FISHERMEN FAMILY

The number of earning members in the fishermen families vary from a minimum of one to a maximum of three. The data obtained during the year 2015 showed that, among 1720 families, 1210 (70%), 271 (16%) and 239 (14%) families were having two or three earning members per family respectively. It was observed that, among the earning members, the women were not regular earning members.

Out of six categories of income range the percentage of families under each category was recorded during 2015 as 59%, 15%, 7%, 6%, 7%, and 6% respectively. As per the data collected, only 7% of fishermen families were belong to fifth category (₹.1,60,001 to ₹.2,00,000), whereas, only 6% were belong to the income category of

₹.2,00,001 to ₹.2,40,000 but, 15% were belonging to income category of ₹.40,001 to ₹.80,000. Altogether, the income level or the economic status of the fishermen population of the study area was observed as low. The percentage of families under higher income group seemed to be low. (Table-8). These results were coincided with the reports of Seenivasan and Ramdas (2014).

During 2015, it was found that, more families (14%) were having three earning members per family. Usually women were not as a earning members and they involved mostly in household activities.

**Table-8: Annual Income Status of Fishermen Families in the Vembar during the period from January – 2015 to December - 2015.**

S. No.	Income Range	January – 2015 to December - 2015	
		No	%
1	Upto to Rs.40000	1017	59
2	Rs.40001 to Rs.80000	250	15
3	Rs.80001 to Rs.20000	127	7
4	Rs.120001 to Rs.160000	98	6
5	Rs.160001 to Rs.200000	124	7
6	Rs.200001 to Rs.240000	104	6
<b>Total No. of Families</b>		<b>1720</b>	<b>100</b>

## 2.0. CONCLUSION

Fishing is the traditional occupation of the fishermen living all along the coast of India and it contributes to the national income. The study shown that the majority of the fishermen were middle and old age group. Hindu and Backward community people are mostly involved in the fishing activities when compared to others. Most of the fisher folks had their own houses with thatched. Literacy percentage is considerable raised in the study period. Most of them completed their primary level education. Employability was high in the field of fishing when compared to other fields. Most of the fishermen had minimum annual income and it was spent in purchase of gear and crafts and other expenses. Almost all of the fishermen were benefited by the government announced welfare schemes. The study clearly stated that the fishermen community in Vembar village is in the medium level.

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**A STUDY ON THE SOCIO-ECONOMIC PROFILE OF SCHOOL DROPOUTS IN THE COASTAL VILLAGES OF KARAIKAL DISTRICT, U.T. OF PUDUCHERRY**

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**INTRODUCTION**

Education is the single most instrument of change in social, political or individual life since the inception of the human society. Education is essential to reduce poverty and increase human capital. The education has revolutionized the social order as well as the individual's role and responsibilities for social order based on which the developed and underdeveloped societies are recognized. Moreover, a literate, well-educated work force is essential for any country to achieve sustainable economic development and to compete effectively with developed societies (societies in the developed countries).

On the other hand, the developed societies apart from being a well ordered society has also the massive spread of education among its population in contrast to the underdeveloped societies. Further, in the present world, education is the most important cause for socio-economic and political transformation as a well educated population, equipped with the relevant knowledge, attitudes and skills is essential for economic and social development. So, to boost itself to be among the leading nations with developed societies, India needs to strengthen its education system because education is primarily running in the backbone of economy, polity as well as among individuals. Therefore, India as a developing nation, recognizing the role of education in socio-economic development, now places more emphasis on provision of quality of education for various target groups such as children, youth and adults.

Actually, education is designed to guide children in learning a culture, molding their behaviour in the ways of adulthood and directing them towards their eventual role in society. Through education, the quantity of knowledge to be passed on from one generation to the next and it is the process of preparation for making life pleasant and acquaintance with right principles of life. But this process of preparation for pleasant life is disturbed by dropouts.

**PROFILE OF THE STUDY AREA IN BRIEF**

Karaikal district is one of the four districts of the Union Territory of Puducherry in India. The Karaikal is a town located at about 16 km north of Nagappattinam and 12 km south of Tarangambadi and is the headquarter of Karaikal district. Karaikal region is made up of four Commune panchayats, viz., Kottucherry, Nedungadu, Tirunallar, Neravy & Tirumalarayanpattinam and Karaikal Municipality.

The formation of Karaikal National Congress on 13th June 1947 and Students Congress on 31st January 1947 symbolised the first concrete expression of popular desire in Karaikal for freedom from French rule. The French ruled this district till 31st October 1954 on which date the French flag flying atop the government house at Karaikal was lowered with due military honours before a large gathering of officials and non-officials. Thus the de facto transfer of power took place on 1st November 1954 followed by de jure transfer on 16th August 1962.

**STATEMENT OF THE PROBLEM**

Education plays a pivotal role to in the process of socio-economic development of India as in every country in the world. Indeed such development depends largely on the level of education attained by people in all walks of life, i.e., people of all communities. Any country can grow faster only if weaker sections and minorities are very well educated. But in India, the education level of weaker sections and minorities is yet to reach the desired level.

The fishermen community in India is one such weaker section of our society which is still educationally backward. The educationally backwardness is mainly due to school dropouts because of certain occupational practices and socio-economic background like poverty, inability of parents, unfavourable influence of their own community, pressure of domestic work and employing children in fishing and fish related to supplement family income in addition to lack of interest in studies, poor performance and failure in examination. Though there are many factors responsible for school dropouts, the socio-economic conditions of the fishermen community are likely to play major role in dropping out from schools as the mental ability of children is associated with such conditions. Therefore, the present research work is undertaken to address the problem of school dropout due to socio-economic conditions of fishermen community in Indian context.



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**DROPOUTS**

As defined by UNESCO (United Nations Educational, Scientific and Cultural Organization), “Dropout” is leaving school without completing the started education cycle or education program. The drop out is also called as “early school leaving”. The dropout is defined by OECD (Organisation for Economic Co-operation and Development) as a student who leaves a specific level of education without achieving specified qualification. The definition of dropout differs by country and level of education. According to Hussien and Postlewhite (1985), the dropouts are those pupils who leave schools before the final year of the educational cycle in which they are enrolled, which could be primary, ordinary or advance level, or even college or university levels.

**OBJECTIVES OF THE STUDY**

The present research work is undertaken with the following objectives:

- To identify the socio-demographic profile of the respondents.
- To identify Education and Occupation of Parents of the dropout
- To study the activities of fathers in school dropout families of fishermen community.
- To identify the reasons for dropout..

**HYPOTHESIS**

- There is no significant relationship between school dropout due to family problem and socio-economic conditions in fishermen community.

**SAMPLING TECHNIQUE**

For the present study, the sample size was initially fixed at 200. But during the survey, there were less than 200 respondents who fulfill the school dropout criteria. The questionnaire was distributed to everyone satisfying the criteria in the selected coastal fishermen village in person and filled in questionnaire was received on the day itself. It took nearly three months to complete the survey. The total number of filled in questionnaire was 186 initially. But after scrutinization, around 24 questionnaires were found with insufficient information which was set aside. So, the final sample size stood at 162. The statistical techniques adopted for measuring the variables under study is explained hereunder.

**LIMITATION OF THE STUDY**

The present study is limited to Karaikal region. Therefore the findings of the study cannot be generalized for the whole population of entire Union Territory of Puducherry. Only the observations of the coastal fishermen are taken for the research and not that of inland fishermen community.

**LITERATURE REVIEW**

**Sudhakar, Umamohan and Sugunakumari (1999)** studied the enrolment and dropout trends in schools, family members' interest in their children's education, weavers' views regarding education, and their perception towards child earnings and work-orientation during 1998-99 in Somandepalli village of Anantapur district, Andhra Pradesh. The sample comprised 120 households, 60 from traditional weavers and 60 from non-traditional weavers. There were 3 schools in the village; a high school, an elementary and a private school. It was found that school dropouts were highest among STs followed by SCs and then OBCs. The percentage of boys who dropped out was higher than girls among backward castes. The results also showed that drop out tendency were higher among traditional weavers. More than 50 per cent (51.6%) traditional weavers felt that 5 years of schooling was sufficient for a girl's education. The respondents were of the view that their children's earnings would certainly reduce their financial difficulties. More than 60 per cent parents wanted their child to learn either their occupation or some other vocation.

**Bedi (2002)** studied the dropout children in one of the block of Jammu district and found that dropout was inversely proportional to family income i.e. higher the family income, lower the chances of dropping, poor socio-economic-factor and large family size was found to be the main factor for dropping, Illiteracy of the parents (68%) was one of the factor for dropping of the children, indulgence of the girl child in house hold chores as one of the factor for dropping of the girl child and death of the head of the family as one of the factor for dropping of the children.

**Sharma, et al.(2007)** studied the extent of school dropouts among girls and to know the factors responsible for low enrolment and dropout of girls in schools in Kangra, Himachal Pradesh and found their parents were primarily labourers and had a small family income of Rs 500 to Rs 2500 per month. The educational status of their parents was low as majority of the mothers were illiterate and fathers were educated up to primary level. Significant relation was found between educational status of the girls and family type, family income and

mother's education. This implies that more the parents are poor, living in a joint family and less educated, more are the incidences of girls being dropped out of school.

**Denteh and Amedeker (2011)** investigated the causes and effects of female school dropouts and found that 60 per cent of the dropouts depend on both parents, 6% of the dropouts depend on Father, 20 per cent of the dropouts depend on Mother and 14 per cent of the dropouts depend on Relatives whereas 20 per cent of the dropout parents are Government employees, 42 per cent of the dropout parents are Traders, 20 per cent of the dropout parents are Farmer, 16 per cent of the dropout parents are unemployed.

**Maranoor and Somashekharappa (2012)** have tried to examine the factors that contribute to dropping out by children at the School level. The findings reveal that both the family and school related factors were responsible and appeared to be highly correlated with each other. It was also found that adolescents dropout not merely due to poverty and financial constraints but also because the schools did not respond appropriately to their special educational needs forcing them to dropout.

**Table-1.1: Demographic Profile of the Sample Respondents**

Demographic Profile	Number of Respondents	% to Total
<b>Sex</b>		
Male	108	66.7
Female	54	33.3
<b>Age (in Years)</b>		
Up to 20	18	11.1
21 – 25	99	61.1
> 25	45	27.8
<b>Religion</b>		
Hindu	156	96.3
Christian	6	3.7
<b>Family Type</b>		
Joint	49	30.2
Nuclear	113	69.8
<b>Family Size</b>		
Up to 3	54	33.3
4 & above	108	66.7
<b>School Type</b>		
Government	143	88.3
Private	19	11.7
<b>Monthly Income</b>		
<= Rs.10000	46	28.4
Rs.10001 – 15000	89	54.9
Rs.15001 – 20000	18	11.1
> Rs.20000	9	5.6
<b>House Type</b>		
Rented	78	48.1
Owned	84	51.9
<b>Earning Members</b>		
Only one	38	23.5
2 members	108	66.7
3 members	16	9.9
<b>Location (Area of Residence)</b>		
Fishing Hamlet	23	14.2
Rural	92	56.8
Urban	47	29.0
<b>Total Sample</b>	<b>162</b>	<b>100.0</b>

**Table 1.1** shows the profile of the respondents according to their socio-economic status. As shown in the table, the male dropouts constitute 66.7 per cent while the remaining 33.3 per cent of the respondents female dropouts. Majority of the dropout respondents are in the age group of 21-25 years (61.1%) followed by above 25 years and up to 20 years age group each constituting 27.8 per cent and 11.1 per cent of the total sample

respectively. Hindu group is highly dominant among dropouts in the fishermen area under study. Hindu religious group constitutes 96.3 per cent of the total sample while the remaining 3.7 per cent are Christians. The family type is nuclear for 69.8 per cent and joint for 30.2 per cent of the total respondents in the sample. The number of members is 4 and above in 66.7 per cent of the dropout student families and in the remaining households it is up to 3.53

The dropout students of Government schools comprise 88.3 per cent whereas the remaining 11.7 per cent of the students belong to private schools. The monthly income ranges between Rs10000 and Rs.15000 for 54.9 per cent, up to Rs.10000 for 28.4 per cent, Rs.15001 to Rs.20000 for 11.1 per cent and above Rs.20000 for 5.6 per cent of the dropout students (respondents) in the sample. More than 50 per cent of the dropout students' families living in owned houses (51.9%) and the remaining dropout students hail from families with rented house (48.1%). There are 2 earning members in 66.7 per cent of the respondents' (dropout students in the sample) families whereas the number of earning member is only one and 3 members in 23.5 per cent and 9.9 per cent of the families. Majority of the respondents reside in rural area (56.8%). The area of residence is fishing hamlet for 14.2 per cent and urban for 29.0 per cent of the dropout students in the sample.

**Table-1.2: Distribution of Respondents by Education and Occupation of Parents**

Particulars	Number of Respondents	% to Total
<b>Father's Education</b>		
Illiterate	53	32.7
Primary	92	56.8
Secondary	17	10.5
<b>Mother's Education</b>		
Illiterate	50	30.9
Primary	77	47.5
Secondary	25	15.4
Higher Secondary & above	10	6.2
<b>Occupation of Father</b>		
Fishing	151	93.2
Non-fishing	11	6.8
<b>Occupation of Mother</b>		
Fish selling	75	46.3
Housewife	87	53.7
<b>Total Sample</b>	<b>162</b>	<b>100.0</b>

Fishing is found to be major occupation as stated by 93.2 per cent of the respondents. Only 6.8 per cent of the fathers of dropout students earn from non-fishing activities. The mothers' of 46.3 per cent of the respondents are occupied with fish-selling while the remaining 53.7 per cent are housewives. **Table 1.2** presents the results of frequency distribution and percentage analysis eliciting the educational and occupational status of the respondents (dropout students in the sample). As presented in the table, the fathers' educational status is primary level for 56.8 per cent of the cases and illiterate for 32.7 per cent while it is secondary level for 10.5 per cent of the cases. The mothers' educational status is also primary for majority of the cases (47.5%) followed by illiterate for 30.9 per cent, secondary level for 15.4 per cent and above secondary level for 6.2 per cent of the cases.

**Table-1.3: Activities of Dropout Students' Fathers**

Parents' Behaviour	Extent of Behaviour					Mean
	Never	Rarely	Sometimes	Very Often	Always	
Alcohol Consumption	16 (9.9)	29 (17.9)	21 (13.0)	38 (23.5)	58 (35.8)	3.57
Gambling	147 (90.7)	8 (4.9)	7 (4.3)	--	--	1.14
Smoking	40 (24.7)	19 (11.7)	34 (21.0)	31 (19.1)	38 (23.5)	3.06

The habits of dropout students' fathers in the fishermen village under study are explored based on the results of frequency and percentage distribution analysis of respondents' opinion provided in **Table 1.3**. As per the table, only 9.9 per cent of the respondents' fathers have never consumed alcohol while alcohol consumption is always with 35.8 per cent, very often with 23.5 per cent, sometimes with 13.0 per cent and rarely with 17.9 per 57 cent

of the fathers of dropout students. That is, there has been alcohol consumption prevalence among fathers in most of the families of dropout student.

The habit of gambling is unfound among the fathers as 90.7 per cent of the respondents have stated “never”. However, habit of smoking among fathers is found to be always with 23.5 per cent, very often with 19.1 per cent, sometimes with 21.0 per cent of the respondent families. At the same time, it is rarely in 11.7 per cent and never in 24.7 (i.e., almost one-fourth of the families) per cent of the respondents’ families. By mean score, i.e., on the average, it is evident that the alcohol consumption is very often and smoking is sometimes among the fathers of dropout students in the fishermen area under study.

**Table No-1.4: Reasons for Dropout**

Reasons	Respondents’ Opinion			Mean
	Disagree	Neutral	Agree	
Economic Problem	77 (47.5)	34 (21.0)	51 (31.5)	1.84
Difficulty in Studies	9 (5.6)	28 (17.3)	125 (77.2)	2.72
Family Problem	35 (21.6)	49 (30.2)	78 (48.1)	2.72
Teachers’ Attitude	97 (59.9)	25 (15.4)	40 (24.7)	1.65
Lack of Interest	10 (6.2)	26 (16.0)	126 (77.8)	2.72
Transport Problem	133 (82.1)	18 (11.1)	11 (6.8)	1.25

It can be observed from the table that 47.5 per cent of the respondents have disagreed with economic problem as the reason for dropout. Those with neutral (neither agree nor disagree) opinion is 21.0 per cent and agree opinion is 31.5 per cent. The mean value of 2.16 is in neutral (moderate) range. More than two-third of the respondents (77.2%) have agreed that difficulty in studies is the reason for dropout. Mean value of 1.28 also supports the agree opinion. The proportion of respondents having agreed with family problem is higher (48.1%) compared to those with disagree (21.6%) and neutral (30.2%) opinion. However, from mean value of 1.73, it is understood that the respondents, on the average, have expressed neutral view about family problem as the reason for dropout.

There is a disagreement with teachers’ attitude as the reason for dropout among 59.9 per cent of the respondents. That is, majority of the respondents have expressed this view. But the mean value (2.35) indicates that there is neutral opinion on the average about teachers’ attitude as reason for dropout. As much as 77.8 per cent of the respondents have agreed that lack of interest is the reason for dropout. On the average also, there has been agreement among the respondents with lack of interest as reason.

Regarding transport problem, 82.1 per cent of the respondents have expressed their disagreement. The mean value of 2.75 also supports the disagree opinion of the respondents regarding transport problem for dropout. On the whole, it is found that the difficulty in studies and lack of interest are the major reasons followed by family problem for student dropout from schools in fishermen area under study.

**Table No- 1.5: Dropouts Due to Family Problem- Comparison by Respondents Demographic Status**

Demographic Profile		Opinion			Mean	SD	Test Statistic		
		Disagree	Neutral	Agree			F Value	DF	P Value
Sex	Male	24 (22.2)	26 (24.1)	58 (53.7)	2.31	0.82	1.25	1..160	0.2644
	Female	11 (20.4)	23 (42.6)	20 (37.0)	2.17	0.75			
Religion	Hindu	32 (20.5)	46 (29.5)	78 (50.0)	2.29	0.79	5.96*	1..160	0.0157
	Christian	3 (50)	3 (50)	0 (0)	1.50	0.55			

<b>Family Type</b>	<b>Joint</b>	7 (14.3)	19 (38.8)	23 (46.9)	2.33	0.72	0.41	1..160	0.5208
	<b>Nuclear</b>	28 (24.8)	30 (26.6)	55 (48.7)	2.24	0.83			
<b>Family Size</b>	<b>Up to 3</b>	12 (22.2)	14 (25.9)	28 (51.9)	2.30	0.82	0.12	1..160	0.7277
	<b>4 &amp; above</b>	23 (21.3)	35 (32.4)	50 (46.3)	2.25	0.79			
<b>School Type</b>	<b>Government</b>	32 (22.4)	43 (30.1)	68 (47.6)	2.25	0.80	0.36	1..160	0.5491
	<b>Private</b>	3 (15.8)	6 (31.6)	10 (52.6)	2.37	0.76			
<b>Monthly Income</b>	<b>&lt;= Rs 10000</b>	9 (19.6)	23 (50.0)	14 (30.4)	2.11	0.71	3.48*	3.158	0.0175
	<b>Rs 10001- 15,000</b>								
	<b>Rs 15,001-20,000</b>	23 (25.8)	23 (25.8)	43 (48.3)	2.22	0.84			
	<b>&gt; Rs 20,000</b>	3 (16.7)	2 (11.1)	13 (72.2)	2.56	0.78			
		0 (0.0)	1 (11.1)	8 (88.9)	2.89	0.33			
	<b>Rented</b>	<b>19 (24.4)</b>	<b>18 (23.1)</b>	<b>41 (52.6)</b>	<b>2.28</b>	<b>0.84</b>	<b>0.07</b>	<b>1..160</b>	<b>0.7984</b>
	<b>Own</b>	<b>16 (19.1)</b>	<b>31 (36.9)</b>	<b>37 (44.1)</b>	<b>2.25</b>	<b>0.76</b>			

Continued....

Demographic Profile		Opinion			Mean	SD	Test Statistic		
		Disagree	Neutral	Agree			F Value	DF	P Value
<b>Existing Members</b>	<b>Only One</b>	8 (21.1)	13 (34.2)	17 (44.7)	2.24	0.79	0.14	2..159	0.8694
	<b>2 Members</b>	23 (21.3)	31 (28.7)	54 (50.0)	2.29	0.80			
	<b>3 Members</b>	4 (25.0)	5 (31.3)	7 (43.8)	2.19	0.83			
<b>Location</b>	<b>Fishing Hamlet</b>	6 (26.1)	11 (47.8)	6 (26.1)	2.00	0.74	1.83	2..159	0.1631
	<b>Rural</b>	12 (13.0)	36 (39.1)	44 (47.8)	2.35	0.70			
	<b>Urban</b>	17 (36.2)	2 (4.3)	28 (59.6)	2.23	0.96			

\* Significant at 5% level

However, on the average, the opinion of both male and female respondents is in neutral range (Mean values are in neutral range) and does not differ significantly (F value is insignificant). Between Hindu and Christian

respondents also, the same scenario as above is visible but the group means differ significantly ( $F$  value = 5.96,  $p < 0.05$ ). Across respondent categories by family type, family size, school type, house type, number of earning members and location, the opinion has been in neutral range and does not differ significantly.

At the same time, more than 70 per cent of the respondents in the category with family income between Rs.15001-20000 (72.2%) and above Rs.20000 (88.9%) have agreed that dropout is due to family problem. These two income groups have also scored mean value in agree range. Further, the difference in mean across income groups differ significantly ( $F$  value = 3.48,  $p < 0.05$ ).

Overall, from the entire inferences of the results, it is concluded that the family problems was at moderate level for dropout students and extent of such problems is independent of the sex, family type, family size, school type, house type, number of earning members and location. It is however concluded that dropout due to family problems is significantly higher in Hindu family compared to Christian counterparts. It is also concluded that dropout due to family problem is significantly higher when level of family income is higher.

### CONCLUDING COMMENTS

In this research, an empirical evaluation of socio-economic profile of school dropouts in the fishing hamlets of coastal villages of Karaikal district, Union Territory of Puducherry. It is ascertained that most of the dropouts are male, Hindu religion hailing from nuclear families.

The dropouts are more in the families where primary occupation of father is fishing. The dropouts are also higher in the families where the consumption of alcohol by head of the family (father) is very often. In the families where the frequency of quarrelling among parents.

Government & Private Schools can make arrangement to provide counselling services to the children as well as the parents of fishermen community and make them understand the importance of education. It would be better to appoint a Social Worker in schools to deal with problems related to students.

The school administration/ teachers should keep a regular track of students who regularly abstain from classes and preventive and even proactive steps must be ensured.

The Social Workers/ Counsellors should provide regular counselling to students and motivate them to continue their higher studies. This Social Worker can act as a bridge between teachers and parents

Since the problem of dropout cannot be dealt by the school or government alone, the village panchayat should also come forward to extend their helping hand in dealing with this menace. They can instruct the families in the village not to engage the children in any sort of work other than studies. Since the fishing villages are known for its strict village management/ managing their affairs, this step can prove to be very effective.

It is also observed that students who find it difficult in coping with study is due to sudden change of medium of English from Tamil. It would be better to have both Tamil and English medium of instruction in all the schools. The student who feels comfortable with the medium shall opt for it and there is a greater chance of him/her to continue the studies.

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## REFORMS OF GST IN INDIAN TAXATION SYSTEM

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## ABSTRACT

*This paper is an attempt to understand the concept of Goods and Service Tax (GST), to be implemented in India from 1st July 2017. Goods and Service tax (GST) is single regime tax system which makes India One Nation One Tax by subsuming both Indirect tax levied by Central Government and State Government. Currently Concept of Dual GST is implemented in India with Slab rates of 0%, 5%, 12%, and 18% and 28% respectively. Total 160 countries in the world have already implemented GST/VAT out of which France was the first country to implement GST and India being 161 countries to implement Goods and service tax (GST). This changing face of Indian taxation system paves the path of development and advancement towards which developing country like India is trying to move on. It is the biggest and substantial indirect tax reform since 1947. The main is to replace existing taxes like value-added tax, excise duty, service tax and sales tax. It will be levied on manufacture sale and consumption of goods and services.*

*Keywords: Goods & Service Tax, Impact, Prices, Indian Economy etc.*

## INTRODUCTION

The goods and services tax (GST) will be a comprehensive nationwide indirect tax on manufacture, sale and consumption of goods and services. The objective is to make India a united common market. GST will be levied at each stage of sale or purchase of goods or services. Credits of input taxes paid at each stage will be available in the subsequent stage of value addition, making it essentially a tax on only value addition at each stage. The final consumer will bear only the GST charged by the last dealer in the supply chain.

At the Central level, central excise duty, additional excise duty, service tax, countervailing duty, and special additional duty of customs will be subsumed. At the State level, state value added tax/sales tax, entertainment tax, central sales tax, octroi and entry tax, purchase tax, luxury tax, and taxes on lottery, betting and gambling will be subsumed.

## GOODS AND SERVICE TAX BILL IN INDIA: AN OVERVIEW

GST will amalgamate several central and state taxes and mitigate cascading effect or double taxation. The tax burden on interstate logistics will be cheaper. Compliance will be easy and there will be uniformity of tax rates for industry. GST is expected to lead to easier administration and enforcement from the Government point of view. The administration of GST will be executed through two components- Central GST and State GST. Both Centre and States will simultaneously levy GST across the value chain. Tax will be levied on every supply of goods and services. However, no cross utilisation of credit will be permitted.

The Constitution (122 Amendment) Bill, 2014 will confer powers to Parliament and State Legislatures to make laws for levying GST. The Centre will levy and collect central goods and services tax (CGST) and the states will levy and collect the state goods and service tax (SGST) on all transactions within a state. The Centre's levy will be on all inter-state supply of goods and services. There will be seamless flow of input tax credit between states. Other taxes will be subsumed.

Table No-1: Milestones in GST Saga in India

Year	Proceedings
2000	Shri Atal Bhgari Vajpayee, the prime minister of India, flags of discussions on the GST
2004	A task force chaired by Vijay L. Kelkar, the advisor to the finance ministry, says the existing tax system suffers from many problems and suggests a comprehensive GST.
2005 February	Shri. P.Chidambarm, the finance minister speaks about GST for both the center and the states, in is budget speech,
2006 November	Shri P. Chidambaram sets April 1, 2010, as the date for introducing the GST.
2006 November	Shri Parthasarty Shome, adviser to the nance minster P. Chidambaram, says states will have to take various reform measures to pave the way for the GST.
2007 February	The union budget for 2007-2008 retains the April 1, 2010 deadline for implementation of the GST.
2008 February	While reading our the union budget for 2008-2009, the finance minister P.

	Chidambaram says, "I am also happy to report that here is considerable progress in preparing a roadmap for introducing the Goods and Service Tax with effect from April 1, 2010.
<b>2009 July</b>	India's new finance minister Pranab Mukherjee announces the basic structure for the GST.
<b>2009 November</b>	The committee under Asim Dasgupta releases its first discussion paper on the GST in the public domain.
<b>2010 February</b>	The Government a mission-made project for the computerization of commercial taxes in states which is expected to lay the foundation for the GST.
<b>2011 March</b>	The congress party-led Government introduces a Constitution Amendment Bill in the Lok Sabha to implement GST.
<b>2012 June</b>	The Standing Committee begins discussion.
<b>2012 November</b>	Finance minister Chidambaram holds meetings with state finance ministers.
<b>2013 February</b>	In is budget speech, Chidambaram announces that the Government has made provisions of Rs. 9,000 crore for compensation to states.
<b>2013 August</b>	The Standing Committee submits its report to parliament. The panel approves the legislation with some amendments on the provision of tax structure and resolution mechanism.
<b>2013 October</b>	The Narendra Modi ruled state of Gujarat opposes the bill.
<b>2014 May</b>	The constitution Amendment Bill lapses with the dissolution of the 15th Lok Sabha. The same month , the BJP led by Shree Narendra Modi is voted into power.
<b>2014 December</b>	Seven months later, India's new finance minister, Arun Jaitly, introduces the bill in the parliament.
<b>2015 February</b>	In his budget speech, jaitley announces that the Government is keen on implementing the GST by April 1, 2016 and hoes it will be cleared by parliament.
<b>2015 May</b>	The Lok Sabha passes the Constitution Amendment Bill to GST.
<b>2015 August</b>	The Governement is unable to push the bill in the Rajya Sabha.
<b>2016 March</b>	Shre Jaitly says he agrees with the Congress's demand that the GST rate must not be above 18%.
<b>2016 August</b>	The Congress seems to finally agree with the Modi Government after it agrees to the four broad amendments to the bill on 3rd August the GST bill was passed by the Rajya Sabha with amendments. After moving to the Lok Sabha it approved on 8th August, 2016

GST will be the country's most comprehensive tax change since Independence and the single biggest reform initiative after the 1991 opening up of the economy. By turning India into a common market and unifying a plethora of levies, the Government estimates that GST will radically transform the \$2 trillion economy. Once implemented it is expected to do away with multiple indirect taxes, make the economy more efficient and transform the country into a single market.

#### LITERATURE REVIEW

Agogo Mawuli (May 2014) studied, "Goods and Service Tax-An Appraisal" and found that GST is not good for low-income countries and does not provide broad based growth to poor countries. If still these countries want to implement GST then the rate of GST should be less than 10% for growth.

Nitin Kumar (2014) studied, "Goods and Service Tax- A Way Forward" and concluded that implementation of GST in India help in removing economic distortion by current indirect tax system and expected to encourage unbiased tax structure which is indifferent to geographical locations.

Pinki, Supriya Kamma and Richa Verma (July 2014) studied, "Goods and Service Tax- Panacea For Indirect Tax System in India" and concluded that the new NDA government in India is positive towards implementation of GST and it is beneficial for central government, state government and as well as for consumers in long run if its implementation is backed by strong IT infrastructure.

Dr. R. Vasanthagopal (2011) studied, "GST in India: A Big Leap in the Indirect Taxation System" and concluded that switching to seamless GST from current complicated indirect tax system in India will be a positive step in booming Indian economy. Success of GST will lead to its acceptance by more than 130 countries in world and a new preferred form of indirect tax system in Asia also.



Ehtisham Ahmed and Satya Poddar (2009) studied, “Goods and Service Tax Reforms and Intergovernmental Consideration in India” and found that GST introduction will provide simpler and transparent tax system with increase in output and productivity of economy in India. But the benefits of GST are critically dependent on rational design of GST.

### **OBJECTIVE OF THE STUDY**

The paper uses an exploratory research technique based on past literature from respective journals, reports, newspapers and magazines covering wide collection of academic literature on Goods and Service Tax. According to the objectives of the study, the research design is of descriptive in nature. Available secondary data was extensively used for the study. The objectives of the paper are:

1. To study about Goods and Service Tax and its impact on the economy.
2. To examine benefits and opportunities of Goods and Service tax.

### **RESEARCH METHODOLOGY**

The paper is based on secondary sources of data, which have been obtained from various GST implementation discussion papers, published article in journals, web articles (internet sources), past studies and news paper etc. With the help of these secondary sources, attempt has been made to find the obstacles coming on the way of GST and looking for future opportunities of it in India.

Telangana become the first State to pass the GST Bill while Jammu and Kashmir on July 5th, 2017 passed the GST Bill as 31<sup>st</sup> state.

- 1st – **Telangana** on April 9, 2017
- 2nd – **Bihar** on April 24, 2017
- 3rd – **Rajasthan** on April 26, 2017
- 4th – **Jharkhand** on April 27, 2017
- 5th – **Chhattisgarh** on April 28, 2017
- 6th – **Uttarakhand** on May 2, 2017
- 7th – **Madhya Pradesh** on May 3, 2017
- 8th – **Haryana** on May 4, 2017
- 9th – **Gujarat** May 9, 2017
- 10th – **Goa** on May 9, 2017
- 11th – **Odisha** May 11, 2017
- 12th – **Assam** May 11, 2017
- 13th – **Arunachal Pradesh** May 12, 2017
- 14th – **Uttar Pradesh** on 16th May 2017
- 15th – **Andhra Pradesh** on 16th May 2017
- 16th – **Puducherry** on 17th May 2017
- 17th – **Maharashtra** 22 May 2017
- 18th – **Tripura** 24 May 2017
- 19th – **Sikkim** on 25th May 2017
- 20th – **Mizoram** on 26th May 2017
- 21st – **Nagaland** on 27th May 2017
- 22nd – **Himachal Pradesh** on 27th May 2017
- 23rd – **Delhi** on 31st May 2017
- 24th – **Manipur** on 5th June 2017

- 25th – Meghalaya on 12th June 2017
- 26th – Karnataka on 16th June 2017
- 27th – Punjab on 19th June 2017
- 28th – Tamil Nadu on 19th June 2017
- 29th – West Bengal take ordinance route for GST on 15<sup>th</sup> June 2017
- 30th – Kerala take ordinance route for GST on 21st June 2017
- 31st – Jammu and Kashmir on July 5th, 2017

### NEED FOR GST MODEL IN INDIA

#### Following are the supporting reasons to adopt GST

- Present tax system allows is diversity of taxes, the introduction of GST is likely to unique it.
- Many areas of Services which are untaxed. After the introduction of GST they will also get covered.
- GST may help to avoid confusions caused by present complex tax structure and will help in development of a common national market.
- Excise, VAT, CST have the cascading effects of taxes. Therefore, there will be end up in paying tax on tax. GST will replace existing all present taxes.
- GST will lead to credit availability on throughway purchases and reduction in obedience requirements.
- Applying of GST will do more than simply redistribute the tax burden from one sector or Group in the economy to another.
- Achieves, uniformity of taxes across the territory, regardless of place of manufacture or distribution.
- Provides, greater certainty and transparency of taxes.
- Ensures tax compliance across the country
- GST will avoid double taxation to some extent.
- The effective implementation of GST makes sure that India provides a tax system that is almost similar to the rest of world where GST implemented.
- GST will also improve the International level cost competition of various native Goods and Services.
- GST will provide impartial tax structure that is neutral to business processes and geographical locations within India.
- If the GST is implemented in the true spirit, it will have many positives effects for the stakeholders and will lead to a better friendly tax environment.

**Table 2: List of the countries implementing of VAT/GST**

Serial No	Region	Numbers of Country
1	ASEAN	7
2	Asia	19
3	Europe	53
4	Oceania	7
5	Africa	44
6	South America	11
7	Caribbean , Central & North	19

Sources: [http://gst.customs.gov.my/en/gst/Pages/gst\\_ci.aspx](http://gst.customs.gov.my/en/gst/Pages/gst_ci.aspx) (as on 14/08/2015)

World over in 160 countries there is GST or VAT, which means tax on goods and services. Under the GST scheme, no distinction is made between goods and services for levying of tax. This means that goods and services attract the same rate of tax. GST is a multi-tier tax where ultimate burden of tax fall on the consumer of goods/services. It is called as value added tax because at every stage, tax is being paid on the value addition. Under the GST scheme, a person who was liable to pay tax on output, whether for provision of service or sale of goods, is entitled to get input tax credit (ITC) on the tax paid on its inputs.

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**SECTOR-WISE IMPACT ANALYSIS****Logistics**

In a vast country like India, the logistics sector forms the backbone of the economy. We can fairly assume that a well organized and mature logistics industry has the potential to leapfrog the “Make In India” initiative of the Government of India to its desired position.

**E-com**

The e-com sector in India has been growing by leaps and bounds. In many ways, GST will help the e-com sector's continued growth but the long-term effects will be particularly interesting because the model GST law specifically proposes a tax collection at source (TCS) mechanism, which e-com companies are not too happy with. The current rate of TCS is at 1% and it'll remain to be seen if it dilutes the rapid boom in this sector in any way in the future.

**Pharma**

On the whole, GST is expected to benefit the pharma and healthcare industries. It will create a level playing field for generic drug makers, boost medical tourism and simplify the tax structure. If there is any concern whatsoever, then it relates to the pricing structure (as per latest news). The pharma sector is hoping for a tax respite as it will make affordable healthcare easier to access by all.

**Telecommunications**

In the telecom sector, prices are expected to come down after GST. Manufacturers will save on costs through efficient management of inventory and by consolidating their warehouses. Handset manufacturers will find it easier to sell their equipment as GST will negate the need to set up state-specific entities, and transfer stocks. The will also save up on logistics costs.

**Textile**

The Indian textile industry provides employment to a large number of skilled and unskilled workers in the country. It contributes about 10% of the total annual export, and this value is likely to increase under GST. GST would affect the cotton value chain of the textile industry which is chosen by most small medium enterprises as it currently attracts zero central excise duty (under optional route).

**Real Estate**

The real estate sector is one of the most pivotal sectors of the Indian economy, playing an important role in employment generation in India. The probable impact of GST on the real estate sector cannot be fully assessed as it largely depends on the tax rates. However, it is a given that the sector will see substantial benefits from GST implementation, as it will bring to the industry much required transparency and accountability.

**Agriculture**

Agricultural sector is the largest contributing sector the overall Indian GDP. It covers around 16% of Indian GDP. One of the major issues faced by the agricultural sector, is transportation of agri products across state lines all over India. It is highly probable that GST will resolve the issue of transportation. GST may provide India with its first National Market for the agricultural goods. However, there are a lot of clarifications which need to be provided for rates for agricultural products.

**FMCG**

The FMCG sector could see significant savings in logistics and distribution costs as the GST will eliminate the need for multiple sales depots. The GST rate for this sector is expected to be around 17% which is way lesser than the 24-25% tax rate paid currently by FMCG companies. This includes excise duty, VAT and entry tax – all of which will be subsumed by GST.

**Freelancers**

Freelancing in India is still a nascent industry and the rules and regulations for this chaotic industry are still up in the air. But with GST, it will become much easier for freelancers to file their taxes as they can easily do it online. They will be taxed as service providers, and the new tax structure will bring about coherence and accountability in this sector.

**Automobiles**

The automobile industry in India is a vast business producing a large number of cars annually, fueled mostly by the huge population of the country. Under the current tax system, there are several taxes applicable on this sector like excise, VAT, sales tax, road tax, motor vehicle tax, registration duty which will be subsumed by GST. Though there is still some ambiguity due to tax rates and incentives/exemptions provided by different states to the manufacturers/dealers for manufacturing car/bus/bike, the future of the industry looks rosy.

**Startups**

With increased limits for registration, a DIY compliance model, tax credit on purchases, and a free flow of goods and services, the GST regime truly augurs well for the Indian startup scene. Currently, many Indian states have very different VAT laws which can be confusing for companies that have a pan-India presence, specially the e-com sector. All of this is expected to change under GST with the only sore point being the reduction in the excise limit.

**BFSI**

Among the services provided by Banks and NBFCs, financial services such as fund based, fee-based and insurance services will see major shifts from the current scenario. Owing to the nature and volume of operations provided by banks and NBFC vis a vis lease transactions, hire purchase, related to actionable claims, fund and non-fund based services etc., GST compliance will be quite difficult to implement in these sectors.

**HOW GST IS LEVIED**

GST is levied on the place of consumption of goods and services. It can be levied on following states:

- Intra-state supply and consumption of goods and services.
- Inter-state movement of goods.
- Import of goods and services.

**IMPACT OF GST ON PRICES OF GOODS AND SERVICES**

Tax experts claimed that the previous practice of tax on tax – for example, VAT was being charged on not just cost of production but also on the excise duty that was added at the factory gate leading to production cost building up but now all had been gone when GST is rolled out. The prices of consumer durables, electronic products and ready-made garments will be available at low price after rolled out GST. In other aspects, for goods which were taxed at low rate, the impact of GST brings price increment. Services bearing essential ones like ambulance, cultural activities, pilgrimages etc. were exempted from levy are same. India has seen the strongest tax reform that aims to do away with various – tax system on goods and services and bring them under one rate. We can draw the following impact of GST on prices:

The government rolled out the much talked about Goods and Services Tax (GST) on the midnight of June 30. The GST Council has fixed the tax rates, keeping a view on all goods and services; they are classified under tax slabs 0 % (exempted ones), 5%, 12%, 18% & 28%. The GST council has fixed the tax rate for 1211 items. The following table will show comprehensive list of item and services that will be taxed under different slab rate of GST.

**Table No.3: GST rates on Goods and Services**

<b>Tax Rate</b>	<b>Goods</b>	<b>Services</b>
<b>0%[nil] Exempted Goods</b>	Jute, Fresh meat, fish chicken, eggs, milk, butter milk, curd, natural honey, fresh fruits and vegetables, flour, besan, bread, prasad, salt, bindi. Sindoor, stamps, judicial papers, printed books, newspapers, bangles, and handloom. Bones and horn cones, bone grist, bone metal etc, Hoof meal, horn meal, cereal grained hulled, palmyra jiggery, salt all types, kaja, Childrens picture, drawing and colouring books, human hair.	Hotels and lodges with traffic below Rs1000, grandfathering services has been exempted under GST
<b>5%</b>	Apparels below Rs 1000, packaged food items, footwear below rs 500, cream, skimmed milk powder, branded paneer, frozen vegetables, coffee, tea, spices, pizzabread, rusk, sabudana, kerosene, medicines, stent, lifeboats, cashew nut, cashew nut in shell, raisin, ice and snow, bio gas, insulin, agarbatti, kites, postage or revenue stamps, stamp-post marks, first day covers.	Transport services (Railways, Air transport), small restaurants will be under 5 % category because their main input is petroleum, which is outside GST ambit.
<b>12%</b>	Apparel above Rs 1000, frozen meat products, butter, cheese, ghee, fruits in packaged form, animal fat, sausage, juices, bhujia, namkeen, Ayurvedic medicine, toothpowder, agarbatti, colouring books, picture books, umbrella, sewing machine, cell phones, ketchup and sauces, All diagnostic kits and reagents, exercise book and note books, spoons, fork, ladles, skimmers, cake server, fish, Spectacles, corrective, playing cards,	State-run lotteries, on Ac hotels, Business class air tickets, fertilizers, work contract

	board, and other board games, like ludo.	
18%	Flavored refined sugar, pasta, cornflakes, pastries and cakes, preserved vegetables, jams, sauces, soups, ice cream, instant food mixes, mineral water, tissues, envelopes, tampons, note books, steel products, printed circuits, camera, speakers and Monitors, Kajal Pencil Sticks, Headgear and parts thereof, Aluminum foil, Weighing Machinery, Printers, Electrical Transformer, CCTV, Optical Fiber, Bamboo Furniture, Swimming pools and padding pools, curry paste, mayonnaise and salad dressings, condiments and mixed seasonings.	AC hotels that serve liquor, telecom services, IT services, branded garments and financial service, Room traffic between Rs 2500- and Rs 7500, restaurants inside five-star hotels.
28%	Chewing gum, molasses, chocolate not containing cocoa, waffles and wafers coated with chocolate, pan masala, aerated water, paint, deodorants, shaving creams, after shave, hair shampoo, dye, sunscreen, Wallpaper, ceramic tiles, water heater, dishwasher, weighing machine, washing machine, ATM, vending machines, vacuum cleaner, shavers, hair lippers, automobiles, motorcycles, aircraft for personal use, and yachts.	Private-run lotteries authorized by the states, hotels with room tariffs above Rs 7500, 5-star hotels, race club betting, cinema

### SOME ITEMS WHICH ARE COMPLETELY EXEMPT FROM THE GST REGIME

- The unprocessed cereals, rice & wheat etc.
- The unprocessed milk, vegetables (fresh), fish, meat, etc.
- Unbranded Atta, Besan or Maida.
- Kid's colouring book/drawing books.
- Sindoor/Bindis, bangles, etc

Below is a list of the sectors which are negatively or positively affected by GST.

### CONCLUSION

In the light of the above discussion, the authors have recommended that GST system is more beneficial for the Government as well as stakeholders from the management and analysis point of view. We believe that CGST must have the authority to collecting Tax and SGST should be given the power to take the decision regarding Tax rate. In case, if there is any change in the Tax rate it should be decided through democratic consent so that there are minimum chances of political interference. GST is also helpful in avoiding Tax evasion, improved Tax collection and compliances. It reduces the cost of goods and services to some extent and creates a supportive environment for the facilitation of international trade, thereby helping in revenue generation leading to the increase in the GDP of the country. Similarly, it will also be helpful in lowering the Tax burden on the various segments of the economy. Industries, dealers, retailers and the agriculture sector as a whole will benefit from GST.

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## FRUIT WINES AND WINE TOURISM IN MEGHALAYA

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**ABSTRACT**

*Wine (Latin: vinum) is an alcoholic beverage obtained by the fermentation of the grapes, the fruit of the vine plant. In Europe, according to legal regulations, the wine is the product obtained exclusively by full or partial fermentation of fresh grapes, clove or not, or of grape must. The transformation of grapes into wine is called vinification. The science of wine is called oenology. In some other parts of the world, the wine can be obtained from other types of fruit. These wines are referred to as fruit wines, or wear a name by which the fruit is used for obtaining them (for example strawberry wine). Wine tourism is a type of tourism that involves visiting wineries, tasting, consumption and purchase of wine, usually directly from the manufacturer. This type of tourism includes visits to wineries, vineyards/orchards and restaurants famous for special local wines, as well as organized wine tours, visits to wine festivals and other special events. Many wine regions around the world to promote this tourism because it affects very positively to the local economy. Wine tourism in Meghalaya is in a nascent stage. This paper aims to study the fruit wines of Meghalaya and its role in promoting wine tourism in Meghalaya.*

*Keywords: wine, oenology, tourism, wineries, Meghalaya.*

**1 INTRODUCTION**

India is one of the largest producers of fruits in the world. Fruits are among the most important foods of mankind as they are not only nutritive but are also indispensable for the maintenance of health. Fruits both in fresh as well as in processed form not only improve the quality of our diet but also provide essential ingredients like vitamins, minerals, carbohydrates etc. Postharvest loss of fresh fruit is one of the serious problems of tropical countries like India. Due to improper postharvest handling and inadequate processing facilities nearly 35 to 40 per cent of horticultural production goes waste. India incurs postharvest fruits and vegetable losses worth over Rs 2 lakh crore each year largely owing to the absence of food processing units, modern cold storage facilities and a callous attitude towards tackling the grave issue of post-harvest losses. The fruit and vegetable preservation industry in India utilizes less than 2 per cent of the total production of fruit and vegetables for conversion in to products, as against 40 to 50 per cent in advanced countries (Swami et. al., 2014). Fermentation is a viable technique in the development of new products with modified physicochemical and sensory qualities especially flavour and nutritional components. Alcohol, acetic and lactic acid fermentations are important for quality in production. Out of these, alcoholic fermentation is widely employed for the preparation of beverages in which alcohol is major constituent. Fermented beverages have been known to mankind from time immemorial. An alcoholic beverage is a drink that contains ethanol. These are divided into three general classes for taxation and regulation of production namely fermented such as beers, wines, and distilled beverages such as whisky, rum, gin, vodka, tequila, brandy etc. Beer is made by fermentation of starch combining yeast and malted cereal starch, especially barley corn, rye, wheat or blend of several grains and usually flavoured with hops (*Humulus Lupulus*). It contains 4 to 8 per cent alcohol and its energy value ranges between 28 and 73 kcal per 100 mL. Distilled alcoholic beverages are produced by distilling ethanol by fermentation of grains, fruits or vegetables. They are made from sugarcane juice, molasses, fermented mash of cereals and potatoes and fermented malt of barley and rye. The alcohol content in distilled alcoholic beverage ranges between 40 and 60 per cent. Fruit wines are undistilled alcoholic beverages usually made from grapes or other fruits such as peaches, plums or apricots, banana, elderberry or black current etc. which are nutritive, more tasty and mild stimulants. These fruits undergo a period of fermentation and ageing. They usually have an alcohol content ranging between 5 to 13 percent. Wines made from fruits are often named after the fruits. No other drinks, except water and milk have earned such universal acceptance and esteem throughout the ages as has wine. Wine is a food with a flavour like fresh fruit which could be stored and transported under the existing conditions. Being fruit based fermented and undistilled product, wine contains most of the nutrients present in the original fruit juice. The nutritive value of wine is increased due to release of amino acids and other nutrients from yeast during fermentation. Fruit wines contain 8 to 11 per cent alcohol and 2 to 3 per cent sugar with energy value ranging between 70 and 90 kcal per 100 mL (Swami et al., 2014).

**1.1 CLASSIFICATION OF WINE**

A typical wine contains ethyl alcohol, sugar, acids, tannins, aldehydes, esters, amino acids, minerals, vitamins, anthocyanins, minor constituents like flavouring compounds etc. (Amerine *et al.*, 1980). This product is

probably the most ancient fermented beverage and was mentioned in the Bible and in other documents from Asian countries. Depending upon the various attributes such as cultivar, stage of ripening of fruits, chemical composition of juice, use of additives to the must, vinification techniques and ageing of wine, the alcohol and sugar content, the wines are classified as natural wines (9-14% alcohol) and dessert and appetizer wines (15-21 % alcohol). Dry wine, sweet table wine, specialty wine, champagne, muscat and burgundy wines are natural wines while sweet wine, cherries, vermouth and port wines are regarded as dessert and appetizer wines (Amerine and Singleton, 1972). The most famous types of wines are red and white wines, followed by rosé and sparkling wines. There are other wine specialties around the world, such as the Portuguese Port Wine, a very rich flavor, often used by chefs in their signature dishes. Many types of wines can be divided into several groups, which are easy to remember. Depending upon product manufacturing all wines can be classified as grape wine, fruit wine, berry wine, vegetable wine, plant wine, raisin wine etc. Grape wine is made exclusively from grapes and during the production process prohibited from using any other materials (exception is made only for sugar and oak barrels). Fruit wines are fermented alcoholic beverages made from a variety of base ingredients other than grapes; they may also have additional flavors taken from fruits, flowers, and herbs. These types of wines are made from pear, apple, banana, papaya, mango, jackfruit juice etc. Cherry wine is produced from cherries, usually those cherries that provide sufficient acidity to wine. Plant wine is produced from juice of trees like maple, birch, melons, watermelons, and other garden plants such as rhubarb, parsnips and rose petals. Raisin wine is made from dried grapes (raisins). Multisort wine is produced by mixing different kinds of grapes and wine materials. Depending on the time of fermentation, grape varieties and colour fruit wines are classified as red, white and pink wines.

### **1.2 SERVICE OF WINE**

Wines must be served at the right temperature to improve its taste and aroma. Excessively chilled wine loses its aroma and taste and insufficiently chilled wine makes it uncomfortable to drink, primarily due to excessive evaporation of the alcohol covers all odours and changing the characteristics of the wine.

- Red wine is served at a temperature of 16 ° C to 18 ° C
- White wine is served at a temperature of 12 ° C to 14 ° C
- Rose wine served at a temperature of 10 ° C to 12 ° C
- Sparkling wine is served at a temperature of 8 ° C to 10 ° C

Wines are served in wine glasses. There are basically 4 types of wine glasses, for the red, white, sparkling and dessert wine. Wine glass must be clean and thin glass without engravings. The bracket height is different and it is determined how much heat the wine over the hand. The glass must be of greater volume, so for example, if the glass Pour 150 ml wine, its volume should be at least 300 ml.

### **1.3 WINE TOURISM**

Wine tourism = wine industry + tourism. Wine tourism is a complex phenomenon: culturally authentic occasion for festivals dedicated to wine affects the architecture of the village, educational, romantic. "Wine tourism is visiting vineyard, wineries, wine festivals and exhibitions are organized in order for recreation" (Johanson, 1997). "Visiting vineyard, wineries, wine festivals, wine exhibitions in the wine tasting and / or sightseeing, wine regions are the primary motives" (Hall et al, 2000).

Wine Tour includes: food and wine, enjoying the environment, living or extended recreation, many cultural, natural and other activities that are available in the wine regions. Economic and social benefits of wine tourism, an increased number of visitors (domestic and foreign) coming several times, extended holidays and increased spending of visitors increased satisfaction among visitors due to increased entrepreneurship to tourists, increased demand for sales of wine "from the basement".

### **1.4 WINE TOURISTS**

Wine tourists are visiting the vineyard/orchards, wineries, wine festivals and wine shops in order to acquire knowledge of wine making. Wine tourists can be divided into three categories according to incentive / pending:

- Random or curious wine tourists
- Interested wine tourists
- Committed wine tourists

Motivation wine consumer may be: wine tasting, learn something new about wine, to be in a rural environment, to enjoy the beauty of vineyard, learn about culinary tourism, have fun, appreciate and architecture and to know



eco tourism etc. Services in wine tourism: tourists expect full sensory experience, new knowledge for a particular region, and an opportunity for relaxation; attention to accommodation, restaurants, hospitality, value, quality, attraction and many activities and information available; recommendations from the owners of wineries.

### 1.5 WINES FROM TROPICAL AND SUBTROPICAL FRUITS

Many tropical and subtropical fruits, including grapes, apples, pears, apricots, berries, peaches, cherries, oranges, mangoes, bananas, strawberry and pineapples etc. yield good amounts of juice on extraction. Upon fermentation, fruit juices can be changed into wines. However, the premium raw material for winemaking has been the grape, although attempts to process other fruit wines are being made. The techniques used for the production of other fruit wines closely resemble those for the production of wines made from white and red grapes. The differences arise from two facts. It is somewhat more difficult to extract the sugar and other soluble materials from the pulp of some fruits than it is from grapes, and secondly the juices obtained from most of the fruits are lower in sugar content and higher in acids than is true for grapes. As a solution to the above mentioned problems, the use of specialized equipment to thoroughly chop or disintegrate the fruits such as berries, followed by pressing to extract juice from the finely divided pulp, solves the first problem. The second problem is solved by the addition of water to dilute the excess acid and the addition of sugar to correct the sugar deficiency (Amerine *et al.*, 1980).

### 2. WINES OF MEGHALAYA

Fruit wines in Meghalaya will have a niche market at its best, where the excess quantity of fruit abundant in the areas can be processed. Meghalaya has plenty of fruits such as pineapple, banana, strawberry, Jackfruit, starfruit, peach, plum, passion fruit and sohiong etc, that would make decent wines once the proper focus and commercial exploitation is made feasible. All this is possible only if and when the government of takes some positive steps to allow harnessing of the fermentation potential of its abundant fresh fruits. The production of indigenous beverages may serve as a good source of income for livelihood of the ethnic groups and a source of revenue to the state. The production may be encouraged at the level of cottage and small scale industry. The wine making from local fruits could also grow gradually as a cottage industry and then commercialized into an industry, which would automatically boost the economy of the state as well generate employment to unemployed local youths. Fermented alcoholic beverages have been widely consumed by people in almost all countries for centuries (Fellows, 2000). These fermented beverages are usually prepared from locally available raw materials using age-old techniques (Rose, 1997) and their art is believed to pass down by cultural and traditional values to subsequent generations with the processing being optimized through trial and error (Food and Agricultural Organisation, 2012).

**TABLE-1: Indigenous Wines of Meghalaya**

Sl.No	Name of The Wine	Basic Ingredients and Botanical Names	Seasonality
1	Cashew nut apple	Cashew Nut Apple ( <i>Anacardium occidentale</i> )	March to October
2	Cherry wine	Cherry ( <i>Prunus cerasus</i> L.)	Throughout the Year
3	Orange Citrus sinensis (L.)	Orange ( <i>Citrus sinensis</i> )	Throughout the Year
4	Ginger wine	Ginger ( <i>Zingiber Officinale</i> )	Throughout the year
5	Mulberry Wine	Mulberry ( <i>Morus</i> )	May to August
6	Strawberry Wine	Strawberry ( <i>Fragaria</i> )	December to march
7	Passion fruit Wine	Passion fruit ( <i>Passiflora</i> )	May to July
8	Blackberry Wine	Blackberry ( <i>Rubus</i> )	May to September
9	Plum Wine	Plum ( <i>Prunus Domestica</i> )	May to September
10	Banana Wine	Banana ( <i>Musa</i> )	Throughout the year
11	Jackfruit Wine	Jackfruit ( <i>Artocarpus Heterophyllus</i> )	May to September
12	Peach Wine	Peach ( <i>Prunus Persica</i> )	May to September
13	Pear Wine	Pear ( <i>Pyrus</i> )	May to September
14	Pine Apple	Pineapple ( <i>Ananas Comosus</i> )	March to October

Source: Compiled by the authors.

### 3. RESEARCH QUESTIONS

RQ1. What are the potential of wine production from various fruits in Meghalaya?

RQ2. How to promote Meghalaya as a tourist destination on the trail of wine tourism?

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**4. OBJECTIVES OF THE STUDY**

The proposed study has been conceptualized with the following objectives:

- i) To study the potential of wine production from various fruits in Meghalaya.
- ii) To explore the role and involvement of wine tourism in promoting Meghalaya as a tourist destination.

**5. RESEARCH METHODOLOGY**

The study has been carried out in the state of Meghalaya. This paper is based on qualitative research techniques where an exploratory research approach has been applied. In this regard, personal visits and survey has been done to observe the potential and conducted focus group interview of various tourism stakeholders, local entrepreneurs, Department of Tourism, Headmen of Villages, local communities specially people involved in wine making practices. Secondary data has been collected from reputed journals of tourism research, books, travel magazines, national and local newspapers, annual reports of Ministry of Tourism, Government of India, Meghalaya Tourism etc.

**6. FINDINGS AND SUGGESTIONS****6.1 Potential And Challenges For Wine Tourism In Meghalaya**

Wine consumption in India is rising day by day; still it resides in the rock bottom in the state of Meghalaya. The state of Meghalaya has a old tradition of wine making but there are very few players who comes forefront in the wine tourism sector. Wine tourism has not flourished because of many impeding factors like legalisation issues, cost and product knowledge and lack of awareness of promoting wine tour as the holiday vacation. The challenges in terms of of quality of wine compared to the other states like Maharashtra, Karnataka, Himachal Pradesh and Mizoram and Arunachal Pradesh is also a major setback. The other major hurdles of wine tourism sector includes the amount of initial investment required, lack of technical expertise, the professional knowledge & skills, and various marketing and distribution channels. The lack of proper understanding regarding the wine tourists, their needs and expectations, buying behaviour etc. also plays a major role in promotion of wine tourism .

**6.2 Benefits of wine tourism in Meghalaya**

The wine tours and packages allow the wine manufactures to create personal relationships with the esteemed customers, this later can lead to the direct or indirect sales through positive “word of mouth” (Jaume Salvat, Jordi Blay Boqué (2008/2009). Furthermore, direct sales to the consumer results in increased margins due to reduction of distributor costs. Additionally, producers gain marketing intelligence on products and consumers through getting an instant and valuable feedback from the customers. With the winery serving as an additional sales outlet, it can make a big difference for small businesses, especially if there are other by-products such as food and souvenirs. Finally, winery visitations lead to brand awareness and loyalty due to establishing links between producers and consumers and purchasing of branded merchandise. Besides its contribution to wineries, wine tourism is considered to be an important element in the tourism industry in that the sector experience develops through the investment inflow which is the result of the increasing number of new wineries. Wine tourism plays the role of an initiator for regional development which increases regional employment and economical advancement of an area. However, besides the benefits of wine tourism there a number of challenges for wineries in general.

**6.3 Challenges of wine tourism in Meghalaya**

The government support is important for wine tourism development. Wine tourism cannot function successfully without partnership within the community. Strong cooperation with restaurants and hotels, excise and police, health agencies, employment services and environmental groups are widely needed to support the growth of the wine tourism industry. Finally, it is crucial to take good care of the environment and preserve the rural beauty of the fruit orchards so the region can keep its status as a wine destination.

**7 CONCLUSION**

Fruits both in fresh as well as in processed form not only improve the quality of our diet but also provide essential ingredients like vitamins, minerals, carbohydrates etc. Fruit wines are undistilled alcoholic beverages usually made from grapes or other fruits such as peaches, plums or apricots, banana, elder berry or black current etc. which are nutritive, more tasty and mild stimulants. Being fruit based fermented and undistilled product, wine contains most of the nutrients present in the original fruit juice. The nutritive value of wine is increased due to release of amino acids and other nutrients from yeast during fermentation.

The wine tourism in Meghalaya, is still at a nascent stage and needs a proper tourism development plan. Conscious collaborative efforts are required from the wine and tourism industries to come together and form a

wine tourism development board. Such board or body should own the overall wine tourism road map and will remain committed to finance and support its implementation. A long term development program needs to undertaken which includes development of overall road infrastructure for better accessibility, affordable accommodation and restaurants, accessibility to airports, uninterrupted access to basic amenities like water and electricity, tourism information centre for tourist guidance, enthusiastic wine clubs and tasting centres. The wine tourism board also needs to undertake measures which include integrating wine tourism marketing with other state and national level tourism marketing drives. Wine tourism marketing should be taken to the next level of using international tourism channels like Incredible India, Agro-tourism and Indian tourism. The indigenous beverages and wines may be promoted as a tourism product/ attractiveness for the tourists visiting the state of Meghalaya. There are so many tourist destinations in India, better known for their local beverages and it attraction for the tourists. Every year the fruit wines are show cased in the wine festivals, where several manufacturer participate to create awareness about their indigenous products. The indigenous beverages should be launched in food and wine festivals where free tasting session should be organised for wine lovers. The hotels and restaurants should promote these local beverages. The wine festival is aimed at creating awareness not only on the art of wine making but also to show its potential as an industry. Fruit wines of Meghalaya will have a niche market at best, where the excess quantity of fruit abundant in the areas can be harnessed. Meghalaya has plenty of pineapple, Banana, Strawberry, passion fruit and sohiong that would make decent wines once the proper focus and commercial exploitation is feasible. All this is possible only if and when the government of Meghalaya takes some positive steps to allow harnessing of the fermentation capability of its abundant fresh fruits. The production of indigenous beverages may serve as a good source of income for livelihood of the ethnic groups and a source of revenue to the state. The production may be encouraged at the level of cottage industry. There is ample scope for improving the rice beer quality which could have a great commercial value. India is considered to be the third largest market for alcoholic beverages in the world.

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## THE IMPACT OF EMOTIONAL INTELLIGENCE ON PSYCHOLOGICAL CAPITAL OF EMPLOYEES AND ITS CONTRIBUTION TO WORKPLACE SPIRITUALITY

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### ABSTRACT

*To effectively demonstrate Emotional Intelligence and Psychological Capital in the workplace, employees are required to acquire a greater capacity of the various factors mentioned above supporting the human potential. Workplace Spirituality is materialized in the organization by effectively demonstrating Emotional Intelligence and Psychological Capital, especially focusing on empathy, compassion and respecting individual differences in order to create meaning and direction.*

*Hence, the aim of the study is to find whether emotional intelligence effects psychological capital of employees and further contributes to workplace spirituality. The study fulfills this aim by finding out the correlation between the variables.*

*The study adopts quantitative approach to research and primary data is collected through survey method. Standardized scales for the three dimensions, namely, emotional intelligence, psychological capital and workplace spirituality were utilized to collect data from a sample of 100 employees.*

*The results indicated a significant positive correlation between emotional intelligence and psychological capital as well as emotional intelligence and workplace spirituality. This shows that the higher emotional intelligence effects psychological capital and further contributes to workplace spirituality.*

*Keywords: Emotional Intelligence, Psychological capital; Workplace Spirituality*

### 1. INTRODUCTION

In today's dynamic work environment, when dealing with issues of change and work performance, concepts of Emotional Intelligence, Psychological Capital and Workplace Spirituality hold great importance. These concepts not only focus on work performance but also employee happiness and well-being. The competitive environment of the workplace puts employees under pressure and increases feelings of isolation, dehumanization and exploitation. Hence, there is an increasing need to attain complete state of harmony between mind, body and soul. This need encourages workplaces to focus on these concepts of positive psychology.

#### 1.1 Emotional Intelligence

Mayer and Salovey coined the term Emotional Intelligence in 1990 describing it as a type of social intelligence. It is defined as the ability to monitor one's own and others' feelings and emotions, to distinguish among them and to utilize this information to guide one's thinking and action.

Further, Daniel Goleman became aware of this term and wrote a book on this concept, namely, 'Emotional Intelligence: why it can matter more than IQ'. According to Goleman (1995), Emotional Intelligence's contribution to effective workplace performance is as much as 66 percent for all jobs and 85 percent for leadership jobs. Emotional Intelligence also referred to as Emotional Quotient (EQ), is used to describe an ability to regulate impulses, empathize with others, and persist and be resilient in the face of obstacles.

### MODEL OF EMOTIONAL INTELLIGENCE

**The Ability Model of Emotional Intelligence:** this model was put forth by Mayer and Salovey (1997). In this model, emotional intelligence consists of four dimensions,

- Perceiving emotions: it is defined as an individual's ability to recognize emotions both in ourselves and in others and also in objects, stories, music, and art. Facilitating thought: it is defined as the capability of an individual to produce, utilize and sense emotions as a means to convey feelings or utilize them in various thinking processes.
- Understanding emotions: the capability of an individual to comprehend and make meaning out of how emotions are put together and developed through various relationship stages and to be able to respect such meanings.
- Managing emotions: the capability of an individual to openly express and feel emotions and moderate them in our own self as well as others to enable one's personal development and growth

People high on Emotional Intelligence also portray certain interpersonal and social skills like, affect, interaction, management of conflict, leadership, change stimulant, developing relationship, alliance and association, and team potential. Another category of skills displayed by the people high on Emotional Intelligence is the regulation of those emotions. This category entails skills like, adaptability, conscientiousness, innovation, self-control, and trustworthiness.

Goleman pointed out that emotional intelligence primarily emerges through relationships. Also, emotional intelligence impacts the status and quality of relationship and human association. Any kind of relationship, be it the ones that are formed formally or the ones that are built naturally in the firms, they all have a role to play in emotional intelligence in the organization. Bonding and relationships are way that help individuals in enhancing their emotional intelligence even when they do not purposely want it to happen.

The four dimensions of emotional intelligence, namely, assessment and articulation of emotions, utilizing emotions to improve thinking and cognition and making decisions, comprehension of emotions, and modulating emotions- all make a contribution to making effective leaders. Emotionally intelligent leaders tend to have understanding about the point that their positive moods lead them to be highly optimistic. Hence, leaders high on emotional intelligence also tend to better at mending their negative moods that may be a result of various sources that somehow negate their flexibility and innovativeness. They use meta-mood processes to moderate their emotions and moods in practical ways.

## 1.2 Psychological Capital

Using positive psychology, positive organizational behavior, and the four dimensions which meet psychological measures of efficacy, optimism, hope, and resiliency, Luthans and colleagues demonstrated a higher-order core construct called Psychological Capital or PsyCap. PsyCap is described as a person's positive psychological condition of growth which is defined by, having conviction (self-efficacy) to take up and apply the required effort to gain success in tasks that are challenging; to make positive acknowledgement (optimism) about gaining success both in the present and the future; working hard towards objectives and also being flexible to change paths to goals when required (hope) to gain success; and whenever faced by some problematic situation, showing perseverance and facing the adversity to bounce back (resiliency) for success.

1. **Self-efficacy:** Bandura and Wood described self-efficacy as, 'believing in one's own abilities to moderate the motivation, thinking responses, and behaviors which are required to meet a particular demand of the situation.' It is defined as a thinking design created by the progressive experiences of learning in an individual's life. Such experiences lead to a person to create the thinking or supposition that they are not capable in successfully performing a particular task or activity. People's beliefs in their efficacy also define the scenarios they expect. Individuals with a high sense of efficacy, visualize success scenarios while those with low self-efficacy visualize failure scenarios which in turn influence their performance. Self-efficacy thoughts can play an important role in the self-modulation of motivation. People tend to motivate themselves and guide their actions by thinking and planning beforehand. While individuals with strong self-efficacy beliefs attribute their failures to lack of effort, people low on self-efficacy connect their failures with low ability or talent. People who have a strong belief in the coping mechanism are confident about how they will manage stress, depression or anxiety in difficult or challenging situations.
2. **Optimism:** optimism or life orientation can be defined as the way a person evaluates or predicts outcomes. This is somewhat related to but at the same time different from the concept of locus of control. Locus of control can be defined as a person's thinking about whether the results of one's behaviors are dependent on one's own behavior (internal locus of control) or on situations which are outside of one's personal control (external locus of control). People whose orientation towards life is high on optimism tend to believe in more positive results. On the other hand, people who are more pessimistic towards life tend to see results in a more negative light. Hence, a person can hold up responsibility for and be in command of situations and still predict a negative result or not feel in control but still see the consequences in a positive note.

Researchers have attached an explanatory positive form to various categories of positive behavior results in various fields like academic, athletic and work domains (Peterson & Seligman, 1984). Optimism enlarges an individual's options to solving problems, mechanisms to adapt to situations, and cognition-behavior collection, at the same time, creating stocks and safeguards of rational, physiological, interpersonal as well as significantly, psychological domains like resilience and orientation to goals (Fredrickson, 2003).

3. **Hope:** hope can be referred to as a condition that is positively motivational and is dependent on an interactively acquired sense of successful force (energy directed towards goal) and passages (plan of action to meet goals). According to Seligman, hope in any individual to be present or not is persistent upon two

domains: penetration and execution'. Research indicates that there exists a positive relation between hope and job related expectations for goal attainment, perceived command, self-esteem, positive feelings, coping mechanisms and success. Research also have found that the level of hope in employees is linked to their level of job satisfaction, commitment to the organization, happiness at work and work behavior. Entrepreneurs with high levels of hope are also seen to be positive in their approach towards business. Entrepreneurs with high levels of hope have higher satisfaction in their business performance and perceive themselves to be compensated well than those who are low on hope.

4. **Resiliency:** resiliency is referred to as a category of occurrences which are mainly described by sequences of positive adaptability in the situation of significant problems or risk. It is the capability to recover or make a comeback from adverse situations, dispute, defeat or even positive situations, growth and added responsibility. This capability involves various characteristics like mouldability, accomodation, malleability and dealing with change continuously that can sometimes become a beacon of psychological stress and threat to one's happiness and well-being over the long term. Resiliency can be enhanced through improving the resources that an individual owns, through knowledge, training, guidance and fostering social relationships bonding, and in general by enhancing the standard of assets that are accessible for the person to take advantage of. Certain unpredictable variables can be moderated by appropriately managing one's physical and psychological health and well-being.

### 1.3 Workplace Spirituality

Workplace spirituality can be defined as the recognition of principle of work life and involves expressing innate spiritual qualities via ones actions, thoughts and attitudes, to help understand others deeply. It involves differentiating not only the accurate reason of actions without judgment and fulfill the accurate needs of others till the time they come to learn of fulfilling their needs on their own. One can learn this capacity by first freeing oneself from the bounds of neediness and being capable to meet one's own inner needs.

According to Zohar & Marshal, spiritual intelligence involves solving problems related to one's own life significance and valuing the concept of our life and action. According to Snyder (2006), spiritual intelligence is a concept of positive psychology. He describes it as love, understanding and empathy, forbearance, endurance, forgiveness, fulfillment, sense of personal responsibility, and harmony with one's environment.

Furthermore, it has found that workplace spirituality programmes have had a positive effect on employees seen in the form of improved job performance, tranquility, job satisfaction and job commitment (Reave, 2005) and positive impact on employee well-being and work-life balance (Neck & Milliman, 1994. Spiritual individuals portray the following behavioral characteristics:

1. Seeking to surpass their own self-interests
2. Being aware and accepting their association with others
3. Understanding the greater implication of their behavior while pursuing to accommodate their lives holistically
4. Having undoubted faith in something over and above the material universe which would sooner or later give value to everything else.

Spiritual intelligence cannot be understood within the realms of conventional psychological development. It not only implies being aware of our own selves but also how we associate to the supreme, to other people, to the earth and all other beings. Ashmos and Duchon (2000) describe Workplace Spirituality in terms of recognizing the fact that workers have an internal life that sustains and can be sustained by job that is considered meaningful and takes place in the setting of community". According to them, Workplace Spirituality comprises of three major dimensions: (1) inner life; (2) meaningful work; and (3) conditions for community. Firstly, inner life relates to the comprehending of a supreme and transcendent supremacy and how to utilize that power in the organization. Secondly, meaningful work signifies how one perceives the daily activities that one performs in terms of their importance. Third, conditions for community refers to how well employees associate and connect with their colleagues in the workplace. These three Workplace Spirituality factors have been used vigourously by past researches to measure spirituality in the organization (Duchon & Plowman, 2005; Milliman et al., 2003; Rego et al., 2007).

To effectively demonstrate Emotional Intelligence and Psychological Capital in the workplace, employees are required to acquire a greater capacity of the various factors mentioned above supporting the human potential. Workplace Spirituality is materialized in the organization by effectively demonstrating Emotional Intelligence



and Psychological Capital, especially focusing on empathy, compassion and respecting individual differences in order to create meaning and direction.

## **2. LITERATURE REVIEW**

The coming of the era of positive psychology paradigm shifted focus to the importance of concepts like individual well-being and happiness. Such shifts in focus to improve performance, as well as well-being and happiness led to emergence of emotional dynamics and psychological capital. Positive psychology paradigm gives equal importance to happiness and pain, and focuses on enhancing awareness and strength of an individual by improving his individual happiness (Seligman, 2007). The concept of emotional dynamics stresses upon the presence of emotional competence in an individual that leads to successful performance at work (Goleman, 2002).

Emotional Intelligence comprises the ability to utilize one's information processing systems effectively to understand one's own as well as other's emotions, and to further utilize this information to mold thinking and behavior. This ability supports adaptable functions and provides benefits to oneself as well as others (Mayer et al, 2008). The idea of Emotional Intelligence was popularized as a success predictor after Goleman's work in 1995. Goleman emphasized that Emotional Intelligence is one of the most important ability which contributes to triumph at work, and hence companies invest highly in training the workforce and modifying work practices. However, Emotional intelligence should not be proposed as an ability, till any relation can be empirically stated (Davies, et al, 1998). There exists individual differences in the levels of emotional intelligence and it can be developed in individuals through training throughout the person's life. Emotional intelligence comprises particularly of abilities to help reason about emotions effectively. Individuals with high levels of emotional intelligence can successfully identify, recognize, interpret, and manage emotions, both in themselves and others (Palmer et al, 2006).

Additional research in the area of Emotional Intelligence suggests that people high on emotional intelligence are likely to have skills in two focus areas which are namely, personal competence (self-management) and social competence (managing relationships). Personal competence relates to self-awareness (relating to resources, tastes, internal states, and apprehensions), self-regulation (relating to internal states, resources, and instincts), and motivation (factors that push accomplishment of goals). Social competence on the other hand comprises empathy (the ability to understand other's emotions through their perspective, the ability to influence, develop and communicate effectively with others, conflict management, team management and catalytic change), and social skills such as instilling the expected responses in other people (Kierstead, 1999; Bhalla & Nauriyal, 2004). Hence, Emotional Intelligence is a makeup of various skills which can be enhanced through education and training.

The tendencies of emotional responses can be managed by either maneuvering the inputs of the system or the outputs. The inputs of the system involve antecedent-focused emotion regulation, and the output involves response-focused emotion regulation (Gross, 1998). The regulation of antecedent-focused emotions involves four steps: selecting the situation (approaching or avoiding a particular situation or people based on their expected emotional impact), modifying the selected situation (altering the environment or the emotional impact), disposing attention (focusing attention to or away from something effect one's emotions), and changes in cognition (analyzing the situation that one faces or one's ability to regulate the situation to further change one's emotions). There are various steps to response-focused emotion regulation as well. A person may escalate, reduce, extend or retrench the emotional experiences that one is going through for particular purposes (Wong & Law, 2002).

When the above model is utilized in the organization setting to Emotional Intelligence, employees will better be able to regulate their understanding of the work environment, and these understandings impact their emotions, through antecedent-focused emotion regulation, by selectively choosing the people they want to interact with, change the work setting, concentrate on certain features of the work environment, or they might entirely change their perspective of the work setting (Wong & Law, 2002). Employees can escalate, reduce, extend or retrench specific emotions, a regulation of response-focused emotion, and in turn effect the modulation of emotional stimuli from the work setting.

Researchers have extensively tried to find the advantages of hiring employees and managers with high levels of emotional intelligence. Studies show that the presence of Emotional Intelligence supports human resource practices (O'Leary et al, 2002; Rynes, Colbert, & Brown, 2002; Teng Fatt, 2002; Voola, Carlson, & West, 2004) as well as human resource development (Brooks & Nafukho, 2006). Researchers have shown that enhances emotional intelligence through education and training enhances performance at workplace (Abraham,

2004; Kunnanatt, 2004; Lopes, Salovey & Strauss, 2003; Sy & Cote, 2004; Sy, Tram & O'Hara, 2006; Tischler, Biberman, & McKeage, 2002), performance of a group as well as a team (Jordan et al, 2002; Kelly & Barsade, 2001; Welch, 2003).

Moods and emotions play an important role in leadership, and Emotional Intelligence majorly advances the impact of effective leadership in the organization (George, 2000). Emotional Intelligence is one of the most important competency for effective leadership as well as successful team performance in organizations today (Prati et al, 2003a). Researchers agree with Goleman's proposition that Emotional Intelligence even more important as one goes higher in the organization (Dulewicz & Higgs, 2003). Researchers studying the relationship between Emotional Intelligence and effective leadership concluded that transformational leadership style is significantly related to Emotional Intelligence (Palmer et al, 2001). The ability to perceive emotions, an important aspect of emotional intelligence can help to speculate effective leadership (Rosete & Ciarrochi, 2005). Feyerherm & Rice (2002) concluded that effective understanding and management of emotions holds a significant positive relationship with team performance. Transformational leadership is seen to have associations with positive organizational outcomes, and hence, researchers are trying to search factors that speculate transformational leadership behaviors. These factors will further furnish the theoretical amplification of transformational leadership theory and can further improve the training and selection of effective leaders. Hence, emotional intelligence is one important variable in this facet (Sivanathan & Fekken, 2002). Effective leaders who have higher emotional intelligence better understand their employee's needs and give them constructive feedback. Even sales manager need to have emotional intelligence to better understand customers and give better service to them (Murray, 1998).

Research shows that people high on emotional intelligence would be effective performers at work, based on the assumption of the construct's existence and it's utility (Cobero, Primi, & Muniz, 2006). Other researchers discovered that there exists a positive relationship between emotional intelligence, work performance and successful careers of individuals in the organization (Cherniss, 2000; Dulewicz & Higgs, 2000; Goleman et al., 2001, 2002; Wong & Law, 2002; Rego & Fernandes, 2005). Wong & Law (2002) through their research in the food service industry found a significant positive relationship between job satisfaction and emotional intelligence. Lack of emotional intelligence negatively effects work environment (Weisinger, 2000). Unexpressed emotions and a highly defective reinforcement system can lead to mismanagement of emotions and hence negatively affect work efficiency and threaten success of the organization.

Emotions present in an individual can consequently lead to a number of positive outcomes on his performance at work as well as enhanced creativity, attention to validated threats, and challenging previous assumptions (Caruso & Salovey, 2004). However, certain negative outcomes like, pessimism and aggressiveness can disrupt work performance (James, 2002). Certain training interventions have been recognized by behavioral experts that can be utilized in organizations to handle how individuals manage these emotions at work and how effectively they utilize these emotions to enhance work performance (Hopfl & Linstead, 1997).

Both the personal as well as social competencies of an individual form emotional intelligence which are important in understanding, directing, managing and controlling one's emotions towards one's job and efficient work performance. These competencies majorly help to manage and direct the individual's moods and impulses at work. It is important to be aware of one's emotions and feelings as and when one experiences them, and adjust them according to varied contexts. This can be achieved through emotional competency, emotional maturity and emotional sensitivity which are required at the workplace. Working in an organization requires an individual to work with people with different suggestions, ideas and opinions which impacts his own performance. Hence, it is important to effectively use emotional intelligence for harmonious team efforts (Ashforth & Humphrey, 1995).

Emotional intelligence plays a crucial role in promoting team engagement and development of individual members. This helps in developing organizational culture as well as environment to actively participate in the change process (Saruhan, 2013). The presence of emotional intelligence in individuals can help to enhance their stress coping mechanism and regulate the strong emotions (Vakola & Nikolaou, 2006). Emotional intelligence helps in improving an individual's ability to strengthen his existing skills and become more capable in various work-related social and emotional skills, which further help in improving work performance (Zeidner et al, 2004).

The second paradigm of positive psychology, namely, psychological capital, emphasizes the growth and development of individuals from their present self to their future self (Avey, et al, 2008). According to Avey (2008), a significant positive relationship exists between psychological capital and positive emotions. A study

by Mellao & Monico (2013) revealed a significant positive relationship between emotional intelligence and psychological capital of employees. Psychological capital, a combination of hope, optimism, resilience and self-efficacy helps to deal with resistance to organizational change (Avey et al, 2008). It also helps in overcoming negative attitudes like cynicism and deviance. These negative attitudes adversely impact individual's capacity to adapt to changing working conditions. Research also confirmed that the positive emotions and favorable attitudes and behaviors are positively related (Avey et al, 2008).

Luthans et al. (2013) best describes PsyCap as a quality lying somewhere in the middle of the trait-state continuum in between transient states. These transient states are short-lived and dynamic, and hard-wired traits, which are steady and hard to change (Luthans et al, 2007b). The concept of PsyCap can be explained as a developmental state which is supported by growing number of researchers. These studies indicated that PsyCap can be developed through training interventions (Newman et al, 2014). In the recent studies, models have been developed to find associations between PsyCap and safety, which indicated that PsyCap is a positive motivational state which moderates and motivates safety oriented behavior and practices in safety oriented organizations (Eid et al, 2012). A study on air traffic controllers supported the association between PsyCap and safety, by finding that 15.5% of the variance in safety climate perception among the air traffic controllers could be explained through individual differences in PsyCap (Berghem et al, 2013). One of the dimensions of PsyCap, namely, hope was reported to be the greatest contribution in clarifying the perceived notions of safety climate of air traffic controllers. This is an important finding since hope, a positive psychological resource is also positively associated with good job performance in various independent studies (Peterson & Byron, 2008). The good job performance outcomes mainly include organizational commitment, job satisfaction and employee performance (Luthans et al, 2007b; Youssef & Luthans, 2007).

People have distinct emotional and temperamental tendencies. Hence, the differing perceptions of individuals about organizational conditions and their varying framework of behavior is something inevitable. Hence, PsyCap plays an important role in bringing out and enhancing employee's compelling and positive aspects (Luthans, 2002) and a contributory personal trait to employee's efficiency (Gohel, 2012). It plays an important role in developing attitudes for employee's job. A study was carried out in manufacturing, service, public, and private sector to find out relationship between various psychological aspects. It found out that a positive relation exists between resiliency and job satisfaction, hope and job satisfaction as well as optimism and job satisfaction (Youssef & Luthans, 2007).

People-related capital, especially human capital (person's reserve of abilities, skills and knowledge, which can be enhanced either through experience and /or education and training) (Becker, 1993) and social capital (it is accumulation of the genuine or prospective skills and abilities that help in creating and maintaining long-term system of relationships) (Luthans & Youssef, 2004) can be easily differed from PsyCap. PsyCap impacts various human-related outcomes which are significant not only to the organization but also outside it (Avey, Reichard, Luthans & Mhatre, 2011). However, prior researches have mainly emphasized on domain-specific measure based in the workplace setting. Research has shown that PsyCap has significant relationships with various employee related attitudes, like employee attendance (Avey, Reichard, Luthans & Mhatre, 2011), job commitment and satisfaction (Larson & Luthans, 2006). Employee empowerment is seen to have a positive relationship with PsyCap which further results in lower employee turnover intentions (Avey, Hughes, Norman & Luthans, 2008) and lower rates of employee absenteeism (Avey, Patera & West, 2006). Research also shows that job performance of individuals is better for those high on PsyCap rather than those low on PsyCap because individuals high on PsyCap can better utilize their resources to accomplish goals (Luthans, Avolio, Avey & Norman, 2007).

Researchers have found significant relationship between PsyCap and Positive Affect which has been related with the three major sub components of PsyCap: Optimism, Self-efficacy and resiliency. The studies found that individuals high on positive affect have better problem skills, methodical coping mechanisms, and balanced outlook at work (Lyubomirsky, King & Diener, 2005). Also, it has been found that in adverse situations resilience is increased due to the presence of positive affect (Tugade, Fredrickson & Feldman, 2004). Individuals high on positive affect are also found to be more optimistic and also have a positive outlook towards dealing with adverse situations (Lyubomirsky, King & Diener, 2005). Furthermore, they also have increased levels of personal competence and self-esteem as well as self-efficacy (Lyubomirsky, King & Diener, 2005).

Studies have found a significant relationship between PsyCap and job satisfaction. People with higher levels of PsyCap also have enhanced levels of job satisfaction (Avey, Reichard, Luthans & Mhatre, 2011). Employees who are more optimistic and effective experience greater job satisfaction and better work performance

(Luthans, Avolio, Avey & Norman, 2007). Such individuals show better confidence, deal effectively with challenges and work diligently towards achieving goals.

Individual well-being is a construct that is measured in studies as an amalgamation of life and job satisfaction as well as positive and negative affect (Judge & Klinger, 2008). Studies also found a positive relationship between PsyCap and well-being (Avey, Luthans, Smith & Palmer, 2010). Higher levels of PsyCap can contribute to better psychological well-being over time (Avey, Luthans, Smith & Palmer, 2010). Individuals with optimistic outlook tend to assess future events in a positive light. Optimists believe that the social context should be evaluated positively and one should not doubt its ability to give required support (Karademas, 2006). Social support not only enhances optimism but has a link with self-esteem (Symister & Friend, 2003). Increased levels of social support also contribute to reduction in mortality and bring out positive health results, since social support also encourages resilience to stress (Ozbay, Fitterling, Charney & Southwick, 2008).

Individuals today, give a lot of importance to finding meaning in life, also termed as living a “full life” (Seligman, Parks & Steen, 2004). Finding meaning in life shares a relationship with resilience, and hence, also is related to PsyCap (Coutu, 2002). People high on resilience are able to attach some significance to their life and give meaning to it even in the face of hardships. People high on resilience learn from hardships and see them as opportunities for growth rather than portraying themselves as the victims. Hence, they are successful in giving meaning to life and work even in hardships (Coutu, 2002). Research has found that the search for meaning in life stands on two pillars, namely, self-efficacy and self-worth (Baumeister, 1991), and since, research found that individuals low on PsyCap also show lower levels of meaning in life (Newman, Ucbasaran, Zhu & Hirst, 2014), hence it proves that a positive correlation exists between PsyCap and meaning of work.

Engagement can be defined by terms like, robustness, commitment and involvement (Bakker, Schaufeli, Leiter & Taris, 2008). Resilience, the sub factor of PsyCap has similarities with robustness (Bakker, Schaufeli, Leiter & Taris, 2008). Robust people are high on resilience and willingly give their full efforts to a task and are persistent when facing adverse situations. Not only resilience, but other factors, namely, optimism and self-efficacy have also proved to have relationship with engagement (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009). Studies also show that people high on PsyCap are also significantly high on job commitment (Avey, Reichard, Luthans, & Mhatre, 2011). Their organizations look after their needs for achievement and efficacy, hence, the employees become more engaged and enthusiastic about their work.

PsyCap and its various constructs also shares close relationship with gratitude (Luthans, Youssef, & Avolio, 2006). Gratitude can be an indicator of inclusion and describes it as putting an effort by people high on PsyCap. People high on gratitude can do away with negative labels and thinking about colleagues, which leads to a decrease in positivity in relationships, which would further reduce the level of PsyCap. Studies suggest that gratefulness encourages a positive outlook within towards life in general and positive reinforcement to each other. A positive outlook towards life indicates optimism and hope. This finding is indicated in other studies as well which show a positive relationship between optimism and gratitude (Emmons & McCollough, 2003), life satisfaction, hope and happiness (Rash, Matsuba, & Prkachin, 2011).

Similarities were found between the two paradigms, Emotional Intelligence and Psychological Capital related to evaluating and solving problems, and developing various perspectives to a particular problem. Individuals with high levels of resilience utilize positive emotions in their life to overcome negative emotional experiences (Tugade & Fredrickson, 1990). The study further suggests that psychological capital furnishes positive emotions. For example, if the employees are optimistic and hopeful, their expectations would be productive and worthwhile for accomplishing the goals effectively and cope with change. This would lead to feelings of confidence and self-efficacy. This would lead to positive emotions and reconstruct the way to achieving the goals (Fredrickson, 1998). Various researchers studying psychological capital have found a significant positive relationship between the individual's performance and attitudes at work with their optimism, hope and resilience (Green, Medlin, & Whitten, 2004; Luthans, Avey, Avolio, Norman, & Combs, 2006; Luthans & Youssef, 2007). Resilient individuals always try to attach positive meanings to negative situations. Significant positive relationships were found between emotional intelligence and self-efficacy, life satisfaction and coping with stress in a healthy way (Ignat, 2010). Research has also shown personal capital and emotional intelligence to be highly significant intangible sources from economic perspectives (Tomer, 2005).

Employees everywhere are effected by their organization and work life. Employees consistently focus on adopting ways to enhance themselves and their performance at work to contribute to the success of the organization. Harmony at workplace results in a stronger organization that can effectively confront the changes in the dynamic organizational environment. Success in these endeavors requires not only emotional intelligence

but also spiritual intelligence. The type of spirituality that exists in organizations is termed horizontal spirituality. It can be defined as the inclination to serve others at the workplace displayed through service orientation and high concern for co-workers (Burbach, et al, 2003).

The concept workplace spirituality was introduced as a consequence of the humanistic movement in organizations (McGuire et al, 2005). This movement focused on regarding employees as human beings and not as assets (Giacalone & Jurkiewicz, 2003). It emphasized that it is necessary to understand the humanistic aspect of employees, i.e., their needs, motivation and environment of the work to help them attain their full potential (Herzberg et al, 1959; Mayo, 1993).

Workplace spirituality is a concept that is considered to be personal and philosophical variable. Definitions of workplace spirituality agree on the fact that it involves a sense of being complete, connectivity at work, and strong and deep values (Gibbons, 2000). It involves searching for the definitive goal in life, to develop a sense of association with colleagues and to align one's vital beliefs with the organizational values (Mitroff & Denton, 1999). Workplace spirituality can be defined as recognizing the inner life and goals of employees that they cherish and is nourished by meaningful work which if performed in the context of community (Ashmos & Duchon, 2000). Some people attach religious meanings to workplace spirituality while others keep the two separate (Neck & Milliman, 1994). However, most of the concept of spirituality is embedded in religion.

However, with changing times, many people do not mix the two connotations together but keep it to their own personal values and philosophy (Cavanagh, 1999; Mitroff & Denton, 1999). There has been immense work done on the concept of spirituality since the last decade. However, there are certain limitations attached to this work (Gibbons, 2000). Studies have mainly focused on providing a picture about personal experiences of spirituality at work (Konz & Ryan, 1999), rather than placing focus on the effect that dimensions of spirituality have on work behaviors and attitudes. Studies should not only focus on personal spirituality experiences but also understand the significant positive impact it can have on employee attitude and behavior, if management can encourage and sustain individuals' needs in the organization (King & Nicol, 1999). Also, studies which have focused on the impact of workplace spirituality on employee attitude have simply accepted that the relationship between the two constructs is always positive (Gibbons, 2000), and ignored empirically testing the relationships between them.

The primary dimension of workplace spirituality is having a sense of recognition, value, and significance in one's work. This aspect involves how employees interact and connect with their everyday job on a personal level. Workplace Spirituality denotes the presumption that every individual possesses an inner motivation and desire that guides him to perform certain activities which provide him with a bigger and significant meaning in his own as well as others life (Ashmos & Duchon, 2000; Hawley, 1993). Finding purpose at work is an idea dating far back. The concept of workplace spirituality extends the concept of work from not just it being mere challenging and interesting, but also something that gives individuals a sense of being, meaning and purpose, expression of one's inner desires, living one's dream and seeking one's highest potential (Ashmos & Duchon, 2000; Fox, 1994; Neal, 1998). Work is not just an amalgamation one performs to achieve certain stated goals but it is more of a pursuit which has a purpose of providing greater meaning and a sense of identity in the organization (Moore, 1992).

Another dimension of workplace spirituality defined by various studies is having a sense of community, a strong connection and association with others (Ashmos & Duchon, 2000). This dimension of workplace spirituality involves the whole group and concerns human behavior and interactions between individuals and co-workers in the organization. Sense of community at work supports the belief that individuals view themselves as related and connected to each other and a significant relationship exists between their inner self and that of others (Maynard, 1992; Miller, 1992). This dimension of workplace spirituality combines aspects of mental, emotional and spiritual connections among co-workers at the team or group level at the workplace (Neal & Bennett, 2000). Having a sense of community at the workplace involves having a deeper and stronger connect with people including freedom to express oneself, support, nurturing and caring. Needless to say, only a few firms have been able to develop such a sense of deep inner connect and bond among employees and create a strong organizational culture that focuses on strengthening sense of community among workers (Freiberg & Freiberg, 1996; Milliman et al, 1999).

The third dimension of workplace spirituality can be defined as an alignment between individual's personal beliefs and values and the organization's mission and purpose. This alignment helps the employee to connect and interact better with the greater purpose of the organization (Mitroff & Denton, 1999). Aligning one's values with that of the organization indicates that the purpose of an individual's existence is greater than his self and it

is the duty of the individual to contribute to the society and its people. Alignment also indicates that individuals have a belief that employees and superiors in the workplace have suitable values and beliefs, strong work ethics and morals and care about the well-being of the employees and society (Ashmos & Duchon, 2000). Alignment indicates that employees are concerned about how much their organization is concerned about the greater good of the society other than just focusing upon meeting its corporate goals (Hawley, 1993). Organizations should have high integrity and conscience and contribute to the welfare of the stakeholders and community at large.

Many successful organizations, namely, Ford motor company, Hewlett- Packard (Burack, 1999), and Apple computer have developed programmes to introduce and instill spirituality at work. Various problems common in the workplace, like stress, work holism and burnout can be resolved by bringing in spirituality and positively impact the well-being of the employees. Researchers have found spirituality to play a positive impact on job performance, job satisfaction and commitment (Reave, 2005) as well as personal well-being (Neck & Milliman, 1994).

The concepts of both emotional intelligence and spiritual intelligence relates to the deep feelings or spirit of the employees. This helps employees in being motivated intrinsically. Workplace spirituality, according to Ashmos & Duchon (2000), comprises of three components: Community at work, meaningful work and inner life.

To develop a sense of community among employees, they need to feel safe at the workplace (McMillan, 1996; McMillan & Chavis, 1986). Such safety and security can be experienced by employees if they are honest and sincere to their co-workers and are able to motivate their colleagues to do the same (Milliman et al, 2003). Two of the major factors that foster emotional safety at the workplace are empathy and caring (McMillan, 1996). Another factor that is considered important to be truthful at workplace is intense emotional courage which would contribute to sense of community (McMillan, 1996). High emotional quotient can also contribute to developing sense of community in the workplace by allowing employees to connect with colleagues sincerely, resulting in enhanced emotional safety. These factors contribute to developing trust in the organization (Goleman, 1995; Mayer et al, 2008).

The second factor of workplace spirituality, meaningful work, is far more than monetary rewards. It involves making something significant for society, achieving self-actualization or a chance for assertion (Morse & Weiss, 1955). A recent perspective on meaningful work defines it as how employees comprehend the objective of their work (Wrzesniewski & Dutton, 2001). Studies show that the EQ levels of employees can determine the possible level of meaning they attach to their work. The higher the ability to regulate and manage one's own emotions, the higher level of positive attitudes towards their work. According to research, thoughts and emotions tend to be convoluted (Storebeck & Clore, 2007). Hence, the ability of employees to maintain consistent positive attitudes helps them to behave more rationally and be less affected by negative thoughts (George, 2000). Their optimistic attitudes helps them in evaluating their work positively (Gundlach et al, 2003) and hence attach meaning to their work.

Inner life, the third factor of workplace spirituality, involves individuals' spiritual needs that he carries with him to the workplace (Duchon & Plowman, 2005). Inner life relates to what meaning individuals attach to their existence, their work, and how they are contributing to it (Vaill, 1998). Inner life, hence, are the personal needs and emotions that individuals attach to work and which to some extent is used by them to manage their activities. People with high level of EQ can understand their own emotions, and hence can identify their inner life by acknowledging their emotions, needs, values and beliefs (Chan, 2003). People with high level of EQ are more satisfied in life and more optimistic. They are less likely to be acquainted with incompetency (Law et al, 2004, 2008). Individuals with high EQ also are likely to have high self-efficacy and be self-motivated to face adverse circumstances with confidence (Sosik & Megerian, 1999). EQ levels are also connected to individual's level of self-esteem (Goleman, 1995).

### **3. RESEARCH METHODOLOGY**

#### **RESEARCH OBJECTIVES**

##### **The study has the following objectives**

- To find whether Emotional Intelligence impacts Psychological Capital of employees in an organization
- To find whether Emotional Intelligence contributes to Workplace Spirituality in the organization

Based on the above objectives, the following hypothesis can be framed:

H0: emotional intelligence has no impact on psychological capital of employees

H1: emotional intelligence has an impact on psychological capital of employees.

H0: emotional intelligence does not contribute to workplace spirituality in the organization.

H1: emotional intelligence contributes to workplace spirituality in the organization.

### RESEARCH DESIGN

In this study, a quantitative approach to research was used. The data was collected from primary sources for further analysis. The sample comprised of 100 employees from the IT industry. Purposive sampling method was used to select the sample. Purposive sampling method involves selecting a sample that fulfills the purpose of the research and is particularly representative of the population.

	18-22	23-27	28-32	33-37	Total
Male	4	253	9	11	49
Female	6	29	15	1	51
Total	10	54	24	12	100

**Table-3.1: shows that sample distribution of the study.**

The study employed the survey method of research which involves collecting primary data from a sample of the population through the use of well-constructed standardized questionnaires for each of the variables. The study involved using three standardized scales for individual measurement of workplace spirituality, psychological capital and emotional intelligence (refer to appendix).

**Emotional Intelligence Scale:** Emotional Intelligence was measured using standardized scale developed Schutte et al (1998). The scale consists of 26 statements developed on the work of Mayer & Salovey (1990). The responses are to be provided on 5 pointer scale where, 1 refers to Strongly Disagree and 5 indicates Strongly Agree. It is a multidimensional scale that measure the following dimensions: appraisal of emotions, regulation of emotions, social skills and utilization of emotions. The Cronbach Alpha coefficient was well above 0.70.

**Psychological Capital Scale:** Psychological Capital was measured using standardized scale developed on the work of Luthans and his colleagues (2004). The scale consists of 24 items whose responses were indicated on a 5 pointer scale where, 1 refers to Strongly Disagree and 5 refers to Strongly Agree. The scale measures the four dimensions of Psychological Capital namely, Self-efficacy, Optimism, Hope, and Resilience. The Cronbach Alpha coefficient was 0.95.

**Workplace Spirituality Scale:** Workplace Spirituality was measured using standardized scale developed on the work of Ashmos & Duchon (1995). The scale consists of 17 items whose responses were indicated on a 5 pointer scale where, 1 refers to Strongly Disagree and 5 refers to Strongly Agree. The scale measures three dimensions of Workplace Spirituality, namely, Conditions of Community, Meaning at work, and Inner Life. The Cronbach Alpha coefficient was well above 0.70.

The responses were analyzed by applying various statistical measures utilizing the SPSS software. Correlation and regression was calculated between the various variables and their dimensions to find out the relationship between them.

### 4. DATA ANALYSIS

The research was aimed at finding the effect of Emotional Intelligence on Psychological Capital and its contribution to Workplace Spirituality. The objectives of the study were as follows:

- To find whether Emotional Intelligence effects Psychological Capital of employees in an organization.
- To find whether Emotional Intelligence contribute to Workplace Spirituality in the organization

To fulfill the above objectives, data was calculated using standardized tools for all the three variables: Emotional Intelligence, Psychological Capital, and Workplace spirituality. Emotional intelligence was the independent variable while, Psychological Capital and Workplace Spirituality were the dependent variables upon which the impact of Emotional Intelligence was measured. The tools were administered to 100 employees of IT companies. Correlation and regression methods of statistical analysis were utilized to find out the relationship between the variables. The statistics were calculated using SPSS software.

### RELIABILITY

Chronbach's Alpha is a test of reliability that measures the internal consistency of a test which show the extent to which the items in the test are closely related.

**Case Processing Summary**

		N	%
	Valid	100	100.0
Cases	Excluded <sup>a</sup>	0	.0
	Total	100	100.0

**Table no-4.1: Shows the number of cases included for reliability testing**

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	No. of Items
.890	67

The table shows that all the cases of the sample have been included in the testing the reliability of the test

Table no 4.2 Shows the Cronbach's Alpha Reliability value

The test used in my study shows a high reliability value of .890 which indicates that the items are closely related.

## DESCRIPTIVE STATISTICS

**Descriptive Statistics**

	Mean	Std. Deviation	N
EI	3.8741	.30533	100
Utilization	4.1016	.56997	100
Regulation	3.8103	.41409	100
Social skills	3.9355	.36146	100
Appraisal	3.7843	.40045	100
Psycap	4.0622	.36495	100
SelfEfficacy	4.1449	.38589	100
Optimism	3.8354	.41700	100
Hope	4.0978	.58350	100
Resilience	4.1475	.45916	100
WS	4.1325	.38877	100
Community	4.1617	.46207	100
MOW	4.2009	.44898	100
Innerlife	3.9819	.55459	100

**Table no-4.3: Shows the Descriptive Statistics of the study**

The value of mean should be between 1-5. From the above table it can be interpreted that all the responses varied from 'neutral' to 'agree' for most of the questions in the given questionnaire.

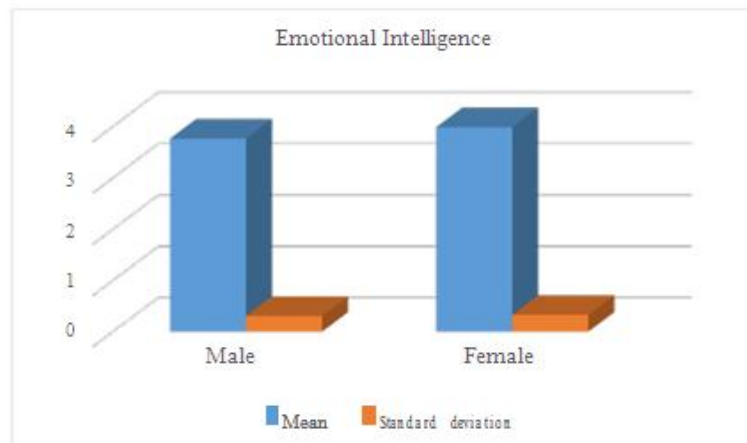
The mean value for Emotional Intelligence is 3.8741 which shows a neutral response for the items related to the variable. Similarly, the mean values for Psychological Capital is 4.0622 which shows that average respondents agree to the items related to this variable. Further, the mean value for Workplace Spirituality is 4.1325 which shows that average number of respondents agree to the items related to this variable.

It can also be interpreted from the value of standard deviation that deviation from mean is low as the values are not close to 1 in most of the cases. The deviation is lowest from the mean in terms of Emotional Intelligence as the value of standard deviation is 0.30533. Similarly, standard deviation for Psychological Capital and Workplace Spirituality is .364 and .388 respectively indicating that majority of the responses are close to the mean.

	Male	Female
Mean	3.764	3.985
Standard deviation	0.305	0.328

**Table-4.4: Shows that mean and standard deviation values of male and female respondents for emotional intelligence scale**

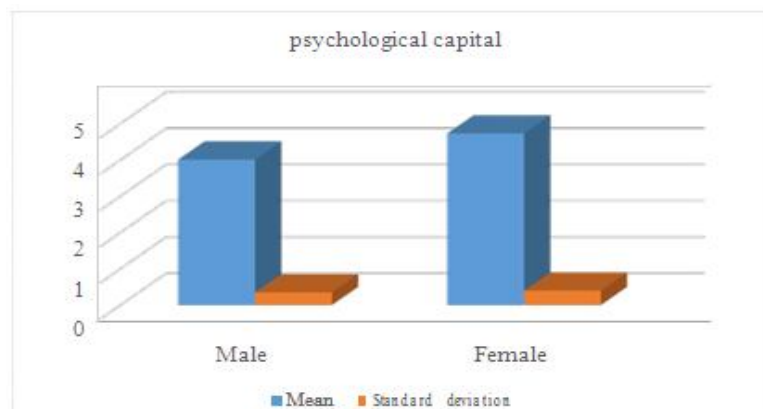




**Figure-4.1:** Shows that mean and standard deviation values of male and female respondents for emotional intelligence scale

	Male	Female
Mean	4.01	4.73
Standard deviation	.347	.398

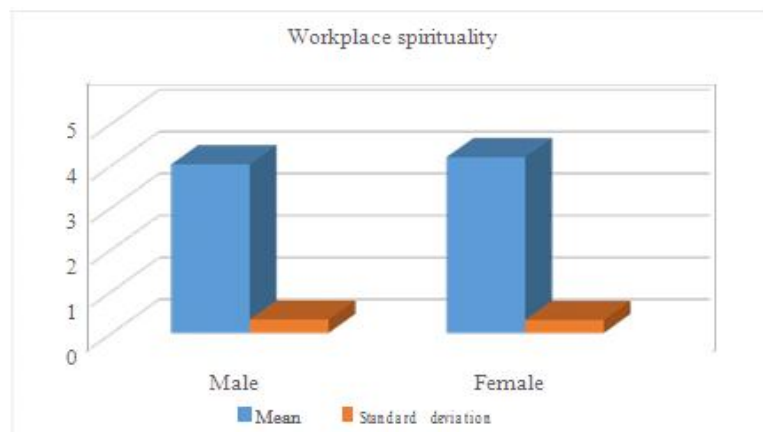
**Table-4.5:** Shows that mean and standard deviation values of male and female respondents for psychological capital scale



**Figure-4.2:** Shows that mean and standard deviation values of male and female respondents for psychological capital scale

	Male	Female
Mean	4.02	4.19
Standard deviation	.324	.312

**Table-4.6:** Shows that mean and standard deviation values of male and female respondents for workplace spirituality scale



**Figure-4.3:** shows that mean and standard deviation values of male and female respondents for workplace spirituality scale

## CORRELATION

Correlation is the relationship between two things based on the co-occurrence. It also says that the tendency for two or more variables to change together, in either the same or the opposite way, the correlation is considered to be positive when two variables move in the same direction, and if they move in opposite direction it is considered to be negative correlation.

0 means there is no correlation between the variables.

0.5 means there is moderate correlation between the variables.

0.8 means there is strong positive correlation between the variables.

-0.8 means there is strong negative correlation between the variables.

From the tables given below it can be interpreted that:

### CORRELATION BETWEEN EMOTIONAL INTELLIGENCE AND PSYCHOLOGICAL CAPITAL

#### Correlations

		EI		Psycap
	Pearson Correlation		1	.722**
EI	Sig. (2-tailed)			.000
	N		100	100
	Pearson Correlation		.722**	1
Psycap	Sig. (2-tailed)		.000	
	N		100	100

**Table no-4.7: Shows the Correlation value between Emotional Intelligence & Psychological Capital.**

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Emotional Intelligence and Psychological Capital are highly correlated since their correlation value is .722.

### CORRELATION BETWEEN EMOTIONAL INTELLIGENCE AND WORKPLACE SPIRITUALITY

#### Correlations

		EI		WSS
	Pearson Correlation		1	.607**
EI	Sig. (2-tailed)			.000
	N			100
	Pearson Correlation		.607**	1
WSS	Sig. (2-tailed)		.000	
	N		100	100

**Table no-4.8: Shows the Correlation value between Emotional Intelligence & Workplace Spirituality**

Correlation is significant at the 0.01 level (2-tailed).

Emotional Intelligence and Workplace Spirituality are highly correlated since their correlation value is .607.

### CORRELATION OF UTILIZATION OF EMOTIONS WITH SUB-VARIABLES OF PSYCHOLOGICAL CAPITAL

#### Correlations

		Utilization	SelfEfficacy	Optimism	Hope	Resilience
	Pearson Correlation	1	.554**	.455**	.622**	.370**
Utilization	Sig. (2-tailed)		.000	.000	.000	.002
	N	100	100	100	100	100
	Pearson Correlation	.554**	1	.500**	.574**	.651**
SelfEfficacy	Sig. (2-tailed)	.000		.000	.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.455**	.500**	1	.455**	.626**
Optimism	Sig. (2-tailed)	.000	.000		.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.622**	.574**	.455**	1	.488**
Hope	Sig. (2-tailed)	.000	.000	.000		.000
	N	100	100	100	100	100
	Pearson Correlation	.370**	.651**	.626**	.488**	1
Resilience	Sig. (2-tailed)	.002	.000	.000	.000	
	N	100	100	100	100	100

**Table no-4.9: Shows the Correlation value between Utilization of emotions & sub-variables of Psychological Capital**

Utilization of emotions and Self efficacy are moderately correlated with each other as their correlation level is .554.

Utilization of emotions and optimism are slightly less correlated with each other as their correlation level is .455.

Utilization of emotions and Hope are moderately correlated with each other as their correlation level is .622.

Utilization of emotions and resilience are less correlated with each other as their correlation level is .370.

#### CORRELATION OF EMOTIONAL REGULATION WITH SUB VARIABLES OF PSYCHOLOGICAL CAPITAL

Correlations						
		Emotional	SelfEfficacy	Optimism	Hope	Resilience
	Pearson Correlation	1	.603**	.510**	.607**	.651**
Emotional	Sig. (2-tailed)		.000	.000	.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.603**	1	.500**	.574**	.651**
SelfEfficacy	Sig. (2-tailed)	.000		.000	.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.510**	.500**	1	.455**	.626**
Optimism	Sig. (2-tailed)	.000	.000		.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.607**	.574**	.455**	1	.488**
Hope	Sig. (2-tailed)	.000	.000	.000		.000
	N	100	100	100	100	100
	Pearson Correlation	.651**	.651**	.626**	.488**	1
Resilience	Sig. (2-tailed)	.000	.000	.000	.000	
	N	100	100	100	100	100

**Table no-4.10: Shows the Correlation value between emotional regulation & sub variables of Psychological Capital**

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Emotional Regulation and Self-efficacy are moderately correlated with each other as their correlation level is .603.

Emotional Regulation and Optimism are moderately correlated with each other as their correlation level is .510.

Emotional Regulation and Hope are moderately correlated with each other as their correlation level is .607.

Emotional Regulation and Resilience are moderately correlated with each other as their correlation level is .651.

#### CORRELATION BETWEEN SOCIAL SKILLS AND SUB-VARIABLES OF PSYCHOLOGICAL CAPITAL

		Social	SelfEfficacy	Optimism	Hope	Resilience
	Pearson Correlation	1	.451**	.251*	.187	.341**
Social	Sig. (2-tailed)		.000	.037	.125	.004
	N	100	100	100	100	100
	Pearson Correlation	.451**	1	.500**	.574**	.651**
SelfEfficacy	Sig. (2-tailed)	.000		.000	.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.251*	.500**	1	.455**	.626**
Optimism	Sig. (2-tailed)	.037	.000		.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.187	.574**	.455**	1	.488**
Hope	Sig. (2-tailed)	.125	.000	.000		.000
	N	100	100	100	100	100
	Pearson Correlation	.341**	.651**	.626**	.488**	1
		.004	.000	.000	.000	
Resilience	Sig. (2-tailed)	.004	.000	.000	.000	
		100	100	100	100	100

**Table no-4.11: Shows the Correlation value between social skills & sub variables of Psychological Capital**

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

Social skills and Self-efficacy are moderately correlated with each other as their correlation level is .451.

Social skills and Optimism are less correlated with each other as their correlation level is .251.

Social skills and Hope are less correlated with each other as their correlation level is .187.

Social skills and Resilience are less correlated with each other as their correlation level is .341.

#### CORRELATION BETWEEN APPRAISAL OF EMOTIONS AND SUB-VARIABLES OF PSYCHOLOGICAL CAPITAL

Correlations						
		Appraisal	SelfEfficacy	Optimism	Hope	Resilience
	Pearson Correlation	1	.384**	.273*	.400**	.380**
Appraisal	Sig. (2-tailed)		.001	.023	.001	.001
	N	100	100	100	100	100
	Pearson Correlation	.384**	1	.500**	.574**	.651**
SelfEfficacy	Sig. (2-tailed)	.001		.000	.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.273*	.500**	1	.455**	.626**
Optimism	Sig. (2-tailed)	.023	.000		.000	.000
	N	100	100	100	100	100
	Pearson Correlation	.400**	.574**	.455**	1	.488**
Hope	Sig. (2-tailed)	.001	.000	.000		.000
	N	100	100	100	100	100
	Pearson Correlation	.380**	.651**	.626**	.488**	1
Resilience	Sig. (2-tailed)	.001	.000	.000	.000	
	N	100	100	100	100	100

**Table no-4.12: Shows the Correlation value between appraisal of emotions & sub variables of Psychological Capital**

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

Appraisal of emotions and Self-efficacy are less correlated with each other as their correlation level is .384.

Appraisal of emotions and Optimism are less correlated with each other as their correlation level is .273.

Appraisal of emotions and Hope are less correlated with each other as their correlation level is .400.

Appraisal of emotions and Resilience are less correlated with each other as their correlation level is .380.

#### CORRELATION OF UTILIZATION OF EMOTIONS WITH SUB-VARIABLES OF WORKPLACE SPIRITUALITY

Correlations					
		Utilization	Community	MOW	Innerlife
	Pearson Correlation	1	.386**	.435**	.360**
Utilization	Sig. (2-tailed)		.001	.000	.002
	N	100	100	100	100
	Pearson Correlation	.386**	1	.705**	.382**
Community	Sig. (2-tailed)	.001		.000	.001
	N	100	100	100	100
	Pearson Correlation	.435**	.705**	1	.279*
MOW	Sig. (2-tailed)	.000	.000		.020
	N	100	100	100	100
	Pearson Correlation	.360**	.382**	.279*	1
Innerlife	Sig. (2-tailed)	.002	.001	.020	
	N	100	100	100	100

**Table no-4.13: Shows the Correlation value between utilization of emotions & sub variables of Workplace Spirituality**

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Utilization of emotions and Conditions for Community are less correlated with each other as their correlation level is .386.

Utilization of emotions and Meaning of Work are less correlated with each other as their correlation level is .435.

Utilization of emotions and Inner Life are less correlated with each other as their correlation level is .360.

#### CORRELATION OF EMOTIONAL REGULATION AND SUB VARIABLES OF WORKPLACE SPIRITUALITY

Correlations					
		Emotional	Community	MOW	Innerlife
	Pearson Correlation	1	.620**	.528**	.456**
Emotional	Sig. (2-tailed)		.000	.000	.000
	N	100	100	100	100
	Pearson Correlation	.620**	1	.705**	.382**
Community	Sig. (2-tailed)	.000		.000	.001
	N	100	100	100	100
	Pearson Correlation	.528**	.705**	1	.279*
MOW	Sig. (2-tailed)	.000	.000		.020
	N	100	100	100	100
	Pearson Correlation	.456**	.382**	.279*	1
Innerlife	Sig. (2-tailed)	.000	.001	.020	
	N	100	100	100	100

**Table no-4.14: Shows the Correlation value between emotional regulation & sub variables of Workplace Spirituality**

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Emotional Regulation and conditions for community are moderately correlated with each other as their correlation level is .620.

Emotional Regulation and Meaning of Work are moderately correlated with each other as their correlation level is .528.

Emotional Regulation and Inner Life are moderately correlated with each other as their correlation level is .456.

#### CORRELATION BETWEEN SOCIAL SKILLS AND SUB VARIABLES OF WORKPLACE SPIRITUALITY

Correlations					
		Social	Community	MOW	Innerlife
	Pearson Correlation	1	.232	.223	.189
Social	Sig. (2-tailed)		.056	.065	.120
	N	100	100	100	100
	Pearson Correlation	.232	1	.705**	.382**
Community	Sig. (2-tailed)	.056		.000	.001
	N	100	100	100	100
	Pearson Correlation	.223	.705**	1	.279*
MOW	Sig. (2-tailed)	.065	.000		.020
	N	100	100	100	100
	Pearson Correlation	.189	.382**	.279*	1
Innerlife	Sig. (2-tailed)	.120	.001	.020	
	N		100	100	100

**Table no-4.15: Shows the Correlation value between social skills & sub variables of Workplace Spirituality**

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

Social skills and conditions for community are less correlated with each other as their correlation level is .232.

Social skills and Meaning of work are less correlated with each other as their correlation level is .223.

Social skills and Inner Life are less correlated with each other as their correlation level is .189.

#### CORRELATION BETWEEN APPRAISAL OF EMOTIONS AND SUB VARIABLES OF WORKPLACE SPIRITUALITY

Correlations					
		Appraisal	Community	MOW	Innerlife
	Pearson Correlation	1	.271*	.224	.394**
Appraisal	Sig. (2-tailed)		.024	.065	.001
	N	100	100	100	100
	Pearson Correlation	.271*	1	.705**	.382**
Community	Sig. (2-tailed)	.024		.000	.001
	N	100	100	100	100
	Pearson Correlation	.224	.705**	1	.279*
MOW	Sig. (2-tailed)	.065	.000		.020
	N	100	100	100	100
	Pearson Correlation	.394**	.382**	.279*	1
Innerlife	Sig. (2-tailed)	.001	.001	.020	
	N	100	100	100	100

**Table no-4.16: Shows the Correlation value between appraisal of emotions & sub variables of Workplace Spirituality**

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Appraisal of emotions and conditions for community are less correlated with each other as their correlation level is .271.

Appraisal of emotions and Meaning of work are less correlated with each other as their correlation level is .224.

Appraisal of emotions and Inner Life are less correlated with each other as their correlation level is .394.

#### MULTIPLE REGRESSION

Multiple regression is used when the value of one variable is to be predicted based on the value of two or more variables. The variable we want to predict is called the dependent variable and the variable we use to predict the value of the dependent variables is called the independent variable.

#### MULTIPLE REGRESSION ANALYSIS OF EMOTIONAL INTELLIGENCE AND PSYCHOLOGICAL CAPITAL

Variables Entered/Removed <sup>a</sup>			
Model	Variables	Variables	Method
	Entered	Removed	
1	EI <sup>b</sup>	.	Enter

**Table no-4.17: Shows the variables for Multiple Regression Analysis**

a. Dependent Variable: Psycap

b. All requested variables entered.

The first table of regression shows which variables are being used to predict which variable. In my study I have used Emotional Intelligence as an independent variable to predict the dependent variable i.e. Psychological Capital.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.722 <sup>a</sup>	.522	.515	.25424	.522	73.121	1

Table no 4.18 Shows the R and R square value

Model	R Square	Adjusted R	Std. Error of the	Change Statistics	
			Model Summary		
Model			df2	Sig. F Change	
1			99 <sup>a</sup>		.000

Table no-4.19: Shows the Significant F change value

a. Predictors: (Constant), EI

This table provides the  $R$  and  $R^2$  values.

The  $R$  value represents the simple correlation which is .722 (the "R" Column), which indicates a high degree of positive correlation.

The  $R^2$  value (the "R Square" column) indicates the percentage of variance in the dependent variable or outcome variable explained by the independent variable or predictor variable how much of the total variation is in the dependent variable.

In this case, it is .522

Adjusted R square in the table is 51.5% (after multiplying R square with 100) which explains that the 51.5% Emotional Intelligence can affect the Psychological Capital.

The next table is the **ANOVA** table, which reports how well the regression equation fits the data (i.e., predicts the dependent variable) and is shown below:

ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	4.726	1	4.726	73.121	.000 <sup>b</sup>
1	Residual	4.331	99	.065		
	Total	9.057	100			

Table no 4.20 Shows the Anova value for Multiple Regression Analysis

a. Dependent Variable: Psycap

b. Predictors: (Constant), EI

This table indicates that the regression model predicts the dependent variable significantly well or not.

The "**Sig.**" column indicates the statistical significance of the regression model that was run.

If significance value ( p-value ) is less than 0.05, we say the model is significant.

Here,  $p = 0.000$ , which is less than 0.05, and indicates that, overall, the regression model is statistically significant in predicting the Psychological Capital.

Coefficients<sup>a</sup>

Model	Unstandardized Coefficients	Standardized Coefficients	T	Sig.
	B	Std. Error	Beta	
(Constant)	.717	.392	1.828	.072
EI	.863	.101	.722	.000

Table no-4.21: Shows the coefficients values for multiple regression analysis

a. Dependent Variable: Psycap

Finally, the last table will help us determine whether Emotional Intelligence and Psychological Capital are significantly related, and the direction and strength of their relationship.

It has equation of line to predict independent variable (Emotional Intelligence) that uses independent variable to predict dependent variable.

$$y = mx + b$$

$$y = .863x + .717$$

Now, with the help of significance given in the table we could say that Emotional Intelligence have a positive impact on Psychological Capital and are good predictors.

#### MULTIPLE REGRESSION ANALYSIS OF EMOTIONAL INTELLIGENCE AND WORKPLACE SPIRITUALITY

##### Variables Entered/Removed<sup>a</sup>

Model	Variables	Variables	Method
	Entered	Removed	
1	EI <sup>b</sup>	.	Enter

Table no-4.22: Shows the variables for Multiple Regression Analysis

a. Dependent Variable: WS

b. All requested variables entered.

The first table of regression shows which variables are being used to predict which variable. In my study I have used Emotional Intelligence as an independent variable to predict the dependent variable i.e. Workplace Spirituality.

##### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.607 <sup>a</sup>	.369			.369	39.178	1

Table no-4.23: Shows the R and R Square values

##### Model Summary

Model			Change Statistics
	df2		Sig. F Change
1		99 <sup>a</sup>	.000

Table no 4.24 Shows the significant F change values

a. Predictors: (Constant), EI

This table provides the  $R$  and  $R^2$  values.

The  $R$  value represents the simple correlation which is .607 (the "R" Column), which indicates a high degree of positive correlation.

The  $R^2$  value (the "R Square" column) indicates the percentage of variance in the dependent variable or outcome variable explained by the independent variable or predictor variable how much of the total variation is in the dependent variable.

In this case, it is .369

Adjusted R square in the table is 36% (after multiplying R square with 100) which explains that the 36% Emotional Intelligence can affect the Workplace Spirituality.

The next table is the ANOVA table, which reports how well the regression equation fits the data (i.e., predicts the dependent variable) and is shown below:

##### ANOVA<sup>a</sup>

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	3.792	1	3.792	39.178	.000 <sup>b</sup>
1	Residual	6.485	99	.097		
	Total	10.278	100			

Table no-4.25: Shows the Anova value for Multiple Regression Value



a. Dependent Variable: WSS

b. Predictors: (Constant), EI

This table indicates that the regression model predicts the dependent variable significantly well or not.

The "**Sig.**" column indicates the statistical significance of the regression model that was run.

If significance value ( p-value ) is less than 0.05, we say the model is significant.

Here,  $p = 0.000$ , which is less than 0.05, and indicates that, overall, the regression model is statistically significant in predicting the Workplace Spirituality.

Coefficients <sup>a</sup>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.136	.480		2.366	.021
1					
EI	.773	.124	.607	6.259	.000

**Table no-4.26: Shows the Coefficients value for Linear Regression Analysis**

a. Dependent Variable: WSS

Finally, the last table will help us determine whether Emotional Intelligence and Workplace Spirituality are significantly related, and the direction and strength of their relationship.

It has equation of line to predict independent variable (Emotional Intelligence) that uses independent variable to predict dependent variable.

$$y = mx + b$$

$$y = .773x + 1.136$$

Now, with the help of significance given in the table we could say that Emotional Intelligence have a positive impact on Workplace Spirituality and are good predictors.

## 1. FINDINGS

The research was aimed at finding the impact of Emotional Intelligence on Psychological Capital and its contribution to Workplace Spirituality. The data had been collected using questionnaire from employees working in different organizations in Delhi/NCR region.

### The objectives of the study were as follows

To find whether Emotional Intelligence effects Psychological Capital of employees in an organization.

To find whether Emotional Intelligence contribute to Workplace Spirituality in the organization

Data was gathered from 100 respondents and after applying descriptive and inferential statistics following are the findings.

The correlation values indicated a high positive correlation between Emotional Intelligence and Psychological Capital.

There was also a high positive correlation between Emotional Intelligence and Workplace Spirituality.

Further by increasing Emotional Intelligence in organization, employee psychological Capital is more likely to be enhanced and this can be verified from the significance level of their correlation which is .000. Thus, accepting the alternative hypothesis which states that Emotional Intelligence impacts Psychological Capital.

Further by enhancing Emotional Intelligence in organization, Workplace Spirituality is more likely to be enhanced and this can be verified from the significance level of their correlation which is .000. Thus, accepting the alternative hypothesis which states that Emotional Intelligence contributes to Workplace Spirituality.

While doing multiple regressions analysis for the summated scale it is found that by changing independent variables by one unit there is an increase in dependent variables by certain units.

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## **2. CONCLUSION AND LIMITATIONS**

### **6.1 CONCLUSION**

It was inferred from the study that positive psychological orientation develops better EQ competencies to maintain a healthy interpersonal relation that is instrumental in achieving optimal organizational performance.

The employees in Delhi/NCR showed high levels of Emotional Intelligence which made them more professionally competent.

In order to maintain and develop their competences, the employees should have an open-mind for spirituality and emotions Intelligence. This proactive approach can be generated by providing adequate knowledge about spirituality and emotional intelligence as well as motivation for the employees by fostering a supportive and favorable climate for employee engagement in the organizations.

Through the correlation made, it can be deduced that the capacity of self-motivate using the own feelings (self-encouragement) and to control your feelings in emotional situations (emotional self-control) are factors that contribute very much to promote the Psychological Capital of employees.

From the study it's concluded that both the hypothesis are accepted i.e.H1: Emotional Intelligence impacts Psychological Capital of employees and H2: Emotional Intelligence contributes to Workplace Spirituality in the organization.

### **6.2 LIMITATIONS**

1. The study is restricted to the organizations in Delhi/NCR only.
2. Time is the major constraint; thus the findings of the study are used for this project only.
3. The study is done on the assumption that all the responses gathered from respondents are true and relevant.
4. Respondent provides data from their own organizations and perceptions which may be rough estimates.
5. The study cannot be generalized since the studied sample was very less.

## **3. SUGGESTIONS**

### **The following suggestions can be made based on the research**

Psychological welfare of workers is hugely dependent on the emotional intelligence level they have. More of emotional stability increases the level of psychological capital of employees. Organizations can adopt a number of techniques to enhance their employees' emotional intelligence. It would be beneficial to invest in the training and development of employees in this area.

The future researchers may use qualitative or mixed model, that too in different time frame for comprehending the concepts. Future studies may also focus on carrying longitudinal research to understand the trend of relationships examined in the present study over an extended period of time, which will effectively refine the results.

Motivating employees for prayers/ yoga sessions, designing multi faith prayer spaces, will strengthen employee's mental alertness, reduction of stress level and build up community spirit. The aim of any organization should be to engage as a whole every person at work with all their minds, spirits and souls. It is important to acknowledge employees as spiritual beings. workplace spirituality/ emotional intelligence which does not only begins with employees bodies & minds to work, but also from their souls, creativity, talents and unique spirits.

Organizational culture plays a dynamic role for influencing the Psychological Capital of employees. Therefore, management needs to encourage positive affectivity among their employees and possibly they may think of revisiting their mission and values. HR functionaries need to play the role of a custodian in appraising emotional reactions, displaying care and concern for people and using emotions for creating a positive work environment.

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## STUDY OF PLANER KINEMATIC CHAINS OF 1F 8LINKS

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### ABSTRACT

Author's aim is to develop the all possible mechanisms from a kinematic chain, so that the designer has the liberty to select the best or optimum mechanisms according to his requirements. Author has prepared a catalogue of equivalent and distinct links in the distinct mechanisms of kinematic chains of 8 Links, 10 Joints, 1degree of freedom. This work will be hoghly useful and give the freedom for new researchers / designers to select the best mechanism kinematic chain to be used to perform the desired task according to needs at the conceptual stage of design. The proposed method is presented by comparing the structural invariants 'sum of the absolute values of the characteristic polynomial coefficients' [SCPC] and 'maximum absolute value of the characteristic polynomial coefficient' [MCPC] of [JJ] matrices. These invariants are identical for structurally equivalent mechanisms and different for distinct mechanisms. These invariants may be used to detect isomorphism in the mechanism kinematic chain having simple joints.

**Keywords:** Kinematic chain, distinct mechanism, Equivalent link, SCPC, MCPC.

### 1. INTRODUCTION

Duplicate distinct mechanisms results in wrong solutions and wastage of effort. So, the necessity of reliable solution is necessary. For identification of isomorphism and distinct mechanisms, number of methods are available in the literature given by various inventors like Raicu [1], Mruthyunjaya, Raghavan [2], Yan and Hall [3]. Balasubramaniam [4]. Mruthyunjaya [5-6], Rao [7-13], Agrawal [14-15], Ambekar [16-17], Hasan [18-21], Hwang [24,27], Uicker [25], Yadav [26], Zhang [28], Yang [29], and Zou [30], etc. are found in the literature. But most of the methods either failed at one or later stage or processing time is more. Hence, it is felt to develop an efficient method to determine the distinct mechanisms of a kinematic chain. In the present case, a new, easy and reliable method proposed by myself [23] is used to determine the distinct mechanisms of a kinematic chains of 8 Links, 10 Joints, 1degree of freedom.

### 2. THE JOINT-JOINT [JJ] MATRIX

This is a square symmetric matrix of size  $n \times n$ , where  $n$  is the number of joints in a kinematic chain.

$$[JJ] = \begin{Bmatrix} L_{ij} \end{Bmatrix}_{n \times n} \quad \text{----- (1)}$$

Where,

$$L_{ij} \begin{cases} = \text{Degree of link between } i^{\text{th}} \text{ and } j^{\text{th}} \text{ joint those are directly connected} \\ = 0, \text{ if joint } i \text{ is not directly connected to joint } j \end{cases}$$

### 3. CHARACTERISTIC POLYNOMIAL OF [JJ] MATRIX

$D(\lambda)$  gives the characteristic polynomial of [JJ] matrix. The monic polynomial of degree  $n$  is given by equation (2).

$$|(JJ - \lambda I)| = \lambda^n + a_1 \lambda^{n-1} + a_2 \lambda^{n-2} + \dots + a_{n-1} \lambda + a_n \quad \text{----- (2)}$$

Where;  $n$  = number of simple joints in kinematic chain and  $1, a_1, a_2, a_{n-1}, a_n$  are the characteristic polynomial coefficients. The two important properties of the characteristic polynomials are (a) The sum of the absolute values of the characteristic polynomial coefficients (SCPC) is an invariant for a [JJ] matrix. i.e.  $|1| + |a_1| + |a_2| + \dots + |a_{n-1}| + |a_n| = \text{invariant}$ . (b) The maximum absolute value of the characteristic polynomial coefficient (MCPC) is another invariant for a [JJ] matrix.

### 4. STRUCTURAL INVARIANTS [SCPC] AND [MCPC]

Two invariants namely 'SCPC' and 'MCPC' are introduced as identification numbers to find the isomorphism among kinematic chains. The characteristic polynomial coefficients values are the characteristic invariants for the kinematic chains. The proposed [JJ] matrix gives distinct set of characteristic polynomial coefficients of the kinematic chains having co-spectral graphs. The theorem; Two similar square symmetric matrices have the same characteristic polynomials [31] has been used for isomorphism of two kinematic chains.

## 5. ILLUSTRATIVE EXAMPLE

Considering the case of KC of 8 links having one dof given in Fig.1

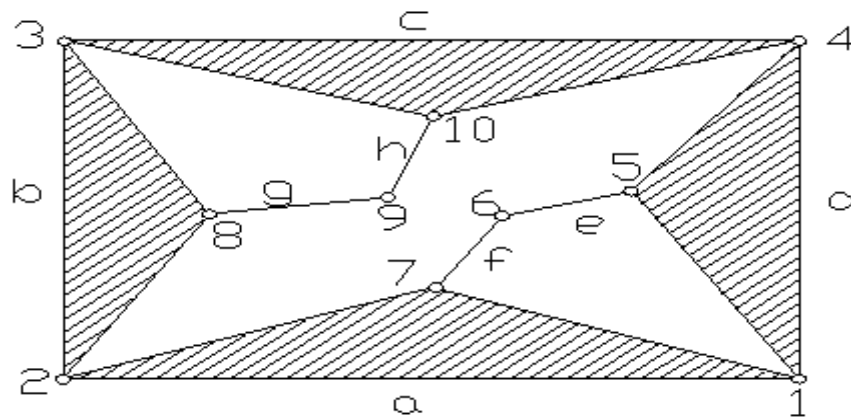


Fig.1: Eight Link, Single DOF Kinematic Chain

The matrix of KC shown in Fig 1 is [JJ] obtained with the help of eq. (1). The SCPC and MCPC of [JJ] matrix of KC given by Fig.1 are:  $3.0011e+005$  and  $134784$ . Now fixing link 'a', we write matrix [JJ-a] by changing the diagonal element L11, L22 and L77 from 0 to 1 of [JJ] matrix.

The SCPC and MCPC of first mechanism (link 'a' is fixed) =  $3.4310e+005$ ,  $1.6407e+005$ .

Similarly.

SCPC and MCPC of first mechanism (link 'b' is fixed) =  $3.4310e+005$ ,  $164070$ .

SCPC and MCPC of first mechanism (link 'c' is fixed) =  $3.4310e+005$ ,  $1.6407e+005$ .

SCPC and MCPC of first mechanism (link 'd' is fixed) =  $3.4310e+005$ ,  $1.6407e+005$ .

SCPC and MCPC of first mechanism (link 'e' is fixed) =  $4.5503e+005$ ,  $2.3069e+005$ .

SCPC and MCPC of first mechanism (link 'f' is fixed) =  $4.5503e+005$ ,  $2.3069e+005$ .

SCPC and MCPC of first mechanism (link 'g' is fixed) =  $4.5503e+005$ ,  $2.3069e+005$ .

SCPC and MCPC of first mechanism (link 'h' is fixed) =  $4.5503e+005$ ,  $2.3069e+005$ .

We see that the SCPC and MCPC of mechanism by fixing link – a, b, c and d are similar. Hence, they are equivalent links and make 1DM. Similarly, SCPC and MCPC of mechanisms by fixing link- e, f, g and h are same, So, make second DM. Hence, 2 DM are obtained from KC shown in Fig.1

$$[JJ] = \begin{pmatrix} 0 & 3 & 0 & 3 & 3 & 0 & 3 & 0 & 0 & 0 \\ 3 & 0 & 3 & 0 & 0 & 0 & 3 & 3 & 0 & 0 \\ 0 & 3 & 0 & 3 & 0 & 0 & 0 & 3 & 0 & 3 \\ 3 & 0 & 3 & 0 & 3 & 0 & 0 & 0 & 0 & 3 \\ 3 & 0 & 0 & 3 & 0 & 2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 2 & 0 & 2 & 0 & 0 & 0 \end{pmatrix}$$

$$[JJ-a] = \begin{pmatrix} 1 & 3 & 0 & 3 & 3 & 0 & 3 & 0 & 0 & 0 \\ 3 & 1 & 3 & 0 & 0 & 0 & 3 & 3 & 0 & 0 \\ 0 & 3 & 0 & 3 & 0 & 0 & 0 & 3 & 0 & 3 \\ 3 & 0 & 3 & 0 & 3 & 0 & 0 & 0 & 0 & 3 \\ 3 & 0 & 0 & 3 & 0 & 2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 2 & 0 & 2 & 0 & 0 & 0 \end{pmatrix}$$



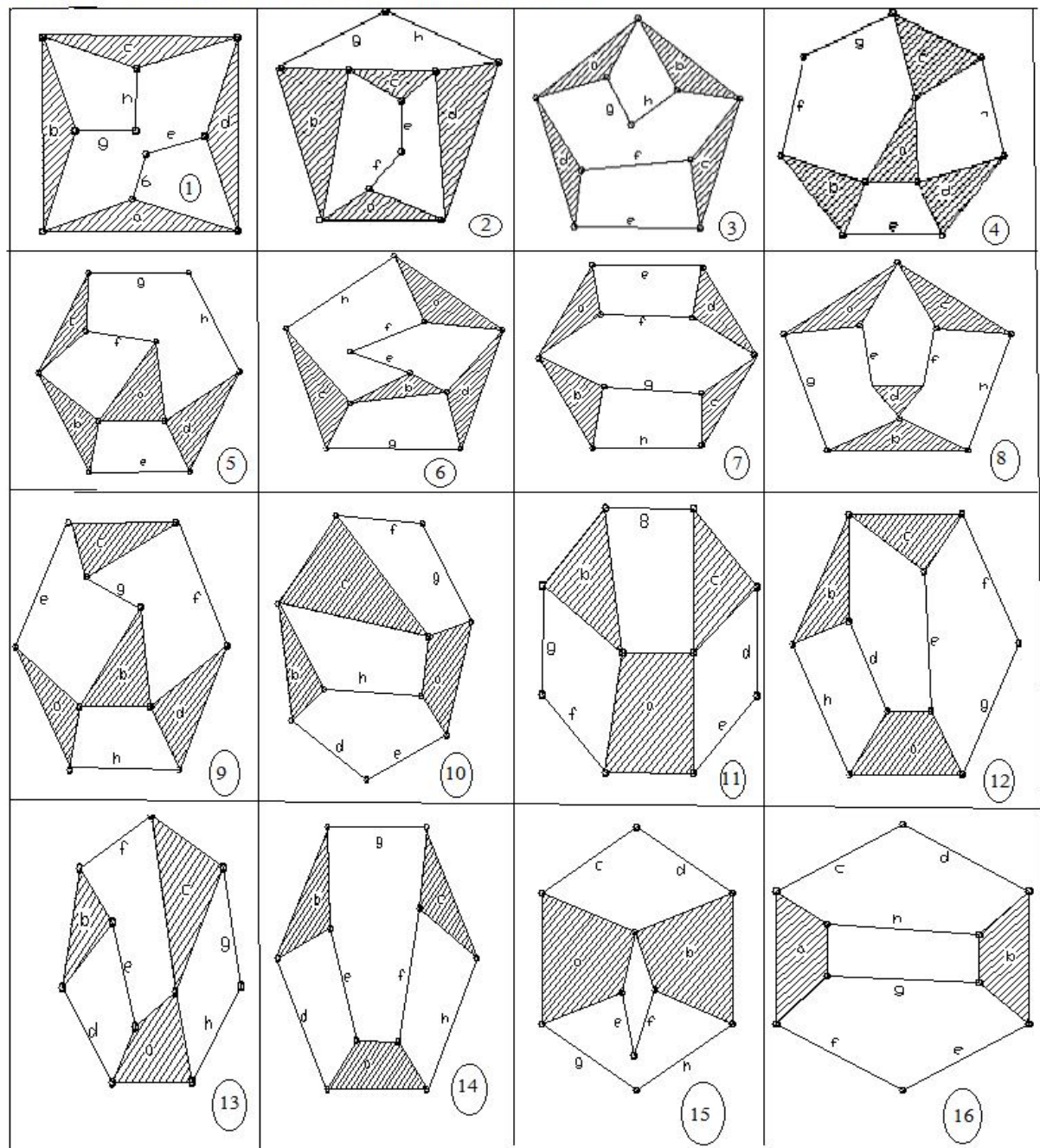
## 6. RESULTS

The suggested structural invariants [SCPC] and [MCPC] of all 1-F KC up to 10-Links are with the author. These identification numbers have the ability to check isomorphism among the KC with multiple joints also. Fixed Links and Equivalent Links in DM of 8 Links, 10 Joints, 1 F KC ( redrawn in Table-1 from [22]) are listed in Table 2.

## 7. CONCLUSIONS

In this paper, an application of [23] is extended to identify isomorphism. By this method, the isomorphism of mechanisms kinematic chains can easily be identified. It incorporates all features of the kinematic chains and as such, violation of the isomorphism test is rather difficult. The method has been found to be successful in differentiating all known 16 KC of 8-links, 230 KC of 10-links having 1-F. The advantage is that they are very simple to determine with MATLAB software. It is not necessary to calculate both SCPC and MCPC to compare two KC, only in case the SCPC is similar then it is required to find MCPC for both KC. The [JJ] matrices can be written with very little effort, even by mere inspection of the chain. The proposed test is quite general in nature and can be used to detect isomorphism of not only planar kinematic chains of one degree of freedom, but also kinematic chains of multi degree of freedom.

**Table-1: 8 link, 10 Joints, 1F Kinematic Chains Jensen [22]**



**Table 2: Equivalent links in the distinct mechanisms of 8 Links, 10 Joints, 1F, KC**

KC No.(Table 1)	Equivalent and distinct links	Total distinct mechanisms
1	$a=b=c=d, e=f=g=h$	2
2	$a=b=c=d, e=f=g=h$	2
3	$a=b, c=d, e=f, g=h$	4
4	$a, b=c, d, e=h, f=g$	5
5	$a=b, c=d, e=f, g=h$	4
6	$a, b, c, d, e, f, g, h$	8
7	$a=b=c=d, e=f=g=h$	2
8	$a=b=c=d, e=f=g=h$	2
9	$a=d, b, c=f, e, g, h$	6
10	$a, b, c, d, e, f, g, h$	8
11	$a, b=c, d=f, e=g, h$	5
12	$a, b, c, d=h, e, f, g$	7
13	$a, b, c, d=e, f, g, h$	7
14	$a, b=c, d=e=f=g, h$	4
15	$a=b, d=e=f=g=h$	2
16	$a=b, c=d=e=f, h$	3
<b>Total distinct mechanisms</b>		<b>71</b>

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**EVALUATION OF BASE KITCHEN SANITATION AND HYGIENE AMONG FOOD SERVICE ESTABLISHMENTS IN HYDERABAD**

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**ABSTRACT**

*Food safety program includes promoting and protecting the overall health and wellbeing of consumers. The adoption of good sanitation practices and good hygiene practices can enable the food businesses to serve wholesome safe food. India took an important step by enacting the FSS (Food standards and safety act). The new food regulatory act has emphasized on the safe food culture in the country. In light of this a study has been designed with an objective to assess the Base kitchen sanitation and Hygiene practices in the upcoming metro city Hyderabad. A cross sectional survey is conducted between December 2016 and July 2017. A total of 350 food service establishments were considered under the study. Data pertaining to the facility, equipment, food procurement, temperature control, prevention of cross contamination and Food preparation and service, waste disposal and safety measures is collected using a 5 point scale score card. The results showed that only 7 percent of the total outlets have shown excellent compliance towards Food safety but adopting good hygiene and manufacturing practices while 23 percent of the outlets have shown poor compliance. Only 57 percent of the outlets have a valid license or registration to operate. However the requirements of GHP and GMP have not been fully implemented by FBOs even after obtaining the license primarily due to complexity in understanding the requirement, economic constraints involved in the implementation of the standard requirements in terms of human and material investment. The FSSAI before bringing a shift from catching and punishing the food business offender to mere self regulatory approach has to insist capacity building by incorporating formal education and mandatory on job certificate courses on the know- how and skill based education in food handling, also it has to be regulated that only a person with proper food safety and hygiene knowledge should be permitted a license to operate with stringent measures of punishment if found guilty in adoption and implementation of the safe food practices to their consumers.*

*Keywords: Sanitation, Hygiene, Compliance, license, Registration, Certificate courses*

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**INTRODUCTION**

Food safety is defined by FAO/WHO as the assurance that when food is consumed in the usual manner does not cause harm to human health and wellbeing (WHO, 2002). Food Hygiene and personal Hygiene are the two most critical factors ensuring food safety.

India took an important step towards building a safe food culture a decade ago by enacting the FSS Act. In one stroke, brought about a paradigm shift in the way we look at food safety regulations. The act did not merely repeal the pre-existing, nine acts and many scattered orders governed by different ministries, it did not just unify them into a single act but it marked a change in the basic thinking about the processes of implementing food safety - from detecting adulteration and punishing the culprit to promoting self- regulation and setting science based standards for the same.

The right approach and focus areas can lead to a very strong Food Safety & Quality culture and a shift from 'compliance mindset' to 'culture of choice and team ownership' in an organization. Food safety is a social responsibility as food is a product where consumption is not just a matter of choice, but is ultimately a matter of life (Peattie, 2006) and consumption of contaminated food can be responsible for ill health (Prabhu & Shah, 2012).

Growth of multinational companies and IT sector in India lead to the increase in migration of people from rural areas to the major cities with no exception to Hyderabad, the capital city of Telangana State. The long hours spent away from home commuting to work places make eating out a necessary part of people's daily life. The changing scenario of lifestyle, breakdown of joint family system, increase in number of working women and increase in the incomes, people are unable to prepare their own meals regularly at home. (Santosh, M. J., Nogueira, J. R. & Patarata, 2008). Thus people have various reasons to consume meals at any place at an affordable price. (Abhay B, Muddey et al., 2010)

The food service industry is not monolithic. It encompasses many market and submarket segments. As **Identified by FSSAI, Food Business Operators engaged in food service** includes premises where public is

admitted for repose or for consumption of any food or drink or any place where cooked food is sold or prepared for sale. It includes:

1. Eating Houses
2. Restaurants & Hotels
3. Snack Bars
4. Canteens (Schools, Colleges, Office, Institutions)
5. Food Service at religious places
6. Neighborhood Tiffin Services / dabbawalas
7. Rail and airline catering
8. Hospital catering

Quality and safety of food are the heart and soul of any food handling operation, be it preparation, processing, preservation, cooking, catering, distribution, or sale of food, regardless of the category or class of the business and size of the operation as also the kind or kinds of the foods handled. Survival or success of any food business depends primarily on the quality and safety of food or foods offered by it, in the fiercely competitive marketplace of today, both domestic and global.

The quality and safety of food served by various outlets is determined by numerous factors such as the business organization, regulatory aspects, technical aspects related to the preparation, preservation and handling of food, the consumer perspective, and educational programs. In order to improve the conditions of food service industry and to make sure that the food sold does not pose a major threat to public health

WHO to ensure access to adequate, safe, nutritious food for everyone has formulated five key principles of food hygiene, they are

1. Prevent contaminating food with pathogens spreading from people, pets, and pests.
2. Separate raw and cooked foods to prevent contaminating the cooked foods.
3. Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens.
4. Store food at the proper temperature.
5. Do use safe water and raw materials

## METHODOLOGY

A cross-sectional study is conducted between May 2016 and June 2017 to evaluate the food sanitation and hygiene practices in base preparation areas of food service establishments in GHMC limits of Hyderabad, Telangana.

A random sample of 500 food service outlets were listed in 5 zones of Hyderabad of which 350 outlets were participated with a consent from the management.

The outlets are picked from 5 zones (East, West, North, South and Central zones) of Hyderabad. The study was carried out in urban Hyderabad in the newly formed state of Telangana, India with a Jurisdiction of 625 sq km and population of 78 lakh plus. There were about 12,000 plus hotels other eateries and Tiffin centres in greater Hyderabad with varying scope from road side push cart vendors to star hotels there are also other facilities such as schools and college hostel canteens, working men and women's hostels and canteens at Government offices. (The Hindu, 2013). The sample size of 350 food outlets was obtained using a single population proportion formula, at 5% confidence interval, marginal error 5%,

**Percent Distribution of Food outlets in different zones of GHMC**

Zones	No of outlets	Percent of outlets
North Zone	69	20
East Zone	71	20
West Zone	71	20
South Zone	65	19
Central Zone	74	21
<b>Total</b>	<b>350</b>	<b>100</b>

The Base Kitchen Hygiene and Sanitation was assessed by using a scorecard of 5 point scale, ranging 1-5, 1 being the poor and 5 being the excellent compliance of the kitchens based on the parameter of Good hygiene practices and Licensing and Registration of Food businesses 2011 as mentioned by FSSAI

The score card pertaining to 13 parameters is devised to ensure Food sanitation and hygiene of base kitchen. The parameters are studied by analyzing 57 questions pertaining to these parameters with 1 being the poor and 5 being the highest score showing excellent compliance and Zero to show Not Applicable

Based on the Individual parameter score totals the complete score of the tool if is above score i.e., 57 questions \* 5 = 285

1.  $\geq 80\%$  ( $\geq 228$ ) score = Excellent compliance
2.  $\geq 70\%$  &  $< 80\%$  ( $\geq 200$  and  $< 228$ ) = Very good compliance
3.  $\geq 60\%$  &  $< 70\%$  ( $\geq 171$  and  $< 200$ ) Good compliance
4.  $\geq 50\%$  &  $< 60\%$  ( $\geq 143$  and  $> 171$ ) Fair Compliance
5.  $< 50\%$  ( $< 143$ ) poor compliance

## RESULTS AND DISCUSSION

The Base kitchen food Sanitation and Hygiene score card revealed that among the 350 food outlets chosen for the study only 201 food service outlets has a valid license or registration to operate while others did not register or the license is due for renewal. It is evident that Food outlets only those with license are more inclined in maintaining the minimum basic requirements.

India ranks 80<sup>th</sup> position in global food safety and quality Index with a score of 46.7 in 2016. The scoring and ranking on the Food quality and safety which is one of the three major parameters of Global Food safety Index (GFSI) is done based on the composite indicator measuring the enabling environment for food safety with the sub indicators as agency to ensure safety and health of food, percentage of population with access to potable water and presence of formal grocery sector. (FICCI, 2016) The score of this index can be increased by regulating the food vendors to meet the prerequisites of Licensing and Registration act 2011.

The food Sanitation and Hygiene scorecard used to check the compliance of food procurement, storage, conditions of storage quality of raw ingredients, temperature control Safety and cleanliness of preparation surfaces, sanitization of utensils, measures taken in collection and disposal of kitchen wastes, adequacy of suitable cleaning equipment, condition of chopping boards, cleanliness of refrigerators, personal Hygiene practices of kitchen staff and routine sprays to ensure pest control which acts as the key indicators to assess the quality and safety of the foodservice

**Table - 1: Compliance status of food service outlets on different parameters of Food safety**

S. No	Parameter	Poor	Fair	Good	Very Good	Excellent	Total
I	Facility and Equipment	83	95	89	59	24	350
II	Food procurement and Storage	66	72	107	78	27	350
III	Refrigeration storage and temperature control	128	57	104	57	4	350
IV	Prevention of cross contamination	120	66	121	41	2	350
V	Personal Hygiene	60	86	102	67	35	350
VI	Employee Facilities	155	158	33	4	0	350
VII	Food Preparation	122	88	115	21	4	350
VIII	Food Service	132	95	70	41	12	350
IX	Dish and Utensil Washing	99	64	86	87	14	350
X	Pest Control	108	77	80	76	9	350
XI	Water supply and Plumbing	107	96	96	35	16	350
XII	Waste Disposal	97	91	96	57	9	350
XIII	General safety Procedures	117	76	98	36	23	350
	Total score of Food Sanitation and Hygiene	82	77	101	64	26	350

Table 1 projects the compliance status of Base kitchen sanitation and Hygiene based on the total scores of the score card which reveals that about 82 food service outlets (23 percent) has shown poor compliance, 101 outlets had good compliance and 26 outlets has shown excellent compliance towards the indicators used to measure and ensure the food safety and hygiene at the base kitchen premises.

**Table - 2: Food outlets distributed against their degree of compliance under the specific requirements at Base preparation area**

S. No		Poor	Fair	Good	Very Good	Excellent	Total
I	<b>Facility and Equipment</b>						
1	Floors Clean, tidy non porous without low area and depressions, free from Hazards	40	89	102	98	21	350
2	Walls Clean, Non porous, No cracks, tiled adequately in cooking and wash area	75	72	103	77	23	350
3	Ceiling clean, brushed, has proper vents, Drop ceiling panels in place with no signs of water leakage and damage	81	91	86	65	28	350
4	Electrical chords, exhaust fans in good condition, function and clean, lights has shatterproof /covers	63	79	112	70	26	350
5	Effective measures for control of insects and rodents in place and regular	77	53	117	70	33	350
6	Gas cylinders vented out. Fire extinguishers available , first aid kit available	93	112	82	30	33	350
7	Hand washing and sanitizing facilities adequate	77	116	93	35	30	350
8	Water pipelines are leak proof, potable water supply present and used	91	109	68	56	26	350
9	Personal protective equipment is adequate and in use	123	98	81	39	11	350
10	Separate processing areas are identified and are kept clean	72	102	96	56	25	350
11	Food preparation equipment cleaned, good, separate for veg and Non veg	75	114	102	32	28	350
12	Employees are trained adequately and ahs signs posted to them on the personal hygiene	138	116	67	25	5	350
13	Equipment not in use is clean and covered, separate from food and utensils	70	88	79	98	16	350
II	<b>Food Procurement and Storage</b>						
1	Foods purchased from approved vendors, inspected, checked for Date of manufacture and expiry	44	110	98	82	16	350
2	Supplies stored in appropriate shelves above 6# height above the floor and below the ceiling. Area is clean and the supplies are stacked in an orderly manner	96	46	130	70	9	350
3	Empty crates and other packaging materials removed promptly	54	91	119	53	33	350
4	Chemicals and Non food items stored separately and away from the food supplies	93	74	95	67	23	350
5	Dry stores s clean and free from dampness and moisture	72	72	114	61	32	350
6	Foods are stacked to ensure FIFO	35	91	117	61	46	350
III	<b>Refrigeration and Temperature Control</b>						
1	Refrigerators and freezers used are in good condition( no excess Frost built) and maintained at appropriate temperatures	117	46	140	40	7	350

2	Raw food stored below cooked food. Covered and placed to ensure FIFO	121	60	98	72	0	350
3	Shelves are clean, free from spilled and not over stacked	149	68	77	56	0	350
IV	<b>Prevention of cross contamination</b>						
1	Separate storage facilities for veg, meat, dry goods etc.	95	84	133	39	0	350
2	Separate and clearly identified knives & utensils ( COLOUR CODING ) preparation areas and surfaces	81	84	123	56	7	350
3	Surfaces, equipment etc, sanitized between tasks	133	56	126	35	0	350
V	<b>Personal Hygiene</b>						
1	Physical health of employees is good, They are in clean uniform , worn hair cap and minimum jewelry	60	119	91	53	28	350
2	Handlers hands are washed , sanitized, free from cuts , burns and boils	42	56	165	56	32	350
3	Food handlers do not smoke or chew tobacco in the work areas	56	74	91	98	32	350
4	Dish wash clothes and clothes used for other wiping purposes are separate , clean and used as intended	84	102	74	60	32	350
VI	<b>Employee Facilities</b>						
1	Adequate cloak rooms are changeover rooms facilities are available	214	95	42	0	0	350
2	Lightening and ventilation of rooms adequate	182	133	35	0	0	350
3	Employees are given uniforms and also maintenance for laundry	95	238	18	0	0	350
VII	<b>Food Preparation</b>						
1	Restricted entry into the preparation area	67	60	224	0	0	350
2	Use of spoon, tongs and gloves as intended by the personnel during preparation is seen	242	81	28	0	0	350
3	Separate cutting boards, knives and areas for preparation are identified	147	56	137	11	0	350
4	Thorough preliminary operations (like cleaning , washing and thawing) are ensured while handling foods	84	98	151	18	0	350
5	No cleaning operations are seen during food preparation	21	63	123	144	0	350
VIII	<b>SERVICE</b>						
1	Dining area, serving utensils , trolleys, vehicles and service lifts are clean , tidy and dry	137	144	56	14	0	350
2	Food carried in well insulated containers	154	91	63	28	14	350
3	Left out food is handled appropriately	144	133	67	7	0	350
4	Wiping clothes and packing materials are handled hygienically	221	98	32	0	0	350
IX	<b>Dish and Utensil Washing</b>						
1	Appropriate procedures in place ensuring proper washing of dishes	63	81	121	49	37	350
2	Waste material / garbage removed promptly from dish wash area	60	51	112	107	21	350
3	Cleaned dishes are stored properly away from food	54	86	103	93	14	350
4	Separate personnel are employed to handle the	124	75	82	53	16	350



	dish wash facility						
5	Dish washing equipment and storage racks are kept clean	82	96	88	68	16	350
X	<b>Pest Control</b>						
1	Adequate precautionary measures and regular pest control in place	109	79	74	84	5	350
XI	<b>Water supply and Plumbing</b>						
1	Overhead tanks / water storage tanks are cleaned and maintained as scheduled	116	107	96	21	11	350
2	Water purification system / purified water as per specified norms is in use	95	110	105	25	16	350
3	Drains and sinks are free of Debris and choking	112	86	77	53	23	350
XII	<b>Waste Disposal</b>						
1	Garbage containers, are adequate, lined with plastic bags and kept cleaned when not in use	102	84	119	35	11	350
2	Garbage is removed frequently and held for disposal as required safely	88	100	84	72	7	350
XIII	<b>General safety Procedures</b>						
1	Floors are free of slip hazards, equipments covered when not in use	70	105	68	74	33	350
2	Fire extinguishers in place and personnel are trained for their use. Passages of exits are clear	165	93	65	25	4	350
3	Mandatory training to employees and documentation of operations is in place	193	102	42	9	5	350
4	Mandatory health checkup to all the employees before employment and surveillance health check is in place.	200	105	32	9	5	350

Table 2 projects the compliance status of food outlets based on 57 point checklist as per the regulatory framework which reveals the data on Location of Facility and maintenance of equipment, procurement of non perishables and perishables, their storage conditions, Food preparation and service, safe handling of food during procurement, preparation and storage, personal hygiene, water supply and plumbing and Dish and Utensil washing: water supply and raw material quality and general safety procedures likewise presence of fire extinguishers, food handlers training medical fitness checkup Fire extinguishers. The distribution of the food outlets as per the compliance of the minimum requirement at the preparation area shows that 83 food service outlets have poor facility and equipment maintenance, while 89 food service outlets were good at this aspect and only 24 food service outlets had excellent scoring. The food vendors who are supplying the food at the vendor's site few thing properly maintained, as it is the requirement of the food businesses to meet the standards to continue their services. The food procurement and conditions of storage has scored poor by 66 food service outlets of the outlets while 78 food service outlets scored very good compliance and only 27 food service outlets had excellent compliance. The refrigeration storage and temperature control was very poor scored by 128 food service outlets while only 4 food service outlets has excellent condition and 107 food service outlets had good compliance, the availability of Bain Marie in the service areas and its working conditions were major aspects of temperature control to serve hot food hot also the perishables had no refrigerated cold walk ins and hence most of the vegetables lost their freshness. The freezer capacity is very less in comparisons to the production of the food businesses and hence excess stacking of foods on the shelves without proper labeling is evident. Also the prevention of cross contamination is very poor among 120 food service outlets and 41 food service outlets scored very good compliance and 121 food service outlets had good compliance. The personal hygiene of the personnel was poor among food handlers working in 60 food service outlets while 86 food service outlets had fair compliance, 102 food service outlets had good compliance and 35 food service outlets had excellent compliance.

The employee facilities were the most overlooked aspect of the food safety and hygiene parameters among the food business. The food handlers forms the basic unit of any foodservice outlet but the basic conditions available for his comfort is quite often overlooked, The employees had no proper lockers or dress change over facilities which makes the handlers to use same clothes worn during his transit even in the food preparation

premises and towards the food safety also the purses and other personal belonging are often held with the food handlers even in the food preparation area which can always a assign of unhygienic practice. The food preparation is poor among 122 food service outlets while 115 food service outlets had good compliance and , 4 food service outlets has excellent compliance as there is no separation in the vegetarian and non vegetarian foods , the cutting boards, knives and preparation at the sites the food handlers are not oriented to taste the food using a spoon and no hygiene is maintained in cleaning and other preliminary operations, while 132 food service outlets had very poor compliance towards proper service and 70 food service outlets had good compliance which include the cleanliness of food trolleys, dining area , handy clothes hygiene and handling of left over foods. The dish and utensil washing areas had no proper racks to mount or stack the cleaned vessels, no hot water supply, poor drain system and hence about 99 food service outlets had poor compliance and around 87 food outlets had very good compliance which is most effectively seen in the food outlets with the help of dishwasher facility

The pest control is done often by spraying around the premises but no proper cleaning of the floors of the stores and drains is observed which attracts a large no of pests and insects and rodents in the premises. 108 food outlets have poor compliance while 80 food outlets have shown very good compliance. The supply of the water , plumbing system in the kitchen which are leak proof, maintenance of the overhead tank cleaning and underground storage tank cleaning are the parameters which are not scheduled and hence 113 food outlets had poor compliance while 96 food service outlets had good compliance and only 11 outlets scored excellent and the waste disposal aspect is poor among 102 outlet and 84 food outlets ranked fair compliance as it is observed that almost all the food businesses do not cover the waste bins lying in the preparation area and often they are also not lined with the garbage bag anf the bins with heaped garbage are held for long duration in the premises before cleared up with the municipal agents, thus increases the chances to attract rodents and other pests

Others studies also suggested that it is the duty of the employer to provide and enforce use of facilities and tools for safe handling of food including Personal protective equipment, a study in Uganda (Baluka et al., 2015) has shown inadequate provision of uniforms, hygiene, and food handling equipment. Most of the facilities had sinks with no soap and hand washing remainder signs neither were nor posted, and the kitchen staff did not wear proper full uniforms. There is need for the Govt to improve food safety management systems and education and awareness programs by (Onyeneho and Hedberg, 2013, Ababio and Lovatt, 2015) facilities which subject to Regular inspection had better sanitary conditions than uninspected facilities ( Zeru and Kumie, 2007)

Catering organizations like hotels, restaurants showed more adherences to food hygiene and safety practices. While in case of street food and community caterings like langars, etc no food hygiene and safety norms were adopted. (Yadav H. and Rekhi T.K., 2011). Regular training and monitoring plays an important role in assuring food safety in a catering organization. It helps the employees to imbibe the basic hygiene practices in their day to day work (Sharma S., Sundararaj P., 2002).

## **CONCLUSION**

Every Food Business Operator (FBO) applying for licensing shall have a documented Food Safety management system plan and shall comply with Schedule 4 of the regulation which introduces the concept of Food Safety Management System (FSMS) based on implementation of Good Hygiene Practices (GHP) Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP). However these requirements have not been fully implemented by FBOs even after obtaining the license primarily one to complexity in understanding the requirement, lack of understanding and awareness about the importance of food safety amongst the personnel employed in Food industry and less emphasis to abide by in implementation and usefulness of FSMS plan by the food inspection authority in general.

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**TRANSFORMATION IN LIVELIHOOD: A CASE STUDY OF A PARTICULARLY VULNERABLE TRIBAL GROUP - THE JUANGS OF KEONJHAR DISTRICT, ODISHA**

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**INTRODUCTION**

'Transformation' and 'tribe' have a strong co-relation between each other. In Indian society when we try to identify tribes, we also find two more communities which also live side by side with tribes; these two groups are peasants and caste. Usually it becomes very difficult to classify and distinguish tribes from peasants. According to Wolf (1966), Peasants are those "for whom agriculture is a livelihood and a way of life, not a business for profit." Referring to this definition, we can easily make an understanding that peasants and tribes are almost same in terms of their livelihood, but there is also some distinction between the groups. The peasants are usually part of a wider society and great tradition whereas the tribes are not a part of a wider society. Apart from all these distinctions and classifications we cannot ignore the transformation of the tribes into caste and peasants.

Generally on transformation of tribes, two models of incorporation are discussed. B.K. Roy Burman (1994) talks of two models, one is 'The Hindu Method of Tribal absorption'<sup>1</sup> given by N.K. Bose and the other model is 'Sanskritization'<sup>2</sup> propounded by M.N. Srinivas. The Hindu Method of Tribal absorption by N.K. Bose suggests that many of the interior hill and forest tribal groups who has remained untouched from the influences of other civilization, slowly and gradually got fused into Hindu society and caste system. For example the tribes like Bhil, Munda, Santhal, Juang, Soara are to be named a few who were influenced by the Hindu method of Tribal absorption.

The other model through which the tribal transformation was further aggregated was Sanskritization and Hinduization. These processes had a tendency to attract the lower strata of the society to observe the lifestyle of a dominant caste or dominant strata of the region. In this process they would turn themselves into a higher and dominant community of the region. Thus many tribal groups were influenced by this process of transformation. This created further more complications in identifying the tribal communities and more opinions aroused on the definition of tribes. But this process of transformation of tribes is a continuous and slow process, which keeps on going even till date.

With the advent of colonial succession<sup>3</sup>, the transformation among tribe and the tribal world became more visible. The term 'tribe' and the concept of 'transformation' in the tribal world are till now debatable on various platforms. The whole notion of 'tribe' varies from individual to individual. It may vary from the definition by a layman to the definition provided by an anthropologist or sociologist compared to the definition provided by an administrator or a researcher. Unfortunately or Interestingly, even people who are involved with the tribes and the tribal issues, they also vary in their opinions (practically and theoretically) on the very concept of 'tribe'. However, for the purpose of smooth administration<sup>4</sup> the term has been defined on the basis of certain specific characteristics. These characteristics include geographical isolation, distinctive culture, primitive traits, shyness of contact with outside world and backwardness according to the Lokur committee's definition (Srivastava,

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<sup>1</sup> Hindu Method of tribal Absorption propounded by N K Bose shows how the tribes get influenced by the Hindu mode of living and gets incorporated into the influence of Hindu society. N K Bose defines this citing the example of the Juang tribe of Orissa, starting worshipping Laxmi goddess and performing other Hindu rituals while still continuing with their traditional rite of sacrificing animals and eating beef and wild animals.

<sup>2</sup> The concept of Sanskritisation as a process of social change is supposed to be postulated by Prof. M.N. Srinivas, after doing an extensive fieldwork among the Coorgs of South India in his book "Religion and Society among the Coorgs of South India". Sanskritisation is the process by which castes placed lower in the caste hierarchy seek upward mobility by emulating the rituals and practices of the upper or dominant castes.

<sup>3</sup> The introduction of British administration in India and their hidden intention of exploiting natural resources to expand and strengthen their colonial spread in Indian subcontinent.

<sup>4</sup> Demarcation of certain areas as Scheduled areas and declaration of certain communities as scheduled tribe. It also made census easier and accountable.

2008). Although these definitions made certain demarcation to define a tribe but they are still not concrete. Till today also these parameters are continuously debated upon by various social scientists at different platforms as these characteristics are no more relevant to define a tribe. For example in the present era of globalization, there is hardly any tribe which is 'geographically isolated' or exhibits 'primitive trait'; this is also because the tribes are in a vicious process of transformations.

Transformation is a continuous and a never ending process. There are various factors which are responsible for transformation among tribes. The colonial administration described tribes as geographically isolated community whereas the post-colonial ethnography shows a close interaction of tribes along with the larger society or the so-called mainstream population (Xaxa, 1999). Further, the transformation that has been a part of the tribal world can be well understood if tribe is viewed from the dimension of little tradition<sup>1</sup> in relation to the great tradition (Sinha, 1958). Later, Kosambi (1975) has also referred to the tribal elements being fused into the general society. The transformation among tribes is conceived to occur through various methods which have been diversely conceptualized by eminent social researchers. The Hindu mode of tribal absorption propounded by N K Bose also makes a reference to tribes being absorbed into Hindu society. Bose's first independent field research was among a tribal community named the Juangs of Odisha's Pal Lahara region in Dhenkanal District. Bose's example of the coronation ceremony of the King of Keonjhar and celebration of the Spring Festival celebrated by the Juang tribe shows the penetration of Hindu elements into tribal life. The Spring Festival, which combines on one side the burning of a human or animal effigy with animal sacrifice, provides the tribe with magical power in ensuring good crops whereas for the Hindus the act of sacrifice is a purification rite (Bose, 1941). Juang's worship of Hindu Goddess Laxmi and performing sacrifices as well as eating beef and wild boars, shows a contradiction to Hindu system of belief and thus N K Bose points out the Hindu Method of tribal Absorption into the Juangs of Orissa. Bose's fieldwork glimpse gave him the basic insight into the ways tribes were being absorbed into the fold of Hindu caste-based society. He also pointed out the necessity of understanding the process of social change, which he referred as "adaptation into cultural inheritance" (Guha, 2016). Sanskritization by M N Srinivas (1962) is also seen as another method through which tribes are absorbed into the larger society, in which the lower sections of the society, tries to imitate the rituals and customs performed and observed by the upper strata of the society. This imitation of rituals and customs may provide a way for the lower strata of the section to jump up to the higher strata or at least near to it so that they won't be any more treated badly or neglected by the society. The other significant methods are tribal assimilation and acculturation, is what being proposed by Sinha [1962, 1987]. All these processes together have resulted in changes and transformation in various aspects of a tribe. The paper discusses about such processes and incurring results faced by a Particularly Vulnerable Tribal Groups (PVTG)<sup>2</sup> of Odisha known as the Juang Tribe, of Keonjhar District in terms of their livelihood.

### **THE JUANGS AND THE UNIVERSE OF STUDY**

The Juangs are among one of the thirteen<sup>3</sup> PVTGs present in Odisha. They have been traditionally known as shifting cultivators and are also hunter-gatherers. The Juangs claim themselves to be originated from the Gonasika Hills of the Keonjhar district of Odisha and thus are majorly predominant in the Keonjhar district. Originating from Gonasika Hills, The Juangs have been residing in the forest for long thus are also known to be forest tribe. Like any other tribe, The Juangs have also undergone through various phases of transformations from time to time. Due to the impact of industrialization the trees in the forest were slashed down leading to receding tree line in the forest. Developmental programmes such as the construction of roads, industries, infrastructure and highways for better communication further allowed cities and towns to expand. With the passage of time, the Juangs who used to reside in the forest in scattered hamlets gradually increased in their

<sup>1</sup>The term 'little' and 'great' tradition are being proposed by Sir Robert Redfield in 1950s. Little tradition consist of local rituals, customs, cultural practices, norms and dialect used by a smaller group mostly in rural areas and smaller ethnic groups. The legitimate and wider acceptance of these customs, rituals, cultural practices and norms at a larger society is referred to be as Great Tradition.

<sup>2</sup> Particularly Vulnerable Tribal Group (PVTG) was earlier known as Primitive Tribal Group (PTG). The PTG category was proposed by Dhebar Commission in fourth five year plan to those tribes within the category of Schedule Tribe who are very low at the level of development such as stagnant or decreasing population, simple economy, low literacy etc. In 2006, the term PTG was renamed into PVTG by Government of India.

<sup>3</sup> There are total 75 PVTGs listed in India, out of which the highest number of PVTGs are present in Odisha. Namely – Birhor, Bondo, Didayi, Dongria-Khond, The Juangs, Kharias, Kutia-Kondh, Lanjia-Saura, Lodhas, Mankidias, Paudi-Bhuyans, Soura, Chuktia-Bhunja.

population as well as in their day to day needs and thus came much closer to cities and towns. At the same time, few groups migrated to different nearby districts<sup>1</sup> and settled there, while few other groups who resided inside the forest in remote areas further shifted towards the forest, away from towns and cities.

N K Bose did his initial anthropological fieldwork among the Juang tribe and often described this tribe as an example of communities which remained away from the Brahminical<sup>2</sup> civilization. According to N K Bose, the Juangs worshiped Hindu God and Goddess, although it was done in their own way. They bathed in the morning, offered sun-dried rice<sup>3</sup> and the concept of 'satya', 'devata', 'dharama' all had their presence in the Juang community, which shows that the religious aspect of the Juangs is being strongly influenced by those of the neighboring caste people. The Juangs are also characterized by the presence of "their own language; they perform their marriage and funeral customs all by themselves. They eat beef and are not considered by the Hindus to be one of the Hindu castes. Yet, there is clear indication that Hindu religious ideas have penetrated into Juang's culture". (Munshi 1979)

The universe of study focuses on one such village, which moved towards the forest, named Upara Champei Village. The village is remotely located in the forest area of Banspal Block of Keonjhar District in Odisha. It is approximately 20 kilometers away from the highway and approximately 25 kilometers away from the nearest city i.e., the Keonjhar City, which is a municipality in Sadar Block. The Upara Champei Village is surrounded by forest from all the four directions and is connected by Kachha road, from two directions i.e. one road from the west and other from the south direction of the village. The village is predominantly a Juang village except two households one belonging to a Gauda<sup>4</sup> Jati(caste) and another to a Maharana (Iron Smith) house. The nearest village to Upara Champei Village is Gauda Champei village in the proximity of less than a kilometer and is predominantly occupied by Gauda Jati households. A few number of Juangs households also reside in the Gauda Champei Village<sup>5</sup>. Owing to such a location and realizing the impact of development programmes on their day to day life, the Juangs of Upara Champei village have been facing major changes and transformations. In the recent years, the village has gone through various change and transformation in the arenas of economy, social, political and day to day activities. The major and instant changes can be visible in one of the most viable areas of any community i.e. Livelihood<sup>6</sup>. The article discusses the transformation occurring in the Upara Champei village in their ways of earning livelihood, while analysing the impact and effect of development programmes on them.

### **LIVELIHOOD AT A GLANCE**

Livelihood is basic and essential for every human struggling to survive in this world. The term 'livelihood' has various definitions; for some livelihood may be defined as a way of making a living or supporting one's own family or one's own job etc. The term is well identified in every nook and corner of the world as humans everywhere inherently develop and implement strategies to ensure their survival. Various definitions have emerged that attempt to represent the complex nature of a livelihood. According to Chambers and Conway: "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base" (Chambers & Conway, 1991).

<sup>1</sup> Along with the Keonjhar district, the presence of Juang population in abundance is also found in Dhenkanal district, which is located in the west of the Keonjhar district of Odisha.

<sup>2</sup> A group or community represented by the presence of hierarchy and rank in its social existence.

<sup>3</sup> Sun dried rice is locally called as Arua Chaula in odia language. The Juangs used sun dried rice for offering whereas they used double boiled rice for consumption purpose.

<sup>4</sup> Gauda are a caste group who are engaged in the pastoral activities (mostly grazing and herding cows and bulls), which is also their main source of income. In North India, the Yadav caste can be equivalent to the Gauda caste present in Odisha.

<sup>5</sup> The Gauda Champei village is a caste dominated village by Gauda caste who are basically cow herders. These Gauda are more educated and more developed and advance in terms of wearing dress, earning livelihood and their exposure to modern economy and market. These Gauda caste has been living along with the Juangs for a long time thus the impact of this caste on the Juang tribe is not negligible.

<sup>6</sup> Livelihood in lay person's definition means a way or means through which one arranges basic needs for its own self as well for its family which include food, shelter and cloth.

The hidden complexities behind the term livelihood come to light when external forces such as developmental activities, dedicated government plans and programmes, civil society and non-government organizations intrude or make an attempt to assist people whose means of making a living is threatened, damaged, or destroyed. The most suffered ones are the tribes, especially the forest dwellers who have a very close relation with the forest for their livelihood. In terms of their rights, the struggle against these external forces became more intense and challenging during the colonial regime, as during the pre-British or pre-modern forest administration, forests were in the domain of kings and their kingdoms. The local people or the forest dwellers used to inhabit, cultivate, graze their cattle and earn their livelihood from forest resources without any restrictions or impositions (Guha, 1983). With the introduction of modern forest administration, various changes took place on the rights of forest dwellers until the introduction of the Forest Right Act<sup>1</sup>, 2006 otherwise called as the Scheduled Tribes and Other Traditional Forest Dwellers Act, which aimed at protecting the rights of forest dwelling tribal communities.

### TRADITIONAL MODE OF LIVELIHOOD

The Juangs of Upara Champei village are one such forest dwelling tribal communities who are primarily known as shifting cultivators as well as hunter-gatherers. They are entirely dependent on forest and on forest resources for earning their livelihood. For a long time till now, the forest has been the only source of their livelihood from where they used to collect forest produces and other edible things as a part of their daily activity to sustain themselves. For The Juangs, living for the present and earning for each day they live is the motto of their life. Being shifting cultivators, The Juangs used to slash and burn a patch of forest covered with trees for cultivating rice, black til, mustard seeds, maize, pulses and other oilseeds, according to the season. After a year of cultivation, they used to barter their cultivated product with other nearby caste and tribal villages for getting other requirements in exchange; they need for their day to day life. Not only for cultivated products but also for fuel woods, wood logs and other forest produces the barter system of the economy continued. The Juangs of Upara Champei village go to the forest every day as a part of their day to day activity. For them, forest is not strange or scary, as it is for us who lives in towns and cities. For the Juangs of Upara Champei, the forest is just yet another home for them as well as the only source of their living. They spend equal time in the forest as they spend at their homes.

Citing an instance from my initial fieldwork in the Upara Champei village, when once I showed my interest to Chemena Juang (Pseudonyms<sup>2</sup>) 50 years old approximately, to assist him to visit forest one day, to which his reply was very negative for me. He asked me not to enter forest as the forest is not a safe place for outsiders. Moreover, it was the rainy season, and he further asked me that it is likely that I will slip in the mud in the forest as I was always wearing shoes or slippers. He further threatened me that I would also be having problem while walking through jungles because of the presence of poisonous insects and itching weeds on the way. Lastly, he asked me what I shall do if all of a sudden I face a wild animal like a wild boar or a wild elephant, for which I cannot even climb a tree nor rescue from there. Listening to all the arguments given by Chemena Juang, I really had to think on these lines and had no answer to his arguments. As per curiosity, I asked him, how he would manage if he would face such a situation and how all the Juangs living here has managed to go to forest every day. To this Chemena Juang answered that *'going to the forest is a daily activity for us. We know all the paths and ways in the forest, so we never get lost inside the forest. From the birth of a child till the death we all go to forest every day for our day to day needs. Our forest is our livelihood and is another home for us. We spend nights<sup>3</sup> together in Jungle to keep a watch on our crops and paddy fields protecting them from elephants and other wild animals. From our food to our houses, everything is provided by forest to us, from our sorrows to happiness, everything is being protected by our Gods who reside in the forest. We have been living in Forest*

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<sup>1</sup> The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, is a key piece of forest legislation passed in India on 18 December 2006. It has also been called the Forest Rights Act, the Tribal Rights Act, the Tribal Bill, and the Tribal Land Act.

<sup>2</sup> Generally, depending on the sensitivity of the questions and the data, the advice is not to use real names. Sometimes people may want their names to be used now, but may not feel so pleased about being named in the future. Thus to maintain dignity of the researcher and sensitivity of the data the pseudonyms are used.

<sup>3</sup> Juangs of Upara Champei village usually spend their nights in the hand-made hut made by them on the branch of a tree so that they can keep a vigil on their paddy fields and ward away wild elephants and monkeys. Usually these huts are made up of trees branches and dried paddy straws so that they can save themselves from extreme climatic conditions and also save themselves from wild animal attacks.

*for centuries, and the forest is so vast that it will never be limited for us'. Lastly Chemena Juang said: "Jungle has enough for us and will survive us for centuries and generations to come."*

The Juangs of Upara Champei village starts their day with the sunrise and roosting of cock, followed by bathing, cleaning, cooking and eating. As soon as they finish up these activities, they leave for forest for the whole day till sunset. They spend their whole day in the forest doing various activities. Apart from shifting cultivation, the Juangs are also engaged in other activities like hunting (activity done by a group of young and masculine Juang men along with their trained and aggressive dogs), gathering ( includes collecting any type of forest produce like Sal leaves, tooth brushes, mushrooms, mangoes, jackfruit, fishes, crabs, prawns, wild berries and fruits and as such produces which is collected by both male and female, young and old whenever they go to forest out of their own interest and need), grazing cattle(usually females married and unmarried takes the cattle of their own household and sometimes of the neighbour or of another household to the Jungle everyday to graze them and at the same time they also collect the forest produces till they return in the evening around sun set), worshipping( the mountains and hills are marked by the presence of their religious sentiments as they believe that these mountains and hills are empowered by God and Goddess, to whom they convey their problems and issues who in return always protect them and from any evil), and relaxing (forest act as a place where they release their worries by gossiping to each other, sometimes they sleep under a tree and sometimes they bath in a stream, sometimes they get elated by finding a fruit or berry of their like, sometimes they just walk through the forest to release their worries while remembering the memories related to them) in the forest. Be it old or young generation, be it a male or female, everyone goes to forest every day religiously to earn their livelihood. Forest and its importance and relevance in a Juang's life are not at all easy to understand; it has multifaceted meaning and significance for them.

While shifting cultivation is a major source of livelihood, similarly hunting is a regular activity<sup>1</sup> performed by the Juangs of this village almost every day. While the men are busy in cultivation and hunting, the women and the children are usually engaged in gathering fuel woods, edible items like honey, ant eggs, fruits, fishes, crabs, etc; and other needs. The daily need of the Juangs is met from the forest and its resources. Except hunting (which is regarded as a male - dominated activity) both the Juang male and female of the Upara Champei village inter-exchange with their other activities like cultivation, gathering, cattle grazing, etc.

Narrating an instance from my fieldwork, when on one of the days, I visited forest along with a group of children from Upara Champei village. This group consisted of only seven Juang girls aging from 4 years to 10 years. As long as these girls were walking on the village road, they were moving in a reserved and silent mode; the moment they entered the forest, all of them started giggling, smiling and then sung folklores in their own language. One of the girls saw ant's egg hanging from tree covered in leaves and others also identified few other such nests of ants in another tree. Immediately one of them went to get an iron ax and then started cutting down the tree. I was really shocked to see a six year old Juang girl trying to ax the trunk of a Sal tree with all the confidence and strength. One after another girl came and tried axing the trunk till the tree fell. In the mean time, I saw some other girls collecting Sal leaves from the ground and from the branches approachable to them, while some other girls were collecting fire woods and branches for using them as tooth brush. As soon as the tree fell they all collected the nest of the red ants and then immediately threw them on the ground, so that the ants would get dispersed in the soil. After some time they again threw it to the ground and waited till the ants left their nest leaving the white eggs wrapped in between leaves. These ants' eggs were then collected by the girls, and they started segregating the edibles from the ant's nest of eggs. These ants eggs are locally called as *kurkuti* in Juang language are eaten by the the Juangs as a condiment along with rice or sometimes used as snacks by the children. These ants egg are quite popular among children than in elders. After segretating the ant's egg, they immediately made plates out of Sal leaves and then placed it in those leaves futher making those leaves into leaf boxes. Moving inside forest I saw lactating mother around 18 years old was feeding her baby and collecting firewood simultaneously. While retuning back to village, I also saw patches of land used for

<sup>1</sup> Hunting among Juangs used to be almost a regular activity earlier when the young men used to go to Jungle for hunting small games in which they were not always successful. On specific occasions hunting used to be a ritualistic activity and they go for big game hunting as well. This phenomenon has started reducing for last decade with the imposition of forest rights and wild life protection acts by government. Moreover the young men of Juangs now find it more suitable to earn their livelihood by working as daily wage labourer or a construction worker in a city. The young generation of Juang of Upara Champei village is more engaged in cities and towns than staying in the village, thus their participation as well as the frequency of hunting small games has reduced drastically.



shifting cultivation and a group of goats being herd by women. While few other women were resting in the forest under a tree, few of them were tying firewood in a bunch. On the way to their village, the girls also plucked and collected forest produces whichever was accessible and approachable to them on their way. We then returned to the village before the sun set. This was an incredible experience in my life unparalleled to anything more exciting and adventurous.

The Juangs of Upara Champei village interacts with forest in their everyday life. This interaction with forest is not something that is related only towards livelihood rather forest is what completes them. After having a close look at the children of the Juangs of the village who felt themselves more comfortable at forest than in the village, made me realize that the forest has been the lifeline and backbone of the Juangs since centuries which is reflected in their process of socialization with forest. The way the Juang children identify and recognise each and every tree and shrub in the forest; identify the forest ways and paths which a stranger like me would never be able to find out; also feel and put their rights on the forest without any hesitation, elaborates that forest is not only a source of their livelihood rather it is the means through which they identify themselves and establish their identity. Forest is imbibed into the lifestyle and existence of the Juangs of Upara Champei village itself as Forest Tribes.

### **TRANSFORMATION IN THE MODE OF LIVELIHOOD**

A decade ago, the Juangs of Upara champei village were entirely dependent on forest as it was the only source of their livelihood until they were introduced to the effect of modernisation and development. In early 20<sup>th</sup> century, development took full pace to penetrate into the remotest of the areas including the forest and tribal areas. With the passage of time and advent of developmental plans and programmes, various opportunities of livelihood opened up. For the last few years, the Juangs have shown their interest in the modern market economy, the influence of industrialization and modernisation is quite visible on them with gradual changes in their dress pattern, changing lifestyle, introduction of electronics media in the village and most importantly their attraction towards the town and cities to earn livelihood. Moreover, continuous attempt for the Juang's upliftment through various plans and programmes by dedicated developmental agencies of government have further provided the Juangs of Upara Champei village with multiple livelihood opportunities like wage labour, construction labour, entrepreneur<sup>1</sup>, cattle and livestock economy and many such ways of earning livelihood. These Modern livelihood opportunities very easily attract the younger generation than the older generations of the Juangs living in Upara Champei village.

In recent years there has been a significant shift in the ways of livelihood among the Juangs of Upara Champei village. Earlier the Juangs who used to spend their most of the time in the forest, either for shifting cultivation or for hunting-gathering, are now attracted towards towns and cities for earning their livelihood. With the advent of new livelihood opportunities like mining worker, construction labour, daily wage labour, agricultural labour, individual entrepreneurship, etc, the younger generation of the Juangs are now getting absorbed into modern ways of livelihood. Shifting cultivation, which has been the most viable way of subsistence for years together, is now done mostly by elderly people of the tribe in the age group of 35 years to 70 years. The younger generation in the age group of 15 years to 35 years, who used to give their participation in the shifting cultivation earlier, are no more engaged nor have a keen interest in this activity. This inclination among the younger generation towards the modern mode of livelihoods has become steeper because of the introduction of money/currency in their economy. Moreover these modern livelihood opportunities are less risky and gives instant money every day which can be spend on buying the luxuries and attractive commodities without much wait and patience. Even earning money as daily wage labour everyday at the end of the day also makes them feel more free and independent to make their own decisions of life. For example the decisions such as marriage, construction of home, bride price, drinking alcohol, wearing modern clothes, purchasing electronics items, eating broiler chicken and going to visit their relatives and friends in other villages etc., has become more easier without any obligations and responsibilities towards their livelihood sources.

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<sup>1</sup> Entrepreneurship includes providing loans and grants from the government, development agencies like Juang Development agency, NGOs, so that the Juangs of the Upara Champei village can buy auto-rickshaws, small vans, build and own a grocery shop, establish their own business and shop in market in towns and cities and other avenues that they wanted to opt for. Usually these loans and grants are waived off from the government as in majority of the cases the person who takes loan to establish a business fails or finds loss because of various market factors.

One fine day while I was conducting my fieldwork in the Upara Champei village I met Angad Juang, age 35 years, is the panchayat samiti member of the village. While having conversation with him I got to know how the barter system in the village got replaced by the presence of currency in the economy. As narrated by Angad Juang, earlier the cultivated grains and pulses grown through shifting cultivation were exchanged in barter system with other nearby caste and tribes to get in return the needs and amenities required by the Juangs for their day to day life. On a contrary, at present Money has replaced the system of barter, the commodities are no more exchanged rather they are now bought from the market. The Juangs earlier used to trade their cultivated products for goods which were very much essential to them. For example, the Juangs of Upara Champei Village used to exchange a sack of rice or mustard seed for getting an Iron ax or some ploughing implement. Obtaining an Iron ax would help them to cut trees and ploughing implements would help them to cultivate in hilly forest areas. Similarly, they also used to exchange forest produces like honey or mushrooms or Sal Leafs for getting in return salt. Salt is the core essence of food, it was very much essential for them. At present, such exchanges are not seen much among the Juangs of Upara Champei village. In place of exchanging the commodities, now they prefer to buy them from the market. The presence of money and market has made things more approachable and easily available.

The market plays a major role in the lives of the Juangs of Upara Champei Village. Earlier the Juangs of Upara Champei village used to go to local weekly market, to exchange their commodities. Gradually these markets replaced their commercial transactions with currency and so did the Juangs have to also earn money now than earning commodities. The local market which earlier used to provide only those items which can be exchanged have now transformed. At present, the local markets are loaded with various commodities, which attract the young generation to lead a luxury<sup>1</sup> life. The modern markets sell items such as good quality of clothes, artificial ornaments, fashionable entities, which attracts women and young girls. Similarly, the young boys and men get attracted by electronic equipment, modern clothes like jeans and t-shirts, foreign liquor, packed tobacco and many other attracts. When at times, obtaining only basic needs of life was the only criteria of the Juangs of Upara Champei village, the greed for the other needs have also increased with the passage of time.

The younger generation of Upara Champei Village is now more interested in working as daily wage labour or as a construction worker to earn their livelihood. Nowadays the young boys in the age group of 15 years to 25 years usually prefer to stay out of their village for days together to earn wages in the cities and towns. Similarly, the young girls in the age group of 12 years to 20 years, who were earlier engaged in collecting forest produces, looking after younger one at home, acted as a helping hand in shifting cultivation of their families, is no more doing these activities. These young girls are also now engaged in developmental programmes as daily wage labourers or construction workers. Some of these young Juang girls of Upara Champei village also work as seasonal agricultural labour during sowing and reaping season to earn money in the field of those who own lands. The concept of seasonal agricultural labour was also present earlier among the Juangs, where they would work on the fields day and night and get food and house to stay throughout the time as well as get some gift in kind while returning to their villages. At present, the old system is replaced by money at the end of the season. Earlier, the priority was to earn physical capital and social capital in terms of constructing a home, hunting wild boar, collecting woods, hens, goats, etc., but now their major focus is in earning financial capital i.e. money. The presence of money in their economy has transformed their ways of earning a livelihood.

Besides all the factors, the Juangs being Particularly Vulnerable Tribal Groups are being supported by dedicated developmental plans and programs of government policies. These plans and programmes not only provide them food, shelter, and clothes but also support them to improvise their livelihood. For example, the provision of providing rice and pulses to each Juang households through the Public Distribution System(PDS), Anna Antodaya Yojana(AAY), Integrated Child Development Service (ICDS), dedicated Ration shops etc provide them grains and pulses at regular interval at free of cost or at very minimal price. Further providing them with houses through Indra Awas Yojna (IAY) and providing them livelihood opportunities through plans like National Rural Livelihood Mission (NRLM), Targeted Rural Initiatives for Poverty Termination and Infrastructure (TRIPTI), Odisha Tribal Empowerment & Livelihood Project (OTELP), Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) etc have transformed the livelihood opportunities

<sup>1</sup> Luxury in this context is a relative term compared to the way the Juangs of Upara Champei village used to live earlier with minimum basic needs and living only for the present. At present, with the introduction of market and money, the basic needs are easily attainable and now they yearn to possess a mobile, pair of jeans, bike, TV, radio, watch, funky shirts, Sports shoes, eating packed tobacco, drinking packaged liquor etc.

among the Juangs. Various central sponsored schemes, state-funded projects, dedicated agencies like Integrated Tribal Development Agency (ITDA) and the Juang Development Agency (JDA) have further sped up the pace of development among The Juangs including their changing ways of livelihood. The Juangs who were wholly dependent on forest are now provided with various modern livelihood opportunities provided through these developmental plans and programmes that would help them to develop and improve overall.

## CONCLUSION

Changing socio – economic scenario around the Juangs of Upara Champei village along with the impact of developmental plans and policies on them, has transformed them a lot. The major transformation and changes are prominently visible in the sector of livelihood. The Juangs also faced various livelihood interrelated changes as well. The changes in their economic aspect in terms of earning their livelihood have also brought about transformation in their socio- political aspect. These includes, changes in their in family structure, changes in their marriage rituals, changes in their social relations, changes in daily food habits, dress pattern, political administration and much more. These transformations in the lines of livelihood cannot be portrayed on the lines of complete transformation of the Juangs into the so-called main stream population. The Juangs of upara Champei village in one side being attracted by modern livelihood opportunities, on the other side still deal with barter system although at a very small scale. The Juangs of Upara Champei village who are now attracted towards cities and towns have also not forgotten their knowledge base on forest and the relationship they share with the forest. The Juangs of this village who are lured and pacified by various development plans and programmes to improve their health, literacy, livelihood, lifestyle, basic needs requirements have also not forgotten their cultural rituals and rites completely. The presence of electricity has not replaced the value of fire and cool breeze of the forest. The introduction of mobile and television has not yet entirely replaced the folklores and stories of the Juang old men. The presence of school and educational institution has not replaced the Juang dormitories. All these changes and transformations that the Juangs of Upara Champei village are undergoing cannot be categorised as completely negative or positive on them. Rather we can say the Juangs of Upara Champei village are in a *sui generis* phase of transformation and transition of their own identity and cultural significance.

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**A STUDY OF OCTAPACE CULTURE AND JOB SATISFACTION OF EMPLOYEES IN EDUCATIONAL SECTOR**

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**ABSTRACT**

*In this 21<sup>st</sup> century, organizational growth and development largely depend upon their human capital and as such they need to be developed, motivated, and involved in contributing towards their organizations success. It calls for creating sound and congenial atmosphere at work places so that employees would feel happy and satisfied with their job and organization. A satisfied employee brings a lot of energy and enthusiasm at work places which creates positive vibes among other employees as well and consequently develops their outlook towards their work and organization. Keeping the above facts in view, the purpose of the present paper is to study the existing perception of employees towards OCTAPACE Culture and Job Satisfaction. The study targeted 120 teachers working in 5 private schools in Srinagar district of J&K. Only 104 respondents returned the questionnaire and among them six questionnaire were not found fit for further analysis and hence were rejected. Thus final analysis was done on only 98 respondents with a usable response rate of 81.66%. The reliability of constructs varied from 0.73 to 0.86. The data whatsoever collected was analyzed using descriptive statistics and inferential statistics. The findings of the study reveal that OCTAPACE Culture and Job Satisfaction is perceived positively by employees. Moreover, OCTAPACE culture positively and significantly influences Job Satisfaction of employees. The study suggests that OCTAPACE culture values need to be further promoted so that congenial atmosphere is attained in organizations and more so will help in enhancing employee's satisfaction towards their work and organization.*

*Keywords: educational institutions, job satisfaction, OCTAPACE culture, teachers*

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**INTRODUCTION**

Educational sector continues to dominate and lead in producing and developing sound human resources for the 21<sup>st</sup> century. Human capital is considered as a pivotal tool in enhancing nation's progress and development. In this competitive work environment retaining employees has become a challenge before organizations as there are numerous opportunities and green pastures available to individuals. With growing avenues knocking at the doorsteps of workers it demands organizations to tap and address the needs and requirements of their workers in order to retain their employees. Therefore, it becomes crucial to create a satisfied and committed workforce who will actively involve themselves in taking institutions to higher levels. A satisfied worker is highly beneficial for an organization and thereby brings positive energy at work at individual, group and organizational level. Consequently, it becomes necessary for universities and higher educational institutions to develop and promote sound, effective and satisfied workforce. Job satisfaction among employee brings qualitative changes and leads to organizational effectiveness. In attaining this endeavor, institutions need to create and develop positive and healthy culture at work places so that employee would feel motivated, committed and satisfied with work conditions.

**JOB SATISFACTION**

The subject of job satisfaction has been discussed many times in the past and lot of literature is available on this issue. Over the years various researchers, academicians and policy makers have thrown light on this and yet it still continues to dominate as a topic for debate. Job satisfaction of employees plays a key and a critical role in enhancing their performance and in boosting their morale at work places. Institutions irrespective of their nature of work have paid attention on how to make their employees contented and satisfied towards their job. Service sector in general and educational sector in particular is paying immense focus on job satisfaction of their academic staff. Academic institutions are facing immense challenges due to growing global academic competition and increasing aspirations of students but all these areas can be covered and handled properly if academic staff is given avenues and opportunities to develop themselves. Past studies on job satisfaction have continuously explored its various facets. The concept of job satisfaction has been defined by many researchers and each has given their definitions as per their understanding and knowledge of the subject. Kerego and Muthupha (1997) have highlighted that job satisfaction comprises the feeling an employee has towards his working environment in an organization. Ivancevich et al. (1997) stated that job satisfaction is a psychological feeling which an individual gets when he/she is interacting with organizational environment. Reichers (2006) viewed job satisfaction as the phenomenon of ascertaining employee contentment and the extent to which his/her qualification matches with job profile. Hop Pock (1996) viewed that employee satisfaction is a

combination of psychological, physiological and environmental factors that influences an individual's perception towards his work and organization. Bullock (2003) pointed out that job satisfaction is "an attitude which results from balancing and summation of many specific likes and dislikes experienced in connection with the job". Similarly, Poptone (1999) shared a similar perspective by stating that job satisfaction comprises the feelings of individuals towards his work, superior- subordinate relationship, management, and how he/she interacts with social factors that surrounds his work.

Past research studies have highlighted the association between job satisfaction and organizational culture. (Mansoor and Tayib, 2010; Bhatti and Qureshi, 2007; Chang and Lee 2007; Robbins , 2003; Jiang and Klein, 2000) viewed that if a teacher is satisfied with his nature of job and other work conditions he would that contribute significantly towards organizational objectives. They further argued that a satisfied teacher tend to be more productive, motivated, involved and committed with their work and organizations.

### **OCTAPACE Culture**

The OCTAPACE culture is characterized by the occurrence of openness, confrontation, trust, authenticity, pro-activity, autonomy, collaboration and experimentation, it deals with the extent to which these values are promoted in the organization (Pareek & Rao 1986). These are briefly explained below:

i) *Openness & Risk Taking*: Employees feel free to express their ideas and the organization is willing to take risks and to experiment with new ideas and new ways of doing things ii) *Confrontation*: Employees face the problems and work jointly with others concerned to find its solution. They face the issues openly without hiding them or avoiding them for fear of hurting each other iii) *Trust*: The employees department and groups trust each other and can be relied upon to 'do' whatever they say they will do iv) *Authenticity*: Authenticity is the value underlying trust. It is the willingness of a person to acknowledge the feelings he/she has, and to accept him/her as well as others who relate to him/her as persons v) *Pro-action*: Employees are action – oriented, willing to take initiative and to show a high degree of pro-activity. They anticipate the issues and act or respond to the needs of the future vi) *Autonomy*: Autonomy is the willingness to use power without fear, and helping others to do the same. Employees have some freedom to act independently within the boundaries imposed by their role/job vii) *Collaboration*: Collaboration involves working together and using one another's strength for a common cause. Individuals, instead of solving their problems by themselves, share their concerns with one another and prepare strategies, work out plans of action, and implement them together viii) *Experimentation*: Experimentation as a value emphasizes the importance given to innovation and trying out new ways of dealing with the problems in the organization.

Past research evidences (Bhardwaj, 2002; Kumar and Patnaik, 2002; Alphonsa, 2000; Mishra, Dhar and Dhar, 1999; Rohmetra, 1998; Kumar, 1997; Rao and Abraham, 1986) indicate that the culture of OCTAPACE values help organization to develop positive and favourable linkages between employees and the management with the aim to achieve and attain individual as well as organizational goals and objectives.

### **RESEARCH OBJECTIVES**

- i) to examine the perception of teachers towards OCTAPACE Culture and Job Satisfaction,
- ii) to analyze teachers perception towards OCTAPACE Culture across Gender and Age,
- iii) to assess teachers perception towards Job satisfaction across Gender and Age, and
- iv) to draw conclusions and suggest measures to improve OCTAPACE Culture for enhancing Job Satisfaction among school teachers.

### **RESEARCH HYPOTHESES**

H 1 a: Perception of teachers towards OCTAPACE Culture would vary across age.

H 1 b: Perception of teachers towards Job Satisfaction would vary across age.

H 2 a: Perception of teachers towards OCTAPACE Culture across gender is more or less same.

H 2 b: Perception of teachers towards Job Satisfaction across gender is more or less same..

### **RESEARCH METHODOLOGY**

The present paper is empirical in nature and gathered responses from teachers of 5 different private schools in Srinagar district. Convenience sampling was employed to gather information from the respondents. OCTAPACE Culture was measured by using a scale of HRD Climate survey questionnaire developed by Rao and Abraham (1986). Job Satisfaction was measured by employing Job Satisfaction survey tool developed by Spector (1996). The study targeted a total of 120 teachers and gathered information from 104 respondents. Out

of the 104 questionnaires returned, six questionnaires were not found fit for analysis and hence rejected. The final analysis was done on 98 questionnaires with a usable response rate of 81.66%. The reliability of constructs varied from .71 to .85 in case of Job Satisfaction and .72 to .84 in OCTAPACE Culture. The entire gamut of data collected on various aspects of the present study both primary and secondary for determining the level of satisfaction of school teachers with respect to job satisfaction and OCTAPACE Culture was analyzed statistically by applying various statistical tools such as mean averages, comparative mean averages, standard deviation, percentage to mean score & summary statistics.

## DATA ANALYSIS AND DISCUSSION

**Table-1: Employee's perception towards OCTAPACE Culture**

Construct	Mean Score	Std. Dev
Openness	3.28	.66
Collaboration	3.34	.78
Trust	3.31	.76
Autonomy	3.24	.69
Proactivity	3.26	.72
Authenticity	3.33	.67
Confrontation	3.29	.70
Experimentation	3.27	.78
<b>OCTAPACE</b>	<b>3.29</b>	<b>.72</b>

Source: Data compiled by the author for the present study

The perception of employees towards OCTAPACE culture values are shown in table 1. It can be inferred that employee showed favourable satisfaction level towards OCTAPACE culture values with overall mean score of 3.29. The highest satisfaction among OCTAPACE values was seen in collaboration with mean score of 3.34 which depicted that employees work jointly in attaining organizational objectives. The least perception was perceived towards autonomy with mean score of 3.24 which highlighted that employees are not given autonomy with respect to their work. It can be seen that employees felt they do not have much say in decision making process with regards to developmental aspects.

**Table-2: Employee's perception towards Job Satisfaction**

Construct	Mean Score	Std. Dev
Promotion	3.33	.70
Supervision	3.29	.77
Fringe Benefits	3.36	.68
Operating Conditions	3.40	.66
Coworkers	3.43	.69
Nature of Work	3.36	.74
Communication	3.27	.71
Pay	3.34	.79
Contingency Rewards	3.30	.73
<b>Job Satisfaction</b>	<b>3.34</b>	<b>.72</b>

Source: Data compiled by the author for the present study

The perception of employees towards Job satisfaction is shown in table 2. It can be inferred that employee depicted favourable perception level towards Job satisfaction with overall mean score of 3.34. The highest satisfaction among job satisfaction elements was seen in coworker's aspect with mean score of 3.43 which depicted that employees feel that there is a good relation between coworkers in the organization. The least perception was perceived towards communication with mean score of 3.27 which highlighted that employees are not been appraisal about latest development and more important about what needs to be done with respect to their job roles.

**Table-3: Perception of Academic Staff towards OCTAPACE Culture across Age**

Factor	Dependent Variable	Group	(N)	Mean Score	ANOVA	Sig*
Age	OCTAPACE Culture	30- 40 years	28	3.19	2.555	.028*
		40- 50 years	33	3.32		
		> 50 years	47	3.36		

Note: \*P< .05

Source: Data compiled by the author for the present study

The table 3 examines the difference in the perception of academic and non-academic staff regarding transformational leadership on the basis of variable age. It is revealed from the above table 3 that employees who are above 50 years age are having highest perception towards OCTAPACE culture with mean score of (3.36) while as employees in between 30-40 age group showed least satisfaction towards transformational leadership with mean score of (3.19).

The perceptual differences of respondent employees regarding OCTAPACE culture is statistically significant when the differences were examined on the basis of age factor (ANNOVA=2.555;  $p < .05$ ). Hence hypothesis 1(a) is accepted, indicating that there exists a significant difference among academic staff across age.

**Table-4: Perception of Academic Staff towards Job Satisfaction across Age**

Factor	Dependent Variable	Group	(N)	Mean Score	ANOVA	Sig*
Age	Job Satisfaction	30- 40 years	28	3.29	2.116	.024*
		40- 50 years	33	3.34		
		> 50 years	47	3.39		

**Note: \*P< .05**

Source: Data compiled by the author for the present study

The table 4 examines the difference in the perception of academic and non-academic staff regarding job satisfaction on the basis of variable age. It is revealed from the above table 4 that employees who are above 50 years age are having highest perception towards job satisfaction with mean score of (3.39) while as employees in between 30-40 age group showed least satisfaction towards job satisfaction with mean score of (3.29).

The perceptual differences of respondent employees regarding job satisfaction is statistically significant when the differences were examined on the basis of age factor (ANNOVA=2.116;  $p < .05$ ). Hence hypothesis 1(b) is accepted, indicating that there exists a significant difference among academic staff across age.

**Table-5: Perception of Academic Staff towards OCTAPACE culture across Gender**

Construct	Mean Score		Z Value*
	Male Academic Staff (N=66)	Female Academic Staff (N= 42)	
Openness	3.33	3.23	.032
Collaboration	3.39	3.29	.026
Trust	3.36	3.26	.028
Autonomy	3.21	3.27	.039
Proactivity	3.29	3.23	.034
Authenticity	3.31	3.35	.059
Confrontation	3.27	3.31	.063
Experimentation	3.31	3.23	.048
<b>Total Score</b>	<b>3.31</b>	<b>3.27</b>	<b>.064</b>

\*p < .05; Note: Higher the % of mean score, higher is the level of satisfaction.

Source: Data compiled by the author for the present study

The (table 5) depicts the comparison between male and female teaching staff's perception towards OCTAPACE Culture. It has been reported from (table 5) that male academic staff (mean score = 3.31) shows slightly higher satisfaction towards OCTAPACE Culture as compared to female teaching staff (mean score= 3.27). With respect to constructs of OCTPACE culture, female teaching staff showed higher satisfaction towards autonomy (mean score= 3.27) and authenticity (mean score=3.35) as compared to male teaching staff.

However, the results of z test, administered to ascertain whether the difference in the mean scores reported by the male and female teaching staff with respect to OCTAPACE Culture, is statistically significant or merely an outcome of chance factor, indicated that the difference in the mean scores is statistically insignificant (z value=0.064;  $p > .05$ ), indicating that there is no significant difference in the perception levels of male and female teaching staff with respect to OCTAPACE Culture (Table 5). Hence, hypothesis 2(a) is accepted indicating that the perception of male and female staff towards OCTAPACE Culture is more or less same.

**Table-6: Perception of Academic Staff towards Job Satisfaction across Gender**

Construct	Mean Score		Z Value*
	Male Academic Staff (N=66)	Female Academic Staff (N= 42)	
Promotion	3.39	3.27	.028
Supervision	3.28	3.30	.132
Fringe Benefits	3.35	3.37	.112
Operating Conditions	3.38	3.42	.078
Coworkers	3.46	3.40	.060
Nature of Work	3.38	3.34	.067
Communication	3.30	3.24	.059
Pay	3.32	3.36	.071
Contingency Rewards	3.28	3.32	.079
<b>Total Score</b>	<b>3.35</b>	<b>3.33</b>	<b>.097</b>

\*p <.05; Note: Higher the % of mean score, higher is the level of satisfaction.

Source: Data compiled by the author for the present study

The (table 6) depicts the comparison between male and female teaching staff's perception towards Job Satisfaction. It has been reported from (table 6) that male academic staff (mean score = 3.35) shows slightly higher satisfaction towards Job Satisfaction as compared to female teaching staff (mean score= 3.33). With respect to constructs of Job Satisfaction, male teaching staff showed higher satisfaction towards coworkers (mean score= 3.46), promotion (mean score =3.39), nature of work (mean score = 3.38) and communication (mean score=3.30) as compared to female teaching staff.

However, the results of z test, administered to ascertain whether the difference in the mean scores reported by the male and female teaching staff with respect to Job Satisfaction, is statistically significant or merely an outcome of chance factor, indicated that the difference in the mean scores is statistically insignificant (z value=0.064; p>.05), indicating that there is no significant difference in the perception levels of male and female teaching staff with respect to Job Satisfaction (Table 6). Hence, hypothesis 2(b) is accepted indicating that the perception of male and female staff towards Job Satisfaction is more or less same.

### RELIABILITY OF SCALE

In the present study Cronbach's alpha was used to examine the internal consistency of measures. The values of Cronbach's alpha of the study variables were found within the acceptable limit of .70 and the same is depicted in table 7.

**Table-7: Scale Reliability of Study Variables**

Job Satisfaction		OCTAPACE Culture	
Constructs	Cronbach's alpha	Constructs	Cronbach's alpha
Promotion	.78	Openness	.77
Supervision	.76	Collaboration	.74
Fringe Benefits	.85	Trust	.72
Operating Conditions	.77	Autonomy	.83
Coworkers	.80	Proactivity	.82
Nature of Work	.71	Authenticity	.84
Communication	.76	Confrontation	.79
Pay	.82	Experimentation	.75
Contingency Rewards	.79		

Source: Data compiled by the author for the present study

### CONCLUSION

The purpose of this study was to examine the existing perception of teachers towards OCTAPACE Culture and Job Satisfaction prevailing in sample selects institutions in Srinagar district. Further it was indicated from the findings that male teachers showed higher satisfaction towards both OCTAPACE Culture and Job Satisfaction elements as compared to female teachers. Also the statistically insignificant difference between them depicted that gender has no effect on the perception of respondents towards OCTAPACE Culture and Job Satisfaction. However, the perception of teachers showed that variable age has an effect on both OCTAPACE Culture and Job Satisfaction.

The present study is faced with some limitations. Firstly, the study targeted only few schools in Srinagar region and that too with less sample size. As such the findings of the study cannot be generalized. Therefore future



research can include schools from other districts in attaining wider geographical representation. Secondly, government schools could be considered for future research so as to grasp broader perspective towards study variables in school education sector. Lastly, only two demographic variables such as gender and age were studied therefore future research can consider other demographic factors namely experience, designation and qualification in order to examine their influence on study variables more minutely.

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**STUDY OF INDOOR  $^{222}\text{Rn}$ ,  $^{220}\text{Rn}$  AND THEIR PROGENY LEVELS USING LR-115 (II) NUCLEAR TRACK DETECTORS IN GUWAHATI, ASSAM****Debajyoti Barooah<sup>1</sup> and Simi Barman<sup>2</sup>**Assistant Professor<sup>1</sup> and Associate Professor<sup>2</sup>, Department of Physics, Cotton University, Guwahati**ABSTRACT**

Guwahati of Assam located in the the North East India is an ever growing city. Guwahati has significant geological characteristics, which may lead to radioactivity in dwellings. Keeping in view of health hazards due to radiations in indoors, we studied variations of indoor radon ( $^{222}\text{Rn}$ ), thoron ( $^{220}\text{Rn}$ ) and their progeny levels along with equilibrium factors and inhalation dose rates by employing LR-115 (II) nuclear detectors fitted with twin-chamber dosimeters in some dwellings in Guwahati. The indoor radon and thoron concentrations showed house-to-house variations with geometric mean (GM) values of  $162.9 \text{ Bq/m}^3$  and  $78.7 \text{ Bq/m}^3$  respectively. The obtained results showed that the indoor radon levels were lower than reference level of  $200 \text{ Bq/m}^3$  of International Commission on Radiological Protection [ICRP 2007] with some exceptions having values marginally above the reference level. The estimated radon progeny levels (GM:  $15.1 \text{ mWL}$ ) were higher than the corresponding values of thoron progeny levels (GM:  $10.9 \text{ mWL}$ ). Equilibrium factors for radon and thoron progeny were estimated to be 0.34 and 0.04 (GM) respectively. Inhalation dose rates were estimated to be lower than upper reference level of  $10 \text{ mSv/y}$  [ICRP 2007].

**Keywords:** Equilibrium factor, Inhalation dose rate, LR-115 (II) detectors,  $^{222}\text{Rn}$ ,  $^{220}\text{Rn}$ , Progeny.

**INTRODUCTION**

Radon ( $^{222}\text{Rn}$ ) is a naturally occurring odourless, colourless, tasteless chemically inert gas. It is a radioactive gas with half life of 3.82 days.  $^{222}\text{Rn}$  is produced as a decay product of  $^{226}\text{Ra}$  (radium-226, half life: 1600 years).  $^{222}\text{Rn}$  decays to  $^{218}\text{Po}$  with the emission of alpha-particles having energy of 5.49 MeV [Barooah et al 2014]. Thoron ( $^{220}\text{Rn}$ ) is the most important radioactive isotope of  $^{222}\text{Rn}$  and occurs naturally as an immediate progeny of  $^{224}\text{Ra}$ .  $^{220}\text{Rn}$  has a half life of 55.6 s and decays to  $^{216}\text{Po}$  with emission of alpha particles of energy 6.29 MeV [Fleisher 1997; Barooah et al 2014]. Radon isotopes are found in all types of rocks, soils, water, underground fluids and hydrocarbons [Fleisher 1997; Segovia 1991, Barooah et al 2014]. Radon and thoron are carcinogenic gases and can also cause other health diseases [WHO 2009; ICRP 2012; Stranden et al 1988]. Radon and thoron gases show seasonal variations with maximum values during winter season and minimum values during summer season [Ramachandran et al 1990; Sannappa et al 2003; Sivakumar 2010].

**THE STUDY AREA**

Geologically the Guwahati city is composed of Precambrian basement gneissic complex with thin veneer of alluvium. The hills are made up of the gneisses and granite bodies. Granitic rocks are generally rich in radioactive elements like uranium and so may lead to radioactivity. When granites are used as building stones for construction of houses they may lead to enhanced radioactivity. In order to assess health risks due to inhalation of radon, thoron and their progenies a study was carried out in some selected dwellings of Guwahati during the winter season.

**EXPERIMENTAL METHODS**

In this research work, plastic twin-cup dosimeters fitted with LR-115 (Type II) nuclear track detectors were used to measure gas and their progeny concentrations [Barooah et al 2014; Mayya et al 1998]. The nuclear track detector is 12  $\mu\text{m}$  thick alpha sensitive layer of red dyed strippable LR-115 (Type II) (Kodak cellulose nitrate), deposited on a 100  $\mu\text{m}$  thick non-etchable polyester base (cellulose acetate). The plastic dosimeter cup has a length of 4.5 cm and a radius of 3.1 cm [Mayya et al 1998]. To expose the detectors they were cut into 2.5 cm x 2.5 cm sizes, and then were fitted in the bare mode, filter mode and membrane mode of the twin chamber dosimeter cup. The bare detector is responsible to record tracks formed by all alpha particles emitted from radon, thoron and their progeny. The membrane mode detector film with covered semi-permeable membrane (latex) of 25  $\mu\text{m}$  thickness records tracks formed due to radon only. The glass fibre filter paper of thickness 0.56 mm in the other compartment of the twin cup dosimeter, allows diffusion of both radon and thoron. The LR-115 (Type II) detectors are only sensitive to alpha particles with an energy window of 1.9-4.2 MeV [Barooah et al 2014]. After retrieval of the exposed detectors, they were chemically etched in 2.5 N NaOH solutions at  $60^\circ\text{C}$  for 110 minutes under mild stirring condition for uniform etching for revealing the tracks formed due to alpha particles [Barooah et al 2014]. Then the films were washed in distilled water properly, and were dried up in the laboratory conditions. A Leitz Optical Microscope of suitable magnification (x 100) was used to count tracks for at least 100 fields of view for each film to obtain a representative value of track density ( $\text{track cm}^{-2}$ ).

The gas concentrations ( $C_R$  for radon and  $C_T$  for thoron) in the indoor environs were determined from the observed track densities, using the following relations [Mayya et al 1998]:

$$C_R = \frac{T_1}{d K_R} \quad (1)$$

$$C_T = \frac{T_2 - d C_R K_R}{d K_T} \quad (2)$$

$T_1$  and  $T_2$  are track densities recorded in membrane and filter modes of the dosimeter respectively.  $K_R = K_R^f = 0.019$  track  $\text{cm}^{-2}$  per Bq  $\text{m}^{-3}$  per day.  $K_R$  and  $K_R^f$  are the calibration factors for radon in the compartment covered with membrane and in the compartment covered with the filter paper respectively [Barooah et al 2014]. Whereas  $K_T = 0.016$  track  $\text{cm}^{-2}$  per Bq  $\text{m}^{-3}$  per day is the calibration factor for the thoron in the compartment covered with filter paper [Mayya et al 1998].  $d = 90$  days indicates exposure durations for a season.

The bare track density  $T_3$  can be related to the concentrations of both radon and thoron gas as well as their progeny concentrations by:

$$T_3 = K_B d [C_R + C_{R-A} + C_{R-C}] + (2C_T + C_{T-C}) \quad (3)$$

Where  $K_B = 0.021$  track  $\text{cm}^{-2}$  per Bq  $\text{m}^{-3}$  per day is bare mode calibration factor for all the alpha emitters [Mayya et al 1998].  $C_{R-A}$  and  $C_{R-C}$  are concentrations of alpha-emitting radon progeny ( $^{218}\text{Po}$  and  $^{214}\text{Po}$ ), and  $C_{T-C}$  is the concentration of alpha-emitting thoron progeny ( $^{212}\text{Po}$ ).

As the half life of  $^{220}\text{Rn}$  is short, the activity fractions of thoron progenies are related to a representative average thoron concentration ( $\bar{C}_T$ ), instead of the measured  $C_T$  by [Mayya et al 1998]:

$$C_{T-B} = \bar{C}_T F_{T-B} \text{ and } C_{T-C} = \bar{C}_T F_{T-C} \quad (4)$$

$C_{T-B}$  and  $C_{T-C}$  and  $F_{T-B}$  and  $F_{T-C}$  are concentrations and activity fractions (with respect to average thoron) of  $^{212}\text{Pb}$  and  $^{212}\text{Po}$  respectively. The progeny working levels were determined by [Mayya et al 1998]:

$$WL_R = \frac{C_R F_R}{3700} = \frac{C_R (0.104 F_{R-A} + 0.518 F_{R-B} + 0.37 F_{R-C})}{3700} \quad (5)$$

$$WL_T = \frac{\bar{C}_T F_T}{275} = \frac{\bar{C}_T (0.908 F_{T-B} + 0.092 F_{T-C})}{275} \quad (6)$$

$F_R$  and  $F_T$  indicate the equilibrium factors for the radon and thoron progeny respectively, and  $F_{R-A} = \frac{C_{R-A}}{C_R}$  etc.

are the activity fractions of radon progeny. The inhalation dose rates in  $\text{mSv y}^{-1}$  were calculated assuming 7000 hours in indoors by [UNSCEAR 2000; Mayya et al 1998]:

$$D = 7000 \times 10^{-6} [(0.17 + 9 F_R) C_R + (0.11 + 32 F_T) \bar{C}_T] \quad (7)$$

## RESULTS AND DISCUSSION

The results for indoor  $^{222}\text{Rn}$ ,  $^{220}\text{Rn}$ , progenies, equilibrium factors and inhalation dose rates with geometric mean values (GM) are shown in Table 1. For this study 40 dwellings were selected during the winter season. The variations of indoor radon concentrations, thoron concentrations and inhalation dose rates with construction types are presented in Figures 1-3. It has been found that the obtained values varied considerably with different construction types. The results as obtained in this study show that the indoor radon concentrations, radon progeny levels and equilibrium factors for radon were higher than the corresponding thoron concentrations, thoron progeny levels and equilibrium factors for thoron. The obtained radon concentrations varied from 121.6-210.0 Bq/ $\text{m}^3$  (GM: 162.9 Bq/ $\text{m}^3$ ) while thoron concentrations varied from 52.5-101.3 Bq/ $\text{m}^3$  (GM: 78.7 Bq/ $\text{m}^3$ ). Assam Type houses (cemented floors, bamboo walls with plaster and tin roofs; house nos. 1-20) showed comparatively maximum values than Mud houses (with mud floor; house nos. 31-40) and RCC houses (reinforced cement house; house nos. 21-30). Ventilation conditions were observed to be poorer in the rooms of the dwellings where obtained values were higher. And dwellers were advised to increase ventilations. The

results as obtained in this study show that the mean radon values for all types of houses (Fig. 1) were lower than the recommended lower reference level, i.e., 200 Bq/m<sup>3</sup> of ICRP [1]. The variations of gas progeny levels corresponded to the same trend of variations as that of their parent gases. The estimated equilibrium factors did not vary much as reported earlier and the values are comparable with the values reported earlier in Indian dwellings as well as with the global equilibrium factors for 0.38 and 0.09 for radon and thoron progenies respectively [Barooah et al 2014]. It has been found that the inhalation dose rates varied from house-to-house with GM values of 5.2, 4.0 and 3.8 mSv/y for AT, RCC and Mud houses respectively. This pattern of variations of inhalation dose rates in different houses may be attributed to the trend of variations of parent radionuclides in the respective houses. The variations in values among dwellings may also be attributed to different levels of radioactive elements, viz. uranium and thorium in the soil, bedrock and building materials and their exhalations into indoor environs. Nevertheless, it has been estimated that all obtained inhalation dose rates are below the upper reference level of 10 mSv as per ICRP [1].

**Table-1: <sup>222</sup>Rn and <sup>220</sup>Rn concentrations (C<sub>R</sub> and C<sub>T</sub>), <sup>222</sup>Rn and <sup>220</sup>Rn progeny levels (WL<sub>R</sub> and WL<sub>T</sub>), equilibrium factors for <sup>222</sup>Rn and <sup>220</sup>Rn progeny (F<sub>R</sub> and F<sub>T</sub>) and inhalation dose rates (E)**

House no.	C <sub>R</sub> (Bq/m <sup>3</sup> )	C <sub>T</sub> (Bq/m <sup>3</sup> )	WL <sub>R</sub> (mWL)	WL <sub>T</sub> (mWL)	F <sub>R</sub>	F <sub>T</sub>	E (mSv/y)
1	154.2	83.1	16.7	14.9	0.40	0.05	5.1
2	156.8	71.9	19.0	16.5	0.45	0.06	5.7
3	162.1	101.3	15.2	13.7	0.35	0.04	4.7
4	209.0	85.0	17.3	9.4	0.31	0.03	4.9
5	175.3	79.4	12.5	6.9	0.27	0.02	3.6
6	157.9	61.9	21.9	20.0	0.51	0.09	6.6
7	155.8	52.5	16.7	9.2	0.40	0.05	4.7
8	181.1	59.4	19.4	10.5	0.40	0.05	5.4
9	164.7	76.9	17.0	12.6	0.38	0.05	5.0
10	177.9	74.4	24.6	24.0	0.51	0.09	7.5
11	173.2	68.8	23.7	21.5	0.51	0.09	7.1
12	167.9	81.3	20.8	19.6	0.46	0.07	6.3
13	174.7	62.5	20.2	12.9	0.43	0.06	5.8
14	170.0	76.3	16.7	11.3	0.36	0.04	4.9
15	202.1	96.3	14.2	8.2	0.26	0.02	4.1
16	191.1	63.1	15.7	6.9	0.30	0.03	4.4
17	160.5	80.0	15.9	12.1	0.37	0.04	4.7
18	158.4	74.4	17.8	14.5	0.42	0.05	5.3
19	165.8	96.3	15.7	13.3	0.35	0.04	4.7
20	166.8	68.8	17.6	11.7	0.39	0.05	5.1
21	210.0	87.5	17.1	9.4	0.30	0.03	4.9
22	170.0	87.5	9.9	5.6	0.22	0.02	2.9
23	198.4	99.4	14.2	8.6	0.26	0.02	4.1
24	196.8	100.0	14.2	8.8	0.23	0.02	4.2
25	167.4	89.4	17.8	15.4	0.39	0.05	5.4
26	125.3	75.0	11.0	9.1	0.33	0.03	3.3
27	121.6	75.0	11.6	10.6	0.35	0.04	3.6
28	168.4	98.1	13.5	10.2	0.30	0.03	4.0
29	166.3	96.3	14.3	11.3	0.32	0.03	4.3
30	173.2	95.6	12.9	8.8	0.28	0.03	3.8
31	179.5	99.4	10.8	6.6	0.22	0.02	3.2
32	121.6	73.1	11.7	10.5	0.34	0.04	3.6
33	124.2	69.4	12.3	10.4	0.34	0.04	3.4
34	130.5	67.5	11.6	8.4	0.33	0.03	3.3
35	132.1	68.8	11.0	7.7	0.31	0.03	3.3
36	156.3	56.3	14.0	7.2	0.34	0.04	3.9
37	169.0	93.8	16.4	13.6	0.36	0.04	4.9
38	192.1	100.0	16.5	11.7	0.32	0.03	4.9
39	126.8	75.0	11.1	9.1	0.32	0.03	3.4
40	132.1	75.0	10.5	7.7	0.29	0.03	3.1
GM	162.9	78.7	15.1	10.9	0.34	0.04	4.5

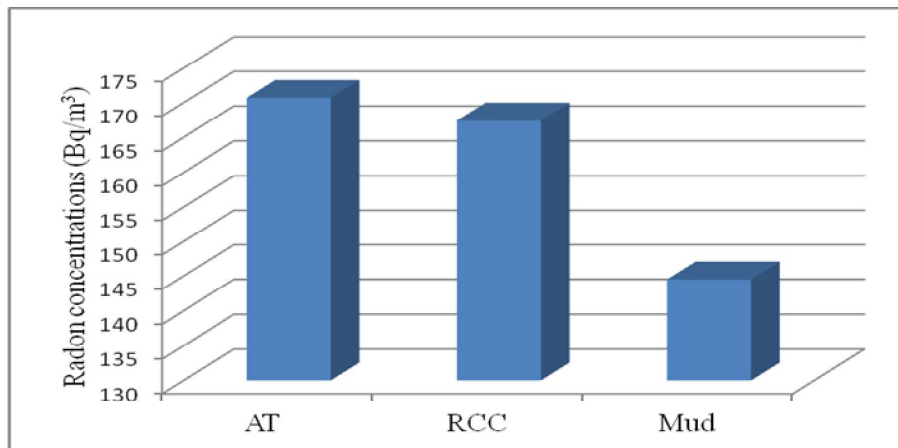


Figure-1: Variations of radon concentrations with different construction types

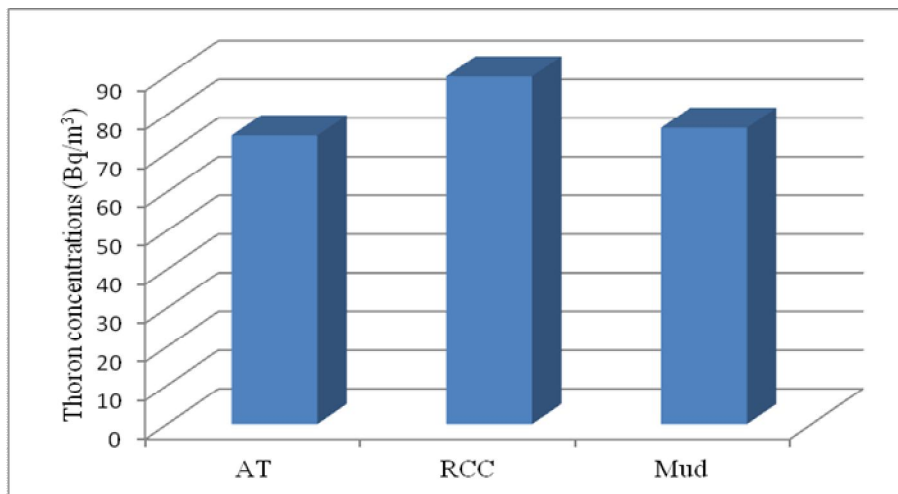


Figure-2: Variations of thoron concentrations with different construction types

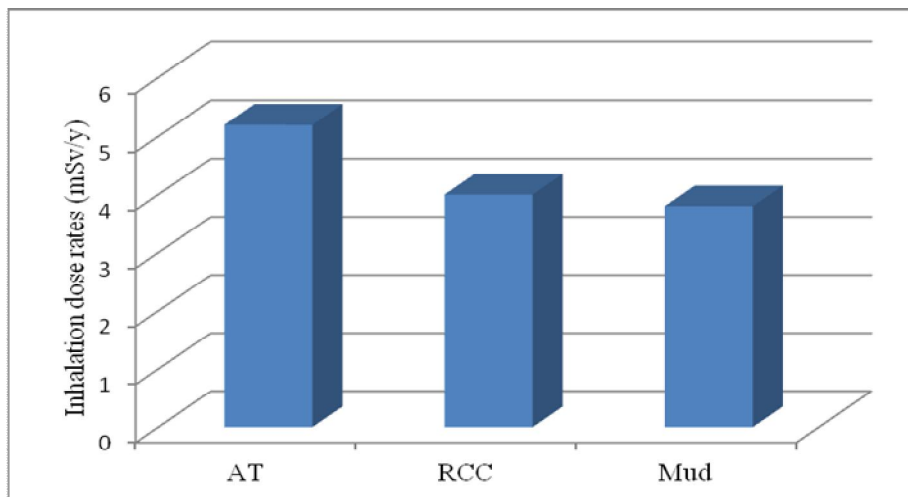


Figure-3: Variations of inhalation dose rates with different construction types

## CONCLUSIONS

The measurements show that the values of the radon/thoron concentrations are lower than the recommended action level ( $200\text{--}300\text{ Bq/m}^3$ ) with three houses marginally above the lower recommended reference level of ICRP [1]. The inhalation dose rates are found to be below than the upper reference level 10 mSV of ICRP [1]. So the dwellings in which the measurements were carried out are supposed to be free from health risks due to inhalation of indoor radon, thoron and their progenies. However, as Guwahati city is ever expanding with multi storied buildings, it would require an extensive study on estimation of indoor radon and thoron concentrations to make a complete assessment of health risks.

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**IMPACT OF MIGRAINE ON HEALTH OF WOMEN DUE TO PHYSICAL HEALTH ASPECTS OF INDIVIDUAL LIFESTYLE**

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**ABSTRACT**

*There are several types of migraine and symptoms vary from person to person. The most common feature of a migraine attack is a persistent one-sided headache. The headache is often accompanied by nausea and vomiting, and may be hypersensitive to light and noise. Migraine attacks can last between 2 and 72 hours, but there are no symptoms between attacks. The exact cause of migraine is not known. However, it is believed that the headache develops as a result of swollen blood vessels in the head pulsating, causing the surrounding nerves to feel pain, while visual disturbances are caused by blood vessels to the eyes contracting. The brain chemical serotonin, whose levels drop during a migraine, is also involved. The research paper concludes the impact of migraine on the health of women due to physical aspects of their individual life. The research work completed by the counselling women visited government hospital for curing migraine.*

*Keywords* Migraine; Throbbing; Physical; Headache; Sensitivity

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**INTRODUCTION**

The common migraine - a term that reflects the disorder's more frequent occurrence in the general population - is not preceded by an aura. Some people do experience a variety of vague symptoms before common migraines - mental fuzziness, mood changes, fatigue, and unusual retention of fluid. During the headache phase of a common migraine, you may have abdominal pain and diarrhea, increased urination, nausea and vomiting. Both classic and common migraines can strike as often as several times a week or rarely as once every few years. A migraine is a very bad headache that tends to recur. [1-4] With a migraine, you may feel nauseated and might vomit. The pain is usually on one side of your head and you may be very sensitive to bright lights and noises. Moving around can make the headache feel worse. There are many forms of migraine headaches. Classic and common are the two major varieties.[5-7]

**MAIN CAUSES OF MIGRAINE**

Doctors think migraines may be caused by a chemical or electrical problem in certain parts of the brain. A key element of a migraine headache is blood flow change in the brain. According to theory, the nervous system responds to a trigger such as stress by creating spasms in the nerve-rich arteries at the base of the brain. [12] The spasms constrict several arteries supplying blood to the brain, including arteries from the scalp and neck. As these arteries constrict, the flow of blood to the brain is reduced. At the same time, platelets clump together and release a chemical called serotonin. Serotonin acts as a powerful constrictor of arteries further reducing blood and oxygen supply to the brain. In reaction to the reduced oxygen supply, certain arteries within the brain dilate to meet the brain's energy needs. Doctor's believe this dilation causes the pain of migraine. [8-14]

Factors affecting the Migraine:

- Some things can trigger a migraine or make it worse. Headache triggers can be things you eat, smell, hear or see.
- Stress and time pressure, major hassles, major losses, anger and conflict.
- Smells and fumes, tobacco smoke, light glare or dazzle, weather changes.
- Monthly periods, birth control pills, estrogen therapy.
- Too much, too little or interrupted sleep.
- Hunger, fasting, specific foods or beverages. (See List 1.)
- Excessive activity.
- Certain medicines may cause migraine. Talk to your provider before you stop taking a medication. (See List 2.)

List 1 - Foods that Might Trigger a Migraine

- Aged Cheese
- Bananas, figs and raisins

- Beer, wine and hard liquor
- Caffeine in coffee, tea and cola, and some over-the-counter medicines, as well as caffeine withdrawal (if you try to give up caffeinated sodas, for example); chocolate
- Dairy products such as ice cream, milk, yogurt, cheese, whipped cream and sour cream
- Fermented and pickled foods such as pickled herring
- Monosodium glutamate (MSG), which is found in Chinese food, Accent seasoning, Lawry's Seasoned Salt, canned soups, TV dinners, processed meats, and some processed nuts and snack chips
- Most citrus fruits like oranges, grapefruit and lemons
- Nuts and peanuts
- Onions
- Pea pods, or pods of lima beans
- Processed meats, deli sandwich meats, hotdogs and other nitrite-containing meats
- Saccharin or aspartame in diet foods or diet sodas and drinks
- Sulfites in shrimp and processed potatoes, like boxed mashed potato mix
- Yeast-containing products, such as fresh breads and donuts

**List 2 - Medicines that Might Trigger a Migraine**

- Cimetidine (brand name: Tagamet)
- Estrogens (including birth control pills)
- Fenfluramine (brand name: Pondimin)
- Indomethacin (brand name: Indocin)
- Nifedipine (brand name: Adalat, Procardia)
- Nitroglycerin (brand name: Nitrostat)
- Pain medicines in general (either overuse or withdrawal from them)
- Reserpine-containing medicines (brand names: Ser-ap-Es, Hydropres, Regroton)
- Theophylline (brand name: TheoDur, Theo-24)

Every person responds differently to treatment. Some people have rare headaches that require little to no treatment. Others require the use of several medications or even occasional hospitalization. Migraine headaches generally represent no significant threat to your overall health. However, they can be chronic, recurrent, frustrating, and they may interfere with your day-to-day life.

Stroke is an extremely rare complication from severe migraines. This risk may be due to prolonged narrowing of the blood vessels, limiting blood flow to parts of the brain for an extended period of time.[14-20]

**RESEARCH METHODOLOGY**

The important developments in our understanding and harnessing the biology of migraine have not diminished the need to consider the psychology of migraine. Psychological treatments especially relaxation training and biofeedback have been well validated as effective in treating frequent migraine. When the frequency and severity of migraine warrants more than analgesics, these treatments are the first line treatment for adults who cannot or do not wish to take abortive or prophylactic medications and for adolescents. The use of psychological interventions to enhance compliance to treatment or treatment effects is an underutilized resource. Psychological measurement is also critical in development and understanding of quality of life scales and the examination of decision-making by patients in taking medication. Modern clinical psychology has much to offer in the study of migraine and the amelioration of suffering from this common problem. Researches found that woman who complained of feeling very tired or extremely tired at the end of work day and who also bear a heavy load of responsibility for taking care of the home, had close to five times the risks for migraine, compared with women with lighter workloads. The most common complications included marital adjustment, occupational stress and sexual satisfaction. It is evident from the review that despite the fact that unexplained migraine is a widespread problem, it has received little attention from gynecologists and psychologists. The review of the studies suggested that both psychological and physiological parameters are related with migraine among women. [21-26]



Mostly research studies have concentrated to study the impact of migraine on the aspects of health:

- Blood pressure vs. Hypertensive,
- Structural disease
- Life style, consulting behaviour and medication
- Major depressive disorder and physical illness
- Role of physical and emotional dimensions
- Cluster headaches
- Relaxing techniques
- Temperature biofeedback and relaxation
- Migraines and lower family income – demographical variable

On the Physical health aspect of health, no study had traceable.

Migraine is very complex and multidimensional problem. Realizing this in the present research work, an attempt has been made to assess the impact of migraine on various aspects of health. The novelty of research lies in the multidimensional approach and also taking of gynae and sexual health, the equally important aspects of health but less researched. The findings of research study will provide additional information on the impact of migraine on psychological, physical, sexual and gynae problems. The physicians health experts and psychologist will be greatly benefited in terms of making complete diagnosis of migraine and also in deciding the line of treatment the patients to be given whether psychological, medical or psycho medical treatment. The success of any research depends upon the selection of an appropriate method and the tools for the study of the problem. Research and the investigations in any field can be of different type's viz. historical research, descriptive research and experimental research (Best 1981). The decision about the method to be employed always depends upon the nature of selected problem and the kind of data necessary for its analysis and solutions. The method selected and tools employed for the problem under investigation should be appropriate feasible, objective, valid and reliable.[27-30]

### LOCALE OF THE STUDY

All the women were taken from the Udaipur and Jaipur cities of Rajasthan. The migraine patients were undertaken with the prior permission of Head of the Unit of the Hospital. There age range from 25 to 45 years.

### SAMPLE

In the present study the sample comprised of 200 women who were purposively selected. Half of them are working and others are non-working similarly half of them are with migraine and rest half of them are without migraine.

The women who were purposively selected then divided into four groups i.e. 50 subjects in each group i.e.. The table shows the distribution of the sample.

**Table – A : Distribution of the Sample**

	Working Status		Total
	Working	Non-working	
<b>Migraine</b>	<b>Group I</b> <b>N =50</b>	<b>Group II</b> <b>N = 50</b>	<b>100</b>
<b>Non-migraine</b>	<b>Group III</b> <b>N =50</b>	<b>Group IV</b> <b>N = 50</b>	<b>100</b>
<b>Total</b>	<b>100</b>	<b>100</b>	<b>200</b>

### RESEARCH DESIGN

**Table – B: Research Design**

Group	Particulars	Testing
I	Working Women with Migraine	Physical Health
II	Working Women without Migraine	
III	Non-working Women with Migraine	
IV	Non-working Women without Migraine	

**PARAMETERS OF THE STUDY****Dependent Variables**

Physical Health

**Independent Variables**

- a. Working Status (Working / Non-working)
- b. Migraine Status (Migraine/ Non Migraine)

**DIAGNOSTIC CRITERIA**

Women registered herself in medicine unit of Govt. Janana Hospital of Udaipur & Jaipur worked as subjects for migraine status and are diagnosis on the basis of medical doctor's report.

**TOOLS EMPLOYED**

The study was conducted with the help of the following instruments:

- a. Background Information Performa – Tool Developed by the first Investigator
- b. Physical Health – Tool developed by the first Investigator

**PROCEDURE OF DATA COLLECTION**

The above psychological tests were administered on the women at their ease availability place. It was done with a view to study psychological changes in a women before, during and after migraine. The tools were given to all four groups i.e Working Women with Migraine, Working Women without Migraine, Non-working Women with Migraine and Non-working Women without Migraine. The migraine patients were contacted in the Hospital, separate room was provided by the Doctor to collect the necessary data for research. Adequate rapport was established with every women before initiating the work of the data collection. It was more indispensable as the information required was highly personal and confidential in nature. Investigator also explained about some question asked by subjects to get correct response. Each women was assured of keeping the obtained data confidential.

**ANALYSIS OF RESULTS**

The data so obtained through working and non-working women both with and without migraine on physical health were analyzed using mean, S.D., two way analysis of variance and students' 't' test. Bar diagrams are drawn for the pictorial presentation of data.

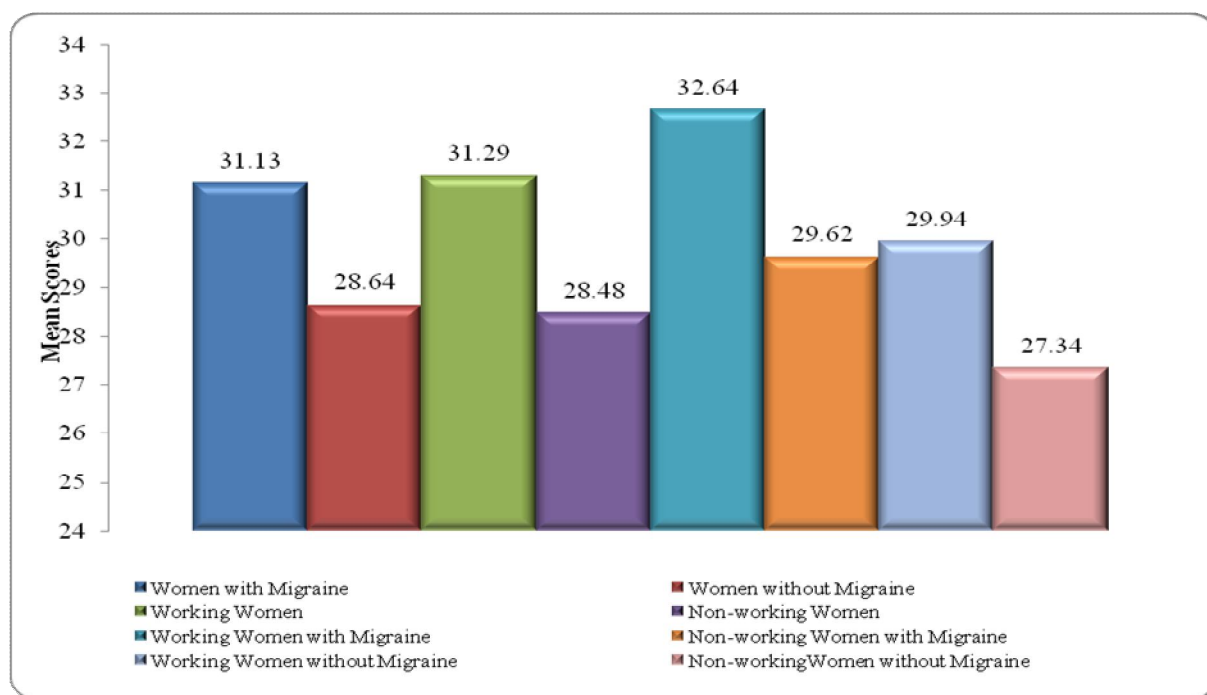
**PHYSICAL HEALTH**

Table 1.1 & Graph 1.1 showing mean, SD scores of study groups on Physical Health.

**Table 1.1: Mean and S.D. Scores of Study Groups on Physical Health**

Groups	Mean	S.D.	N	Category
Women with Migraine	31.13	2.62	100	Poor
Women without migraine	28.64	2.12	100	Average
Working Women	31.29	2.10	100	Poor
Non-working Women	28.48	2.47	100	Average
Working Women with Migraine	32.64	1.55	50	Poor
Non-working Women with Migraine	29.62	2.61	50	Poor
Working Women without migraine	29.94	1.66	50	Poor
Non-Working Women without migraine	27.34	1.69	50	Average

Table 1.1 shows that mean scores of women with migraine on Physical Health is 31.13 which shows poor Physical Health. Women without migraine possess mean scores 28.64 which shows average level of Physical Health. Total working women found to be with mean scores 31.29 which reflects poor Physical Health while non-working women have mean scores 28.48 and it shows average Physical Health. Working women with migraine have mean scores 32.64 which shows average physical health. Mean scores of Non-working women with migraine are found to be 29.62, which infers poor Physical Health. Working women without migraine have mean scores 29.94 which shows poor Physical Health. Non-working women without migraine have mean scores 27.34 which shows average Physical Health.



**Graph 1.1 Graph showing Mean Scores of Study Groups on Physical Health**

Table 1.2 shows analysis of variance to see the effect of Migraine Status, Working Status and their interaction on Physical Health.

**Table 1.2: Analysis of Variance on Physical Health**

Source	SS	df	MS	F
Migraine Status	310.01	1	310.01	83.77*
Working Status	394.81	1	394.81	106.68*
Interaction	2.21	1	2.21	0.59
Residual	725.34	196	3.70	
Total	1432.36	199		

\* significant at 0.01 level

Table 1.2 shows the significant effect of migraine status at 0.01 level on Physical Health of women. Table also interprets that there is a significant effect of working status (Working & Non-working)) at 0.01 level on physical health. The interaction effect is found insignificant.

Table 1.2 shows t values to compare mean scores of study groups namely (Women with Migraine Vs Women with Non-migraine; Working Women Vs Non-working Women; Working Women with migraine Vs Non-working Women with Migraine; Working Women with Non-migraine Vs Non Working Women with Non-Migraine; Working Women with Migraine Vs Working Women with Non-migraine & Non-working Women with Migraine Vs Non-working Women with non-migraine on Physical Health.

**Table 1.3: t-values to Compare Mean Scores of Study Groups on Physical Health**

Groups	Mean	S.D.	N	Mean Diff	Df	t - value
Women with Migraine	31.13	2.62	100	2.49	198	7.40*
Women without migraine	28.64	2.12	100			
Working Women	31.29	2.10	100	2.81	198	8.68*
Non-working Women	28.48	2.47	100			
Working Women with Migraine	32.64	1.55	50	3.02	98	7.04*
Non-working Women with Migraine	29.62	2.61	50			
Working Women without migraine	29.94	1.66	50	2.60	98	7.77*

<b>Non-Working Women without migraine</b>	27.34	1.69	50			
<b>Working Women with Migraine</b>	32.64	1.55	50	2.70	98	8.41*
<b>Working Women without migraine</b>	29.94	1.66	50			
<b>Non-working Women with Migraine</b>	29.62	2.61	50	2.28	98	5.19*
<b>Non-Working Women without migraine</b>	27.34	1.69	50			

\* significant at 0.01 level

Table 1.3 shows that Physical Health of Women with Migraine differs significantly at 0.01 level from women without migraine. Mean Scores infer that Women with Migraine have poorer Physical Health in comparison to women without migraine.

Table 1.3 presents that Physical Health of working women differs significantly at 0.01 level from Non-working Women. Mean scores infer that working women have poorer Physical Health in comparison to non-working women.

Table 1.3 reflects that Physical Health of working women with migraine differs significantly at 0.01 level from non-working women with migraine. Mean scores infer that working women with migraine have slightly poorer Physical Health in comparison to non-working women with migraine.

Table 1.3 shows that Physical Health of working women without migraine differs significantly at 0.01 level from non-working women without migraine. Mean scores shows that working women without migraine have slightly poorer Physical Health in comparison to non-working women without migraine.

Table 1.3 shows that Physical Health of working women with migraine differs significantly at 0.01 level from working women without migraine. Mean scores suggest that working women with migraine have slightly poorer Physical Health in comparison to working women without migraine.

Table 1.3 shows that Physical Health of non-working women with migraine differs significantly at 0.01 level from non-working women without migraine. Mean scores suggest that non-working women with migraine have slightly poorer Physical Health in comparison to non-working women without migraine.

## CONCLUSION

Results conclude that mean scores of Women with migraine on Physical Health shows poor Physical Health while Women without migraine possess average level of Physical Health.

Total Working women found to be with poor Physical Health while total Non-working women are with average Physical Health. Working women with migraine have average physical health while Non-working women with migraine are with poor Physical Health. Working women without migraine shows poor Physical Health while Non-working women without migraine shows average Physical Health.

There is significant effect of migraine status at 0.01 level on Physical Health of Women. Results also interprets that there is a significant effect of Working status (Working & Non-Working)) at 0.01 level on physical health. The interaction effect is found insignificant. The Physical Health of Women with Migraine differs significantly at 0.01 level from Women without migraine. Mean Scores infer that Women with Migraine have poorer Physical Health in comparison to Women without migraine. The Physical Health of Working women differs significantly at 0.01 level from Non-working women. Mean scores infer that Working women have poorer Physical Health in comparison to Non-working women. The Physical Health of Working women with migraine differs significantly at 0.01 level from Non-working women with migraine. Mean scores infer that Working women with migraine have slightly poorer Physical Health in comparison to Non-working women with migraine.

The Physical Health of Working women without migraine differs significantly at 0.01 level from Non-working women without migraine. Mean scores shows that Working women without migraine have slightly poorer Physical Health in comparison to Non-working women without migraine.

The Physical Health of Working women with migraine differs significantly at 0.01 level from Working women without migraine. Mean scores suggest that Working women with migraine have slightly poorer Physical Health in comparison to Working women without migraine.

The Physical Health of Non-working women with migraine differs significantly at 0.01 level from Non-working women without migraine. Mean scores suggest that Non-working women with migraine have slightly poorer Physical Health in comparison to Non-working women without migraine.

## RESULT & DISCUSSION

Results conclude that mean scores of Women with migraine on Physical Health shows poor Physical Health while Women without migraine possess average level of Physical Health. It may be due to that women with migraine have feeling of physically unfit while in contrast women without migraine have a feeling of physically fitness having optimum level of endurance, agility and power to meet out routine manifestations. Total Working women found to be with poor Physical Health while total Non-working women are with average Physical Health. It may be due to that working women has less time to take rest because of over burden of domestic and official work.

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SYNTHESIS AND CHARACTERIZATION OF A SERIES OF BIOLOGICALLY ACTIVE TRANSITION METAL COMPLEXES INCORPORATING TRIDENTATE *ONO* DONOR HYDRAZONE LIGAND

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## ABSTRACT

A new acid hydrazone( $H_2L$ ) derived from the condensation of 2-hydroxy-5-methylacetophenone and salicylhydrazide and its metal complexes of Mn(II), Co(II), Ni(II), Cu(II), Ti(III), Cr(III), Fe(III), Zr(IV) and  $UO_2(VI)$  have been prepared. Their structures have been elucidated on the basis of elemental analyses, magnetic moment, spectral (IR and electronic), powder X-ray diffraction and thermogravimetric analysis (TG). The analytical data indicate 1:1 (metal: ligand) stoichiometry for all complexes. The powder X-ray diffraction suggests orthorhombic crystal system for Cu(II) complex. The complexes exhibit an octahedral geometry around the metal centre except Cu(II) ion. Cu(II) complex shows square planar geometry. The IR spectral data suggest that the ligand behaves as tridentate with ONO donor atoms sequence towards central metal ion. Electrical conductivity of the complexes was measured in their compressed pellet form and showed their semiconducting nature over a studied range of temperature. Thermal behaviour of complexes was studied using TG and data have been analyzed for kinetic parameters by Horowitz–Metzger method. The ligand and its complexes were also screened for their antibacterial activity against *E. coli*, *S. typhi*, *P. aeruginosa* and *S. aureus* bacterial strains by disc diffusion method.

Keywords: Acid hydrazine, TGA, Biological Activity, Powder XRD.

## INTRODUCTION

The Schiff base metal complexes are in a field of coordination chemistry with increasing interest. These compounds have played a major role in the development of the inorganic chemistry due to easily excellent chelating properties, diversity of structural features and providing the effects of steric interactions on coordination geometry. Hydrazone Schiff bases have received a renewed attention in recent years because of their biological importance such as antimicrobial, antituberculosis, and antitumor activities [1–5]. The coordination compounds of hydrazones have been reported as enzyme inhibitors [6]. The metal complexes of hydrazones are also have been reported as potent inhibitors of DNA synthesis [7]. To the best of our knowledge, reports of substituted acetophenone hydrazones are scarce. Therefore, it is interesting to study complexes of hydrazone Schiff base ligands. In present work, we report the results of our study of 2-hydroxy-1-(2-hydroxy-5-methylphenyl)ethylidene]benzohydrazide and its Mn(II), Co(II), Ni(II), Cu(II), Ti(III), Cr(III), Fe(III), Zr(IV) and  $UO_2(VI)$  complexes.

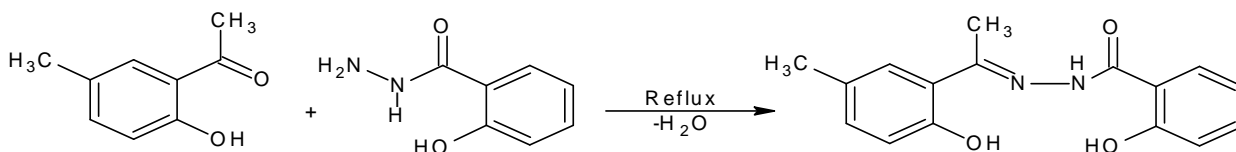
## MATERIALS AND METHODS

All the chemicals used as starting materials for the synthesis of the ligand and its metal complexes were of AR grade or chemically pure purchased from Qualigens Chemicals. Solvents were purified and dried before the use by the literature methods. Zirconium (IV) acetate was prepared by the known method [8]. Carbon, hydrogen and nitrogen were estimated on a Carlo Erba 1108 C–H–N–S analyzer. The infrared spectra of the ligand and its complexes were scanned in the region  $4000\text{--}400\text{ cm}^{-1}$  in KBr pellets on a Perkin Elmer RX–I spectrophotometer. The  $^1\text{H}$ –NMR spectrum of the synthesized ligand was recorded using the mixture of deuterated chloroform and dimethyl sulfoxide and TMS as an internal standard on a Bruker DRX–300 NMR Spectrophotometer. The magnetic susceptibility measurements of the metal complexes were carried out by Gouy method at room temperature using mercury(II) tetrathiocyanatocobalt(II),  $\text{Hg}[\text{Co}(\text{SCN})_4]$  as the calibrant. Thermogravimetric analysis of the complexes was carried out to study their thermal stabilities. For this a simple manually operated thermobalance set up in our laboratory was used using 50–60 mg sample and temperature upto  $700^\circ\text{C}$  in air atmosphere. The balance used was Adico–80 having the sensitivity of 0.01 mg. The TG instrument was calibrated by using sample of copper(II) sulphate pentahydrate from room temperature to  $700^\circ\text{C}$  at a heating rate of  $\sim 10^\circ\text{C min}^{-1}$ . The antimicrobial activity of the ligand and its complexes was studied by the disc diffusion method against *E. coli*, *S. typhi*, *P. aeruginosa* and *S. aureus*. The media used were nutrient agar and nutrient broth. The plates were inoculated with 24 h cultures. The compounds were tested at a concentration of 500 ppm in DMSO by measuring the zone of inhibition of growth of the microorganisms in millimeter. Electrical conductivity measurements were obtained on the samples in the form of pellets ( $\sim 2\text{--}3\text{ mm}$  thick and 12 mm diameter) at a pressure of  $3\text{ tons cm}^{-2}$ . The surface of each sample was covered by a layer of silver foil, then was held between two copper electrodes and inserted with a holder vertically into a cylindrical electrical

furnace. The potential across the heater was varied gradually through a varied gradually through a varied transformer to produce a slow rate of increase of temperature measurements. The resistance of samples as a function of temperature was measured in the temperature range (313-403 K) using Zentech electrometer. The temperature was measured by NiCr–NiAl thermocouple.

### SYNTHESIS OF LIGAND

A stirred hot ethanolic solution of salicylhydrazide (3.04 g, 0.02 mol) (25 ml) was added to a solution of 2-hydroxy-5-methyl-3-nitroacetophenone (3 g, 0.02 mol) hot ethanol (25 ml). The reaction mixture was refluxed while stirring on a water bath for 5 h. The reaction mixture was then allowed to cool to room temperature overnight. On cooling the reactant media a yellow colored product was separated out. It was filtered off, washed with hot ethanol, diethyl ether followed by recrystallization from DMF and finally dried over vacuo. Yield 68%, m.p. 282°C. (Found: C, 66.68; H, 5.49; N, 9.77 % – Calcd.: C, 67.59; H, 5.67; N, 9.85%);  $\delta$  2.27 (3H, s, Ar-CH<sub>3</sub>); 2.42 (3H, s, -CH<sub>3</sub>, imine); 6.80–7.99 (7H, m, aromatic proton); 11.50 (1H, s, OH); 11.73 (1H, s, -NH); 12.88 ppm (1H, s, OH).



### SYNTHESIS OF METAL COMPLEXES

Mn(II), Co(II), Ni(II), Cu(II), Ti(III), Cr(III) and Fe(III) complexes were prepared by using their metal chlorides while for the synthesis of UO<sub>2</sub>(VI) complex, uranyl nitrate hexahydrate was used. All the complexes were synthesized using the following general procedure. Equimolar quantities of appropriate metal salt and ligand were dissolved separately in minimum quantity of hot methanol and DMF (40:60 v/v). Both the solutions were filtered and mixed in hot conditions with continuous stirring. The resulting reaction mixture was digested/refluxed on a sand bath for suitable time. In case of Zr(IV) complex, zirconyloxochloride octahydrate (0.64 g, 0.002 mol) was dissolved in methanol (15 ml) and to this a methanolic solution of anhydrous sodium acetate (0.32 g, 0.004 mol in 15 ml) was added and stirred for 5 min. The separated sodium chloride was filtered off. The ligand was dissolved in minimum quantity of hot DMF. To this solution, the solution containing oxozirconium(IV) diacetate was added with continuous stirring and the mixture was refluxed on a sand bath for suitable time. The colored complexes obtained with different metal salts were filtered and washed with methanol, DMF and finally with petroleum ether to remove unreacted ligand. The products were dried in air at room temperature and stored in desiccators over calcium chloride.

### RESULTS AND DISCUSSIONS

All the complexes are colored solids, air and moisture stable for an extended period of time and decompose at high temperature. The complexes were found to be insoluble in water and in most of the organic solvents except DMF and DMSO. The physical and electrical conductivity data of the compounds are summarized in Table 1. From the analytical data, the stoichiometry of the complexes was 1: 1 (metal: ligand).

### INFRARED SPECTRA

The IR spectra of the complexes are compared with the parent ligand in order to determine the coordination sites that may be involved in chelation. The ligand shows a medium broad band at 2913 cm<sup>-1</sup> due to  $\nu(\text{OH})$  vibrations, lowering of the band may be due to the presence of intramolecular hydrogen bonding between phenolic hydrogen and azomethine nitrogen atoms [9]. The other bands at 3217, 1678, 1645 and 1278 cm<sup>-1</sup> are assignable to  $\nu(\text{N-H})$ ,  $\nu(\text{C=O})$ ,  $\nu(\text{C=N})$  and  $\nu(\text{C-O})$  (phenolic) respectively. The absence of  $\nu(\text{OH})$  band in the complexes indicates deprotonation of the phenolic group and coordination of oxygen atom to the metal ion, which is further supported by the appearance of a band due to  $\nu(\text{C-O})$  phenolic at higher frequency (06–24 cm<sup>-1</sup>) which indicates coordination of ligand to metal atoms by the oxygen of the hydroxyl group. This shift to higher energy is expected due to maintenance of ring currents arising from delocalization in the chelate ring. On complexation  $\nu(\text{C=N})$  band is shifted to lower wave number (08–36 cm<sup>-1</sup>) with respect to free ligand indicating the coordination of azomethine nitrogen in the metal ion [10]. The coordination of the phenolic hydrogen and azomethine nitrogen is further supported by the appearance of non ligand band at 502–512 and 455–498 cm<sup>-1</sup> due to  $\nu(\text{M-O})$  and  $\nu(\text{M-N})$  stretching vibrations respectively [11]. The downward shift in  $\nu(\text{C=O})$  band by 12–18 cm<sup>-1</sup> in the spectra of Ti(III), Cr(III) and Fe(III) complexes, indicates the involvement of carbonyl oxygen in the complex formation. The spectra of Mn(II), Co(II), Ni(II), Cu(II), Zr(IV) and UO<sub>2</sub>(VI) complexes do not show any bands due to  $\nu(\text{N-H})$  and  $\nu(\text{C=O})$  frequencies indicating the coordination of ligand to metal in



its enol formed through the enolic carbonyl oxygen [12, 13]. The above facts reveal that ligand behaves as dibasic tridentate in Mn(II), Co(II), Ni(II), Cu(II), Zr(IV) and UO<sub>2</sub>(VI) and monobasic tridentate in Ti(III), Cr(III) and Fe(III) complexes. The coordination of H<sub>2</sub>O in the Mn(II), Co(II), Ni(II), Ti(III), Cr(III) and Fe(III) complexes is indicated by the appearance of bands at 3210–3394, 1516–1536 and 813–842 assignable to  $\nu(\text{OH})$ ,  $\delta(\text{H}_2\text{O})$  and  $\rho\omega(\text{H}_2\text{O})$  respectively. The spectra of UO<sub>2</sub>(VI) complex  $\sim 984\text{ cm}^{-1}$  indicating presence of methanol group. Additional band at  $908\text{ cm}^{-1}$  in the spectra of UO<sub>2</sub>(VI) complex may assigned to  $\nu_{\text{asy}}(\text{O}=\text{U}=\text{O})$  modes [14].

### ELECTRONIC SPECTRA AND MAGNETIC PROPERTIES

The Mn(II) complex shows three bands in the range 17152, 23094 and  $26595\text{ cm}^{-1}$ . These bands may be assigned to  ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{1g}({}^4\text{G})$ ,  ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{2g}({}^4\text{G})$ ,  ${}^6\text{A}_{1g} \rightarrow {}^4\text{E}_g$  transitions respectively, corresponding to octahedral environment around the Mn(II) ion [15,16]. The magnetic moment value observed for the Mn(II) complex is 5.94 B.M., which is suggestive of high spin arrangement of five unpaired electrons one in each d-orbital. The Co(II) complex shows three peaks around 10787, 16339 and  $24096\text{ cm}^{-1}$ , which are assigned to  ${}^4\text{T}_{1g}(\text{F}) \rightarrow {}^4\text{T}_{2g}(\text{F})$  and  ${}^4\text{T}_{1g}(\text{F}) \rightarrow {}^4\text{T}_{1g}(\text{P})$  and  ${}^4\text{T}_{1g}(\text{F}) \rightarrow {}^4\text{A}_{2g}(\text{F})$  transitions, respectively and the position of the bands indicates an octahedral structure. The interelectronic repulsion parameter B for the present Co(II) complex is lower than free ion value (B') of  $971\text{ cm}^{-1}$ , which indicates orbital overlap and delocalization of d-orbitals. Co(II) complex is found to have magnetic moment value 4.83 B.M., which characterizes high-spin octahedral type. The electronic spectra Ni(II) of complex shows three bands in the range 10638, 17182 and  $25575\text{ cm}^{-1}$  corresponding to  ${}^3\text{A}_{2g}(\text{F}) \rightarrow {}^3\text{T}_{2g}(\text{F})$ ,  ${}^3\text{A}_{2g}(\text{F}) \rightarrow {}^3\text{T}_{1g}(\text{F})$  and  ${}^3\text{A}_{2g}(\text{P}) \rightarrow {}^3\text{T}_{1g}(\text{P})$  transitions respectively, suggesting octahedral geometry around Ni(II) ion [17]. The Racah interelectronic repulsion parameter  $\beta$  observed is lower than the Ni(II) free ion value which indicates the covalent character in the metal-ligand bonds. The ratio  $\nu_2/\nu_1$  is found to be 1.61, which is in the range of the octahedral Ni(II) chelates. The magnetic moment value for Ni(II) complex is observed to be 3.12 B.M. which suggests an octahedral geometry around the metal ion. The Cu(II) complex exhibits three bands at 15313, 16920 and  $20283\text{ cm}^{-1}$  in their normally expected region for square planar Cu(II) complexes [18]. These bands are assigned as  ${}^2\text{B}_{1g} \rightarrow {}^2\text{A}_{1g}$ ,  ${}^2\text{B}_{1g} \rightarrow {}^2\text{E}_g$  and charge transfer transitions, respectively. Magnetic moment value of Cu(II) complex is 1.27 B.M. This subnormal value of magnetic moment may be due metal-metal interaction in dimeric structure. The electronic spectra of Ti(III) complex shows a broad band at  $18621\text{ cm}^{-1}$  which may be assigned to  ${}^2\text{T}_{2g} \rightarrow {}^2\text{E}_g$  transition towards octahedral geometry around the Ti(III) ion. The magnetic moment value of Ti(III) complex is found to be close to the spin-only value of 1.59 B.M. corresponding to one unpaired electron in an octahedral environment. The electronic spectra of present Cr(III) in the present study exhibited characteristic three bands. The lower energy band  $17985\text{ cm}^{-1}$  ( $\nu_1$ ) which may be assigned to transition  ${}^4\text{A}_{2g}(\text{F}) \rightarrow {}^4\text{T}_{2g}(\text{F})$ . The other bands at  $24451\text{ cm}^{-1}$  ( $\nu_2$ ) and  $40648\text{ cm}^{-1}$  ( $\nu_3$ ) are due to  ${}^4\text{A}_{2g}(\text{F}) \rightarrow {}^4\text{T}_{1g}(\text{F})$  and  ${}^4\text{A}_{2g}(\text{F}) \rightarrow {}^4\text{T}_{1g}(\text{P})$  transitions respectively. The Racah interelectronic repulsion parameter 'B' is found to be lower than the free ion value ( $920\text{ cm}^{-1}$ ) suggesting delocalization of electron on metal into molecular orbital covering both the metal and the ligand [19] i.e. the appreciable covalent character in the metal ligand bond. The  $\nu_2/\nu_1$  is found to be 1.36 which is very close to the value of 1.42 obtained for pure octahedral Cr(III) complexes [19, 20, 21]. The complex exhibits magnetic moment value at 3.92 B.M. which is expected to be normal moment for  $d^3$  octahedral complexes at room temperature [22]. Fe(III) complex shows three bands at 13908, 17853 and  $23094\text{ cm}^{-1}$  which may be assigned to  ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{1g}(\text{G})$ ,  ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{2g}(\text{G})$  and  ${}^6\text{A}_{1g} \rightarrow {}^4\text{E}_g$ ,  ${}^4\text{T}_{1g}(\text{G})$ , transitions, respectively for octahedral geometry around Fe(III) ion [23,24]. At room temperature the magnetic moment value of the Fe(III) complex is found to be 5.87 B.M. close to 5.92 B.M. indicating high spin state of the complex. The Zr(IV) complex under study is found to be diamagnetic as expected in accordance with the  $d^0$  configuration of Zr(IV) ion. The room temperature magnetic measurements suggest that the UO<sub>2</sub>(VI) complexes is diamagnetic as expected for  $f^0$  system [25]. The solid state reflectance of UO<sub>2</sub>(VI) complexes exhibit an electronic spectral band at  $22000\text{ cm}^{-1}$  corresponding to  $\Sigma_g^+ \rightarrow {}^3\pi_u$  transition typically O=U=O symmetric stretch frequency [26].

### POWDER XRD STUDY

The X-ray diffraction powder diagram was obtained from 6 to  $54^\circ$  with a graphite monochromator crystal and Cu-K $\alpha$  radiation. Parameters of crystal lattice were determined using a set of programs, called PowdMult 2.3, which are based on least-squares approach. Cu(II) complex belong to the orthorhombic crystalline system and the parameters are:  $a = 12.50\text{ \AA}$ ,  $b = 14.31\text{ \AA}$  and  $c = 09.04\text{ \AA}$ .

### THERMOGRAVIMETRIC ANALYSIS

Horowitz-Metzger method was used to calculate the kinetic parameters of the ligand and its complexes from their thermograms. All the complexes show a gradual weight loss indicating decomposition by fragmentation

with increase in temperature. A careful analysis of the thermograms of Mn(II), Co(II), Ni(II), Ti(III), Cr(III) and Fe(III) complexes indicate that they are stable upto 82°C and are decomposed in three stages whereas Cu(II), Zr(IV) and UO<sub>2</sub>(VI) complexes are decomposed in two steps. Elimination of coordinated water molecules takes place in the first step; a part of ligand decomposed in the second stage and complete decomposition of the ligand followed by oxidation-reduction reaction leading to the formation of respective metal oxides in the last stage. The Mn(II), Co(II), Ni(II), Ti(III), Cr(III) and Fe(III), complexes lose their weights in the temperature range 150–220°C corresponding to the loss of four coordinated water molecules for Mn(II) and Co(II), three coordinated water molecule for Ni(II) and one coordinated water molecule for Ti(III), Cr(III) and Fe(III) complexes [27]. [% wt. loss, obs./calcd. Mn(II) : 8.71/8.57; Co(II): 8.59/8.48; Ni(II): 13.83/13.66, Ti(III) : 4.41/4.28; Cr(III) : 4.38/4.24; Fe(III) : 4.37/4.20]. The ligand and Cu(II), Zr(IV) and UO<sub>2</sub>(VI) complexes decompose in two stages. The thermograms of these compounds show no weight change upto 150–220°C revealing the absence of any water molecules in them. The continuous and rapid weight loss has been observed above 280°C corresponding to thermal degradation of free part of the coordinated ligand along with the other groups present there in. A gradual weight loss above ~450°C corresponding to the degradation of actual coordination moiety of the ligand. Finally, the horizontal nature of the curve beyond 650°C suggests the formation of final decomposition product with residue corresponding to the metal oxide [% residue, obs./calcd. Mn<sub>3</sub>O<sub>4</sub>: 20.12/ 20.43; Co<sub>3</sub>O<sub>4</sub>: 21.39/ 21.27; NiO: 18.78/ 18.90; CuO: 23.72/ 23.43; TiO<sub>2</sub>: 19.22/19.01; Cr<sub>2</sub>O<sub>3</sub>: 18.04/17.91; Fe<sub>2</sub>O<sub>3</sub>: 18.74/18.65; ZrO<sub>2</sub>: 27.98/28.03; and U<sub>3</sub>O<sub>8</sub>: 48.21/48.03] of the respective metal complexes. The kinetic parameters calculated for the compounds are given in Table 2. The activation energies of decomposition are found in the range 11.35–57.36 kJmol<sup>-1</sup>. There is no definite trend in the values of Ea. The negative values of ΔS indicate a more ordered activated state that may be possible through the chemisorptions of oxygen and other decomposition products. The more ordered nature may be due to the polarization of bonds in activated state which might happen through charge transfer of electronic transitions.

### ELECTRICAL CONDUCTIVITY

The solid state electrical conductivity of the complexes in their compressed pellet form was measured by two probe method over a wide range of temperature i.e. room temperature to 403 K. The temperature dependence of electrical conductivity values are shown in Table 1. A plot of log σ vs 1/T obeys the equation  $\sigma = \sigma_0 \exp(-E_a/kT)$  where the symbols have their usual meanings [28]. Linear dependence of log σ vs 1/T was observed, which suggests the semiconducting behavior of the chelates [29]. Electrical conductivity of these chelates lies in the range  $6.16 \times 10^{-12}$  to  $1.51 \times 10^{-08} \Omega^{-1} \text{cm}^{-1}$ . The activation energy of conduction of these complexes was found to be in the range 0.145–0.295 eV.

### ANTIBACTERIAL ACTIVITY

The synthesized ligand and its complexes were screened for their antibacterial study. The ligand shows bactericidal behavior against the bacterial strains used. The observations show that the compounds exhibit low to moderate activity (Table no. 3). The ligand and the complexes show less zone of inhibition in case of *S. typhi* and show good biological activity against *S. aureus*. The Ni(II) and Zr(IV) complexes possess good activity against *E. coli* while Cr(III) and Fe(III) complexes are found to be of good activity against *P. aeruginosa*. In general, the results reveal that the activity of the ligand was found to be enhanced on complexation with the metal ions. This is because of the chelation. According to Tweedy's chelation theory [30], the chelation reduces the polarity of the metal atom mainly because of the partial sharing of its positive charge with donor groups and possible π electron delocalisation over the whole ring [31, 32].

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Table-1: Analytical Data of Metal Complexes

Complex	Elemental Analysis % Found (Calcd)				Electrical conductivity $\Omega^{-1} \text{ cm}^{-1}$	Activation Energy (eV)
	C	H	N	M		
[Mn(L)2H <sub>2</sub> O] <sub>2</sub>	51.19 (51.48)	4.58 (4.86)	7.23 (7.51)	14.64 (14.72)	$6.16 \times 10^{-09}$	0.171
[Co(L)2H <sub>2</sub> O] <sub>2</sub>	50.82 (50.94)	4.72 (4.81)	7.30 (7.43)	15.50 (15.62)	$2.04 \times 10^{-10}$	0.239
[Ni(L)3H <sub>2</sub> O]	48.53 (48.65)	5.17 (5.10)	6.98 (7.09)	14.76 (14.84)	$2.69 \times 10^{-10}$	0.237
[Cu(L)] <sub>2</sub>	55.43 (55.57)	3.92 (4.08)	7.97 (8.10)	17.31 (18.37)	$2.51 \times 10^{-11}$	0.295
[Ti(L)Cl <sub>2</sub> H <sub>2</sub> O]	45.58 (45.75)	4.19 (4.08)	6.58 (6.67)	11.08 (11.39)	$1.51 \times 10^{-08}$	0.146
[Cr(L)Cl <sub>2</sub> H <sub>2</sub> O]	45.24 (45.30)	4.12 (4.04)	6.47 (6.60)	12.12 (12.26)	$1.41 \times 10^{-10}$	0.222
[Fe(L)Cl <sub>2</sub> H <sub>2</sub> O]	44.81 (44.89)	3.91 (4.00)	6.42 (6.54)	13.16 (13.05)	$4.67 \times 10^{-09}$	0.265
[Zr(OH) <sub>2</sub> (L)CH <sub>3</sub> OH]	46.32 (46.45)	4.55 (4.69)	6.19 (6.37)	20.60 (20.75)	$1.25 \times 10^{-08}$	0.195
[UO <sub>2</sub> (L)CH <sub>3</sub> OH]	34.86 (34.94)	3.21 (3.10)	4.68 (4.79)	40.65 (40.73)	$6.16 \times 10^{-12}$	0.145

**Table-2: Thermal Decomposition Data of H<sub>2</sub>L Ligand and Its Metal Complexes**

Compound	Activation Energy (E <sub>a</sub> ) (kJmol <sup>-1</sup> )	Frequency factor (Z) (sec <sup>-1</sup> )	Entropy Change (-ΔS) (Jmol <sup>-1</sup> K <sup>-1</sup> )	Free Energy Change (ΔG) (kJmol <sup>-1</sup> )
H <sub>2</sub> L	11.35	20.42	271.6	280.06
[Mn(L)·2H <sub>2</sub> O] <sub>2</sub>	15.69	12.33	276.4	321.14
[Co(L)·2H <sub>2</sub> O] <sub>2</sub>	53.13	60.56	261.9	711.23
[Ni(L)·3H <sub>2</sub> O]	29.28	33.46	268.0	481.10
[Cu(L)] <sub>2</sub>	39.87	40.63	265.1	568.81
[Ti(L)Cl <sub>2</sub> ·H <sub>2</sub> O]	48.51	62.61	261.7	667.78
[Cr(L)Cl <sub>2</sub> ·H <sub>2</sub> O]	40.42	49.04	263.9	584.43
[Fe(L)Cl <sub>2</sub> ·H <sub>2</sub> O]	38.40	41.84	265.7	568.81
[Zr(OH) <sub>2</sub> (L)·CH <sub>3</sub> OH]	57.36	52.90	263.3	756.61
[UO <sub>2</sub> (L)·CH <sub>3</sub> OH]	52.56	54.67	276.7	626.65

**Table-3: Biological Activity of H<sub>2</sub>L Ligand and its Metal Complexes**

Compound	E. coli (mm)	S. typhi (mm)	P. aeruginosa (mm)	S. aureus (mm)
H <sub>2</sub> L	12	11	14	13
[Mn(L)·2H <sub>2</sub> O] <sub>2</sub>	14	13	17	20
[Co(L)·2H <sub>2</sub> O] <sub>2</sub>	15	14	16	16
[Ni(L)·3H <sub>2</sub> O]	17	12	15	19
[Cu(L)] <sub>2</sub>	17	16	18	17
[Ti(L)Cl <sub>2</sub> ·H <sub>2</sub> O]	14	15	16	18
[Cr(L)Cl <sub>2</sub> ·H <sub>2</sub> O]	15	17	19	15
[Fe(L)Cl <sub>2</sub> ·H <sub>2</sub> O]	15	16	19	19
[Zr(OH) <sub>2</sub> (L)·CH <sub>3</sub> OH]	16	13	17	17
[UO <sub>2</sub> (L)·CH <sub>3</sub> OH]	15	12	16	15

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**USE OF THE LIBRARY AND THE INTERNET AS SOURCES OF INFORMATION**

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**ABSTRACT**

*This study was conducted to compare Internet use and library use among students. It was based on the assumption that students use the Internet more than the library. Literature on library and the internet were reviewed. The researcher adopted convenient sampling technique to select the sample for the study. Data was collected using questionnaires. Collected data was statistically analyzed and interpreted using the Statistical Package for the Social Sciences. Findings of the study indicated students do not bypass the library in satisfying their information need. They use both the library and the Internet, although Internet usage was more than the library, hence the Internet was the most preferred source of information. It was recommended that the library should be upgraded to meet recent advancement in research.*

*Keywords: digital information, internet technology, Revolution, document distribution, OPAC*

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**INTRODUCTION**

Today is an information age. Information plays a very important role to the society. Every human being needs information to know what is happening around the nation, one and the world. Information is asked pin pointedly now a days therefore, it must be available at different forms. It is being said that information is a product or commodity which is available in various forms like print, electronic and digital.

An early age users used to visit libraries and information centers for their information needs because they knew it was available in print form only. People were not able to purchase every book therefore; they would go to the libraries and information centers to get they're seeking information. Information generation consumes lot of time, money and energy so it is essential to communicate the newly generated information on time. Information has no value if it does not communicate to the users after its generation. It is said that information can be useful to the users if it reaches to them on time.

In the last few decades the tremendous magnification of internet has transmuted the scenario of libraries and information centers. Now a day's availability of digital information on different format like CDs, audio/video cassette, an early age users used to visit libraries and information centers for their information needs because they kenned it was available in print form only. People were not able to purchase every book therefore; they would go to the libraries and information centers to get they're seeking information. Revolution of information and communication technology (ICT) and the proliferation of internet technology have opened incipient sources of acquiring cognizance.

**WHY USE INTERNET IN LIBRARIES?**

- Internet as an information source due to revolution of information and communication technology, use of internet in libraries and information center to extend local collections to include information sources on the Internet.
- To improve the quality and the productivity of housekeeping operations of the libraries and the information centers.
- Using web browser as the common user interface for integrates different L&I services, local and remote information sources.
- Directly deliver the information to the desktop of the patron of the libraries.
- Get Efficient and correct information.
- Cover entire area local and remote, so all the users of both areas get benefits.
- Better resources sharing between libraries.
- Get full text information pin pointy.
- Dissemination of information quickly.
- Can be digitization, indexing, retrieval over intranets and the internet.

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**ROLE OF INTERNET**

Internet plays a vital role to purchase all germane libraries cognate documents like books, journals and electronic publications. Facilely & efficaciously correspondence with the book publishers, supplier and the bookseller. If libraries relish purchasing books they can place an order through e-mail. We can withal get the catalogue & price proof of books on internet, so can be facilely compare and purchase at cheapest price.

Internet withal avails in culling process of books. Most of the publisher now a day's link their website on the net and availability of their catalogue on the website. Internet has been instrumental in establishing more incipient concepts such as electronic, virtual and digital libraries. These more incipient models are accepted, appreciated and utilized worldwide.

After coming in act of Internet has transmuted the scenario of libraries and the information's centers, it is become supersession for the immensely colossal numbers of reference implements like books, journals, encyclopedia, thesis, projects, dissertations etc.

**In 1995 library association has described Internet as follows**

The Internet consists of the immensely colossal number of links computers networks composing a global network. This is a largely open & free sanctioning user. This communicates with each other for work & recreational purport and for corporate and personal reasons.

**ROLE OF INTERNET IN DISCHARGING LIBRARY FUNCTIONS**

Discharging of library functions the role of internet playing a vital role, entire accommodations of the library from the registration of patron to the document distribution can be managing by the cyber world.

**FOLLOWING ACCOMMODATIONS PROVIDED BY THE CYBER WORLD****Acquisition of Documents**

Now days all the publisher & book seller published their catalogue and the leaflet of incipient publications on their website, through internet libraries can probe the required books, journals & literature from the publisher's website facilely & procure for libraries.

**Technical Processing/Classification & Cataloguing**

Preparing the catalogue and the relegation of the books & document facilely by the cyber world. Through Internet, the libraries can withal provide bibliographical databases via OPACs from libraries of other institutions worldwide. Libraries additionally check the catalogue of other library of the world on internet and WWW.

**Circulation**

Through internet the circulation of documents made facile, after the technical processing of the literature can be placed in the OPAC on the day of acquisition itself, patron of the libraries if they have internet connection on their desktop or from any place of the world can probe and reserve the same without wasting a time within a fraction of time. Libraries additionally provided the bibliographic database of the entire accumulation via OPACs. Reference and Information services

**Communication**

Communication of information and dissemination of the information made easily to the patron of the libraries; when they need the particular information immediately contact the library, through internet libraries search the information in their own collection through OPAC & search worldwide, when they get it communicate the same to the reader through e-mail or transferring the data.

**Resource sharing**

Resource sharing of the documents and other resource/materials also possible due to internet. Libraries can share their resources with other on demand, as and when needs arrival two or more libraries exchange their resources in between on the mutual understanding.

**Inter-Library Loan**

Internet is also play a vital role between the libraries. Through internet inter-library loan made easily, if the patron of one library demand the particular document for their use and the document not available in the library, so library can arrange the particular document from the other library for his members.

**Updating of library website**

If libraries having internet connection they can easily updating their library website time to time for their patron, all the new arrival, notifications, latest information, new journals, books reviews and library related information can be update on the library website, so readers of the library come to know activities of the libraries through the library website.

## CONCLUSIONS

The internet has thus integrated nearly all aspects of the library activities, the librarians can now use the Internet for exploiting the catalogue of the other institutions, ordering books and journals online, participate in ILL, use e-mail, and discuss through list serves, support reference service through remote databases and most important of all establish library/home pages to project their collection and services on the site.

The scope is only limited to the imagination of library professionals. All that is required by the today's professionals is a through understanding of change in concept of librarianship and psychological willingness to look upon the internet and the WWW as an opportunity and respond to the challenges of information resource management and information infrastructure development for harnessing the benefit of the much talked about internet technology in context of the libraries.

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**REMIFICATIONS OF MIGRAINE ON HEALTH OF WOMEN DUE TO PSYCHOLOGICAL ASPECT OF INDIVIDUAL LIFESTYLE**

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**ABSTRACT**

*Migraine headaches are one of the most common types of headache. A migraine headache is a throbbing or pulsating headache that is often one sided (unilateral) and associated with nausea; vomiting; sensitivity to light, sound, and smells; sleep disruption; and depression. Attacks are often recurrent and tend to become less severe as the migraine sufferer ages. A migraine is a type of primary headache that some people get repeatedly over time. Migraines are different from other headaches because they occur with symptoms such as nausea, vomiting, or sensitivity to light. In most people, a throbbing pain is felt only on one side of the head. The psychological aspect of individual of lifestyle assessed in this research paper. The data has been captured from the sick women visited government hospital for treatment of migraine.*

*Keywords: Migraine; throbbing; psychological; headache; sensitivity*

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**INTRODUCTION**

Migraine headache pain is often described as throbbing or pulsating pain that is intensified by routine physical activity, coughing, straining, or lowering the head. The headache is often so severe that it interferes with daily activity and may awaken the person. The attack is debilitating, and migraine sufferers are often left feeling tired and weak once the headache has passed.[1] A migraine headache typically begins in a specific area on one side of the head, then spreads and builds in intensity over 1 to 2 hours and then gradually subsides. It can last up to 24 hours, and in some cases, several days. There may be accompanying symptoms such as nausea, vomiting, sensitivity to light (photophobia), or sensitivity to sound (phonophobia). Hands and feet may feel cold and sweaty and unusual odors may be intolerable. The pain of a classic migraine headache is described as an intense throbbing or pounding felt in the forehead/temple, ear/jaw or around the eyes. Classic migraine starts on one side of the head, but may eventually spread to the other side. [2-15] An attack may last one to two pain-racked days.

The common migraine - a term that reflects the disorder's more frequent occurrence in the general population - is not preceded by an aura. Some people do experience a variety of vague symptoms before common migraines - mental fuzziness, mood changes, fatigue, and unusual retention of fluid. During the headache phase of a common migraine, you may have abdominal pain and diarrhea, increased urination, nausea and vomiting. Both classic and common migraines can strike as often as several times a week or rarely as once every few years. A migraine is a very bad headache that tends to recur. With a migraine, you may feel nauseated and might vomit. The pain is usually on one side of your head and you may be very sensitive to bright lights and noises. Moving around can make the headache feel worse. There are many forms of migraine headaches. Classic and common are the two major varieties.[15-22]

**CAUSES OF MIGRAINE**

There's a lot of misunderstanding and controversy about the cause of migraine. Are we talking about the cause of migraine as a disease, or simply the cause of a specific migraine attack? Usually when someone gets migraine symptoms, they talk about "triggers". A trigger is something that starts the migraine chain reaction that leads to things like migraine headache or nausea. But a trigger is not a cause of migraine, as a disease. If you're not a migraine affected, you're not going to get a migraine attack, no matter how much coffee you drink or sleep you miss. So for the most part, when we are talking about the cause of migraine, we want to know what actually causes the disease in the first place, the root cause. [23-25]

**MYSTERIES IN THE BRAIN**

The problem is that no one really understands what the cause of migraine is.



The brainstem (in dark) - does it hold the secret of migraine? Fig taken from web.

The brain stem regulates life support in your body - things like breathing, blood pressure and sleep patterns. When a migraine attack begins, it seems that messages from the brain stem are coming out wrong - sending confusing messages that lead to the migraine chain reaction.

### MAIN CAUSES OF MIGRAINE

Doctors think migraines may be caused by a chemical or electrical problem in certain parts of the brain. A key element of a migraine headache is blood flow change in the brain. According to theory, the nervous system responds to a trigger such as stress by creating spasms in the nerve-rich arteries at the base of the brain. [27] The spasms constrict several arteries supplying blood to the brain, including arteries from the scalp and neck. As these arteries constrict, the flow of blood to the brain is reduced. At the same time, platelets clump together and release a chemical called serotonin. Serotonin acts as a powerful constrictor of arteries further reducing blood and oxygen supply to the brain. In reaction to the reduced oxygen supply, certain arteries within the brain dilate to meet the brain's energy needs. Doctor's believe this dilation causes the pain of migraine. "Migraine headaches tend to run in families, suggesting that genetic factors contribute to a person's susceptibility to migraines."

Every person responds differently to treatment. Some people have rare headaches that require little to no treatment. Others require the use of several medications or even occasional hospitalization. Migraine headaches generally represent no significant threat to your overall health. However, they can be chronic, recurrent, frustrating, and they may interfere with your day-to-day life. Stroke is an extremely rare complication from severe migraines. This risk may be due to prolonged narrowing of the blood vessels, limiting blood flow to parts of the brain for an extended period of time.[28]

### RESEARCH METHODOLOGY

The important developments in our understanding and harnessing the biology of migraine have not diminished the need to consider the psychology of migraine. Psychological treatments especially relaxation training and biofeedback have been well validated as effective in treating frequent migraine. When the frequency and severity of migraine warrants more than analgesics, these treatments are the first line treatment for adults who cannot or do not wish to take abortive or prophylactic medications and for adolescents. The use of psychological interventions to enhance compliance to treatment or treatment effects is an underutilized resource. Psychological measurement is also critical in development and understanding of quality of life scales and the examination of decision-making by patients in taking medication. Modern clinical psychology has much to offer in the study of migraine and the amelioration of suffering from this common problem. Mostly research studies have concentrated to study the impact of migraine on the aspects of health:

- Blood pressure vs. Hypertensive,
- Structural disease
- Life style, consulting behavior and medication
- Major depressive disorder and physical illness
- Role of physical and emotional dimensions
- Cluster headaches
- Relaxing techniques
- Temperature biofeedback and relaxation
- Migraines and lower family income – demographical variable

On the psychological aspect of health, no study had traceable.

### LOCALE OF THE STUDY

All the women were taken from the Udaipur and Jaipur cities of Rajasthan. The migraine patients were undertaken with the prior permission of Head of the Unit of the Hospital. Their age range from 25 to 45 years.

### SAMPLE

In the present study the sample comprised of 200 women who were purposively selected. Half of them are working and others are non-working similarly half of them are with migraine and rest half of them are without migraine.

The women who were purposively selected then divided into four groups i.e. 50 subjects in each group i.e.. The table shows the distribution of the sample.

**Table – I: Distribution of the Sample**

	Working Status		Total
	Working	Non-working	
<b>Migraine</b>	<b>Group I</b> <b>N =50</b>	<b>Group II</b> <b>N = 50</b>	<b>100</b>
<b>Non-migraine</b>	<b>Group III</b> <b>N =50</b>	<b>Group IV</b> <b>N = 50</b>	<b>100</b>
<b>Total</b>	<b>100</b>	<b>100</b>	<b>200</b>

### RESEARCH DESIGN

**Table – II: Research Design**

Group	Particulars	Testing
I	Working Women with Migraine	Psychological Health
II	Working Women without Migraine	
III	Non-working Women with Migraine	
IV	Non-working Women without Migraine	

### PARAMETERS OF THE STUDY

#### Dependent Variables

Psychological Health

#### Independent Variables

- Working Status (Working / Non-working)
- Migraine Status (Migraine/ Non Migraine)

### DIAGNOSTIC CRITERIA

Women registered herself in medicine unit of Govt. Janana Hospital of Udaipur & Jaipur worked as subjects for migraine status and are diagnosis on the basis of medical doctor's report.

#### Tools Employed

The study was conducted with the help of the following instruments:

- Background Information Performa – Tool Developed by the first Investigator
- Psychological Health – Tool Developed by the first Investigator

### PROCEDURE OF DATA COLLECTION

The above psychological tests were administered on the women at their ease availability place. It was done with a view to study psychological changes in a women before, during and after migraine. The tools were given to all four groups i.e Working Women with Migraine, Working Women without Migraine, Non-working Women with Migraine and Non-working Women without Migraine. The migraine patients were contacted in the Hospital, separate room was provided by the Doctor to collect the necessary data for research. Adequate rapport was established with every women before initiating the work of the data collection. It was more indispensable as the information required was highly personal and confidential in nature. Investigator also explained about some question asked by subjects to get correct response. Each women was assured of keeping the obtained data confidential.

## ANALYSIS OF RESULTS

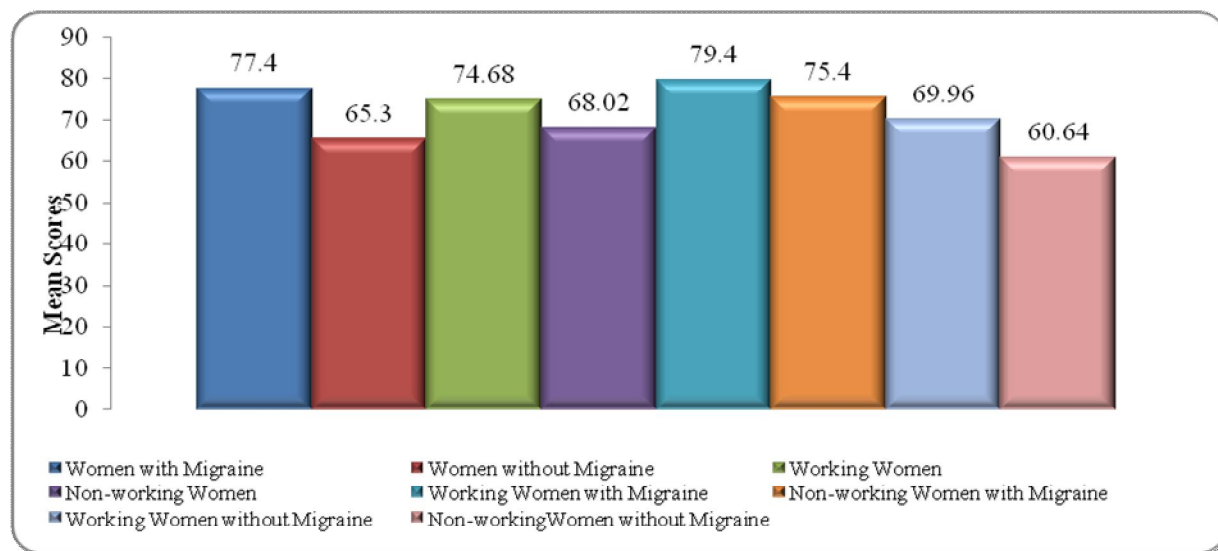
The data so obtained through working and non-working women both with and without migraine on psychological health, physical health, sexual satisfaction, occupational stress, gynecological health and marital health were analyzed using mean, S.D., two way analysis of variance and students' 't' test. Bar diagrams are drawn for the pictorial presentation of data.

## PSYCHOLOGICAL HEALTH

Table 1.1 & Graph 1.1 showing mean, SD scores of study groups on Psychological Health.

**Table 1.1: Mean and S.D. Scores of Study Groups on Psychological Health**

Groups	Mean	S.D.	N	Category
Women with Migraine	77.40	4.42	100	Poor
Women without migraine	65.30	5.64	100	Average
Working Women	74.68	6.22	100	Poor
Non-working Women	68.02	8.01	100	Average
Working Women with Migraine	79.40	4.76	50	Poor
Non-working Women with Migraine	75.40	2.93	50	Poor
Working Women without migraine	69.96	3.18	50	Average
Non-Working Women without migraine	60.64	3.13	50	Average



**Graph 1.1 Graph Showing Mean Scores of Study Groups on Psychological Health**

Table 1.1 shows that mean scores of women with migraine on psychological health is 77.40 which shows poor psychological health. Women without migraine possess mean scores 65.30 which shows average level of psychological health. Total working women found to be with mean scores 74.68 which reflects poor psychological health while non-working women have mean scores 68.02 and it shows average psychological health. Working women with migraine have mean scores 79.40 which shows poor psychological health. Mean scores of Non-working women with migraine are found to be 75.40, which infers poor psychological health. Working women without migraine have mean scores 69.96 which shows average psychological health. Non-working women without migraine have mean scores 60.64 which shows average psychological health.

Table 1.2 shows analysis of variance to see the effect of Migraine Status, Working Status and their interaction on psychological health.

**Table 1.2: Analysis of Variance on Psychological Health**

Source	SS	df	MS	F
Migraine Status	7320.50	1	7320.50	572.22*
Working Status	2217.78	1	2217.78	173.36*
Interaction	353.78	1	353.78	27.65*
Residual	2507.44	196	12.79	
Total	12399.50	199		

\* significant at 0.01 level

Table 1.2 shows the significant effect of migraine status at 0.01 level on psychological health of women. Table also interprets that there is a significant effect of working status (Working & Non-working)) at 0.01 level on psychological health. The interaction effect is found significant.

Table 1.3 shows t values to compare mean scores of study groups namely (Women with Migraine Vs Women with Non-migraine; Working Women Vs Non-working Women; Working Women with migraine Vs Non-working Women with Migraine; Working Women with Non-migraine Vs Non Working Women with Non-Migraine; Working Women with Migraine Vs Working Women with Non-migraine & Non-working Women with Migraine Vs Non-working Women with non-migraine on Psychological Health.

**Table 1.3: t-values to Compare Mean Scores of Study Groups on Psychological Health**

Groups	Mean	S.D.	N	Mean Diff	df	t - value
Women with Migraine	77.40	4.42	100	12.10	198	16.89*
Women without migraine	65.30	5.64	100			
Working Women	74.68	6.22	100	6.67	198	6.57*
Non-working Women	68.02	8.01	100			
Working Women with Migraine	79.40	4.76	50	4.00	98	5.06*
Non-working Women with Migraine	75.40	2.93	50			
Working Women without migraine	69.96	3.18	50	9.32	98	14.76*
Non-Working Women without migraine	60.64	3.13	50			
Working Women with Migraine	79.40	4.76	50	9.44	98	11.67*
Working Women without migraine	69.96	3.18	50			
Non-working Women with Migraine	75.40	2.93	50	14.76	98	24.33*
Non-Working Women without migraine	60.64	3.13	50			

\* significant at 0.01 level

Table 1.3 shows that psychological health of Women with Migraine differs significantly at 0.01 level from women without migraine. Mean Scores infer that Women with Migraine have poorer psychological health in comparison to women without migraine.

Table 1.3 presents that psychological health of working women differs significantly at 0.01 level from Non-working Women. Mean scores infer that working women have poorer psychological health in comparison to non-working women.

Table 1.3 reflects that psychological health of working women with migraine differs significantly at 0.01 level from non-working women with migraine. Mean scores infer that working women with migraine have slightly poorer psychological health in comparison to non-working women with migraine.

Table 1.3 shows that psychological health of working women without migraine differs significantly at 0.01 level from non-working women without migraine. Mean scores shows that working women without migraine have slightly poorer psychological health in comparison to non-working women without migraine.

Table 1.3 shows that psychological health of working women with migraine differs significantly at 0.01 level from working women without migraine. Mean scores suggest that working women with migraine have slightly poorer psychological health in comparison to working women without migraine.

Table 1.3 shows that psychological health of non-working women with migraine differs significantly at 0.01 level from non-working women without migraine. Mean scores suggest that non-working women with migraine have slightly poorer psychological health in comparison to non-working women without migraine.

## CONCLUSIONS

Results conclude that Women with migraine show poor psychological health while Women without migraine possess average level of psychological health. Total Working women were found to be with poor psychological health while total Non-working women shows average psychological health. Working women with migraine and Non-working women shows poor psychological health. Working women without migraine and Non-working women without migraine shows average psychological health. There is significant effect of migraine status at 0.01 level on psychological health of Women. Results also interprets that there is a significant effect of Working status (Working & Non-Working)) at 0.01 level on psychological health. The interaction effect is found significant. The psychological health of Women with Migraine differs significantly at 0.01 level from Women without migraine. Mean Scores infer that Women with Migraine have poorer psychological health in

comparison to Women without migraine. The psychological health of Working women differs significantly at 0.01 level from Non-working women. Mean scores infer that Working women have poorer psychological health in comparison to Non-working women. The psychological health of Working women with migraine differs significantly at 0.01 level from Non-working women with migraine. Mean scores infer that Working women with migraine have slightly poorer psychological health in comparison to Non-working women with migraine. The psychological health of Working women without migraine differs significantly at 0.01 level from Non-working women without migraine. Mean scores shows that Working women without migraine have slightly poorer psychological health in comparison to Non-working women without migraine. The psychological health of Working women with migraine differs significantly at 0.01 level from Working women without migraine. Mean scores suggest that Working women with migraine have slightly poorer psychological health in comparison to Working women without migraine. The psychological health of Non-working women with migraine differs significantly at 0.01 level from Non-working women without migraine. Mean scores suggest that Non-working women with migraine have slightly poorer psychological health in comparison to Non-working women without migraine.

## RESULT & DISCUSSION

Women with migraine show poor psychological health while Women without migraine possess average level of psychological health. It may be due to migraine is a psychosomatic disorder so the causes of migraine are the psychological one which deteriorates the psychological health of women. Total Working women were found to be with poor psychological health while total Non-working women possess average psychological health. It may be due to that working women has to bear dual responsibility. She has to perform her daily routine domestic task with job responsibilities and accountabilities. Lot of work pressure disrupts the psychological health of working women.

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**ACCESS OF WATER SUPPLY IN THE UNAUTHORISED COLONIES OF DELHI**

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**ABSTRACT**

*A total of 830 million gallons (MGD) of water is supplied to the 17 million population of Delhi by the Delhi Jal Board (DJB). The water is sourced from canals bringing water from Ganga and Yamuna from the foothills of Himalayas, 9 water treatment plants (WTP's) and about 4400 tube wells, covering 82% of households in the city as per official DJB data. The areas that are not supplied with the water, majorly fall under the category of illegal settlements like slums and unauthorised colonies. These settlements depend upon sources other than the DJB network for meeting their requirements of water. While majority of slums depend on the water tankers, extraction of ground water is rampant in the unauthorised colonies by installing bore-wells.*

*There are about 1797 unauthorised colonies in Delhi with an estimated population of 4 million, which is about 25% of the entire population of the city. Being illegal settlements, the unauthorised colonies are not provided with the water supply or other infrastructural services until they are regularised. Consequently, only 847 (about 50%) unauthorised colonies falling under the regularised category are supplied with the piped water by the DJB. As per the survey conducted by the Author as part of his Ph.D. on the Informal Housings, 67% of the residents are drawing underground water, while 31% are getting water from the DJB and a small section of 2% is dependent upon tankers. The survey indicated that a majority of the unauthorised colonies are largely dependent upon the illegal bore-wells to meet their water requirement.*

*The underground water in Delhi is brackish and severely polluted, moreover, its extraction is illegal for the private use. Despite that millions of unregulated bore-wells are installed in the unauthorised colonies with possible ramifications on the health of the people as well as the depletion of the aquifers. While, the illegal water supply in the unauthorised colonies has its own issues the centralised water supply by the DJB lacks in the quantity, quality and cost effectiveness. The large size of the city results in the high pumping, storage and maintenance costs along with the substantial loss due to leakages in the supply network. Moreover, the supply is intermittent specially in summers and the water is also not potable in many cases.*

*In the absence of centralised water supply in the unauthorised colonies and considering the related issues, it is imperative that a solution is worked out, to permit and regulate the underground extraction of water in these settlements and improvise the system to address the purification of impurities and recharge of the aquifers. This paper studies the existing supply of water in the unauthorised colonies and attempts to provide a regulatory model for the same.*

*Keywords: Delhi, Unauthorised Colonies, Illegal Water Supply, Ground Water Extraction*

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**1. INTRODUCTION: WATER SUPPLY OF DELHI**

Delhi or the National Capital Territory (NCT) is a megacity with the population of more than 17 million<sup>i</sup> and geographical area of 1484 sq.km. The city is located on the banks of the river Yamuna, but is dependent on many sources for the supply of 830 million gallons (MGD) of water per day like Munak Canal, Upper Ganga Canal, Water Treatment Plants (WTP)<sup>ii</sup> and Tube Wells.

The water supply of the city is undertaken by Delhi Jal Board (DJB) which is a Delhi government agency. As per official DJB data almost 82% of the households in Delhi are provided with the piped water supply. The major part of this supply of water is through the centralised network of pipe lines, pumping stations and water storage tanks traversing through the geography of the city.<sup>iii</sup>

The areas which are not covered by the centralised network are fed by the decentralised system fed by the tube-wells installed in the locality. There are about 4400 tube wells installed by the DJB to supply water in these localities, where network of treated water from WTP has not reached yet.<sup>iv</sup> These localities comprise of mostly unplanned and peripheral settlements of the city.

Despite that there are perpetual issues related to the quantity and quality of the water supplied by the DJB are prevalent.<sup>v</sup>

**2. UNAUTHORISED COLONIES OF DELHI**

As per the latest official list there are about 1797 unauthorised colonies in Delhi with estimated population of 3 to 4 million people.<sup>vi</sup> The unauthorised colonies are unplanned settlements which are built by the people in

contravention of the Master Plans of Delhi (MPD). In majority of the cases the unauthorised colonies are situated on the land earmarked for acquisition or denoted for agricultural land use as per the Master Plans. Unofficial estimates put their number at 2000 with a population of about 6 millions.<sup>vii</sup> Since, these colonies host substantial size of floating and migratory population, the discrepancy in the population is quite possible.

These colonies fall under two categories, regularised and unregularised. Regularised colonies are recognised by the government of Delhi which makes them entitled for basic infrastructure like water supply, sewerage, roads etc. while unregularised are considered illegal, thus do not receive these services.<sup>viii</sup> The number of regularised colonies is 1200 till the last phase of regularisation in 2012.<sup>ix</sup>

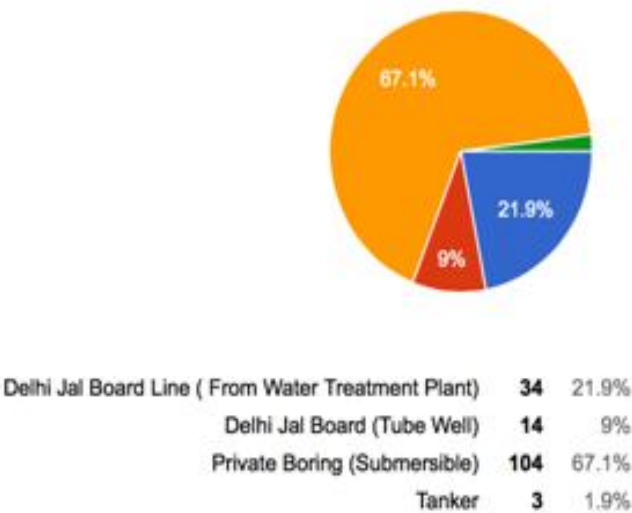
The unauthorised colonies are characterised by the high built up density marked by irregular plots divided by irregular street pattern. The buildings are largely 5 storied apartments with residential flats on the upper stories while parking and commercial spaces on the ground and lower ground floors. Ventilation of the flats is through front side facing the street while shafts are provided for ventilation of interior spaces and plumbing work.<sup>x</sup>

The socio-economic attributes of these colonies are heterogeneous with a majority of people belonging to young middle class section working in private organisations in the city and surrounding satellite towns of National Capital Region. A considerable size of population belongs to the lower middle class section engaged in various self employment activities like carpentry, welding, tailoring, mechanic and running shops and eateries.<sup>xi</sup>

3. WATER SUPPLY IN THE UNAUTHORISED COLONIES

As per the official data, among the 1797 unauthorised colonies, 847 (about 50%) are provided with the piped water supply by the Delhi Jal Board.<sup>xii</sup> While, the water requirement in the unauthorised colonies which do not have DJB supply is met by extracting underground water. In other cases water is also supplied by the tankers belonging to both DJB and private suppliers.<sup>xiii</sup>

Fig. – 1: Status of Water Supply in the unauthorised colonies (Survey by the Author)



As per the Survey (See Fig. 1) conducted by the author as part of his Ph.D. it emerged that about 31% of the residents in the unauthorised colonies are getting water supply from DJB, while a majority of 67% are getting water from private bore-wells and only about 2% are dependent upon the tankers. Among the 31% residents getting the DJB supply, about 22% are getting treated water from the WTP centralised network while, 9% are getting water from the DJB tube wells as mentioned earlier.<sup>xiv</sup>

3.1 Private Bore-wells

In the unauthorised colonies not serviced by the DJB, residents get the drilling done to install private bore-well. (See Pic. 1) These bore-wells are 4” in diameter with 1.5” pipes and fitted with submersible pump of 1 horse power to extract water from the aquifers. The underground water is pumped to the overhead tanks, which is then supplied to the flats within the apartment buildings through standard plumbing apparatus. (See Pic. 2)



Pic - 2 : Overhead Water Storage Tanks as seen in the unauthorised colonies (Author 2014)

In some cases underground water storage tanks are also installed. The depth of the boring varies across the city, as in Shaheen Bagh and other colonies along the river Jamuna the water table is at the depth of 60 to 80 feet while in the western part of the city the depth of the boring more than 100 feet.

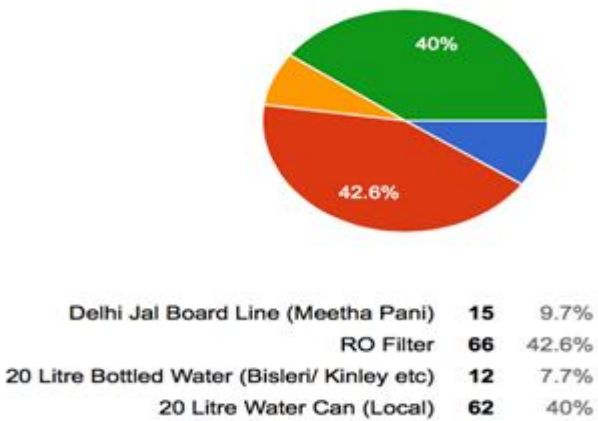
In the summer season the water table goes down, initiating a process of reinstallation of bore-wells at greater depth. In most of the cases the drilling is done manually on the streets in front of the respective buildings to allow the installation and reinstallation of the pipes easily. The cost of installation of the bore-well varies between Rs. 18000 to 25000 and usually takes 2 to 3 days to finish. In some cases, especially smaller buildings, 2 to 3 buildings get a common bore-wells installed to share the cost.

In Delhi, permission is required from the Deputy Commissioner Revenue for conducting boring for drawing water. Moreover, drawing underground water for private use is not allowed in the city, making all these private bore-wells illegal.<sup>xv</sup> Despite that there are millions of private bore-wells installed in the city to meet the basic necessity of water. Even, the concerned agencies ignore the installations and operation of the bore-wells as the shortage of water is a very well known phenomenon. Over the years this has acted as the informal approval of the same resulting in the generation of self-made water supply.

3.2 Source of Potable Water

The underground water in Delhi is unfit for consumption due to its brackish and polluted nature.<sup>xvi</sup> As the unauthorised colonies are largely dependent upon the underground water, filtration is required to make it potable. As per the Survey (See Fig. 2) conducted by the author to determine the availability of potable water in the unauthorised colonies, it was revealed that about 43% of the respondents have installed domestic Reverse Osmosis Units to filter water.

Fig 2: Status of Potable Water in the unauthorised colonies (Survey by the Author)



Almost 40% of the households buy filtered water from hawkers<sup>xvii</sup> selling potable water in 20 litre cans from door to door. (See Pic 3) This water is supplied from privately operated small scale industrial filtration plants running in the same localities. These filtration plants are installed in shop spaces of 10-15 sq.m. area and located in the apartment buildings. (See Pic 4) The filtration plants extract underground water by installing the bore-well similar to that explained above and do filtration in four stages namely sediment filtration, activated carbon, silver ionisation and reverse osmosis. The desalination of the water is conducted to make it soft, through the process of reverse osmosis at the fourth stage of filtration where the total dissolved solids (TDS) level is brought down from 750-1000 ppm to 50-75 ppm. The water after the filtration is potable and devoid of dissolved sediments, biological impurities, chemical impurities, although, the process of reverse osmosis results in the discarding of 25% of the water.



Pic - 3 : Drinking Water Hawker in the unauthorised colonies (Author 2014)



Pic - 4 : Streets flooded with Rain Water (Author 2014)

One such plant is capable of filtering 1000 litres per hour and roughly refills 50 cans of filtered water. The cost of 20 litre water is Rs. 10 to 15, providing a much economical alternative to brands like Bisleri or Kinley which are priced at Rs. 75 for the same quantity. The cans are reused by refilling similar to the branded packaged water. A small percentage of about 8% people do buy branded water as well.

#### 4. ISSUES

The core issue is access to water as a basic necessity in the unauthorised colonies. As a majority of these colonies are not serviced by the centralised water supply network, they are left to fend for themselves. As a result the resident of these colonies are not left with any option but to install private bore-wells to extract the ground water. While, the installation of private bore-wells is illegal in Delhi, its use on the other hand is rampant, with the concerned agencies very much aware. Thus, the core issue gives rise to another issue with no solution in sight.

#### 5. PROPOSALS

In the light of above discussions following proposals can be deduced to address the access of water supply in the unauthorised colonies of Delhi.

##### 5.1 Permitting the use of private bore-wells

As discussed above, the centralised system of water supply is ineffective, expensive and impractical for a large and diverse city like Delhi. While the planned areas of the city are constantly facing water supply shortage, the unplanned areas like the unauthorised colonies are not serviced by the centralised system. It is very much evident that a paradigm shift to decentralised system will be required to provide water to the city in an efficient manner.<sup>xviii</sup> This argument is further supported by the fact that DJB it self has more than 4400 tube wells for water supply to augment and supplement its centralised network.

Thus, by permitting the installation and use of bore-wells, it is possible to provide water supply in a decentralised and efficient manner. The case of the slum, Ismail Camp, in Rangpuri Pahari is one such example, where the residents have laid entire system of pumping, storing and regulating the water supply on their own.<sup>xix</sup> Moreover, since, the cost of the equipment and installation as well as the maintenance will be borne by the users, it will not incur any financial implication on the Government. This can be a win-win solution.



## 5.2 Regulating the use of private bore-wells

The reason for restricting the installation of private bore-wells was to check the possible unregulated extraction of ground water. By permitting the use of private bore-wells as explained in 5.1, it will be required to regulate the extraction of ground water. This can be done by two measures,

5.2.1. By Equipment Specification: The use of domestic category of submersible pumps and other apparatus will ensure that industrial purpose extraction of ground water does not occur. So, as an example, when the system comprising of 1 HP of submersible pump along with the pipe of 1 inch diameter is used, it will limit the extraction capacity of the bore-well to meet the domestic demand.

5.2.2. By Metering the extraction of the ground water: The extraction of the ground water can be effectively regulated by monitoring its volume by installation of water meters. Knowing the volume of water extracted will inform the user to exercise efficiency and simultaneously facilitating decision and policy formulation by the concerned agencies.<sup>xx</sup>

## 5.3 Revenue generation

It is important that the extraction of water is charged as per its usage to generate revenue for the government and also to act as a regulating measure. The charges of the usage can be at par with that of the centralised system or as decided by the statutory agency. Knowing the significant population size that resides in the unauthorised colonies it can be safely said that the revenue collected by metering the bore-wells will be substantial. The revenue thus generated should be used to augment the infrastructure in these colonies.<sup>xxi</sup>

## 5.4 Recharging the Aquifers

One of the major concerns of permitting private bore-wells was also the possible depletion of the ground water. This concern can be addressed by the implementation of the Rain Water Harvesting (RWH) within the existing provisions.

5.4.1 Rain Water Harvesting: As per 'Delhi Water & Sewer Tariff and Metering Regulations 2012 (amended in 2016)', provisions are made towards promoting RWH. As per the regulations, property and plots with size 500 sq.m. and more are supposed to install RWH system. There is 10% rebate in the bill amount as an incentive for the same, conversely the water bill becomes 1.5 times if RWH is not installed.<sup>xxii xxiii</sup>

Similarly, in the year 2001, the Delhi Division of the Ministry of Urban Development and Poverty Alleviation made it mandatory to have RWH for all new constructions on plot size more than 100 sq.m. The installation system of RWH is also simplified by eliminating the boring from the recharge pit and also providing thumb-rules to calculate the pit size.<sup>xxiv xxv</sup>

Despite these provisions, the implementation of RWH at domestic scale is still in negligible proportions in both planned as well as unplanned areas.<sup>xxvi xxvii</sup> The entire focus of the implementation of RWH is for the planned areas with plot sizes of 500 sq.m. and with DJB connections, however it is equally relevant for the informal housings like unauthorised colonies, where water supply is self-made and drawing of groundwater is unregulated. As a result, there are exceptionally few cases of Rain Water Harvesting (RWH) installed in the unauthorised colonies and a large volume of rain water gets disposed in the storm water drains. (See Pic 4)

Rain water harvesting can be an inexpensive solution to recharge the aquifers in the unauthorised colonies. As the Rain Water Pipes (RWP) are already installed in the buildings, the only requirement is to construct a recharge pit and connect the RWP to implement RWH.<sup>xxviii</sup> Simplified and prefabricated recharge pits should be made available for the ease of installation. The community recharge pits may also be installed on the streets and connected to the storm water line.



Pic 5. Roof tops can collect Rain Water for RWH. (Author 2014)

For the implementation part, the RWH should be made mandatory by linking it with permitting the installation of private bore-wells in the unauthorised colonies. Since, these colonies are built in high density, the aggregate roof top area is about 80-90% of the ground area. The large roof top area will lead to substantial collection of rain water. (See Pic 5) Every 100 sq.m. rooftop can collect 100.5 litres of water per day during rains.<sup>xxix</sup>

## 5.2 Awareness and incentive schemes

The implementation of the Rain Water Harvesting (RWH) in the unauthorised colonies will require awareness and incentive schemes. Since, the cost of RWH installation is about Rs.15000 per 100 sq.m. of roof top area<sup>xxx</sup> it has to be informed to the residents that this one-time cost is less than the expenses incurred in boring that is required in summers due to depletion in the water table.

Further, RWH system can also be metered to know the volume of the water recharged. This can be used to incentivise the residents by providing discounts in the water charges (as discussed in 5.3).

As a case example the RWH project implemented independently by the Vasant Kunj Resident Welfare Association has solved the water shortage in the otherwise water scarce region.<sup>xxxi</sup> Similarly, by implementing RWH, these colonies can become self sufficient in water supply.

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<sup>ii</sup> There are 9 WTP in Delhi producing 753 MGD water. Prominent WTP are Haiderpur, Sonia Vihar and Wazirabad. GNCTD. (2016). "[http://www.delhi.gov.in/wps/wcm/connect/doiit\\_djb/DJB/Home/About+Us](http://www.delhi.gov.in/wps/wcm/connect/doiit_djb/DJB/Home/About+Us)." Retrieved 15 June, 2016, from [http://www.delhi.gov.in/wps/wcm/connect/doiit\\_djb/DJB/Home/About+Us](http://www.delhi.gov.in/wps/wcm/connect/doiit_djb/DJB/Home/About+Us).

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xv Sharma, V. (2016). Water Smart South Delhi Brims With Ideas. Hindustan Times. New Delhi.

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xvii Discussed in previous Chapter

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xxiv Volume of the recharge pit = Roof top area in sq.m. X 0.8 (run off coefficient) X 0.025 (average rainfall in m/hr)

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Young, M. E., & Wasserman, E. A. (2005). Theories of learning. In K. Lamberts, & R. L. Goldstone (Eds.), *Handbook of cognition* (pp. 161-182). Thousand Oaks, CA: Sage.

- **Electronic sources should include the URL of the website at which they may be found, as shown:**

Sillick, T. J., & Schutte, N. S. (2006). Emotional intelligence and self-esteem mediate between perceived early parental love and adult happiness. *E-Journal of Applied Psychology*, 2(2), 38-48. Retrieved from <http://ojs.lib.swin.edu.au/index.php/ejap>

- **Unpublished dissertation/ paper:**

Uddin, K. (2000). A Study of Corporate Governance in a Developing Country: A Case of Bangladesh (Unpublished Dissertation). Lingnan University, Hong Kong.

- **Article in newspaper:**

Yunus, M. (2005, March 23). Micro Credit and Poverty Alleviation in Bangladesh. *The Bangladesh Observer*, p. 9.

- **Article in magazine:**

Holloway, M. (2005, August 6). When extinct isn't. *Scientific American*, 293, 22-23.

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Central Bank of India (2005). *Income Recognition Norms Definition of NPA*. Retrieved August 10, 2005, from <http://www.centralbankofindia.co.in/home/index1.htm>, viewed on

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