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INTERNATIONAL JOURNAL OF MANAGEMENT STUDIES (IJMS)

(UGC Approved - Journal No. 44925)

(EISSN: 2231-2528 ISSN: 2249-0302)

is hereby awarding this certificate to

Sajeesh T J,
Assistant Professor,
Department of Commerce,
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for the publication of the research paper entitled

SEARCHING FOR A HOME LOAN: THE MOTIVATING FACTORS TO SELECT A BANK

Published in – Volume V, Issue-2(1), April 2018

V.S. More

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(Notification No.F.1-2/2016 (PS) Amendments dated 10th January, 2017)

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INDIAN JOURNAL OF COMMERCE AND MANAGEMENT STUDIES Impact Factor : 2.6

International Refereed Social Sciences Journal Impact Factor : 3.19
RESEARCHERS JOURNAL OF ARTS, SCIENCE & COMMERCE WORLD

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DOI : 10.18843/ijms/v5i2(1)/12
DOI URL :http://dx.doi.org/10.18843/ijms/v5i2(1)/12

Searching for a Home Loan: The Motivating Factors to Select a Bank

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ABSTRACT

Adequate shelter for each and every household is a fundamental prerequisite for a healthy living in any society. With an increase in prices and the reduction in purchasing power, a man cannot accumulate huge funds at a time. So, in order to fulfill its basic necessity, a man has to go for a home loan. Choice housing finance is a most significant decision because it requires a huge capital investment as well as a long term commitment for a period of 15-20 years. The borrower should consider various factors before availing the finance from formal sources. While studying the perception of borrowers the socioeconomic and demographic factors are also studied and the effect of their influence is also assessed. This study is trying to analyse the influence of rate of interest, security and leagal requirements, margin money, EMI, convenience and customer services to select a bank for home loan.Thestudy observed that margin of money and EMI are the most influencing factors.

Keywords: Housing finance, customer perception.

INTRODUCTION:

Housing is one of the most important basic needs next only to food and clothing for leading a safe and dignified life. Every youngster who begins his life have dream of having his own house. Most of the people are not able to afford it out of his own personal income and savings. So they prefer to borrow from either formal or informal sources. Informal sources include savings of family, assistance from friends and relatives, sale of property, chitty, provident fund etc. formal source include loans from commercial banks, Housing finance companies, specialised institutions, building societies, cooperative societies etc. The various types of housing loan such as home extension loan, home improvement loan, plot plus construction loan, construction loan and conversion loan are offered by commercial banks and private banks. In this period of decreasing interest rates, the bank are offering a competitive interst rates and more customer friendly features for every home loan to explore all avenues to exist in market.
Factors in influencing (attributes) the customer in selecting a financial institution for housing loan

Rate of Interest:

The rate of interest is the basic factor considered by people in selecting the loan provider. The repayment of home loan comprises of a large portion of interest rates and principal amount Naturally, people compare the interest rate of other agencies before finalising one. However, the comparison becomes difficult as the interest rate varies on the basis of the loan amount as well as the loan tenure. Further, the softening of interest rate after availing loan by beneficiaries might have influenced their satisfaction level.

Security Requirements:

Generally, the first mortgage on the property that is the title deed has to be provided to the bank as security against the loan. Banks or housing finance companies ensure that the property is free from any

concern that could adversely affect the property. Some banks or housing finance companies ask for collateral security also. Sometimes, borrowers may find it difficult to fulfill all the security requirements demanded by the lender.

Repayment Mode:
The bank will give the loan and also they in the form of a repayment model that they felt would be ideal for customers to pay his equated monthly installments (EMI).The borrowers are given wide options to repay the loan installments at their convenience.These include direct remittance, a deduction from salary, payment through demand draft, depositing postdated cheques and so on.

Margin Money:
In India, Banks are authorized by the Reserve Bank of India to lend only up to 80% of the purchase price of a property. The balance of 20%, referred to as "down payment" has to be arranged by the borrower. Down payment is basically margin money for a loan which has to be paid up-front by the homebuyer. The requirement has been stipulated by RBI with a view to regulate real estate lending and impose a check on banks financing for homes without any limit

Courtesy Treatment by Staff:
Better dealings with organizational staff are very important, particularly in service organization in a highly competitive market. The dealings of the staff will have great influence on borrowers which is reflected in their level of satisfaction. It is the cementing force which makes the customers sticks on to the organisation.

Easy Accessibility:
Accessibility of the lending institution to the borrower is a decisive factor in the selection of a lender.

Requirement of Documents:
The documents required to be submitted for availing housing loan are almost the same in most HFIs. However, the services rendered in connection with obtaining the documents vary among specialized HFIs, commercial banks and co-operative institutions. Specialized HFIs undertake the task of obtaining the different documents such as legal opinion certificates, stage valuation certificate and the like. This will relieve the beneficiaries of the botherations of obtaining them, thereby saving their valuable time and effort.

Eligibility Norms:
The beneficiaries can avail the loan up to the eligible amount as per the eligibility norms prescribed by HFIs. The eligible amount of loan is ascertained on the basis of the value of property mortgaged and also the repaying capacity of the borrower.

LITERATURE REVIEW:

1. (B.C.M., Satpathy, & Samal, 2018)[1] analysed perception and satisfaction by using the variables like dealing with staff, home loan schemes, margin of money available in home loan,security requirements for the loan, processing fee,the rate of interest,affordable installment and innovative services. In their study they found that variables have a significant impact on the satisfaction of customers.
2. (Murugan & Jansirani, 2017) [2]analyzed the customer perception of home loan offered by various banks in Chennai city and observed that the housing finance sector is highly competitive and the bank should ensure the sustainability by evaluating its failure in the present housing finance systems.
3. (G & Riar, 2016)[3] studied the factors motivated a customer for selecting a bank in Punjab. They observed that the variables like, low processing fee, installment options, customer services, repayment mechanism ,simple procedure, desired amount of loan and the comparative interest rate have high impact on the customer's choice for selecting the bank for a home loan.

[1]B.C.M., P., Satpathy, I., & Samal, N. R. (2018). Satisfaction Management for Home Loan –A Study on Indian Public-Sector Banks. *BULMIM Journal of Management & Research* , 11–16.
[2]Murugan, M. S., & Jansirani, J. (2017). *Consumer Perception towards Home Loans*. International Journal of Trend in Research and Development (IJTRD).
[3]G, B. S., & Riar, M. (2016). Customers Perception Towards Home Loan :A Study Conducted in Punjab. *IOSR Journal of Business and Management (IOSR)* , 9-14.

4. (Agarwal & Araya, 2017)[4] analyzed the performance of LICHFL and SBI in terms of their products and services to satisfy the home loan customers. They consider the variables like transparency in the process of sanction of loan ,solve customer problems , loan processing time , the quality services, effective redressal procedure, good return on investment are the highly influence the customers.
5. (Cleedin, 2012)[5] studied the perception of home loan customers of housing financial institutions in Kanuakuamri. He observed that the factors like source of information , quantum of loan ,the rate of interest, repayment options,processing fee etc were influenced majority of the customers for selecting financial institution.
6. (Kumar, 2012)[6]studied the quality of services rendered by LICHFL and HDFC in Hyderabad . He observed that the variables like loan sanctioning trends , the process of loan processing, savings, family commitments, liability of borrowers, affordable EMI and tax benefits etc. were great motivation to borrowers for availing home loan.
7. (Umamageswari & Subhashree, 2016)[7] studied the customer preference with respect to housing loan housing loan offered by public sector and private sector banks in Udumalpet. They found that Procedure to get loan, processing period, insurance coverage is important factor preferred by respondents for selecting the banks for a home loan.

OBJECTIVE OF THE STUDY:

1. To study the consumer perception towards housing loan.
2. To identify the motivating factors to select a bank for housing loan.

Research methodology:
The study, based on following methodology

Type of research:
This study is an analytical nature, conducted to know the motivating factors to select a bank for housing loan

Scope of the Study:
The proposed study about the motivating factors to select bank for housing finance restricted to State Bank of India in Kannur district.

Sampling technique and size:
Simple random sampling used as a sampling technique to select samples from the population. Randomly selects Sreekandapuram Muncipality from Kannur District and collect data from 30 respondents.

Source of data:
Both primary and secondary data were used for the study. Primary data were collected through structured schedule from respondents. The main source of data includes, journals, official website of census India etc.

Statistical tools used for Analysis and Interpretation:
The information gathered was tabulated and analyzed by using mean,standard deviation and independent sample t test.

ANALYSIS AND INTERPRETATION:

Table 1: Occupation of Respondent

	Frequency	Percent	Valid Percent	Cumulative Percent
Govt. Employees	20	66.7	66.7	66.7
Private Employees	10	33.3	33.3	100.0
Total	**30**	**100.0**	**100.0**	

[4]Agarwal, M., & Araya, P. (2017). A Study Of Customers' Perception and Satisfaction Towards Housing Loans of LIC Housing Finance Ltd. and SBI Bank In Haldwani Region. Smart journal of Business Management Studies , 61-72.
[5]Cleedin, F. (2012). Housing Finance in Kanyakumari District. PhD Thesis, Manonmaniam Sundaranar University,Tirunelveli, Research Centre in Commerce Women's Christian College,Nagercoil.
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[7]Umamageswari, K., & Subhashree, S. (2016). A Comparative Study on Customer Preference towards Housing Loan Offered By Banks in Udumalpet. International Conference on "Research avenues in Social Science" (pp. 53-58). Coimbatore: SNGC.

Table 1 Represents occupation of the respondents. It is clear that, out of 30 respondents, 66.7% of respondents are Govt. Employees and remaining 33.3% are Private employees.Here interpreted that majority of respondents are Govt.employees.

Table 2: Descriptive Statistics

Motivating factors to select a bank for home loan	N	Mean	Std. Deviation
Margin money	30	4.40	.621
Rate of interest	30	3.73	.740
Repayment mode	30	4.03	.890
Eligibility norms	30	3.30	.877
Requirement of documents	30	3.63	.850
Security requirements	30	3.40	1.070
Easy accessibility	30	3.80	.761
Courtesy treatment by staff	30	3.90	.759
Valid N (listwise)	30		

Table 2 represent Descriptive statistics.
By comparing the mean value of motivating factors the mean value of margin money(4.40) is high.this shows the most influencing factor to select a bank for home loan is margin money. Next important motivating factor is repayment mode (mean= 4.03) and among the factors least motivating factors are eligibility (mean= 3.30) norms and security requirements(mean= 3.40).

HYPOTHESIS:

1. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor margin money.
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=.380,p=.543)p value is not less than .05 .There is no significant difference in motivating factor margin money for Govt. employee(M=4.4,S.D=.598)and Private employees(M=4.4,S.D=.699) t=.000,p value=1.000 it is not less than .05 so accept null hypothesis at 28 degree of freedom 95% confidence level.
2. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor Rate of Interest.
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=.130,p=.722)p value is not less than .05 .There is no significant difference in motivating factor rate of interest for Govt. employee(M=3.8,S.D=.696)and Private employees(M=3.7,S.D=.823) t=.349 ,p value=.729(two tailed) it is not less than .05 so accept null hypothesis at 28 degree of freedom 95% confidence level.
3. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor repayment mode.
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=.367,p=.550)p value is not less than .05 .There is no significant difference in motivating factor repayment mode for Govt. employee(M=4.2,S.D=.834)and Private employees(M=3.7,S.D=.949) t=1.48 ,p value=.150(two tailed) it is not less than .05 so accept null hypothesis at 28 degree of freedom 95% confidence level.
4. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor eligibility norms
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=.029,p=.867)p value is not less than .05 .There is no significant difference in motivating factor eligibility norms for Govt. employee (M=3.3,S.D=.865) and Private employees (M=3.3,S.D=.949) t=.000 ,p value=1.00 (two tailed) it is not less than .05 so accept null hypothesis at 28 degree of freedom with 95% confidence level.

5. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor requirement of documents.
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=.478,p=.495).There is no significant difference in motivating factor eligibility norms for Govt. Employee (M=3.65,S.D=.813) and Private employees (M=3.6,S.D=.966) t=.149,p value=.882 (two tailed) it is not less than .05 so accept null hypothesis at 28 degree of freedom with 95% confidence level.
6. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor security requirement.
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=.001,p=.982) .There is no significant difference in motivating factor security requirement for Govt. Employee (M=3.45,S.D=1.05) and Private employees(M=3.3,S.D=1.16) t=.356 ,p value=.724(two tailed) it is not less than .05 so accept null hypothesis at 28 degree of freedom with 95% confidence level.
7. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor easy accessibility.
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=2.73,p=.110)p value is not less than .05 .There is no significant difference in motivating factor easy accessibility for Govt. employee(M=3.85,S.D=.671)and Private employees(M=3.7,S.D=.949) t=.502,p value=.619(two tailed) it is not less than .05 so accept null hypothesis at 28 degree of freedom with 95% confidence level.
8. H0=There is no significant difference in between Govt.employees and Private employees towards the motivating factor courtesy treatment of staff.
   An independent sample t test was performed to compare the motivating factors for Govt.employee and private employee.The outcome variable was found to be normally distributed and equal varience are assumed based on result of Levene's test (F=3.396,p=.076)p value is not less than .05 .There is no significant difference in motivating factor courtesy treatment of staff for Govt. employee(M=4,S.D=.649)and Private employees(M=3.7,S.D=.949) t=.1.022 ,p value=.316(two tailed) it is not less than .05 so accept null hypothesis at 28 degree of freedom with 95% confidence level.

FINDINGS AND CONCLUSION:

Among the respondants 66.67% were Govt. employees 33.33% were Private employees.Margine money showed highest mean value so which was considered as the most influencing motivating factor to select a bank.Repayment mode was the another motivating factor with mean value 4.03.The study revealed that there is no significant difference in motivating factors for Govt employees and private employees to select a bank for home loan.

The Indian banking is well regulated and capitalised.The economic and financial conditions in the country make it more superior than any country in the world.The banks are trying to provide best customer services in processing and disbursing, rate of interst and payment. The study on the motivating factors to select a bank for home loan concluded taht all the factors influence the customers for selecting a bank but the most influencing factor is margin and repayment mode,the least motivating factors are eligibility norms and security requirements.Hence the banks which consider these factors can take advantage over others and can only sustain in the longer run.

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for the publication of the research paper entitled

GROWTH AND PERFORMANCE OF SMALL SCALE INDUSTRIES/MICRO SMALL AND MEDIUM ENTERPRISES IN KERALA-REGION WISE ANALYSIS

Published in – Volume V, Issue-2(1), April 2018

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International Refereed Social Sciences Journal Impact Factor : 3.19
RESEARCHERS JOURNAL OF ARTS, SCIENCE & COMMERCE WORLD

DOI : 10.18843/ijms/v5i2(1)/17
DOI URL :http://dx.doi.org/10.18843/ijms/v5i2(1)/17

Growth and Performance of Small Scale Industries/Micro Small and Medium Enterprises in Kerala-Region Wise Analysis

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ABSTRACT

Industrial development is inevitable in the economic development of a nation. Employment generation to satisfy the requirement of educated youth is one of the challenges faced by the Government of India. Industrialization is one among the best way to create employment opportunity to fulfil the requirement of youth. Government of India has undertaken various policy measures to promote industrialisation in the country. Incentives and subsidies has been provided, changing the policies periodically inorder to motivate entrepreneurs. The Government support is essential to stimulate entrepreneurial spirit. This induce many people to enter in the field of entrepreneurship especially in Micro, Small and Medium Enterprises. So Micro Small and Medium enterprises (MSME) is considered as a vibrant and active sector in Indian economy as compared to large scale enterprises. Small scale industries are more attracted in the context of India because it requires less capital, ensure balanced regional development and also create employment opportunity. Small scale industries also work as ancillary unit of large scale industries. Except large scale industry, micro, small and medium enterprises are now under Micro, Small and Medium Development Act 2006.MSME sector shows consistent growth in terms of number of entrepreneurs memorandum filed every year. Kerala has been included in top ten in terms of number of entrepreneurs memorandum filed. This paper analyse the region wise growth and performance of small scale industries/MSME in Kerala by considering the variables number of units, employment, goods and services produced and investment.

Keywords: Small scale enterprises, Growth, Micro small and medium enterprises.

INTRODUCTION:

Micro, small and medium enterprises can play an important role in promoting equitable development and introducing innovation on a small scale. In India 346.12 lakh units functioning across the country employing 805.24 lakh workers and it contributes a share of 37.5 per cent to the country's GDP. MSME sector play an important role in employment generation, self employment, industrial and economic growth and act as an ancilary to large scale industries.So small scale enterprises is considered as one of the two wheels of industrialisation of India.Government of India has undertaken various policy measures to promote industrialisation in the country. Incentives and subsidies provided to motivate entrepreneurs.So Micro, Small and Medium enterprises (MSME) is a vibrant and active sector in the Indian economy as compared to large scale enterprises.In Kerala the small scale sector occupies a special place in the industrial structure because of its labour intensive nature. Our state is rich in manpower, but scarce in capital.Small scale industries are labour intensive in nature.Therefore, Small Scale Industries (SSI)occupy a special place in our state.

Definition of small scale industry as per Micro, Small and Medium Enterprises Development Act, 2006:
The Micro, Small and Medium Enterprises Development Act, 2006 was enacted on 16th June 2006. The Act empowers the government to establish a National Board for micro, Small and Medium Enterprise.As per Micro, Small and Medium Enterprises Development Act 2006, the earlier concept of "industries" has been changed to 'enterprises'.
Manufacturing enterprises have been defined in terms of **investment** in plant and machinery (excluding land and building) they are classified into-
Micro enterprises-investment upto Rs. 25 lakhs
Small enterprises-investment above Rs. 25 lakhs and upto Rs. 5 crores and
Medium enterprises-investment above Rs. 5 crores and upto Rs. 10 crores.
Services enterprises have been defined in terms of investment of equipment (excluding land and building) they are classified into-
Micro enterprises-investment upto Rs. 10 lakhs
Small enterprises-investment above Rs. 10 lakhs and upto Rs. 2 crores and
Medium enterprises-investment above Rs. 2 crores and upto Rs. 5 crores . (Khanka, 2014)

New initiatives undertaken by the government for the promotion and development of MSMEs:
Some of the new initiatives undertaken by the government for the promotion and development of MSMEs are as follows.
Udyog Adhar Memorandum(UAM):
Under this scheme MSME entrepreneurs need to file an online entrepreneurs memorandum to instantly get a unique UdyogAadhaar Number(UAN).The information sought is on a self certification basis and no supporting documents are required.This marks a significant improvement over the earlier complex procedures.
Employment exchange for industries:
An employment exchange for industries was launched on June 15, 2015 in connection with Digital India.More than 3.42 lakh job seekers have been registered.
Frame work for Revival and rehabilitation of MSMEs:
Under this framework, banks have constituted a committee for distressed MSME enterprises at zonal or district level to prepare a corrective plan for these units.
A scheme for Promoting Innovation and Rural Entrepreneurs(ASPIRE):
This scheme was introduced on March 16, 2015 with the objective of setting up a network of technology centres and incubation centres to accelerate entrepreneurship.
MSME in Kerala:
The micro small and medium enterprises sector helps in industrialisation of rural and backward areas focusing youth and socially disadvantaged groups, women and physically challenged persons.MSME sector contributes to the socio-economic development of the State.The industries under MSME sector include handicrafts, handloom, Khadi, food processing, garment making and textile industries, industries related to coir, wood, bamboo, plastic, rubber, leather, clay and electric components.The directorate of industries and commerce of Government of Kerala acts as a facilitator for industrial promotion of the state.The number of new enterprises filed memorandum under MSMED Part II in Kerala during the year 2015-16 was 7705.Investment in the sector during the period was Rupees1, 29, 356.95 lakh while employment generated and the value of goods and services produced were 45407 numbers and rupees 3, 38, 001.36 lakh. (Kerala IT mission, 2017)

LITERATURE REVIEW:

(Kotty, 2008)conducted a study on problems and prospects of small scale industries in India. He suggested that encouraging industry association to establish quality counselling and common testing facilities.Training for entrepreneurship development, granting permission for foreign collaboration in the small scale sector with a view to encourage modernisation and technical upgradation.Provide assistance for exports, setting up industrial estate, developing infrastructural facilities
(Kumar, Selvaraj, & Balaji, 2015) in his article "A study on the development of small scale industries in Tamilnadu, India" studied the performance of small scale industries in terms of number of nits, employment and investment.He suggested that the lead banks in all districts had a periodical meeting with DIC and SSI associations to assess the nature and type of loan required.
(T.Uma & Kiran, 2014)made a paper on performance of small scale industries in India based on the variables number of units registered, investment in fixed assets and employment.During the study period 2001 to 2012

showed progressive increase in the number of units , investment and employment.The study revealed that volatility in respect of investment and production was less because the mean value was higher than standard deviation. The risk associated with this sector was less so more concentration on this sector really helpful in the economic development of a nation.

(Susmitha, 2014)made a paper on growth and performance of small scale industries in India with special reference to Kerala during the period of 1990-91 to 2011-12 by considering the variables number of units registered, production and employment, compared the performance of Kerala with India.The researcher observed that at national level Small scale industry sector showed a progressive growth in all variables.The position of Kerala in terms of investment and production was good but a marginal decline identified in amount of employment generation and number of units.This study suggested effective utilisation of the potential of small scale industries in Kerala benefited for the socio economic development of the state and achieved balanced regional development.

(Ajit & S.N, 2013) made a paper about the performance of small scale industries in Osmanabad district.The researcher concentrated to study performance of small scale industry and examined facilities and provisions provided by the Government .The study revealed that during the study period the number of registered units and rate of investment increased, average employment was 10 in the small scale industrial unit in the district but the growth in working capital showed decreased in the last year of study period.Majority units raised their capital through owned fund and loaned fund.The researcher argued that inorder to overcome the industrial backwardness of the district effective Government support was required.

(V.P & Rani, 2014) made a paper about the growth and performance of SSI in India from 2000 to 2012 based on the variables number of units, production, employment and export.The study revealed that during the study period production increased, number of unit registered showed 3.22 times growth, increase in units leads to increase in employment growth and it was 3.23 times and export increased 3.86 times due to the propotional measures introduced by both Central and State GovernmentThese growth rate indicate small scale industry play a vibrant role in Indian economy.

OBJECTIVES OF THE STUDY:

1. To study the growth and performance of Small Scale Industries/MSME in Kerala in terms of total number of working units, employment, investment and goods and services produced.
2. To compare the growth and performance of Small Scale Industries/MSME in Kerala on the basis of region.

METHODOLOGY:

Type of Research:

An analytical research design was adopted in this study.

Area of Study:

Performance of Small Scale Industries in the fourteen districts of Kerala grouped into three region southern, central and northern region. Northern region includes district of Kasaragod, Kannur, Wayanad, Kozhikode and Malappuram. Districts of Palakkad, Thrissur, and Eranakulam are included in central region; and districts of Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam and Idukki are included in southern region. The base for this classification is earlier division of Kerala as Malabar, Cochin and Travancore region.

Source of Data:

The present study is based on secondary data. The main source of data includes economic review 2011-2012 to 2015-2016, journals etc.

Statistical tools used:

The information gathered was tabulated and analyzed by using average, standard deviation, coefficient of variation and compound annual growth rate.

ANALYSIS AND INTERPRETATION:

Performance of small scale enterprises analysed on the basis of secondary data.

Table 1: Performance of SSI/MSMe in Terms of Working Units

	Southren			Central			Nothern		
Year	Total working unit(Nos)	Increase/ Decrease	%	Total working unit(Nos)	Increase/ Decrease	%	Total working unit(Nos)	Increase/ Decrease	%
2011-12	92352			67589			46046		
2012-13	97983	5631	6.10	72041	4452	6.59	49420	3374	7.33
2013-14	103695	5712	5.83	77229	5188	7.20	53317	3897	7.89
2014-15	109841	6146	5.93	82209	4980	6.45	57646	4329	8.12
2015-16	112704	2863	2.61	85316	3107	3.78	59446	1800	3.12
Average	103315	5088	5	76877	4432	6	53175	3350	7
S.D	8359			7236			5574		
COV	8.09			9.41			10.48		
CAGR	5.1			6.0			6.6		

Source: Economic review from 2011-12 to 2015-16

Table Number 1:Represent the performance of SSI/MSME in terms of number of working units during 2011-2016.From the table the numbers of SSI/MSME in the southern region have increased from 92352 numbers from 2011-2012 to 112704 numbers during 2015-2016 which comes to an increase of 20352 numbers it indicates that the SSI/MSME has made progress during the period of study. The numbers of units registered are at an average of 103315. The average increase of units is increasing at 5088.The average annual growth rate is 5 percent. Standard Deviation of units is less than the mean value of
the units registered. The compound annual growth rate is 5.1 percent and coefficient of variation is 8.09 percent.
The numbers of SSI/MSME in the central region have increased from 67589 numbers during 2010-2011 to 85316 numbers during 2015-2016 which comes to an increase of 17727 numbers it indicatesthat the SSI/MSME has made progress during the period of study. The numbers of units registered are at an average of 76877.The average annual growth rate is 7 percent. Standard Deviation of units is less than the mean value of the units registered. The compound annual growth rate is 6 percent and coefficient of variation is 9.41 percent.
The numbers of SSI/MSME in northern regions have increased from 46046 numbers from 2010-2011 to 59446 numbers during 2015-2016 which comes to an increase of 13400 numbers it indicates that the SSI/MSME has made progress during the period of study. The numbers of units registered are at an average of 53175. The.The average annual growth rate is 7 percent. Standard Deviationof units is less than the mean value of the units registered. The compound annual growth rate is 6.6 percent and coefficient of variance is 10.48 percent .
By comparing the three region the total and average number of working units were highest in the southern region and showed a lowest Coefficient of variation this means the performance of southern region was stable. But the compound annual growth rate and the average annual increase in percentage was highest in northern region. This shows that the northern region now in the way of growth.

Table 2: Performance of SSI/MSMe in Terms of Employment

	Southren			Central			Nothern		
Year	Employm--ent (Nos)	Increase/ Decrease	%	Employm--ent (Nos)	Increase/ Decrease	%	Employm--ent (Nos)	Increase/ Decrease	%
2011-12	462724			342794			215644		
2012-13	495435	32711	7.07	372981	30187	8.81	234710	19066	8.84
2013-14	528989	33554	6.77	406673	33692	9.03	255223	20513	8.74
2014-15	561637	32648	6.17	436659	29986	7.37	276089	20866	8.18
2015-16	578910	17273	3.08	454091	17432	3.99	285665	9576	3.47
Average	525539	29047	6	402640	27824	7	253466	17505	7.31
S.D	47475			45503			28870		
COV	9.03			11.30			11.39		
CAGR	5.8			7.3			7.3		

Source: Economic review from 2011-2012 to 2015-16

Small Scale Sector is playing a vital role in increasing the employment in the economy. The employment generation of the southern region is 462724 during 2011-2012.By 2015-2016 the employment has increased to

578910 numbers.The average annual growth of the employment is 29047, where as the percentage annual growth is 6 percent. Average employment in the region is 525539 and coefficient of variation 9.03 percent. Compound annual growth rate is 5.8 percent.

The employment generation of the central region is 342794 during 2010-2011.By 2015-2016 the employment has increased to 454091 numbers. The average annual growth of the employment is 27824, where as the percentage annual growth is 7 percent. Average employment in the region is 402640 and coefficient of variation 11.3 percent.Compound annual growth rate is 7.3 percent.

The employment generation of the northern region is 215644 during 2010-2011.By 2015-2016 the employment has increased to 285665 numbers. The average annual growth of the employment is 17505, where as the percentage annualgrowth is 7.31 percent. Average employment in the region is 253466 and coefficient of variation 11.39 percent. Compound annual growth rate is 7.3 percent.

By comparing the three region the average number of employment generation is highest in the southern region and Coefficient of variation is lowest.This shows the performance of this region is stable. But the compound annual growth rate and the average annual increase in percentage was highest in Central region and northern region.

Table 3: Performance of SSI/MSMe in Terms of Investment

	Southren			Central			Nothern		
Year	**Investment (lakhs)**	**Increase /Decrease**	**%**	**Investment (lakhs)**	**Increase/ Decrease**	**%**	**Investment (lakhs)**	**Increase/ Decrease**	**%**
2011-12	407278.00			460964.00			214927.00		
2012-13	478202.47	70924.47	17.41	478617.90	17653.90	3.83	255853.51	40926.51	19.04
2013-14	557828.00	79625.53	16.65	575238.00	96620.10	20.19	301991.00	46137.49	18.03
2014-15	658747.00	100919.00	18.09	658422.00	83184.00	14.46	356683.00	54692.00	18.11
2015-16	713734.84	54987.84	8.35	706842.65	48420.65	7.35	378068.89	21385.89	6.00
Average	563158.06	76614.21	15.13	576016.91	61469.66	11.46	301504.68	40785.47	15.30
S.D	125852.16			107970.27			67982.88		
COV	22.35			18.74			22.55		
CAGR	15.1			11.3			15.2		

Source: Economic review from 2011-2012 to 2015-16

Table 3 shows the investment in Small Scale Industries/MSME of southern region is Rs.713734.84 lakhs during 2015-16.which is an increase of Rs 306456.84 lakhs when compared to 2010-2011.The average annual increase is 76614.21 lakhs. The compound annual growth rate is 15.1 percent which are greater than the compound annual growth rate of number of units registered.

The investment in Small Scale Industries/MSME of central region is Rs. 706842.65 lakhs during 2015-16.which is an increase of Rs 245878.65 lakhs when compared to 2010-2011.The average annual increase is 61469.66 lakhs. The compound annual growth rate is 11.3 percent

The investment in Small Scale Industries/MSME of northern region is Rs. 378068.89 lakhs during 2015-16.which is a increaase of Rs.163141.89 lakhs when compared to 2010-2011.The average annual increase is 40785.47 lakhs.. The compound annual growth rate is 15.2 percent.

By comparing three regions average investment is highest in central region but the compound annual rate is low. Annual average increase and compound annual growth rate approximately equal in the southern region and northern region.

Table 4: Performance of SSI/MSMe in Terms Goods and Services Produced

	Southren			Central			Nothern		
Year	**Goods and services(lakhs)**	**Increase/ Decrease**	**%**	**Goods and services(lakhs)**	**Increase/ Decrease**	**%**	**Goods and services(lakhs)**	**Increase/ Decrease**	**%**
2011-12	2091414.00			1177385.00			446772.00		
2012-13	2237209.56	145795.56	6.97	1460641.45	283256.45	24.06	639143.78	192371.78	43.06
2013-14	3138811.00	901601.44	40.30	1787027.00	326385.55	22.35	806474.00	167330.22	26.18
2014-15	3335165.00	196354.00	6.26	2123929.00	336902.00	18.85	985194.00	178720.00	22.16
2015-16	3426332.42	91167.42	2.73	2299773.93	175844.93	8.28	1039037.58	53843.58	5.47
Average	2845786.40	333729.61	14.07	1769751.28	280597.23	18.38	783324.27	148066.40	24.22
S.D	632817.51			461820.04			245322.26		
COV	22.24			26.10			31.32		
CAGR	13.1			18.2			23.5		

Source: Economic review from 2011-2012 to 2015-16

The table 4 shows the goods and service produced of Small Scale Sector/MSME during 2011-2016. The production of Small Scale Sector/MSME of the southern region is Rs. 2091414.00 lakhs in 2011-2012.It has increased to Rs. 3426332.42lakhs by 2015-2016.Production of goods and services is at an average of 2845786.40 lakhs.. On an average the percentage annual growth rate is 13.1 percent. The Compound annual growth rate (CAGR) is 13.1 Coefficient of variation is 22.24 percent.

The production of Small Scale Sector/MSME of the central region is Rs. 1177385.00 lakhs in 2011-2012.It has increased to Rs. 2299773.93 lakhs by 2015-2016.Production of goods and services is at an average of 1769751.28 lakhs. On an average the percentage annual growth rate is 18.38 percent. The Compound annual growth rate (CAGR) is 18.2 percent. Coefficient of variation is 26.1 percent

The production of Small Scale Sector/MSME of the northern region is Rs. 446772.00 lakhs in 2011-2012.It has increased to Rs. 1039037.58 lakhs by 2015-2016.Production of goods and services is at an average of 783324.27 lakhs. On an average the percentage annual growth rate is 24.22 percent. The Compound annual growth rate (CAGR) is 23.5 percent. Coefficient of variation is 31.32 percent.

By comparing three regions average goods and services produced and annual average increase is highest in the southern region and showed lowest coefficient of variation.Highest mean value and lowest coefficient variation indicate the stable performance.But the annual average increase in percentage and compound annual growth rate are highest in northern region.This shows that northern reion in the way of progress.

CONCLUSION:

Industrialisation play a vital role in economic development of the Kerala. Growth of small scale enterprises/ MSME leads to reduce the problem of unemployment, regional disparities.Government of Kerala has undertaken supportive measures to motivate entrepreneurship in the state.The study revealed that southern region good in industrialisation and has showed a stable performance.Number of unit, employment generation, investment and production of goods and services are lowest in northern region but the compound growth rate is highest .This shows that the industrialisation of northern region is in the way of progress.Northern region require more attention to accelerate its growth.The growth and performance of three region ensure that more concentration in MSME sector certainly contribute to the economic development of the State.Decentralisation of industrialisation will achieve only when Equal consideration must be given to all districts.It helps to avoid the concentration of industrialisation in particular locality.

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Journal of Chemistry and Chemical Sciences, *Vol.7(11), 1071-1078, November 2017* *ISSN 2229-760X (Print)*
(An International Research Journal), *www.chemistry-journal.org* *ISSN 2319-7625 (Online)*

An In silico Approach to Analyze the Novel Derivatives of Protocatechuic acid with Thiadiazole as Effective Protein Kinase Inhibitors Against ABL in CML

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(Received on: November 22, 2017)

ABSTRACT

Chronic Myeloid Leukemia (CML), clonal malignant disorder of hematopoietic stem cells caused by the excessive growth and accumulation of granulocytes in the blood. It is well known that ABL kinase is one of the best targets to treat CML. In the present MS, we designed synthetically viable derivatives of Protocatechuic acid (PCA) fused with 2-amino-1,3-4-thiadiazole moiety and computed different poses and binding affinities towards ABL kinase receptor using molecular docking and molecular dynamics employed in Schrödinger software suite. In this study we investigated the inhibitory activity of novel PCA derivatives towards targeted receptor. ADME/T properties were analyzed to check the drug like property of the molecules.

Keywords: Chronic Myeloid Leukemia, Docking studies, Protocatechuic acid analogues, 2-amino-1, 3, 4-thiadiazole, Computer aided drug design.

INTRODUCTION

Chronic Myeloid (Myelogenous or Myelocytic) Leukemia (CML), also known as Chronic Granulocytic Leukemia (CGL), is a cancer of White Blood Cells (WBC) in which number of WBC rise exponentially. Almost 90% of the CML is generated by the chromosomal abnormality that results in the formation of a Philadelphia chromosome, caused by the fusion of the Abelson (Abl) tyrosine kinase gene located in chromosome 9 and the break point cluster (Bcr) gene at chromosome 22, resulting in a chimeric oncogene (Bcr-Abl)[1-2]. This new fusion BCR-ABL gene, which encodes a tyrosine kinase, which continuously carried out the phosphorylation and promotes division of WBC. At present CML is targeted by tyrosine

kinase inhibitors but despite the availability of these inhibitors there have some need for a search of natural inhibitors with easily available and less side effects.

Natural phenolic compounds have been considered as one of the most interesting plant secondary metabolites for their chemo preventive and chemotherapeutic effects in cancer with a common aromatic ring bearing one or more hydroxyl groups[3]. Phenolic compounds isolated from plant sources classified into several subgroups include simple phenols, lignans, flavonoids, xanthones, tannins, coumarins[4] etc. Prior studies have demonstrated that Phenolic acids and its functions has been the subject of a great number of agricultural, biological, chemical and pharmaceutical studies. The health beneficial effects of phenolic compounds are due to their ability to exhibit antioxidant, anti-inflammatory, antitumor, antimicrobial, anti-clastogenic activities[5-7]. The phenolic structures often have the potential to strongly interact with proteins due to their hydroxyl groups and benzenoid rings. Because the hydroxyl groups present in phenolics are good hydrogen donors and also the benzenoid rings present in them are hydrophobic[8]. Protocatechuic acid (3,4-dihydroxy benzoic acid or PCA), one of the phenolic acid found in many food plants such as olives, green tea and white grapes have anticancer activity[9]. The in *vitro* and in *vivo* studies shown that it have anti inflammatory properties, antioxidant and free radical scavenging activities, peroxidation inhibition and anti-estrogenic activity[10-13]. Furthermore, PCA has been shown antiapoptotic and antiproliferative effects in different cancerous cells.

1,3,4-Thiadiazole moiety contains a heterocyclic nucleus in which sulfur present at position-1, and two nitrogen atom at position-3 & 4, also it acts as a "hydrogen binding domain" and "two-electron donor system". Hence the derivatives of 1,3,4-Thiadiazole reported a wide range of therapeutic activities such as antibacterial, antifungal, antimicrobial, analgesic, anti-inflammatory, anti-tubercular activity, anti-depressant and anti-convulsant[14-21]. It also exhibited interesting *in vitro* and *in vivo* anticancer activities[22-24]. Substitution of 1,3,4-thiadiazole ring with amino group resulted in compounds with promising anticancer activity against several cell lines. In view of the above mentioned facts, in this study we used PCA with 2-amino-1,3,4-thiadiazole scaffold as a building block for the design of new potent anticancer agents for CML.

COMPUTATIONAL METHODS

Schrodinger suite 2017-2 software suite was used for all docking simulations. Maestro 11.2 graphical user interface was employed during protein preparation, ligand preparation and high throughput virtual screening[25]. The drug likeness properties of these derivatives were evaluated on the basis of Lipinski's rule of 5[26-27]. We also performed Density Functional Theory (DFT) analysis for optimizing the geometry of the analogues with Gaussian09 program[28] and are analyzed with the help of the Chemcraft program[29]. The geometries of the novel designed molecules are optimized using the 6-31G* basis set and these calculations are mainly carried out in the framework of the Becke–Lee–Yang–Parr [B3LYP] functional. The HOMO, LUMO and band gap of the high score compounds were also analyzed. The best score compounds with ABL was subjected for molecular dynamic simulations, to predict the stability with the help of Desmond software using OPLS 2005 force field[31].

RESULTS AND DISCUSSION

The cellular events leading to CML is controlled by signal transduction and is depended on protein-protein interactions and in turn this relies on reversible phosphorylation reactions catalyzed by protein kinases. Tyrosine kinases play a key role in the signal transduction pathways of CML. The oncogene BCR-ABL that is formed by the interaction of BCR and ABL is absent in normal cells. The molecules which can inhibit BCR-ABL activity may cure CML and this drug does not have any interaction with normal cells functions. We have designed novel structures that may act as inhibitors BCR-ABL considering these functionalities. Molecular docking simulation studies were carried out to understand the binding efficiency of Protocatechuic acid fused with 1, 3, 4-Thiadiazole derivatives with the human ABL kinase (PDB: 3CS9). The ranking were evaluated by top hits docking score of the designed compounds that are analyzed and tabulated in table 1.

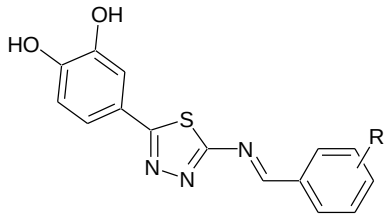

Figure 1. N-substituted benzylidene-5-(3, 4,-dihydroxyphenyl)-1, 3, 4-thiadiazole-2-amine.

Generally, the complex formed during docking study provides the valuable information about the ligand-receptor interactions such as Hydrogen bonding, Electrostatic interactions, Vander wall interactions etc. The results of docking studies are given in Table I. As per the computations, Compound 1(R = 3, 4, 5-trihydroxy) has the dock score of -10.68 kcal/mol which is much higher than the parent molecule PCA. The 2D interaction diagram of the highest score Compound 1 shown in figure 2. It shows that the ligand interacts with receptor through a π-π stacking interaction of the 1,3,4-thiadiazole heterocyclic ring and the PHE 382 amino acid residue of the targeted receptor in addition to the hydrogen bond interaction.

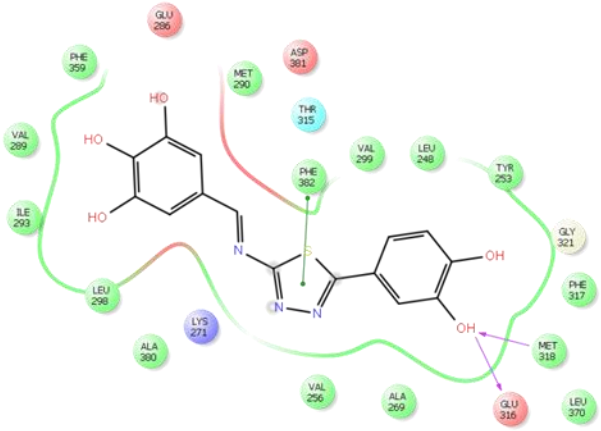

Figure 2. 2D interaction diagram of Compound 1 with 3CS9.

The highest score designed compounds are optimized using Gaussian 09 software packages and the results are analyzed by using chemcraft software. The results obtained from the frontier molecular orbital analysis showed that the band gap of highest score Compound 1 (3.25 eV) is less than that of the band gap of the PCA (4.97 eV), which indicates the kinetic stability of the molecule. The frontier molecular orbital clearly tells that the HOMO is distributed across the molecule, while LUMO more concentrated on the central ring system and the trihydroxy benzene ring (Figure 3).

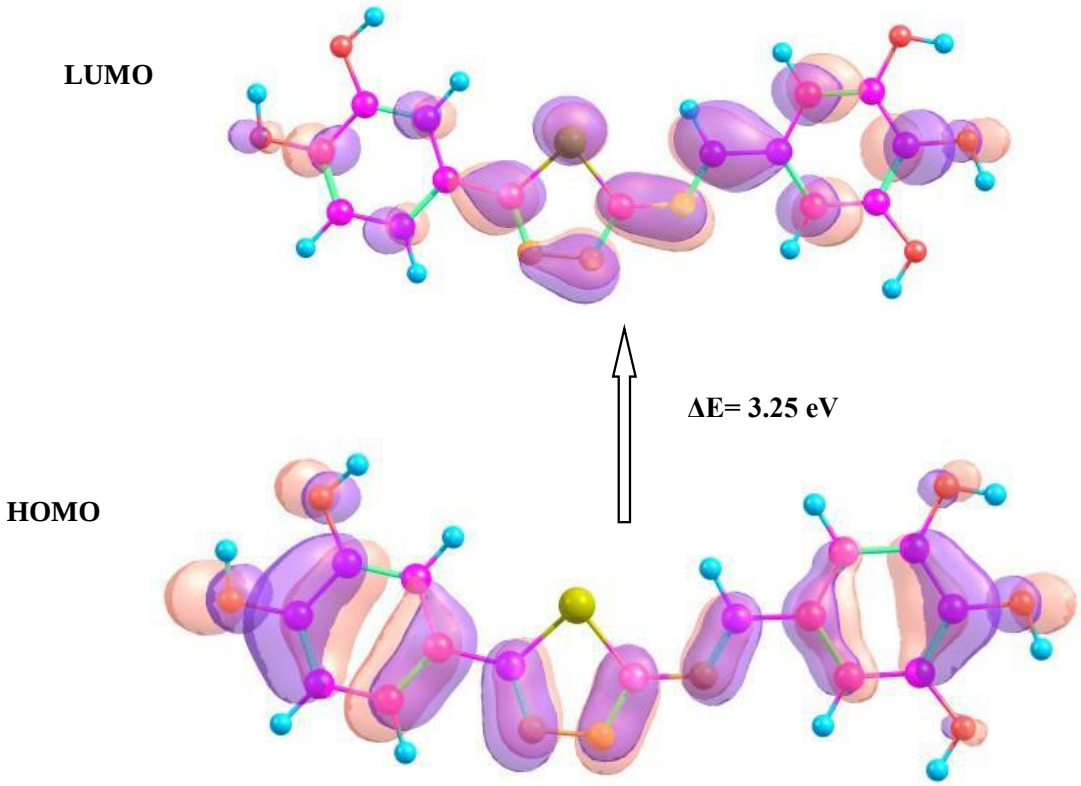

Figure 3. HOMO, LUMO and Band gap of the Compound 1

Table 1. Glide Score, Dock Score and ADME properties of the Compound 1 with the ABL kinase receptor.

	Compound 1	Compound 2	Compound 3	Compound 4	Compound 5
R =	3,4,5-trihydroxy	3-chloro, 4-nitro	3,4-dichloro	2-chloro, 6-fluro	4-chloro, 5-fluro
Docking score (kcal/mol)	-10.68	-10.46	-10.29	-10.20	-10.12
Band gap (eV)	3.25	2.76	3.08	3.23	3.10
Mol_MW (130-725)	345.33	376.77	366.22	349.76	349.76
HBD (0-6)	5	2	2	2	2
HBA (2-20)	6.75	5.5	4.5	4.5	4.5
CNS (-2 - +2)	-2	-2	-1	-1	-1
QPlogPo/w (–2.0 – 6.5)	0.505	2.411	3.52	3.20	3.29
PSA (7.00 -200)	146.89	125.84	81.55	80.02	81.55
%HOA (<25% is poor >50% is great)	50.10	70.79	92.85	91.55	91.53
Lipinski's rule of five (Max 4)	0	0	0	0	0

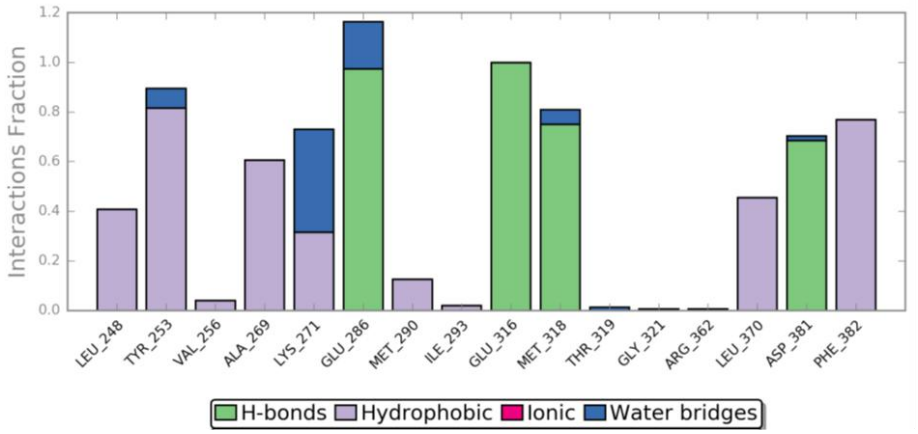

Figure 4. The interaction between ABL kinase and Compound 1 evolved during MD simulation.

Pharmacokinetic parameters of the highest score compounds were analyzed by using QikProp tool of Schrodinger suite 2015 and tabulated in table 1. It has been observed that the predicted properties such as QPlogPo/w, overall CNS activity, percentage of human oral absorption, number of hydrogen bond acceptor and donor[30], polar surface area of the highest docking score compounds are almost all in the acceptable range with zero violation in Lipinski's rule of five.

To predict the stability of binding mode of novel derivatives of PCA (Compound 1) in ABL kinase, we had done molecular dynamics of the complex for 2ns using OPLS 2005 force field. The protein RMSD (left Y-axis) and the ligand RMSD (right Y-axis) shows that

both are stabilized at the end of the trajectory below 3Å (Figure 5). There are strong H-bonds between the phenolic -OH with Glu316 (100%), Met318 (50%), Glu286 (69%) and Asp381 (67%). In addition, hydrophobic interactions of Leu248, Tyr253, Val256, Ala269, Lys271, Met290, Ile293, Leu370 and Phe382 also show the affinity of the ligand to the protein (Figure 4). Moreover π-π stacking interactions of the two benzene moieties with Tyr253, which lasts for 80% and with Lys271 for 31% of the simulation period shows the stability of the binding pose and interprets that the protein-ligand complex is quite stable.

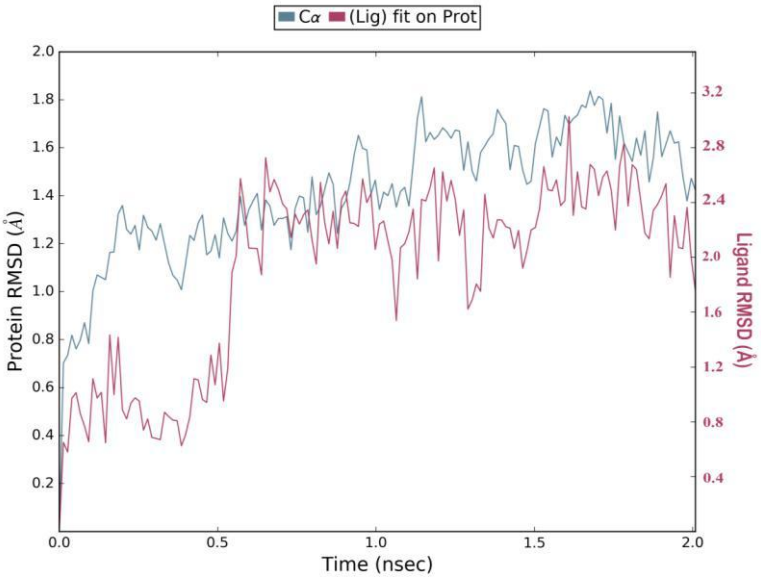

Figure 5. The RMSD deviations between the original structure and the structure enumerated during MD simulation.

CONCLUSION

The preliminary biological evaluations of both PCA and 2-amino-1,3,4-thiadiazole revealed that these class of compounds possesses good anticancer activity. Hence, in the present study we used, rationally designed derivatives of PCA with 2-amino-1,3,4-thiadiazole moiety to investigate the inhibitory activity of human-ABL kinase towards CML. The results of docking analysis, shows that most of the designed analogues possess highest docking score than PCA. This is mainly due to the strong hydrogen bond interaction, π-π stacking interaction and hydrophobic interaction between the novel designed derivative and the amino acid residues present in the ABL receptor. Also, the HOMO-LUMO analysis revealed that the designed compounds possess higher kinetic stability compared to PCA. The molecular dynamic simulation study results clearly indicate that the binding stability and all interactions between the high score compound and the targeted receptor. Hence, it has been clearly demonstrated that the approach utilized in this study is successful in finding novel anticancer inhibitors from the derivatives of protocatechuic acid fused with 1,3,4-thiadiazole moiety.

ACKNOWLEDGEMENTS

The authors acknowledge IIITM-K Trivandrum for research facilities provided. KRR thanks Government of Kerala and MJS thanks University of Kannur for Research Fellowships. DRS thanks KSCSTE for Post Doctoral Fellowship.

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Journal of Chemistry and Chemical Sciences, *Vol.7(12), 1129-1134, December 2017* *ISSN 2229-760X (Print)*
(An International Research Journal), *www.chemistry-journal.org* *ISSN 2319-7625 (Online)*

Design of Novel Planar Tetracoordinate Carbon Molecules Containing Lithium

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(Received on: November 29, 2017)

ABSTRACT

The quest for stable planar tetracoordinate carbon (ptC) compounds still remains as an interesting area of exploration for theoreticians. In this study, we have designed and analyzed two compounds with ptC stabilized by electronic approach. The structures are found to be true minima on the potential energy surface with its bonding parameters nearer to the square planar methane. NBO analysis of the compounds are done.

Keywords: Planar tetracoordinate carbon, electronic stabilization, non-classical carbon, lithium compounds, NBO analysis.

INTRODUCTION

In 1874, J.H van't Hoff[1] and J.A LeBel[2] independently proposed the tetrahedral geometry for tetracoordinate carbon. This evoked curiosity in chemists to know about the spatial arrangement of molecules. After hundred years Hoffmann *et al.*[3], came with ways to stabilize an alternate planar geometry for the tetracoordinate carbon, which could probably serve as a transition state. According to them, the planar tetracoordinate carbon (ptC) is sp^2 hybridized with a lone pair of electrons in its unhybridized p orbital. As a consequence, there exists an electron deficiency in its sigma bonds. Both these makes the ptC unstable. The stabilization of ptC can be done by electronic, mechanical or by employing both ways simultaneously[4–8]. The electronic stabilization is by introducing π acceptors and σ donors substituents or making ptC as a part of an annulene ring. While the mechanical stabilization utilizes steric factors to induce planarity.

The idea of ptC by Hoffmann *et al.* has attracted the attention of both theoretical and experimental research. The literature is gifted with many theoretically and experimentally

derived ptCs of organometallic compounds where Li, N, O, B, Al, Mg etc. and many transition metals as substituents on carbon[5,9–20]. From the literature, we could infer that the electropositive element lithium has got some peculiarity in stabilizing the ptC as it could accept electrons to its empty p-orbital[21]. The first theoretically designed ptC is 1,1 di-lithiocyclopropane[22] was a lodestar towards the designing and synthesis of many ptCs with lithium.

In this work, we have designed two stable ptC compounds **1** and **2** by employing the electronic ways of stabilization. Stabilization by electropositive lithium atoms is the common strategy being used here. In addition to this, compound **1** utilizes oxygen atoms and compound **2** utilizes aluminium atoms which are part of a five membered ring to stabilize our ptC. Though the neighbours to lithium atom in two compounds do not share any common property, it is quite surprising that they are successful in stabilizing the ptC. The designed compounds are subjected to detailed theoretical analysis.

COMPUTATIONAL METHODS

The geometric optimizations and vibrational analysis of all the compounds were done using the Gaussian 09 program[23,24] at the B3LYP[25,26]/6-311++G**[27] level .The NBO analysis[28–31] were done at B3LYP/sdd level to know more about the bonding and electronic distribution in molecules. The visualizations of geometry and orbitals were done using the chemcraft software[32].

RESULTS AND DISCUSSION

By nature, tetracoordinate carbon always prefers tetrahedral geometry, hence special care has to be given to make it comfortable in its non-classical planar geometry. In the newly designed compounds **1** and **2,** lithium atoms together with oxygen and aluminium respectively is holding the carbon to lie in a plane. The structures are found to be true minimum on the potential energy surface with smallest vibrational frequencies 183.12 cm^{-1} and 44.31 cm^{-1} respectively. The stability of wavefuntions was found stable. The optimized geometries of compound **1** and **2** (Figure 1) were visualized and analyzed in chemcraft software. The bond lengths are in acceptable limits and bond angles and dihedral angles are found nearer to the square planar configuration of methane (Table 1). The dihedral angles clearly show the central carbon is held planar by its substituents.

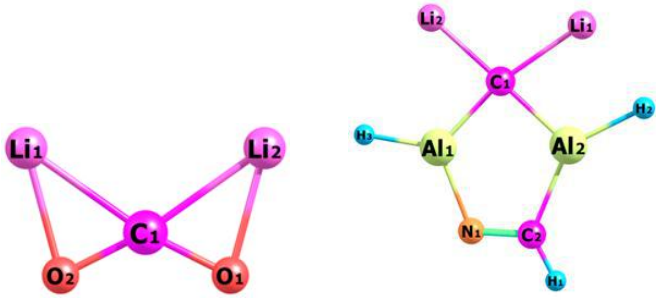

Figure. 1. The optimized geometries of compound 1 and 2.

Table. 1. The bonding parameters of compound 1 and 2.

Bonding parameters	Compound **1**	Compound **2**
Bond lengths (in Å)	C_1 O_1= 1.27 C_1 O_2= 1.27 C_1 Li_1= 1.95 C_1 Li_2= 1.95	C_1 Li_1 = 1.96 C_1 Li_2 = 1.91 C_1 Al_1 = 1.90 C_1 Al_2 =1.90
Bond Angles (in degrees)	$Li_1C_1O_1$ = 171.4 $Li_1C_1Li_2$ = 109.3 $O_1C_1O_2$ = 126.5	$Al_1C_1Li_1$ = 168.1 $Al_2C_1Li_2$ = 179.3 $Li_1C_1Li_2$ = 103.4 $Al_1C_1Al_2$ = 90.8
Dihedral Angles (in degrees)	$Li_1C_1O_1O_2$ = 180.0 $Li_1C_1O_1Li_2$ = -0.0	$Li_1C_1Al_1Li_2$ = 180.0 $Li_1C_1Al_1Al_2$ = -0.0

To have a comparison between tetrahedral and planar geometries of central carbon C_1, the both geometries of each compound were optimized using the same level of theory and basic set. In compound **1,** C_1 retrieves to the planar geometry showing that it is the local minimum. But for compound **2,** C_1 in tetrahedral and planar geometry are local minima on the potential energy surface where C_1 in tetrahedral geometry is slightly more stable than C_1 in planar form with an energy difference of $\Delta E = 0.038$ kcal/mol .

The dipole moment of both compounds were analysed and dipole moment vector is visualized using chemcraft (Figure 2). The compound **2** has got a higher dipole moment than **1** and hence is more polar than **1.** But in both compounds the dipole moment vector is pointing downwards which implies that the negative charge is mainly concentrated on oxygen atoms in **1** and towards the five membered ring in **2**. Further, an NBO analysis of the compounds are done and the wiberg index[33] and natural charges of ptC and its substituents are analyzed (Table 2). In compound **1** the ptC has got positive charge as the oxygen atoms are utilizing the extra lone pair electrons on carbon which is clear from its wiberg index values. In compound **2**, though the carbon has got a negative charge it is stabilized by the vicinity of four metal atoms.

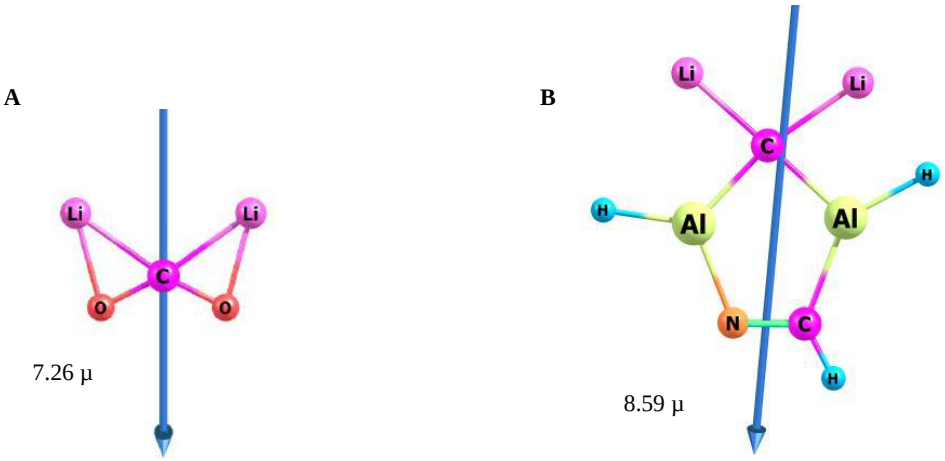

Figure. 2. Dipole moment vector on : A) compound 1 B) compound 2.

Table. 2. The wiberg indices and natural charges of ptC and its substituents in compounds 1 and 2

Entry	Wiberg index	Natural charge
Compound 1	C_1-Li_1 =0.3 C_1-Li_2 =0.3 C_1-O_1 = 1.4 C_1-O_2 = 1.4	C_1 = 0.3 Li_1 = 0.6 Li_2 = 0.6 O_1 = -0.8 O_2 = -0.8
Compound 2	C_1-Li_1 = 0.3 C_1-Li_2 = 0.2 C_1-Al_1 =0.9 C_1-Al_2 =0.9	C_1 = -2.4 Li_1 = 0.7 Li_2 = 0.8 Al_1 = 1.4 Al_2 = 1.2

It has been habitual to check the stability of non-classical structures in terms of the characteristics of its frontier orbitals, especially in terms of its HOMO-LUMO energy gap. The HOMO-LUMO energy gap of the compounds **1** and **2** are 3.22 eV and 3.08 eV respectively which implies that our compounds are kinetically stable. The plots of HOMO, HOMO-1, HOMO-2 and LUMO of both compounds are given in figure 3. For compound **1**, HOMO is a molecular orbital in the plane of the molecule mainly concentrated on the central ptC while LUMO is a molecular orbital mainly concentrated on lithium atoms with small orbital coefficients on central carbon and attached oxygen atoms. The HOMO-1 is a p-type orbital and HOMO-2 is a bonding orbital on lithium-oxygen atoms. For compound **2**, HOMO is a bonding orbital mainly concentrated on the central ptC and the carbon-nitrogen double bond in five membered ring whereas LUMO is mainly concentrated on lithium atoms. The HOMO-1 and HOMO-2 are p type orbitals mainly concentrated on the central ptC with small contribution from carbon-nitrogen double bond. Thus from the frontier molecular orbital analysis, we could conclude that in both compounds the lone pair on ptC is well distributed throughout the molecule, which make them stable.

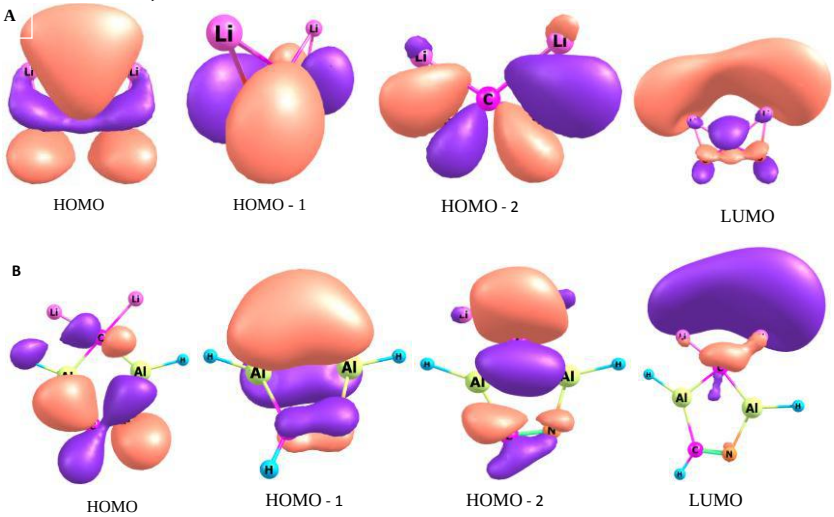

Figure. 3. The frontier molecular orbitals: A) compound 1 B) compound 2.

Additionally, from the HOMO energy (E_{HOMO}) and LUMO energy (E_{LUMO}) ,the global reactivity indices such as electron affinity (EA), electro negativity (χ),electrochemical potential (U) and chemical hardness (η), the very useful physical parameters are calculated[34] and compared with square planar methane (Table 3). Both the compounds got same ionization potential and electron affinity values, but are lesser than that of square planar methane. The electronegativity of compound **2** < square planar methane < compound **1**. From the chemical hardness value, both compounds are harder than the square planar methane and hence stable than square planar methane.

Table. 3. The E_{HOMO}, E_{LUMO} and the global reactivity indices of square planar methane, compound 1 and compound 2 (All the quantities are given in atomic units).

E_{HOMO}	E_{LUMO}	$IE = -E_{HOMO}$	$EA = -E_{LUMO}$	$\chi = \frac{IE + EA}{2}$	$U = -\chi$	$\eta = \frac{IE - EA}{2}$
-0.18	-0.07	0.18	0.07	0.12	-0.12	0.05
-0.17	-0.05	0.17	0.06	0.14	-0.14	0.06
-0.17	-0.06	0.17	0.06	0.11	-0.11	0.06

CONCLUSION

We have successfully designed two compounds with ptC, which are true minima on the potential energy surface .The compound **2** is found to be more stable compared to **1,** with its bond parameters nearer to the square planar methane. Also the dipole moment of compound **2** is greater than that of compound **1**. For compound **1**, geometry with C_1 in the planar form is the local minimum. While in compound **2**, though both structures are local minima on the potential energy surface, the structure with C_1 in tetrahedral geometry is slightly more stable than C_1 in planar geometry. From, the frontier molecular orbital analysis, it is revealed that the lone pair electrons on central carbon is well distributed throughout the molecules in both compounds **1** and **2**. Finally, the global reactivity indices show that both the compounds are harder than square planar methane and hence stable. Thus the designed candidates serve as a novel candidates of compounds having ptC.

ACKNOWLEDGEMENTS

The authors acknowledge IIITM-K Trivandrum for research facilities provided. MJS thanks University of Kannur and KRR thanks Government of Kerala for Research Fellowships. DRS thanks KSCSTE for Post Doctoral Fellowship.

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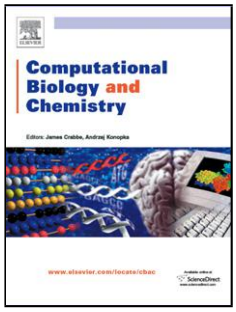

Title: Computational Study of Molecular Electrostatic Potential, Docking and Dynamics Simulations of Gallic acid derivatives as ABL inhibitors

Authors: K.R. Raghi, D.R. Sherin, M.J. Saumya, P.S. Arun, V.N. Sobha, T.K. Manojkumar

PII: S1476-9271(17)30781-8
DOI: https://doi.org/10.1016/j.compbiolchem.2018.04.001
Reference: CBAC 6833

To appear in: *Computational Biology and Chemistry*

Received date: 13-11-2017
Revised date: 23-3-2018
Accepted date: 4-4-2018

Please cite this article as: Raghi, K.R., Sherin, D.R., Saumya, M.J., Arun, P.S., Sobha, V.N., Manojkumar, T.K., Computational Study of Molecular Electrostatic Potential, Docking and Dynamics Simulations of Gallic acid derivatives as ABL inhibitors.Computational Biology and Chemistry https://doi.org/10.1016/j.compbiolchem.2018.04.001

Computational Study of Molecular Electrostatic Potential, Docking and Dynamics Simulations of Gallic acid derivatives as ABL inhibitors

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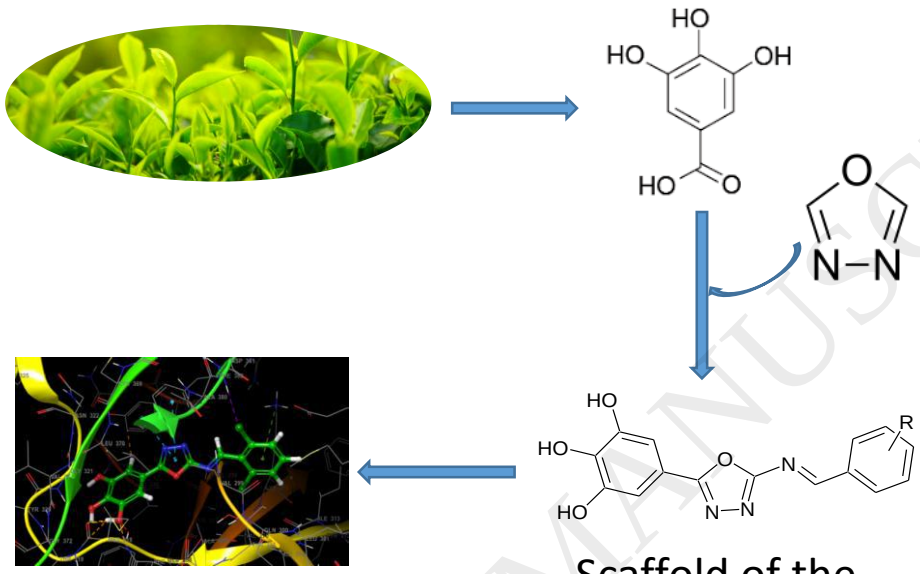
Graphical abstract



Highlights

- Docking
- Molecular Electrostatic Potential map Molecular Dynamics
- ABL Kinase Inhibitor
- New Drug for CML

ABSTRACT

Chronic myeloid leukemia (CML), a hematological malignancy arises due to the spontaneous fusion of the BCR and ABL gene, resulting in a constitutively active tyrosine kinase (BCR-ABL). Pharmacological activity of Gallic acid and 1,3,4-Oxadiazole as potential inhibitors of ABL kinase has already been reported. Objective of this study is to evaluate the ABL kinase inhibitory activity of derivatives of Gallic acid fused with 1,3,4-Oxadiazole moieties. Attempts have been made to identify the key structural features responsible for drug likeness of the Gallic acid and the 1,3,4-Oxadiazole ring using molecular electrostatic potential maps (MESP). To investigate the inhibitory activity of Gallic acid derivatives towards the ABL receptor, we have applied molecular docking and molecular dynamics (MD) simulation approaches. A comparative study was performed using Bosutinib as the standard which is an approved CML drug acting on the same receptor. Furthermore, the novel compounds designed and reported here in were evaluated for ADME properties and the results indicate that they show acceptable pharmacokinetic properties. Accordingly these compounds are predicted to be drug like with low toxicity potential.

Keywords: *Docking, MESP, Gallic acid derivatives, 1,3,4-Oxadiazole, CML.*

1. Introduction

Cancer, the leading cause of morbidity and mortality of contemporary world is a terrifying disease that initiates in the cells and is characterized by the uncontrolled, undesirable and uncoordinated cell growth (Baindur et al., 2005). According to the survey of World Health Organization (WHO) in developing countries, nearly 8.8 million cancer deaths have occurred in 2015. This demands the imperative need for the discovery, development and improvement of novel anticancer drug molecules which could efficiently prevent proliferative pathways and clonal expansion of cells. Chronic Myeloid Leukemia (CML) is a hematological malignancy that affects the white blood cells which are produced in the bone marrow stem cells. CML occurs by a reciprocal translocation between chromosomes 9 and 22 during cell division, forming a new BCR-ABL gene on chromosome 22. Unlike the normal ABL, the BCR-ABL gene is constitutively active and does not require activation by any external signals thereby prompting the leukemic cells to grow, multiply and cause CML (Michael et al., 2017).

Depending on the breakpoints of BCR, three main types of BCR/ABL genes are characterized which include $P^{190BCR-ABL}$, $P^{210BCR-ABL}$ and $P^{230BCR-ABL}$. Among these, $P^{210BCR-ABL}$ can lead to the

malignant transformation of CML and is also considered responsible for the phenotypic abnormalities in the chronic phase of CML. In contrast to ABL, BCR-ABL which is found exclusively in the cytoplasm, constitutively activate tyrosine kinase and if not maintained, deregulated kinase activity can lead to transformation and malignancy. During the formation of BCR-ABL fusion gene, a portion of ABL, responsible for governing the regulation of SH1 domain is lost. Further, the tyrosine kinase activity of the SH1 domain is constitutively activated leading to oncogenic transformation. Its activity disturbs the normal functions of the ABL kinase as it interacts with a number of effector proteins (Marfe, G., Stefano C D., 2014). The malignant transformation of BCR-ABL has been implicated in three major mechanisms viz., alterations of adhesion to the extracellular matrix, constitutive active mitogenic signaling and increased resistance to apoptosis and these include Ras and MAP kinase pathway, JAK-STAT pathway, Myc pathway and PI3K pathway. Recently, a fourth possible mechanism proteasome-mediated degradation of ABL inhibitory proteins was described (Michael et al., 2017). The increased tyrosine kinase activity of $P^{210BCR-ABL}$lead to the disruption of key cellular processes such as the Ras and MAP kinase pathway leading to increased proliferation, JAK-STAT pathway leading to impaired transcriptional activity and PI3K/AKT pathway resulting in increased apoptosis.

Ras and the MAP kinase pathways: The binding of extracellular mitogen to the membrane receptor allows Ras (a Small GTPase) to swap its GDP for a GTP, which activate MAP3K, which then activates MAP2K, successively activates MAPK and a transcription factor. Receptor-linked tyrosine kinases such as the epidermal growth factor receptor (EGFR) are activated by extracellular ligands. The tyrosine kinase activity of the cytoplasmic domain of the receptor is activated by the binding of epidermal growth factor (EGF) to the EGFR. The EGFR becomes phosphorylated on tyrosine residues. Docking proteins such as GRB2 contain an SH2 domain that binds to the phosphotyrosine residues of the activated receptor. By two SH3 domains of GRB2, it binds to the guanine nucleotide exchange factor SOS. When the GRB2-SOS complex docks to phosphorylated EGFR, SOS becomes activated. Activated SOS then promotes the removal of GDP from a member of the Ras subfamily, most notably H-Ras or K-Ras. Ras can then bind GTP and become active. Other cell surface receptors that can activate this pathway via GRB2 are Trk A/B, Fibroblast growth factor receptor (FGFR) and PDGFR (Daniela., Giuseppe 2011; Schulze et al., 2005).

Jak-Stat pathway: The binding of various ligands, usually cytokines to cell-surface receptors, causes the receptors to dimerize, which brings the associated JAKs into close proximity and increases their kinase activity. Binding sites for proteins possessing SH2 domains are created by phosphorylation of tyrosine residues on receptor through activated JAKs. STATs then bind to the phosphorylated tyrosines on the receptor using their SH2 domains, and then they are tyrosine-phosphorylated by JAKs, causing the STATs to dissociate from the receptor. These activated STATs form hetero- or homodimers, where the SH2 domain of each STAT binds the phosphorylated tyrosine of the opposite STAT, and the dimer then translocates to the cell nucleus to induce transcription of target genes. STATs may also be tyrosine-phosphorylated directly by receptor tyrosine kinases, such as the epidermal growth factor receptor (Jatiani et al., 2011; Owen et al., 2013; Michael et al., 2017).

Myc pathway: *Myc* protooncogene is depicted downstream of receptor signal transduction pathways, which elicit positive or negative regulation of the *Myc* gene. *Myc* generates the transcription factor Myc, which dimerizes with Max and binds target DNA sequences or E boxes (with the sequence 5′-CANNTG-3′) which regulate transcription of genes involved in cell growth and proliferation (Dang 2012; Melo et al., 2004).

PI3 kinase pathway: The pleckstrin homology domain of AKT binds directly to PtdInsP3 and PtdInsP2, which are produced by activated PI 3-kinase. Since PtdInsP3 and PtdInsP2 are restricted to the plasma membrane, these results in translocation of AKT to the plasma membrane. Similar to the phosphoinositide-dependent kinase-1 (PDK1) also contains a pleckstrin homology domain which binds directly to PtdInsP3 and PtdInsP2, causing it to also translocate to the plasma membrane upon activation of PI 3-kinase. The interaction of activated PDK1 and AKT allows AKT to become phosphorylated by PDK1 on threonine, leading to partial activation of AKT. Full activation of AKT occurs upon phosphorylation of serine by the TORC2 complex of the mTOR protein kinase (Franke et al., 1997; Daniela and Giuseppe 2011).

In this context, we are suggesting novel inhibitors derived from natural products to treat CML by inhibiting the activity of ABL kinase. Gallic acid, being a natural phenolic acid that induces the

cell cycle arrest and induction of apoptosis has got a wide range of application as a drug for various diseases (Naira et al., 2016). Its antibacterial, antiviral, antioxidant, antifungal, anti-inflammatory (Kim et al., 2006) and anti-mutagenic activity have been reported (Abdelwahed et al., 2007). Antiproliferative properties of Gallic acid against various cancer cell lines such as colon cancer (Pradeepa et al., 2014), prostate cancer (Kaur et al., 2009) and breast cancer (Wang et al., 2014) are reported which attributes the effect of the molecule to its hydrophobic benzenoid rings and the hydrogen-bonding potential of the phenolic hydroxyl groups (Parr et al., 2002) . Furthermore, it has the ability to suppress cell viability, proliferation, invasion and angiogenesis in human glioma cells (Lu et al., 2010), suggesting that Gallic acid can be used for the treatment of brain tumor. Moreover, its protective activity on normal cells (Li, et. al., 2010; Verma, et. al., 2013) made Gallic acid as a potential compound in various cancer therapies. Hence, the present study targets to examine the anticancer activity of derivatives of Gallic acid fused with heterocyclic compound against ABL kinase cancer cell lines.

Traditionally heterocyclic compounds have played a vital role in the metabolism of all living cells and are present in a wide spectrum of pharmaceutical natural and synthetic drugs having different biological activities (Dua et al., 2011). Oxadiazole is a versatile aromatic heterocyclic nucleus that has attracted the attention of the medicinal chemists for the development of new drugs. Compared to other Oxadiazole derivatives, substituted 1,3,4-Oxadiazoles have shown multifarious biological activities such as antimicrobial, anti-inflammatory (Asraf et al., 2015), Tuberculostatic (Franski et al., 2005), anti-proliferative, anti-cancer, (Kavitha et al., 2014), anti-mycobacterial (Maria et al., 2005), antifungal (Guang et al., 2001) and ulcerogenicity (Shashikant et al., 2008). Since anticancer drugs show increased resistance, it is essential to design novel structured heterocyclic moieties that create potential agents with promising biological applications. Based on the above facts, we have attempted to assess the *in silico* interactions of Gallic acid fused with 1,3,4-Oxadiazole derivatives against human-ABL kinase receptor for CML.

2. Computational Methods

2.1 *Molecular Electrostatic Potential (MESP)*

All ligand geometries were optimized using density functional theory employing B3LYP/6-31G* level of theory. Computational Chemistry tool kit Gaussian-09 (Frisch et al., 2009) was used for

the computations. From the cube files of Gaussian programme, molecular electrostatic potential diagram (Kim et al., 1994) of the Gallic acid, 1,3,4-Oxadiazole and the newly designed ligands has been generated. MESP is a useful descriptor to determine the relative electron density in a molecule and helpful in studying non-bonded interactions between molecules. (Govindarajan et al., 2012: Alam M et al., 2018).

2.2 *Molecular Docking Methods*

The optimized 3D structure of the ligands were imported to the builder panel of Maestro 11.2 and different low energy conforms were generated using Ligprep module of Schrodinger Software suite (Schrödinger 2017-2) with OPLS-2005 force field. The X-ray crystal structure of mutant ABL kinase receptor (PDB ID; 3CS9) (Zhou et al., 2016), was downloaded from RCSB Protein Data Bank (PDB) and it was cleaned using the protein preparation wizard application (Sastry et al., 2013), executes the correction of raw PDB structure (Glide). Prior to protein optimization, water molecules with less than five hydrogen bonds were removed from the crystal structure of the target protein (Jacobson et al., 2004). After that, hydrogen bonds and missing side chain atoms were added and breaks present in the protein structure were repaired with prime. This step is then followed by the energy minimization of protein under OPLS-2005 force field (Kalirajan et al., 2017: Shivakumar et al., 2010) with convergence of heavy atoms to a root mean square deviation (RMSD). The correctness of the structure of the protein was evaluated using Ramachandran plot. The electrostatic and van der Waal's potential of binding pocket was assigned through grid box around the centroid of the active site of the internal ligand. Finally for docking, low energy conformation of all the compounds were docked into the binding pocket of receptor using Glide in extra precision mode. In this docking method, the designed molecules are flexible and the target receptor is rigid except the active binding site which has slight flexibility. The docking score analysis of the each ligand with the target receptor was analyzed through XP visualizer and the Glide score of the known inhibitor Bosutinib was taken as a standard for the comparative studies on our comprehensive ligand databases with the same receptor.

To understand the nature of interactions of the inhibitors with the receptor, an empirical scoring function, Glide score, was used to predict the strength of the non-covalent interaction between two molecules after they have been docked, in terms of binding affinity. It includes the ligand-receptor interaction energies, hydrophobic interaction, hydrogen bonds, internal energy, π-π stacking

interaction, π-cation interaction, root mean square deviation (RMSD) and desolvation. The Glide score is calculated by using the following equation (Gopalakrishnan et al., 2010).

GScore = 0.065*vdW + 0.130*Coul + Lipo + Hbond + Metal + BuryP + RotB +Site

Where, vdW denotes the van der Waals energy; Coul is the coulomb energy; Lipo denotes the lipophilic contact term; Hbond is the hydrogen-bonding term; Metal is the metal binding term; BuryP represents the penalty for buried polar groups; RotB is the penalty for freezing rotatable bonds and Site is the polar interactions at the active site.

2.3 *ADME Predictions*

QikProp is performed for all the designed high score compounds to calculate the Absorption, Distribution, Metabolism and Excretion (ADME) properties for assessing the disposition and potential toxicity of ligand with in an organism and the overall pharmacological properties of these molecules justify that these molecules are biologically active without any toxic functional groups(Vanjari et al., 2012 : Pawar et al., 2010).

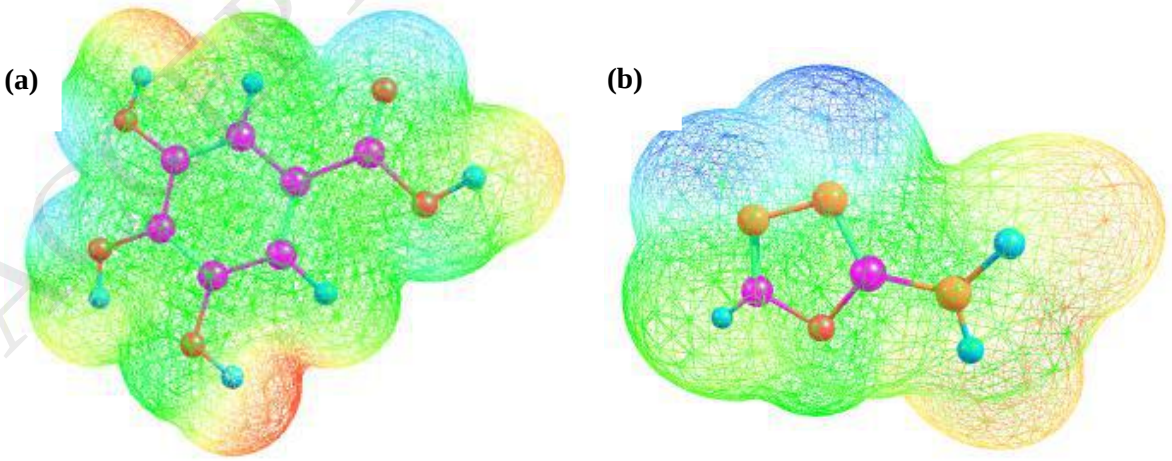
2.4 *Molecular dynamics (MD) simulation*

To estimate the stability and binding interactions, molecular dynamics simulations (MD) were performed for the compound that reported the highest docking score with human ABL kinase (PDB ID: 3CS9) for a time period of 2ns by using Desmond module of Schrodinger software with OPLS-2005 force field (Dileep et al., 2016: Guo et al., 2010). All systems were solvated in orthorhombic boxes with explicit TIP4P water within the Desmond molecular dynamics system. The system was neutralized by adding counter ions and the initial energy minimization for the system was done using the conjugant gradient algorithm. All runs were performed for the system under isothermal isobaric ensemble (NPT) (Azam, Jupudi., 2017) with the temperature of 300K and the pressure of 1.013 bar (Singh et al., 2017). RMSD plots for the backbone atoms for both protein and the ligand bound protein were generated to understand the relative stability of the ligand inside its binding pocket and, the ligand-receptor complexes were visualized.

3. Results and Discussions

3.1 *Molecular Electrostatic Potential Maps*

Molecular electrostatic potential (MESP) projection map for Gallic acid, 1,3,4-Oxadiazole-2-amine and the high score compounds was calculated using B3LYP/6-31G* method (Frisch et al., 2009) and generated using Chemcraft program (www.chemcraftprog.com). MESP provides a three-dimensional visual method to understand the net electrostatic effect of a molecule. It correlates with the partial charges, electro negativity and chemical reactivity of the molecules (Suhasini et al., 2015). MESP surface map of Gallic acid and 1,3,4-Oxadiazole-2-amine (Fig.1a, b) are highly beneficial to explore the molecular structure with its physiochemical property relationship. The MESP diagram clearly tells that the presence of electron rich hydroxyl groups makes Gallic acid as hydrogen bond donor (negative electrostatic potential shows red color) and the nitrogen atoms in 1,3,4-oxadiazole-2-amine makes hydrogen bond acceptor (positive electrostatic potential shows blue color). This indicates that Gallic acid can act as a good donor and the 1,3,4-oxadiazole can act as a good acceptor, which consequently influence the inhibition effects towards the targeted receptors. The binding of a drug to the targeted receptor largely depends on the variation in electrostatic potential produced by a drug molecule as the binding site (receptor) is expected to have opposite areas of electrostatic potential. Hence, in addition to the various pharmaceutical activity of Gallic acid and 1,3,4-oxadiazole, it has an efficient electron donating and accepting nature respectively. Thus we envision that the fusion of 1,3,4-oxadiazole with Gallic acid could serve as an excellent inhibitor (Fig 1c). In this context, we designed novel inhibitors by fusing these two compounds. MESP diagram of the high score compounds are presented in supplementary material.



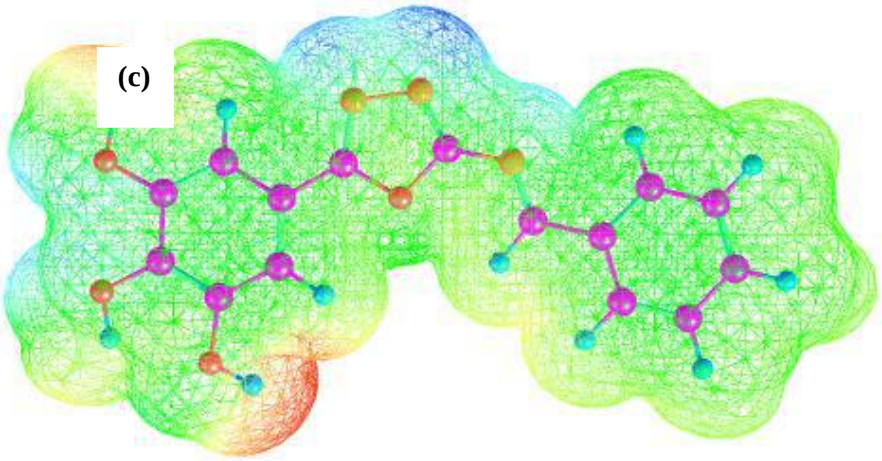


Fig. 1. Molecular Electrostatic Potential Maps of **a)** Gallic acid **b)**1,3,4-Oxadiazole-2-amine **c)** N-substituted benzylidene-5-(3,4,5-tri-hydroxyphenyl)-1,3,4-Oxadiazole-2-amine (Fused system) showing the blue and red color as the positive and negative potential respectively and the green color indicates the intermediate region.

3.2 *Molecular Docking*

Molecular docking simulation study was undertaken to investigate and access the binding efficiency of Gallic acid fused with 1,3,4-Oxadiazole derivatives with the ABL kinase receptor (PDB ID: 3CS9).

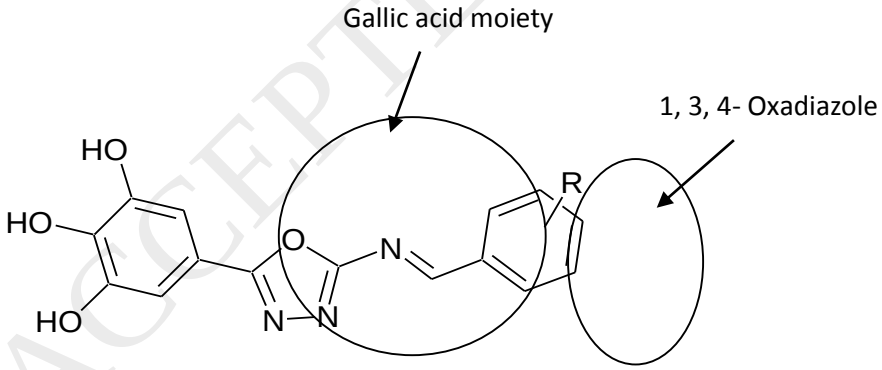


Fig. 2. N-substituted benzylidene-5-(3,4,5-tri-hydroxyphenyl)-1,3,4-Oxadiazole-2-amine.

Table 1

Glide Score, Dock Score and ADME properties of the designed compounds with the ABL kinase receptor.

No	R=	G score (kcal/ mol)	D score (kcal/ mol)	mol_MW	CNS	QPlogP$_0$/W	QPlogS	PSA	QPlogBB	%HOA	#rotor	QPlogKhsa
1	2,6-dichloro	-12.4	-12.4	366.16	-2	2.24	-4.62	112.02	-1.62	76.52	6	-0.09
2	2-chloro, 6-fluro	-12.2	-12.2	349.70	-2	2.00	-4..30	112.14	-1.67	75.03	6	-0.15
3	2-chloro	-11.9	-11.9	331.71	-2	1.82	-4.03	111.93	-1.74	74.18	6	-0.18
4	2-chloro, 5-hydroxy	-11.9	-11.9	347.71	-2	1.09	-3.78	134.21	-2.37	60.73	7	-0.33
5	3-hydroxy, 4-methoxy	-11.6	-11.6	343.29	-2	0.90	-3.47	140.01	-2.47	61.75	8	-0.40
6	2-chloro, 3-hydroxy	-11.6	-11.5	347.71	-2	1.12	-3.72	133.04	-2.30	62.11	7	-0.34
7	3-hydroxy	-11.4	-11.4	313.26	-2	0.66	-3.25	135.68	-2.55	57.26	7	-0.41
8	2-chloro, 4-hydroxy	-11.0	-11.0	347.71	-2	1.07	-3.81	135.51	-2.42	59.75	7	-0.33
9	4-amino, 6-chloro	-10.7	-10.7	346.72	-2	0.90	-3.72	138.03	-2.45	58.40	7	-0.38
10	3-amino	-10.6	-10.6	312.28	-2	0.47	-3.20	139.73	-2.63	54.88	7	-0.46
11	3-chloro, 4-fluro	-10.5	-10.5	349.70	-2	2.05	-4.47	113.14	-1.70	74.70	6	-0.13
12	2,3,6-trichloro	-10.1	-10.1	400.60	-2	2.64	-5.18	112.09	-1.51	78.86	6	0.00
13	4-amino, 5-chloro	-9.94	-9.94	346.72	-2	0.95	-3.80	138.45	-2.44	58.93	7	-0.38
14	3-chloro, 4-hydroxy	-9.9	-9.9	347.71	-2	1.15	-3.88	134.83	-2.36	61.19	7	-0.33
15	3,4-dichloro	-9.8	-9.8	366.16	-2	2.27	-4.76	113.14	-1.67	75.99	6	-0.07
16	4-nitro	-9.8	-9.8	342.26	-2	0.70	-3.70	158.07	-3.04	50.31	7	-0.29
17	2,6-dimethyl	-9.7	-9.7	325.32	-2	1.92	-4.26	111.45	-1.90	75.06	6	-0.03
18	3,4,5-trimethoxy	-9.7	-9.7	387.34	-2	1.73	-4.17	134.44	-2.22	72.72	9	-0.21
19	2,5-dimethyl	-9.5	-9.5	325.32	-2	1.97	-4.41	111.07	-1.92	75.66	6	-0.01

20	2-amino, 5-fluro	-9.5	-9.5	330.27	-2	0.80	-3.46	135.94	-2.33	59.89	7	-0.44

*Recommended ranges are tabulated in supplimentary information (S3).

From the docking results, it is shown that out of twenty designed compounds, eight compounds showed better Glide score and Dock score than the Bosutinib (Glide Score = -10.70 kcal/mol) (Banavath et al., 2014). Among this, Compound 1 seems to be the most promising lead molecule which shows a Glide score of -12.40 kcal/mol with the ABL kinase and the compound 2 have -12.2 kcal/mol Glide score. Docking results clearly indicate that, the interactions between Gallic acid derivatives with ABL kinase are impressive in comparison to bosutinib. The interaction diagrams of highest score Compounds 1 and 2 with 3CS9 are shown in Figure 3 and 4 respectively.

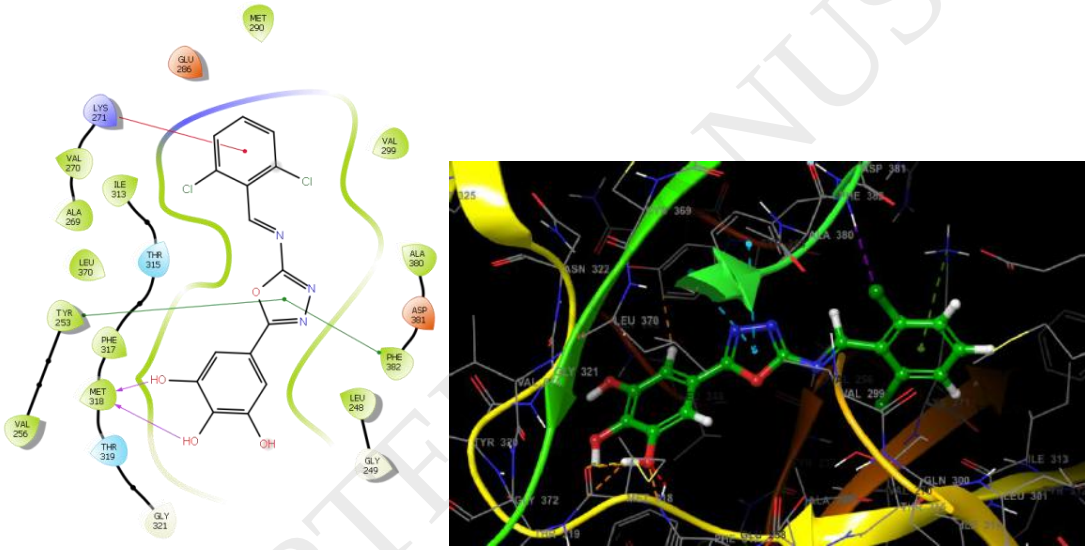


Fig. 3. Binding interaction pattern and pose of Compound 1 with human-ABL cancer cell receptor (PDB ID: 3CS9).

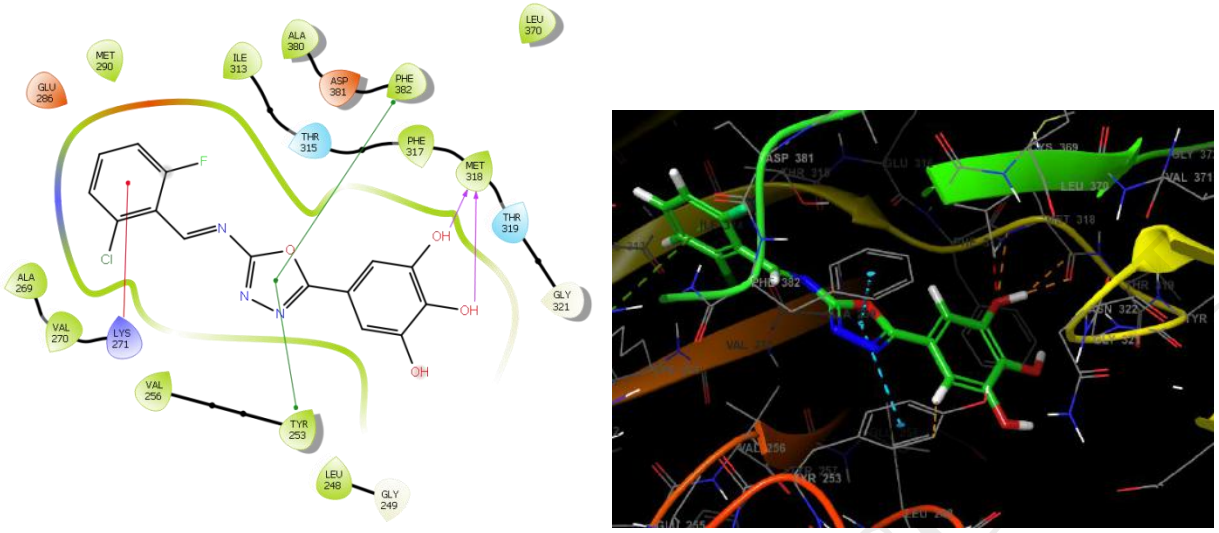


Fig. 4. Binding interaction pattern and pose of Compound 2 with human-ABL cancer cell receptor (PDB ID: 3CS9).

Figure 3, demonstrates the computed interaction mode between the highest score Compound 1 with the active site of the ABL1 kinase. It shows that the amino acid residue Met 318 interact with the Gallic acid moiety of compound 1 via two hydrogen bonds with the distance of 2.77Å and 1.58Å. Apart from this, the cationic side chain of Lys 271 forms π-cation interaction with phenyl ring of the ligand at a distance of 4.99Å. Furthermore, Tyr 253 and Phe 382 form a π-π stacking with oxadiazole ring with 4.49Å and 4.35Å distance respectively. In addition to these interactions, Compound 1 shows hydrophobic interactions with the amino acid residues present in the ABL1 receptor such as Met318, Leu370, Phe317, Phe382, Ala269, Val256, Val270, Ile313, Met290, Val299, Ala380, Tyr253 and Leu248. Studies with Compound 2 also revealed same interactions as Compound 1 and is represented in figure 4. These results indicated that Compound 1 and 2 could effectively block the further metastasis of CML by binding with the human ABL1 kinase.

From the binding interaction diagrams of Compound 1 and 2 with 3CS9 (figure 3 & 4), it is quite evident that the efficient binding affinity of designed compounds with 3CS9 is due to the influence of both Gallic acid and 1,3,4-Oxadiazole moiety. It was observed that the hydroxyl groups present in the analogs depicted strong hydrogen bonds with the protein, whereas 1,3,4-Oxadiazole moiety demonstrated π-π stacking interaction with the amino acid residues present in the protein. The π-π stacking is an important factor in rational drug design, as it is prevalent in protein crystal structures and in the interaction between the ligand and proteins. These results revealed that the Gallic acid

fused with 1,3,4-oxadiazole has the potential to effectively block the metastasis of CML by binding with the ABL1 kinase.

3.3 *ADME/T properties*

The ADME/T properties of the designed compounds were studied with the best conformations through the Qikprop tool and the results are tabulated in Table 1. Molecular weight of the compounds, predicted Octanol/water partition coefficient, predicted aqueous solubility, predicted central nervous system activity of the ligands, *etc.* were analyzed for ensuring the drug-like behavior of screened ligands. Kumar *et al.* performed a virtual screening study against various natural compound databases to inhibit both ABL and SRC receptor which are responsible for CML. The docking results revealed that the compound ZINC14437962 have a highest binding affinity towards ABL receptor with -9.49 kcal/mol docking score. The results of ADME properties show a single violation in the Lipinski rule of five. An important point to be noted is that the human oral absorption activity of this compound is only 32.5% (Kumar et al., 2016). In another recent study Subramanian *et al.* synthesized novel derivatives of heterocyclic compounds containing N and S atoms (thiosemicarbazone, thiadiazole and thiazolidinoyl derivatives) to evaluate their inhibitory activity towards ABL receptor responsible for CML. From the docking result, they concluded that synthesized phenothiazine pharmacophore compound has high docking score (almost -9.0 kcal/mol) than the derivatives having the coumarin moiety (Subramanian et al., 2017). In contrast, almost all compounds reported in our study showed excellent docking score, moderate intestinal absorption, good human oral absorption, drug-likeness property and good aqueous solubility, inactive central nervous system activity and there is no blood/brain barrier penetration. In addition, the optimum value of rotatable bonds (0–15) and van der Waals' surface area of polar nitrogen and oxygen atoms (PSA) (7–200 Å) of the compounds were found to be within the recommended ranges, owing to good bioavailability of the compounds. Thus the ADME results suggest that the designed compounds are safe and non carcinogenic. Hence, we propose that the derivatives of Gallic acid fused with oxadiazole moiety behave as an excellent third generation tyrosine kinase inhibitors for the CML.

3.4 *Molecular Dynamics Simulation Studies*

To get a clear idea about the binding mode and stability of compound 1 in 3CS9, MD simulations were carried out for 2ns using OPLS-2005 force field. root means square deviation (RMSD) for

the protein (left Y-axis) and the ligand (right Y-axis) shows the deviations up to 1.4Å and 1.2Å respectively, which interprets the stability of the protein and the ligand inside (Figure 5). The root means square fluctuations (RMSF) with fewer fluctuations also support the stability of the ligand and the receptor. The protein-ligand (P-L) contacts give the exact binding positions and modes of interactions, which is included as Figure 6. There is a strong H-bond formed between the –Cl of compound 1 and hydrophobic Met318, which lasts for 80% of the simulation time. The terminal benzene rings exhibit two kind of interactions, one strong π-π stacking interaction with the Tyr253 and another π-cation interaction with the positively charged Lys271, which lasts for 46% and 62% of the period respectively. In addition to these, there are extra hydrophobic interactions of Leu248, Lys271, Ile313, Phe317, Met290, Leu370 and Val 256 as depicted in the bar diagram. The overall effect of these interactions helps the ligand to bind more effectively in the receptor site.

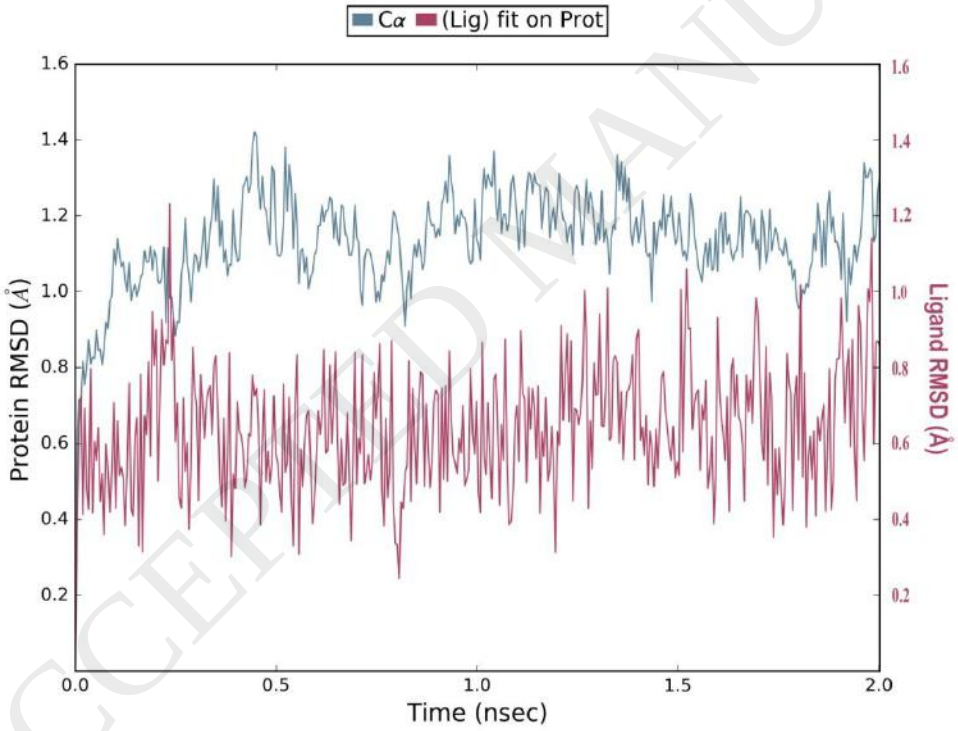


Fig.5. The RMSD deviations between the original structure and the structure enumerated during MD simulation; ligand fluctuations are shown in red color and the protein side chain fluctuations are shown in blue color.

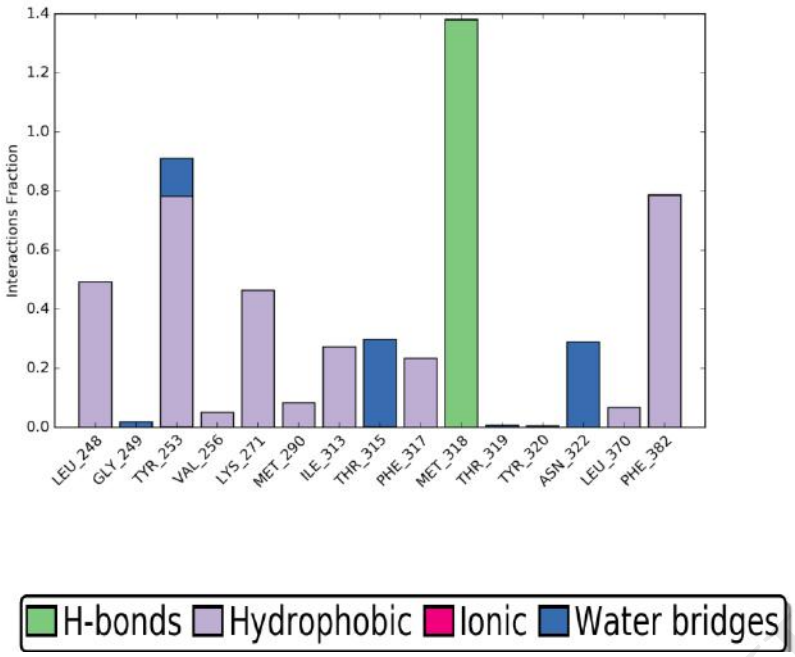


Fig. 6. The interaction between 3CS9 and Compound 1 evolved during MD simulation.

4. Conclusion

The variation in electrostatic potential of a molecule (drug) is largely responsible for its binding at the active sites of the targeted receptors. The MESP analysis of the fused system provides a clear picture of its electrostatic features. It shows that the system possess both hydrogen bond donor as well as acceptor sites, thanks to the presence of two hydroxyl groups in Gallic acid and two nitrogen atoms in 1,3,4-Oxadiazole respectively. Hence the molecules designed by the fusion of Gallic acid and 1,3,4-Oxadiazole are potential inhibitors for the ABL kinase receptor. The conformation of the designed compounds is also complimentary to the active site region of the ABL kinase receptor *in lieu* of hydrophobic interactions, hydrogen bonding interaction and π-π interaction between the designed compounds and the amino acids residues present in the targeted proteins. The designed compounds possessing highest score in the present study were not found violating the rule more than the maximum permissible limits and thus proving their drug-likeness properties. Also, the molecular dynamics simulation confirmed the stability of the binding mode of high score Compound 1 (2,6-dichloro benzylidene-5-(3,4,5-tri-hydroxyphenyl)-1,3,4-Oxadiazole-2-amine) predicted by docking studies. These preliminary studies suggests that gallic

acid fused 1,3,4-oxadiazole derivatives are the promising precursors for the development of promising anticancer agents for Chronic myeloid leukemia.

Acknowledgements

The authors acknowledge IIITM-K Trivandrum for research facilities provided. Also thanks to Planning Board, Government of Kerala for the financial support.

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International Journal of Social Science and Economic Research

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

TECHNOLOGICAL INNOVATIONS IN THE GOLD JEWELLERY SECTOR AND ITS RAMIFICATION IN THE SOCIOECONOMICS AND PERCEPTION OF THE TRADITIONAL GOLDSMITHS IN KERALA

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ABSTRACT

The traditional goldsmith community in Kerala has come to a turnaround in their socio-economics from good to bad levels. This is primarily due to twin effects, the first of it is globalisation of the gems and jewellery sector in the beginning of the 1990s and the second and the most important is the technological innovation and mechanisation with heavy doses of capital investment. In this, the poor traditional goldsmith community faces the major brunt in their socio economics as they are unaware of the global cues in the sector inter alia their poor financial base to embrace the new changes in technology. All these make the situation vulnerable and therefore the community perceives to have an unfavourable future. The study is based on primary data amassed from 300 goldsmiths from the districts of Kasargod and Thrissur based on random sampling methods. Though, the study is more connected to the socio-economics of the community, it uses the conventional theoretical aspects of innovation as in the works of Lundvall (1992), Freeman (1995) and the product adaptation explanations of Rogers (2003). The result of the study shows that there are rampant downward shifts in their socio economics as the income earning from the avocation of the community is below the state average; hence the youngsters are unwilling to continue this traditional work. This is the reason for their weak perception for a sustainable livelihood from the sector.

Keywords: globalisation, inter-generational, jewellery sector, perception evaluation, traditional goldsmiths

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

1. INTRODUCTION

Kerala economy is moulded with a host of resource-based industries. Each of this resource-based sector is in, one form or another, a conduit of traditional skill-based people making their avocation and livelihood from generation to generation with low wages and long working hours mostly connected to their home and its surroundings. The sad situation of the traditional goldsmith community of Kerala is that they seldom know any work other than the jewellery making. The jewellery sector had been mainly rudimentary till the beginning of the globalisation of the sector in the beginning of the 1990s with the organisation of production mostly in the form of micro or small-scale. But mechanisation and technological innovation has led to high level of capitalistic intrusion in the later part of the 1990s with the growth of global demand and control of the sector owing to several socio, economic and cultural determinants. Hence, the traditional hand-made jewellery making gives the way for machine made jewellery making. The poor goldsmiths of Kerala do not have the wherewithal's to invest in the new technology. The resultant technology and labour process have made the traditional skill of the goldsmiths is of no use and hence they are thrown out of the alien. Here starts the beginning of the agony of the goldsmiths of Kerala.

The gems and jewellery sector are not implanted with domestic resources, but with imported inputs and hence the economics of this industry is entirely different and the capitalistic groups playing in the sector is really powerful business groups. They have good knowledge about the local production system and global demand and value of the products. Nonetheless, the gold jewellery sector is connected with a historically important artisan community known as goldsmith community and their art and artefacts are popular in global dimensions. Though, they are a few in number in Kerala they were important groups in the Kerala society in the earlier period because of their skill and nature of job and the interest for jewellery and ornaments from the rich and aristocratic groups. But the malady comes in the form of globalisation as the petty home-linked business of jewellery making becomes the arena for big investment for local as well as for export need with high level of technological change *inter alia* the beginning of gigantic production and retail showrooms.

Hence, the problem of the goldsmith community is all pervasive in India, but the problem is deep rooted in the Kerala economy as Kerala is a major user of the gold jewellery in India (Sumeetha, 2015). This shows how a rudimentary traditional sector of a particular community became a centre of attraction for the capitalistic forces for investment and profit making and thereby making the life of the dependent community in crisis and chaos. They not only become helpless in the sector in losing their employment and livelihood, but also becomes sad victims of the

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

capitalistic forces who are using technology-based machines and thereby losing their labour power. They have no options but to leave the sector in search of employment and livelihood.

2. THEORETICAL FRAMEWORK AND METHODOLOGY

The study embraces the theoretical base of innovation and innovation as explained in the works of Lundvall (1992) and Freeman (1995). The method of diffusion of innovation is a process by which an idea or product diffuses through a specific population which ultimately results in adoption of a new product or technology by the people (Rogers, 2003). The jewellery sector in Kerala underwent changes as part of the liberalisation of the sector during the 1990s in the form of annulling of the Gold Control Act, the introduction of provisions relating to gold in the Foreign Exchange Regulation Act, 1973. These changes had impacted the jewellery sector of Kerala as well. The traditional goldsmiths and certified traders lost their exclusive rights as this attracted big business houses and traders into the gold and jewellery sector especially in the form of retail outlets. While the traditional goldsmiths were relatively poor and did not have the financial backing to impart innovative methods, majority of them were reluctant to follow the same. The outsiders and big investors grabbed the opportunity and became early adopters of technological development. The end result was that the traditional goldsmiths could not capitalise on the development opportunities, the outsiders and big investors used the situation and ultimately became the most powerful players in the jewellery sector. Though technology and innovation induced growth in the gems and jewellery sector has not benefitted the traditional goldsmith community in Kerala, a few could manage to get employment in the big jewellery business houses. The majority of the traditional goldsmith community has not been able to adopt the new innovations in the sector owing to the paucity of capital. The migration of cheap workers in the jewellery sector from Bengal and other states has also badly hit the traditional goldsmiths to get employment in the jewellery manufacturing units (Sumeetha, 2014). The traditional activity could no longer provide livelihood to them and the only option left for them is to shift to other sectors. All these impacts negatively their livelihood situation and also their socio economics.

The data for the study is amassed from 300 traditional goldsmiths who are working in the sector in the districts of Kasargod and Thrissur using random sampling techniques with equal sample from the two districts. These two districts have about 3000 traditional goldsmith's workers. The data collected from the traditional goldsmith community have been put to statistical scrutiny for identifying their socio economics and their perception of the sector about their livelihood and sustainability of the sector owing to the changes that are happening in the sector with technological development and globalisation of the sector. In this respect the study uses analytical and test statistical methods like Likert Scale, Factor Analysis etc.

ISSN: 2455-8834

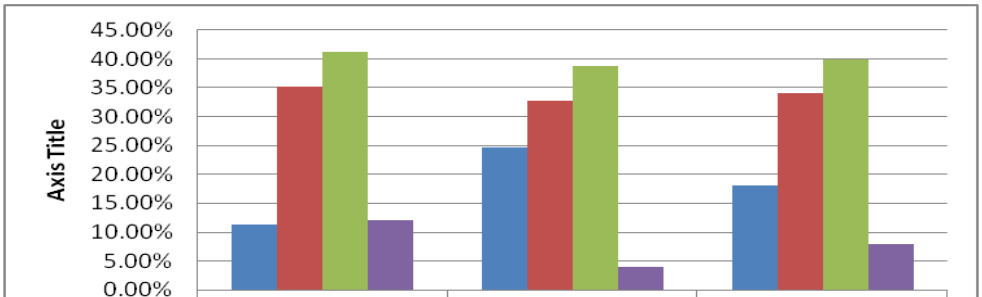
Volume:03, Issue:11 "November 2018"

3. RESULTS AND DISCUSSIONS

The study tries to focus on some of the basic socio-economic indicators which are considered to be important in analysing the socio economics and perception of the community like the age factor to discuss about the view of the youngsters of the community about their traditional avocation. Moreover, it also tries to identify the role of education of the present generation of the community and their attitudinal differences about this traditional community-based activity as a factor of discussion and analysis. Along with this it is equally pertinent to consider the income factor for retaining the young generation in the sector and their perception for the possibility of sustainable income generation. It is also focussed to analyse the problems faced by the goldsmith community and their inter-generational activity status as matters of moot points for discussions.

3.1 Age

The age of the sample respondent is vital in this respect as it helps to know how long the gems and jewellery workersare active in the sector. The average age of the respondent is 48 and district-wise this is 45 years in the case of workers in Thrissur and 50 in Kasargod. About 40 percent of the workers are between 51-60 and 34 percent between 41-50 years. Senior citizens (above 60 years) constitute 8 percent of the total sample. District-wise, the difference is evident in age group of respondents. Only 11.3 percent in Kasargod are below 40 years, whereas 24.7 percent are in this age category in Thrissur. Senior citizens constitute 12 percent of the total respondents in Kasargod. The results are depicted in Figure 1. It is clear that the youngsters show disinterest in the sector as the lesser the age the lesser the interest of the goldsmith community to work as goldsmith.



	Kasargod	Thrissur	Total
Below 40	11.30%	24.70%	18.00%
41 - 50	35.30%	32.70%	34.00%
51 - 60	41.30%	38.70%	40.00%
Above 60	12.00%	4.00%	8.00%

Figure 1: District and Age

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

3.2 Education

The educational profile of the traditional goldsmiths is shown in Figure 2. Though, the illiterates constitute only 3 percent, it is evident that the post-graduates and holders of professional degree are less than 5 percent (1 percent post-graduates and 4 percent professionals). UG qualified persons constitute 13 percent of the total sample respondents. 35 percent have educational qualification of secondary levels. The results show that the illiteracy is low among the workers, the highly qualified workers i.e. graduate and above have 14 percent. However, less regional difference is evident with more respondents have qualification of UG and above in Thrissur district. Compared to the education pattern of the social class of the Kerala society in a community angle the traditional goldsmith community is educationally backward and hence have less possibility for an immediate beneficial alteration in the livelihood pattern.

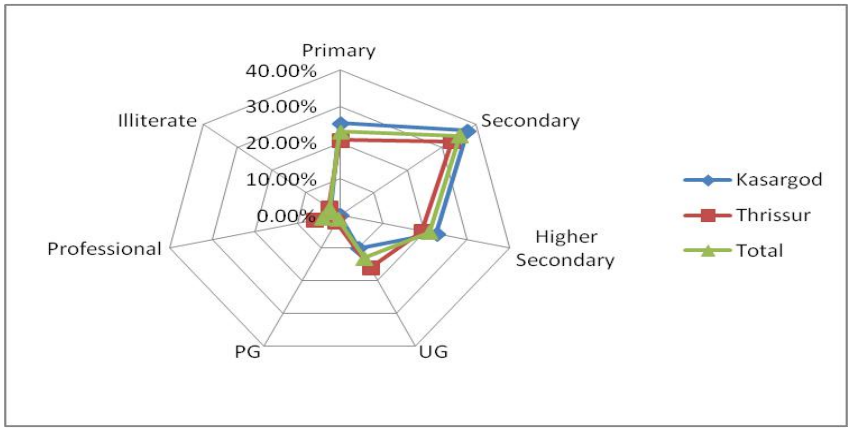


Figure 2: District and Education

3.3 Income

The district-wise results for income category are shown in Figure 3. Overall, 50 percent have an earning between Rs. 400-600 per day. Those with a daily income of above Rs. 800 are only 14 percent in the total sample. About 11 percent earn below Rs. 400. An inter-district comparison gives the picture that the difference in earning pattern based on district. In Thrissur, 49.3 percent of the workers earn more than Rs. 600 per day. The percentage of workers in the same category is 28.7 in Kasargod. In Thrissur those in this low-income group workers are 7.3 percent, which is comparatively less. The difference in income is locational advantage as Thrissur is the hub of gold and jewellery making in Kerala. Hence, the workers have better job prospects and earnings compared to the goldsmiths in Kasargod district. However, this is only a relative position as the field inferences have shown that workers, especially belonging to the higher age groups have raised concerns regarding the work availability and earnings since liberalisation. Even though in

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

money terms earnings have improved, the work prospect has come down and this will have severe implications in their daily earnings. Again comparing the earning pattern of workers in other traditional sectors of Kerala and also in the case of casual workers the earning pattern of the goldsmith community is not impressive even in the gems and jewellery hubs of Thrissur.

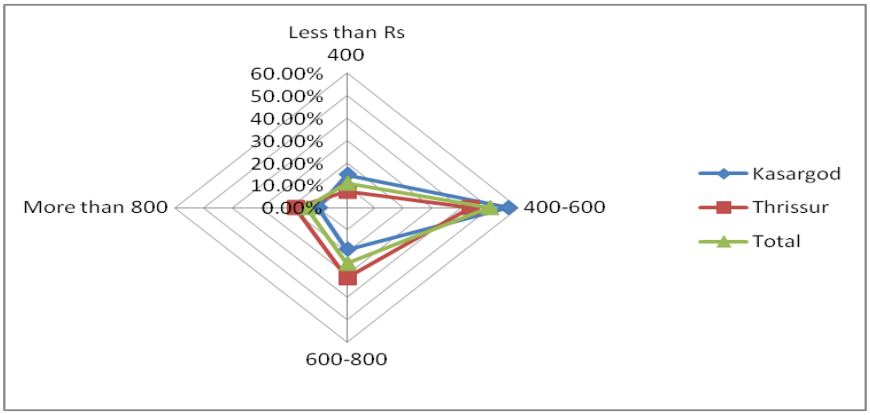


Figure 3: District and Income Category

3.4 Problems faced by the Goldsmiths

The major problems faced by the gold workers are wage issues, lack of orders, competition and lack of capital. The issues faced by the gold workers are shown in Figure 4. The district-wise results for the problems of the traditional goldsmiths show that, except for the fact that the raw gold is available in plenty in the market compared to the pre-liberalisation period, the goldsmiths are facing severe problems in terms of competition (93 percent), wage issues (80 percent), lack of orders (70 percent) and lack of capital (65 percent).

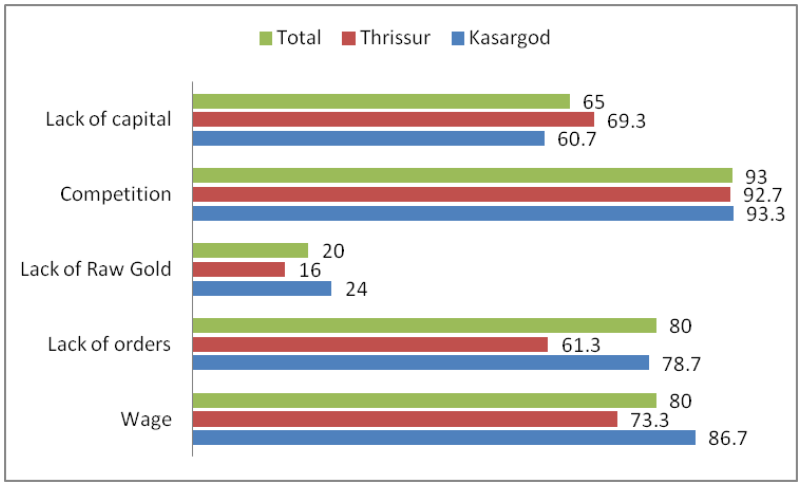


Figure 4: Problems Faced by the Gold Workers

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

Date show that low or inadequate wages is one of the major issues (80 percent) faced by the gold workers. District-wise comparison of the gold workers perception shows a difference with 86.7 percent of the respondents in Kasargod citing this as a major issue compared to 73.3 percent in Thrissur district. However, further evaluation and field inference shows that those using modern equipment have not cited this as a concern.

The major reason cited by the goldsmiths for the low earnings is the lack of orders. Since the growth of retail jewellery sector, the work orders for the traditional goldsmiths have come down. Based on district, the workers in Kasargod face more issues (78.7 percent) compared to Thrissur workers (61.3 percent). As mentioned earlier those who have used modern equipments have better livelihood options, the workers who are using modern tools also face issues of lack of orders. But the problem is not so severe.

During the pre-liberalisation era, the supply of gold was limited. The major source for the goldsmiths was scrap and old ornaments which they used to convert into new ornaments for sale. After liberalisation, gold is available in plenty. However, in terms of district, 24 percent in Kasargod face this issue of gold supply compared to 16 percent in Thrissur. This is understood to be financial rather than supply issues in most of the cases.

Responses with regard to competition, it shows that majority (93 percent) face fierce competition from the large and medium jewellers in terms of demand for their products and from outside state workers in terms of provision of their services to jewellers and manufacturers. The outside labour is relatively cheap compared to the traditional goldsmiths in Kerala and hence medium and large jewelleries choose cheap outside workers. Inter- district difference in this respect is minimal.

Lack of capital is yet another problem faced by the traditional goldsmiths. The workers in Thrissur district are more prone to financial crisis, but the result does not show any significant difference. However, the reason for thesmall difference is that the workers in Kasargod do not even perceive the need for an upgradation and requirement for finance due to cultural barriers, skill issues, etc.

3.5 Inter-generational Aspects and Decline in Workers

The traditional goldsmith or ‘Thattan’ community in Kerala has been involved in jewellery/ornament making and designing ornaments from time immemorial for the royal family and other affluent sections of the societyand also for the common people. The monopoly situation up to the pre-liberalisation period was changed with the removal of import restrictions on gold. This has resulted in livelihood problems and loss of their positions in the society. The major impact of this was happened in the form of worker strength in their unit/workshop before

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

and after liberalisation. Another issue is inter-generational decline in goldsmiths. It is a fact that the earlier generation goldsmiths had more gold workers in the family compared to the present generation. The perception with regard to the gold workers in terms of activity in which their present, previous and next generation (themselves as well as their generation which includes siblings, their parent's generation and their children) are engaged in is recorded. The job status of the three generations of the traditional goldsmiths is presented in Figure 5. In the 1st generation or the generation of their parent, 61 percent worked in their traditional sector. The government employees were only 12.1 percent and 26.9 percent worked in the private sector. Only 36.1 percent in the second generation or the present generation work as goldsmiths or in the traditional sector. Present generation is working in the government sector (21.1 percent), 42.7 percent work in the private sector. The youngest generation i.e. 3rd generation data show that those who work as goldsmiths are only 4 percent, 30.4 percent work in the government sector and 65.6 percent in the private sector.

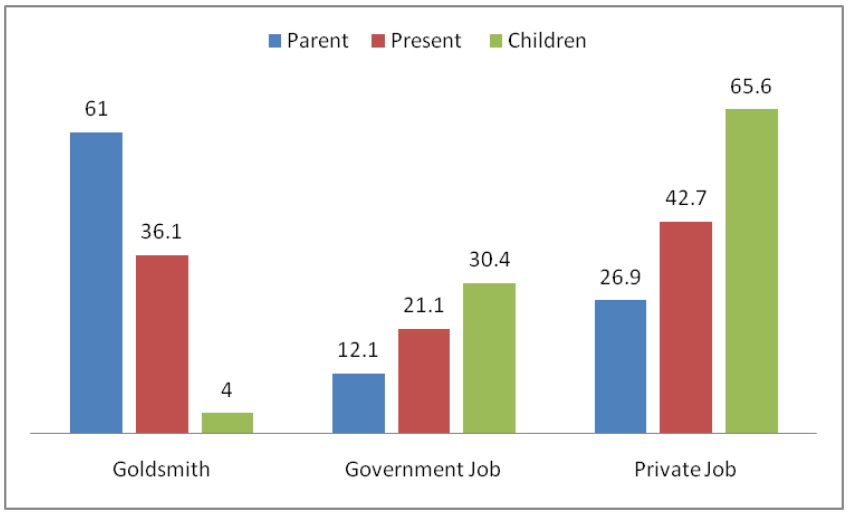


Figure 5: Inter-Generational Employment

3.6 Perception on Problems of Traditional Goldsmiths

The problems of the traditional workers viz. lack of livelihood, low living standards, capital issues, health problems, etc. which were identified during sample surveywere recorded on a five-point scale to identify the intensity of these issues with 1 being the lowest and 5 highest. The results have been evaluated in this section with the aid of Factor Analysis to identify pertinent factors and thereby identifying the key problems of the traditional goldsmiths.

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

Kaiser-Meyer-Olkin test is used to measure the sample adequacy. The value of 0.842 is well above the accepted minimum value. Similarly, Bartlett's Test of Sphericity has also attained significant value.

Table 1: Total Variance Explained: Problems in the Jewellery Sector

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Var	Cumulative %	Total	% of Var	Cumulative %	Total	% of Var	Cumulative %
1	4.357	36.311	36.311	4.357	36.311	36.311	3.189	26.571	26.571
2	1.391	11.588	47.900	1.391	11.588	47.900	2.450	20.421	46.992
3	1.291	10.759	58.659	1.291	10.759	58.659	1.400	11.667	58.659
4	.841	7.007	65.666						
5	.736	6.136	71.802						
6	.683	5.695	77.497						
7	.627	5.222	82.720						
8	.600	5.003	87.722						
9	.460	3.836	91.559						
10	.413	3.439	94.997						
11	.361	3.012	98.010						
12	.239	1.990	100.000						

Extraction Method: Principal Component Analysis.

In the Total Variance Explained (Table 1), it is clear that three factors with an eigen value of more than 1 are extracted. In total, the three factors explain 58.659 percent of the total variance. In the initial solution, the variance explained by the first factor is 36.311 percent, second factor is 11.588 percent and third factor is 10.759 percent. In the rotated solution the first factor explains 26.57 percent of the total variance, whereas the second and third factor explains 20.421 percent and 11.667 percent, respectively.

The Rotated Component Matrix is shown in Tables 2. The rotated solution is worked out as the Component Matrix is inconclusive in exploring the major factors. In the rotated solution, the first factor has six statements, the second four and the third two statements are related to the problems. The first factor explainsthe financial issues of the goldsmiths like lack of income and factors leading to the lack of income. The second factor's four statements explain further reasons behind the low income and other statements of the first factor. The third factor shows the health problems and disinterest from the youngsters to take up the activity.

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

Table 2: Rotated Component Matrix[a]: Problems in the Jewellery Sector

	Component		
	1	2	3
Reduction in orders due to change in consumer preference	.765	.259	-.004
Lack of sufficient income for a sustainable living	.786	.272	-.034
Lack of co-operative movement	.325	.718	-.054
Health issues due to present occupation	.055	-.060	.832
Lack of interest from younger generation to take up the business	.062	.197	.779
Competition from medium/large jewellers	.707	.032	.089
Dependence on informal credit sources for financial needs	.565	.202	.105
Sticking on with traditional beliefs	.216	.763	.116
Lack of investment capital for expansion	.576	.155	-.006
Lack of welfare schemes by the government	.080	.653	.222
Lack of orders compared to earlier times	.773	.183	.075
Lack of technical knowledge	.265	.802	-.098

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

They feel that the present activity does not yield sufficient income for a sustainable living. This is mainly due to the lack of orders which, in turn, is due to customer preferences towards branded and hallmarked ornaments. They still face competition from the large jewellers who lure customers with attractive offers, discounts and also with hallmarking and branding. One of the solutions to overcome this is expansion of business or upgrading the tools and these are not possible due to lack of capital. The overall outcome of the livelihood issue is the dependence on the private money lenders for financial needs. The traditional goldsmiths lack technical knowledge and cultural and traditional barriers are stopping them from changing their traditional tools and also preventing them from learning new techniques. Two of the major reasons cited for the crisis are lack of cooperative activities and government assistance/schemes. Most of the traditional sectors, be it coir, fisheries, handloom, cashew, beedi, etc. have thrived by reducing the ill effects of globalisation owing to cooperation in the respective sectors, which stood as a supportive element for the workers in the sector to overcome the impacts of globalisation. Such an organised movement is missing in the sector and the workers have actually understood the need for the same. Any effort of this kind should be backed with government assistance and schemes to rejuvenate the sector and the goldsmiths in general feel that such an activity is totally missing. Even though these statements feature as the second factor in problems, this could be cited as one of the major ways by which the workers would survive in the future. Work related health problems feature as a statement in the third factor and the last statement in the third factor is disinterest by the younger generation to take up the business.

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

It is well understood from the results that the traditional goldsmith community is facing a crisis and this will lead to a reduction in the number of people from the traditional goldsmith community working in the traditional activity. The major suggestions in this regard from the community point of view are given in Figure 6. Some have suggested for real adaptation to the technical know-how available in the sector with a shift to the big jewellers and manufacturers. The major and the unanimous suggestion is relating to the setting up of cooperative sector in the gold sector for safeguarding the traditional goldsmith workers with prolific help from the government and government schemes and assistance. This will have multiple impacts and the end result will be an overall improvement in their present situation. Another solution is skill development which will help them to upgrade and stay in the production and marketing.

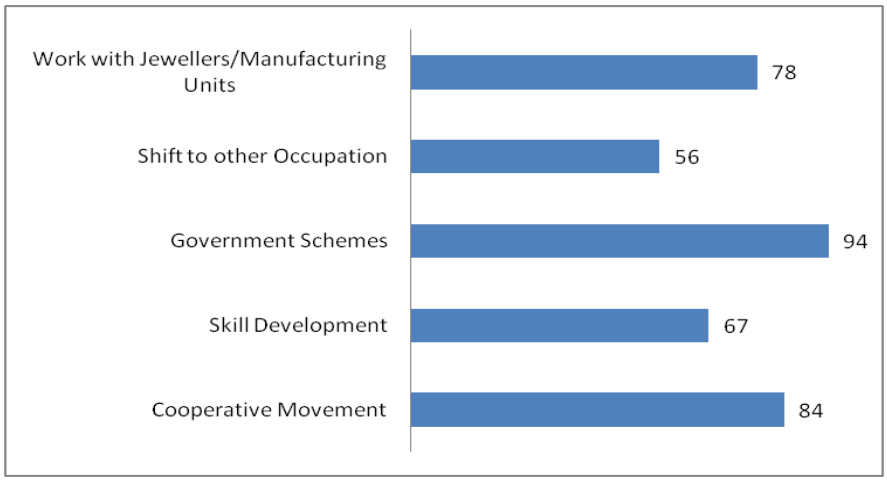


Figure 6: Methods to solve the Crisis

The indications in terms of inter-generational aspects show that across the three generations, the percentage working in their traditional occupation is less and this will further reduce in the next generation as well. Though, better education and skill are helping the younger generation to explore other employment avenues, the fact remains blurred. Hence, the possible way out is to upgrade their skill and break the shackles of their traditional beliefs, which in turn would help many to continue in the sector and also save a community and its traditional skill for social, historical and cultural reasons. In this way it is possible to convert the growth potential of the sector into a growth potential of the traditional community.

4. CONCLUSION

The article explains clearly their socio-economic and perceptions of the community for a sustainable livelihood in tandem with other social groupsin Kerala. Though, the sector unfolds a unique and visible growth dynamics, it is not engendering a growth path to the traditional

ISSN: 2455-8834

Volume:03, Issue:11 "November 2018"

goldsmith community. Instead, it becomes global and hence grows into an avenue for new investors with new mode of production and marketing network with changing consumer perception for gems and jewellery products. The inferences pertaining to the socio economics of the traditional goldsmith communities shows a bleak scenario and survival problem. The sector *per se* is moving around with global cues and this in fact is beneficial to a sector with technology infused modern machines in design and production process and this is not depending on the craftmanship of the traditional goldsmith community, but is based on computer aided designs and machine-made productions done by the big investors in the retail gems and jewellery business groups. This is in a speed track now as the market for gems and jewelleryis expected to grow both in the domestic and international levels. The pertinent issue is the livelihood threat of a traditional community and how it is solved is a herculean task to the policy makers and the protectors of the traditional skills and avocations. Livelihood and income impacts of the community in the recent period do not engender sustainable by a historically driven traditional community and hence feels many survival problems as per their perceptions. This is the reason for the weak perception of the community about their survival and sustainability. With concerted policy it is possible to generate a perpetual livelihood and thereby developing a positive perception provided the traditionally crafted jewellery is promoted and popularised in various parts of the globe, which are in high demand as it is a niche product.

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International Journal of Social Science and Economic Research

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

THE CHALLENGES FACED BY WOMEN ENTREPRENEURS TO RECONCILE WORK AND FAMILY CONFLICTS

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ABSTRACT

Women have gained more and more space in various areas and this development also occurs in the field of entrepreneurship. In Kerala, it is recognised that women entrepreneurs face many difficulties when trying to reconcile their work with the family. The conflict occurs in several aspects of life. The important objective of this paper is to analyse the challenges faced by women entrepreneurs of Kerala to reconcile the conflict between work and family. This study adopted the multiple cases research strategy and ten women entrepreneurs are selected from the Kannur district of Kerala state. By the social structure of Kerala, women have great responsibility towards the family and in an attempt to reconcile the multiple roles these women often face conflict and over load. It is noticed that the need for balance between entrepreneurship and family create physical and emotional stress.

Keywords: Entrepreneurship, Female Entrepreneurship, Work Conflict and Family.

1. INTRODUCTION

Gender equality is helpful for growth, economic development and poverty eradication. But the society and values are male dominated one. The societies where women have a lower status than men, there the inequality emerges and loses the reformation. Even though Indian constitution protect woman's right by reservation and taking necessary steps for empowerment, women entrepreneurship is not deeply rooted in the society. They have to face certain discriminations in this field.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

In India, many women consider entrepreneurship as a career with technical trainings and skill courses by the governments. But it is also true that in spite of all claims of equality, they have to face more problems than men in this field. Our society's view of women is one of the main reasons for this. To overcome obstacles in the way of women entrepreneurs, the first step is to change the views of society.

As per the Global Entrepreneurship Index Rank of All Countries (2018) India was ranked 68th with 25.8 score among 137 countries. The data shows the entrepreneurial situation of the country. It is a hopeful indicator that compared to last year; India's ranking is actually improving. However the situation of female entrepreneurs in the country is getting worse rather than getting better.

In the 71st anniversary of independent India, the half of the women remains uneducated, unemployed, unpopular, unprotected and unprofessional. Democracy is complete only when gender justice is considered as a developmental issue. In addition to discriminations, questions are raised on women's competence. This is the reason that India is ranking 49 among 54 economies as per the Women Business Ownership index (2017). Things are worse in many states of the country. But now entrepreneurship by women is spreading throughout the country and the world but the inequality between men and women still persists.

This study focuses on the women entrepreneurs of Kerala and their conflict between work and family responsibility. Kerala has better status than other states, including the sex ratio (1000: 1084). Kerala has been able to reach literacy, infant mortality and maternal mortality rates among developed countries. But the contradiction is that the statistical figures mentioned above did not help in ensuring gender justice. In Kerala, 75-80% Women gains higher education but the work participation of women is only 22.2% comparing with Men (Economic review 2017) Even though the membership in Kudumbasree is 40 lakhs, it is only 5% women who earn income from self employment.

Higher female literacy, growth in women's education, women's labour participation and their promotion in employment has not improved the status of women in kerala. In Kerala the female labour participation rate is lower than male. Educated unemployment of women is another problem of Kerala. High on literacy, low on workforce is the actual paradox exists in kerala.

Women entrepreneurs from kannur district of Kerala are selected for the case study since Kannur holds rank first in the sex ratio (1000: 1133) among the districts of Kerala and top rank third in all India level considering all the 640 district entries in the census report. (Census Report 2011).

It must be remembered that the female gender is still associated to domestic work and the women continue to perform most of this work in a good manner. The men continue to keep the

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

dominance of professional responsibilities for themselves and continue to be socially allowed to move away from domestic works and tasks which are considered as the responsibility of the women. This situation of the male domination places women in an unfavorable position from the point of view of their social recognition. Machado (2012) emphasizes that this ability to reconcile multiple roles is recognized by men and perceive it as an inherent characteristic of women. The main reason behind entrepreneurship of women is the flexibility of working atmosphere and recent government policies; however the work-family conflict still exists.

Society welcomes women who undertake entrepreneurship, but give more priority to male entrepreneurship. In Kerala, more recent research addresses the theme of "women entrepreneurship" and give the perception that women have been gaining more and more space in many areas. Women have been gaining prominent places in the social, economic, cultural and political spheres and in the field of entrepreneurship; this evolution is reflected.

2. LITERATURE REVIEW

Ever since Kahn et al. (1964) pointed out the concept of conflict between family and work. With this an area of rich literature regarding work-family conflict has emerged. A number of meta-analyses and quantitative reviews provide significant insights into important shortcomings and the important findings of this field of inquiry.

For example, Allen et al. (2000) and Kossek and Ozeki (1998) observe work and non-work results of family –work conflict, whereas Byron (2005) examines at past history of this shape of conflict. Review articles by Ford et al. (2007) and Westman (2001) look into crossover and cross-domain effects. Mesmer-Magnus and Viswesvaran (2005) aim on the bi-directional nature of work-family conflict by evaluating family-into-work and work-into-family conflict actions.

These review articles emphasize a number of significant themes in this literature. Byron (2005) remark the increasing demands, whether stress-based or time-based, at home or at work, tends to intensify work-family conflict. Many of the factors contributed to family and work demands are observed by Byron (2005) This study focused on hours used at work and non-work, job stress, schedule flexibility, family stress, family support, work support, family involvement, job involvement, age and number of children, marital status, elder care, as well as individual and demographic variables such as income, sex, skills and parental status.

In addition to this, scholars have found significant cross-domain relationships, in which factors in family life are connected to satisfaction with the work area and vice versa (Ford et al., 2007) and crossover effects, in which stress experienced by one spouse at work leads to stress experienced by the other spouse at home (Westman, 2001).Important cross-domain relationships include the negative relationships between family satisfaction and job stress, and between family

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

satisfaction and job involvement, and the positive relationship between work support and family satisfaction (Ford et al., 2007). In an assessment of over thirty studies, Westman (2001) found important crossover effects, and noted how strain in one spouse generates an considerate reaction in the other, raising his/her own level of stress.

Particularly, majority of the work are concentrated on White, Ford et al.(2007) highlighted the need for research on ethnic minorities. It resulted in differential emphases being set on differential observations and levels of work-family conflict.

In India a rich literature regarding work-family conflict has emerged. Some of the works are made by Rao, (1991) in his study on 'Promotion of Women Entrepreneurship' emphasised the need for economic backwardness, lack of familial and community support. G. Palaniappan, C. S. Ramanigopal, A. Mani (2012) in their article analysed that women have been successful in breaking their barriers within the restrictions of their homes by entering into various kinds of services and professionals.

3. OBJECTIVES

1. To identify the motivations that led to the women to start the enterprises.
2. To analyse the challenges faced by women entrepreneurs to reconcile work-family conflicts.
3. To examine the limitations of entrepreneurs as a women

4. METHODOLOGY

This study aims to describe the complexity of the problem of work family conflict of women entrepreneurs in Kerala. This paper analyse the interaction of certain variables, understand and classify family conflicts experienced by women entrepreneurs, contribute to the process of change and understanding the particularities of individual behavior.

Case study method is adopted in this paper. In order to select the cases, snowball sampling methodology also known as chain of informants is used. The information gathered was tabulated and analyzed by using average, percentage and graphical representations.

Table 1 below shows the entrepreneurs who participated in the survey from different sectors of entrepreneurship.10 entrepreneurs are selected.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table 1: Categories of Entrepreneurs and their classification

Entrepreneurs	Entrepreneurial Sector	Type of product
Entrepreneur 1	Manufacturing	Garment Sector
Entrepreneur 2	Manufacturing	Candle Making
Entrepreneur 3	Manufacturing	Food & Bakery Products
Entrepreneur 4	Manufacturing	Handicrafts
Entrepreneur 5	Manufacturing	Agarbatti Making
Entrepreneur 6	Service	Beauty parlour
Entrepreneur 7	Service	Tailoring
Entrepreneur 8	Service	Catering Service
Entrepreneur 9	Service	Textiles
Entrepreneur 10	Service	Fancy Store

Source: Case study Report

In order to collect the data, the interview method was used as the main source of evidence. In addition to the interviews, data form DIC (District Industrial Centre) information from neighbours is helped to understand the business context.

Regarding the analytical categories, it is worth emphasizing the importance of defining them. The proper use of these definitions contributes to a better understanding of observed reality and avoids misinterpretation. Therefore, based on the research objectives, the categories and the elements of analysis are listed table two.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table 2: Analytical Categories and Elements of Analysis

CATEGORIES	ELEMENTS OF ANALYSIS
Profile of the entrepreneur	• Age • Marital status • Children • previous experience • Presence of an entrepreneur in the family • Participation in training in the entrepreneurship area.
Motivation to start the business	• Opportunity • Need • Personal fulfillment • Difficulty in career advancement • Possibility of reconciling work and family.
work family Conflicts	• Time spend for the family and to the enterprises • perception about efficiency of the roles played • Existing conflicts; strategies adopted to manage • Conflicts • Relationship with spouse and children • presence of partner (a) as a minimizing effect on the conflict • Vacation.

Source: Case study Report

The precepts of Yin (2010) about the multiple case study protocol is in followed in the area of elaboration of the interview script based on the analytical categories, identification of entrepreneurship founded and managed by women; realisation of the contact with the entrepreneurs located; scheduling and conducting interviews; survey of entrepreneurial data available on websites; description of each case, comparative analysis of cases and comparison with theory.

In order to guarantee the quality of the research paper, following tests are adopted as criteria of validity: validity of the construct to establish the operational measures correctly; external validity seeking the domain to which the findings could be generalized, and, finally, the reliability to demonstrate that the procedures adopted in this study can be repeated obtaining the same result. Following is Table 3, presenting the tests and tactics used.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table 3: Plans used in the Case Study

Plans	Tests of the Case Study
Validity of the construct	• Used multiple sources of evidence • Interview • documentation and direct observation • Established the chain of evidence • The draft report of the case study was reviewed by key informants.
External validity	• Used replication logic in multiple case studies.
Reliability	• Used a case study protocol • Developed database for the case study.

Source: Yin (2010)

All cases were individually described following the order of the analytical categories, to carry out the comparative analysis of the cases through the application of the technique called cross-case analysis, which according to Eisenhardt (1989) is used to discover patterns between cases, making it possible to emphasize their similarities and differences, as well as compare the results obtained with the studies presented in the literature review.

5. COMPARATIVE ANALYSIS OF CASES

After describing the ten cases of women entrepreneurs, a comparative analysis was carried out based on the analytical categories defined in the methodology. The differences and similarities between the cases are analysed, relating them with the theoretical basis already presented.

5.1 Profile of Entrepreneurs

The profile of women entrepreneurs is presented in table 4. Age, education level, and marital status, age at the time of starting the enterprises, previous experience, and entrepreneurial family background are mentioned in the profile. It is observed that the women entrepreneurs in this study are in the mean age of 35 years, with the youngest at 25 years and the oldest at 41 years.

Marital status is well diversified among women entrepreneurs. Exist married women, widows and unmarried women. The predominant marital status is married.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table: 4 Profiles of Women Entrepreneurs.

Cases	Age	Education	Marital status	Previous experience	Entrepreneur in the family
1	35	Higher secondary	Married	Nil	Parents
2	32	Degree	Married	Nil	Nil
3	41	High school	widow	Nil	Nil
4	36	Higher secondary	Married	Yes	Husband
5	25	Degree	Unmarried	Nil	Husband
6	40	High school	Married		Nil
7	33	Higher secondary	Married	Yes	Parents
8	28	Degree	Married	Nil	Relatives
9	37	Higher secondary	Married	Nil	Husband
10	43	High school	Married	Nil	Nil

Source: Case study Report

Most of the women entrepreneurs belong to the higher secondary level. Only three of them have the degree level of education. It was also observed that there are no postgraduates among the respondents.

Previous experience is relevant when it is correlated between previous experiences of entrepreneurs and success of the enterprise. Among women entrepreneurs, only two entrepreneurs have previous experience. It is worth mentioning that most of the women entrepreneurs started their entrepreneurial activities after the age of thirty. Those who did not start early were immersed in their family life. It was noticed that previous experience was an influencing factor in the decision to open a new enterprises.

Among the entrepreneurs interviewed, the existence of entrepreneurial family background is very rare. The inspirations from relatives such as grandparents, parents, siblings, uncles, cousins and husband are very essential for the successes of entrepreneurial development.

5.2 Motivations

When comparing the motivations that influenced the opening of the women entrepreneurship, it has been observed that the influencing characteristic and peculiarities are the flexibility of family

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

setup of Kerala. The nuclear family background and need for financial stability encouraged to start entrepreneurship. In addition to these, encouragement of friends, support of government agencies such as District Industrial Centre, Kudumbasree Mission, Kerala startup mission, RouteSet institute, positive and successful stories of experienced women entrepreneurs, self-confidence, dream, adventurous spirit, and entrepreneurial trainings etc. encouraged for starting entrepreneurship. The following table presents the factors which influenced the opening of the entrepreneurship.

Table 5: Factors Influenced to Start Entrepreneurship

Entrepreneur 1	• Family influence • Previous experience • Training from government agencies
Entrepreneur 2	• Family influence (brother businessman) • Previous experience with sales in the brother trade
Entrepreneur 3	• Friend's encouragement • Desire to change the branch of activity.
Entrepreneur 4	• Training of Kudumbasree Mission • Desire for financial independence • Self-confidence.
Entrepreneur 5	• Successful stories of women entrepreneurs • Kerala startup mission
Entrepreneur 6	• Training of District Industrial Centre • Flexibility of family setup
Entrepreneur 7	• Dream • Desire for financial independence • Family influence (father, brother, aunt).
Entrepreneur 8	• RouteSet institute • Desire for financial independence
Entrepreneur 9	• Family influence • Training of Kudumbasree Mission
Entrepreneur 10	• Friend's encouragement • self-confidence

Source: Case study Report

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

5.3 The Work-Family Conflict

The work-family conflict is analysed here. Following are the notable constrains

a. Time: - Time spends with the family, balancing the workload between family and enterprises.
b. Unsupportive family system: - Unsupportive family system as a result of weak relationship among family members.
c. Personal limitation as a woman: - lack of free mobility, emotional imbalances due to stress and over workload etc. When such constrains exist, a women entrepreneur is not able to perform as a successful entrepreneur and a home maker.

Table 6: Time Management of Women Entrepreneurs

Cases	Time dedicated to Business	Time dedicated to family	Time dedicated to your own
Entrepreneur 1	Satisfactory	Much	None
Entrepreneur 2	None	Satisfactory	Much
Entrepreneur 3	Much	None	Satisfactory
Entrepreneur 4	Satisfactory	Much	None
Entrepreneur 5	None	Satisfactory	Much
Entrepreneur 6	Satisfactory	Much	None
Entrepreneur 7	Much	Satisfactory	None
Entrepreneur 8	Much	None	Satisfactory
Entrepreneur 9	Much	None	Satisfactory
Entrepreneur 10	Much	Satisfactory	None

Source: Case study Report

With the exception of the three entrepreneurs, all other entrepreneurs are unable to find more time to spend with the family. Four entrepreneurs manage time so that they meet the demands of the family satisfactorily and three entrepreneurs are not able to find the time to meet the needs of their own family. As a consequence of "lack of time" these women experience, if not all, at least one conflict of the triad. In this sense, the issue of time management is relevant in the generation of conflicts between work and family.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

5.4 Unsupportive Family System

One characteristic that clearly distinguishes most women entrepreneurs from their male counterparts is the added responsibility society often puts upon them in their roles as mothers and wives. A woman is bound with lot of responsibility towards the family and faces many conflicts due to the unsupportive family background. Most of the women entrepreneurs agreed that they have the work family conflict in their entrepreneurial career. Table 7 analyses the different conflicts of women entrepreneurs from the family.

Table 7: Unsupportive Family System

Cases	Leading conflicts mentioned
Entrepreneur 1	Conflict between House hold work and entrepreneurship
Entrepreneur 2	Husband does not like the entrepreneurship
Entrepreneur 3	No issues worth mentioning
Entrepreneur 4	Cannot look after the children satisfactorily
Entrepreneur 5	Conflict between House hold work and entrepreneurship
Entrepreneur 6	No issues worth mentioning
Entrepreneur 7	Conflict between House hold work and entrepreneurship
Entrepreneur 8	Cannot look after the children satisfactorily
Entrepreneur 9	Conflict between House hold work and entrepreneurship
Entrepreneur 10	Conflict between House hold work and entrepreneurship

Source: Case study Report

One woman entrepreneur remarked that her life partner does not like the entrepreneurship. Four women remarked that they devote more time to the entrepreneurship and as a consequence they do not get enough time to look after their children. 50 percentage of women entrepreneurs observed that there is conflict between House hold work and entrepreneurship. Only two of the entrepreneurs are able to adjust the entrepreneurship and family life without issues.

5.5 Personal Limitations as a Woman

The prevailing attitude that the women's place is at home and that her first priority is to look after the home and family constrains keep away many married women from venturing into entrepreneurship. In Kerala marriage results in geographical displacement and even the women who are interested makes entrepreneurship as the last option. The main personal limitation of a

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

women entrepreneur is lack of free mobility. The emotional burden created by these dual role responsibilities often interfere directly with the conduct of business for women in ways that do not apply to the majority of men. Emotional imbalances due to stress and over workload is the another problem of women entrepreneurs. When such constrains exist, a women entrepreneur is not able to perform as a successful entrepreneur and a home maker. The table 8 illustrates the major personal problems that a women entrepreneur faces.

Table 8: Personal Limitations as a Woman

Cases	Leading personal problems mentioned
Entrepreneur 1	• Limited liberty as a women • Negative attitude of the lab our force
Entrepreneur 2	• Lack of free mobility
Entrepreneur 3	• Emotional instability • Limited liberty as a women
Entrepreneur 4	• Lack of free mobility • Indifferent attitude of the society
Entrepreneur 5	• Negative attitude of the lab our force
Entrepreneur 6	• Lack of free mobility • Lack of confidence to face the challenges
Entrepreneur 7	• Indifferent attitude of the society • Negative attitude of the lab our force
Entrepreneur 8	• Indifferent attitude of the society
Entrepreneur 9	• Lack of free mobility
Entrepreneur 10	• Lack of free mobility

Source: Case study Report

Most of the women entrepreneurs face more than one leading personal constraints. 50 percent of the women entrepreneurs face lack of free mobility. The social structure and circumstances make restrictions for free mobility of women. Unlike men, women mobility in India is highly limited due to various reasons. In most of the cases and in most of the places these entrepreneurs cannot act and / or move freely and independently.

Indifferent attitude of the society and limited liberty as women is another major personal limitation of women. Thus, despite modernization, tradition and family slow down women. Cumbersome exercise involved in starting an enterprise, coupled with the officials humiliating

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

behavior and negative attitude towards women entrepreneurs, often force them to give up the idea of starting an enterprise.

In this case study, four women entrepreneurs responded that the main problem that face is the negative attitude in the work place for being a women. Even though society and government policies provide protection and security to the women, the unhealthy situations still exists. Efficient management of human resources is an important factor in determining the growth and prosperity of an entrepreneurship. Such cases affect the productivity of women entrepreneurship. Moreover, the women entrepreneurs admitted the lack of experience and self confidence on their part to deal with the personnel management in their organizations.

6. FINDINGS AND CONCLUSION

In this study most of the entrepreneurs have higher secondary level of schooling, only a minority has established entrepreneurship in the city and the age groups imply that youngsters are not entertained by entrepreneurship. With regard to the motivation to undertake, it was identified that many of the entrepreneurs started the entrepreneurship due to the need for survival and income. Favorable government policies also motivated to open the enterprises. It justifies the results presented by the GEM report (2017), where a predominance of opportunity-based entrepreneurship was registered among women.

About the work-family conflict, only one entrepreneur has no husband and all her time is devoted to work and to herself. In an attempt to reconcile multiple roles well, these women are often faced with conflict. The emotional burden created by dual role responsibilities often interferes directly with the conduct of women entrepreneurship. The prevailing attitude that the better place of women is at home and that her first priority is to look after the home and family constrains keep away many married women from entering into entrepreneurship.

Knowing this profile is not surprising to note that in general the entrepreneurs practically do not take vacations and have difficulty getting out of work. Those who do can do so because of the support of the work team. Entrepreneurs who can count on effective partner help can better balance the personal work-life conflict, but those who have had negative experiences with partners totally rule out the possibility of new partnerships.

Empowerment in all spheres of life of women can be brought about by providing better atmosphere and support from the family. Family support has to be strengthened to create higher levels of confidence among the women entrepreneurs.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

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INTERNATIONAL JOURNAL OF MANAGEMENT STUDIES (IJMS)

(UGC Approved - Journal No. 44925)

(EISSN: 2231-2528 ISSN: 2249-0302)

is hereby awarding this certificate to

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for the publication of the research paper entitled

The Contribution of Entrepreneurship in the Socio Economic Empowerment of Women in Kannur District

Published in – Volume V, Special Issue – 1, August 2018

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DOI : 10.18843/ijms/v5iS1/13
DOIURL :http://dx.doi.org/10.18843/ijms/v5iS1/13

The Contribution of Entrepreneurship in the Socio Economic Empowerment of Women in Kannur District

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ABSTRACT

The theme of the paper was to discover the contribution of women's entrepreneurship in the socio-economic empowerment of women in Kannur district of Kerala. This paper sought to answer the question, 'How do the female entrepreneurs give meaning to their practices of social and economic empowerment?' It aims to understand, interpret and analyse the meaning of female entrepreneurs attributed to the practice of social and economic empowerment; specifically to identify the concepts of entrepreneurship held by a group of women and to identify some of the socio-economic aspects which relate to the entrepreneurial practices of these women. The paper used the survey method. Results of the paper concluded that besides an increased income, the women gained the social advantages of more autonomy, respect from their families and society and acquired the right to participate in family issues within social and governmental forums.

Keywords: Entrepreneurship, entrepreneurs, enterprises and empowerment.

INTRODUCTION:

Entrepreneurial women are currently writing a new chapter in the history of entrepreneurship. This was the main inspiration behind this work, which title "The Contribution of Entrepreneurship in the Socio economic Empowerment of Women." The paper attempts to answer the following problem: How can entrepreneurship help women to achieve social and economic empowerment? Thus, the paper aims to "Analyze how can entrepreneurship help women to achieve social and economic empowerment."

Concept of Entrepreneurship:

Entrepreneurship is purely an economic activity, conducted personally or by a group of individuals. Entrepreneurship is the process of planning, beginning and running a new business, which is always a small business at the initial stage. Schumpeter depicted entrepreneurship as a process and entrepreneurs as innovators who utilize the process to break the existing system of production and organisation through new blends of resources and new methods of production and trade.

However, the concept of entrepreneurship has undergone constant changes. Today, entrepreneurship, according to the definition presented by Sarkar (2010) is "pursuing an opportunity without look at who controls the resources." In other words, the entrepreneur identifies and realizes it, even though it does not have sufficient resources. (Sarkar, 2010) Thus, the individual who continues to pursue possible business opportunities and to make decisions innovation will continue to play an entrepreneurial role.

Entrepreneurship involves not only the pursuit of an idea or opportunity for survival but also the issue of innovation, that is, the ability to create something new in society, but also the ability to create an opportunity, even at the risk of those who want to undertake. According to A.H. Cole, "Entrepreneurship is the purposeful activity of an individual or a group of associated individuals, undertaken to initiate, maintain or organize, a

profit oriented business unit for the production or distribution of economic goods and services".
Entrepreneurial activity requires certain characteristics that mark the person in his / her daily life such as: the entrepreneurs in general manifest needs for achievement. Entrepreneurs are people willing to take risks; and the entrepreneur is a self-confident person. Therefore, being an entrepreneur means having the desire for fulfillment in life, the need to accomplish things new ideas, put into practice their own ideas built and matured over time, characteristics of personality and behavior that is not always easy to find.
In this perspective, being an entrepreneur requires the will to reach a standard of living above the person meets. Studies reveals that the entrepreneur assumes several risks when starting his own enterprises like financial risks of own money Investment, family risks involving in engaging the enterprises, psychological aspects of risks taking etc.

Concept of Women Entrepreneurship:
Women entrepreneurship is the procedure where women undertake risks and organize all the factors of production, consumption and provide employment to others. A woman entrepreneur is always conscious for opportunities. Therefore a woman entrepreneur is one who is generally mindful of chances who begins business and oversees it autonomously and strategically, takes all the risks, faces the difficulties with intensity.
The effective empowerment of women starts from a reformulation and deconstruction of current political and social schemes, through active participation in movements, awareness in society, acting in governmental instances and also with the creation of welfare oriented associations. These aspects correspond to the alternatives of survival of several entrepreneurs and their families, especially those of low income. The effective contribution of women in income earning activities is not only a part of family welfare, but it is also a way of achieving power in decision making. It is noticed that women have been assuming a role of entrepreneurs and heads of family, mainly because they hold the purchasing power in their hands and contribute effectively to the household budget.

Women Entrepreneurship in India:
Democracy is complete only when gender justice is considered as a developmental issue. Indian women have traditionally been participating in earning livelihood. But her work was largely limited to a small level or she was neglected. From making domestic items like papad and pickles to sewing, cloth weaving and embroidery, direct selling, tuition at home and catering to small programs, women in the industry always take some paths. In recent times, due to increased channels of technology, education, funding and marketing, these women want to become entrepreneurs and want to start their own business. These efforts face many problems in different ways. The important one is the unawareness about funding resources and information about schemes that help their enterprises and unsupportive family background. The most important constraint is that our social viewpoint is also male dominated one. There is a need for ground awareness, encouraging approach and value system for the upliftment of women in the main stream of economic development.
The biggest reason behind changing the dream of women to enter entrepreneurship in reality is the growing period of education and professional training among them. But instead of many more socio-economic reasons, more and more women are increasing their participation in different enterprises like beauty parlor, garments units, candle making, debt collection companies, herbal products, food products etc. At present, there is a change in the traditional structure of families who are giving freedom to women; Apart from this, the gender gap between men and women is declining, due to which women are standing on their feet and recognizing abilities; They are truly amused with the confidence necessary to become a successful entrepreneur in the country; And besides, they are successful in networking, investing and getting directions in a better way than before.
According to the Global Gender Gap Report of the World Economic Forum (WEF) 2016, women constitute more than one-third of the total number of employees in India, due to their contribution to increase GDP and their ability to create employment opportunities. In year 2015, the Global Entrepreneurship and Development Institute (GEDI) has released a report of women entrepreneurship index ranking by ranking the countries in terms of conditions for promoting women entrepreneurship. India's place in the list of 77 countries remained at the bottom of the list, which is 70th place.

Women Entrepreneurship in Kerala:
Kerala has better status than any other states, including the sex ratio (1000: 1084). Kerala woman has been able to reach literacy, infant mortality and maternal mortality rates among developed countries. The Renaissance process and progressive politics of Kerala are the reason behind this. But Kerala's contradiction is that the statistical figures mentioned above did not help in ensuring gender justice. The important reason for the Kerala model being criticized is the embalming of the women. As per the economic review report, in Kerala 75-80% of

girls are studying in higher education level but the work participation of women is only 22%. (Economic review 2014) Even though the membership in Kudumbasree is 40 lakhs, it is only 5% women who earn income from self employment.

The woman's domestic work is totally disappearing in the census figures. Employing women in the family does not even come into policy and policy making. Unemployment of educated women and low employment participation is the main developmental issue of Kerala. There is a need to increase the employment opportunities for women in Kerala. The above problem can be solved by creating opportunities for training. Women's work participation can be improved by providing localised training. Training skills and education should be linked.

The Kudumbashree movement, which has been proudly celebrated for over 16 years by Kerala women, has attracted international innovations with innovative models of women empowerment through economic and social change. Kudumbashree introduced various ways to realise the socio-economic empowerment of women in the society to enable the major objective of poverty alleviation.

LITERATURE REVIEW:

Nadkarni (1982), in her investigation "Social and Economic Study of Women Entrepreneurs with Reference to Pune", has exhibited her discoveries on issues and challenges faced by women entrepreneurs in various enterprises. She has divided the industries into two groups :(i) producer goods industries, and (ii) consumer goods industries. The following observations are worth specifying: (a) 57% of the respondents agree with the statement that women are more apt for desk work than manual work. (b) A change is happening in the attitude of the society however the pace of change is rather slow. (c) Educated family will probably receive moderately liberal approach towards women entrepreneurs as compared to non-educated.

Resia Beegam. (l993) made an observation concerning the problems of women entrepreneurs in Kerala. It was discovered that regardless of adequate support that they get from family members and government, a large number of them are running at a loss. She found that more state assistance is needed for the advancement of their conditions.

Aruna, Sitesh (2007), in the "emerging trends of women at work", Portrayal of Working Women in Indian Popular Literature-Changing Scenario, she has concluded that the women work for different reasons including as (a) who work to help themselves and their families (b) who work because they want to feel more than breeders and caretakers (c) who work to supplement spouse's salary and raise monetary status of the family (d) who work since they need to feel more than reproducers and overseers (e) who work for understanding their vision.

Auti (2010) has done research regarding the matter: "Socio Economic Study of Women Entrepreneurship in the Development of Maharashtra with Special Reference to Pune District". The objectives of the research are to: (I) Study the social, educational, technical and financial foundation of women entrepreneurs ;(ii) Evaluate the economic impact of the entrepreneur's advancement; (iii) Study the impact of globalization on women entrepreneurs and survey the challenges faced by them to develop their units. The hypothesis of this study is: 'Women entrepreneurs influence positively on women employment'. The author has concluded that women prefer to select entrepreneurship as a career after their marriage. Very few women are aware about training schemes. Women run their enterprises utilizing private sources of capital. This is because of the reason that they are unaware of the government schemes.

Singh and Gupta (2013), observed in the research work 'empowerment of rural women through micro entrepreneurship development in India', the Self Help Groups (SHGs) have given monetary help for rural women entrepreneurs; the individuals from Self Help Groups are engaged in micro entrepreneurship. Rural women are independently and economically providing job opportunities for others. Thus empowerment of women is essential in the rural area. The paper suggested that micro entrepreneurship is enhancing the decision making power of women. The major finding of the research is that micro enterprises are effective tool for rural women.

Akshatha and Manjushree (2015), proved the institutional financial support to rural women entrepreneurship development. Women entrepreneurs create new jobs for themselves and others and also by being different the study indentified the institutions are FIWE, SMEs, SIDO, CWEI, WIT, SEWA, SHGs, FIWE, NABARD. Government of India took many initiatives to develop and improve the position of women and thereby promoting their entrepreneurial skills and capabilities like adequate training programmes, management skills. These encourage women participation in decision making. The paper concluded that the Indian women entrepreneurs are interested to do the business and are eager to do income generating activities. Entrepreneurship is the way for women empowerment. The establishment of many institutions and centers for supporting women entrepreneurship are the need of the hour.

OBJECTIVES:

1. To examine the socio-economic empowerment of women through entrepreneurship in Kannur district of Kerala.
2. To analysis the barriers faced by women entrepreneurs in Kannur district.

METHODOLOGY:

To make the present study more realistic and purposeful both primary and secondary data are to be used. Primary data are collected from sampling method and conducting interview through questionnaire, obtaining information from observation, workshops, meeting with women entrepreneurs, unit visit and so on. The secondary data are from the information from Census reports, Economic Reviews, periodicals, journals, website, magazines, news papers etc.

Area of study:
Kannur has been taken as a research area for this study, which is located in northern part of Kerala, consisting of rural and semi urban area. The respondent units are selecting from various taluks of kannur district who had started the enterprises and running successfully. The research paper is on the basis of purposive sampling from both micro enterprises and small scale units.

Statistical tools used:
The information gathered was tabulated and analyzed by using average, percentage and graphical representations.

FINDINGS AND DISCUSSION:

Kannur has secured it's on unique position in the developmental history of Kerala as a rapidly developing economy. The realization of kannur International airport and other social, economic and cultural progress which add for this development has its echoes reflecting up on the industrial domination in the district all over Kerala. Female population in the District is about 53.17% of the total population as per the 2011 census report.
The paper intends with the profile to know the age group, problems faced by women to start the enterprises and socio-economic empowerment of women before and after starting the enterprises.

Age Group:
Age group is one of the most important factors that determine the entrepreneurship. The age is considered as a motivating factor to the development of entrepreneurship.

Table 1: Age group of the women entrepreneurs

Sl No.	Age Group	No Of Respondents	Percentage
1	21- 30	4	16
2	31 - 40	10	40
3	41 -50	9	36
4	Above 50	2	8

Source: Survey data

The results showed that of the 25 surveyed that corresponds to 100%, the age group more productive to the entrepreneurship is between 31 and 40 years of age. The survey reveals that the 40% of the respondents belongs to this age group. The following age group is the one that varies between 41 and 50 years of age with 35%, then it is the age range that ranges from 21 to 30 years of age with 15% and lastly we have the age groups above 50 years of age in a percentage of 10 respectively.

Social and economic situation before starting enterprises:
After searching the profile of the target group, the following was socio-economic status of those surveyed before starting the business. For this part the monthly income of the family, the difficulties they encountered and the family's economic sustainability is analysed.

Monthly income:
The results showed that in the total of 25 entrepreneurs 20% earned between 10000 and 15000 rupees per month. The data also show that 50% earned monthly income varying between 5000 and 10000 rupees, While 20% earned below or up to 5000 rupees per month.

Table 2: Monthly Income before starting enterprises

Sl. No.	Monthly Income	No Of Respondents	Percentage
1	10000 - 15000	5	20
2	5000 - 10000	13	52
3	Bellow 5000	7	28

Source: Survey data

In social and economic life, they had faced many difficulties before opening the enterprises. The data show that of the 25 entrepreneurs surveyed, 10% had no economic and social difficulties before opening their enterprises. By establishing a link with the profile of these respondents, it can be assumed that they are already graduates, since they are in the income range of 10,000 to 15,000 rupees.
However, 90% stated that they had many economic difficulties and social issues before they open the business. In the set of economic difficulties, the lack of money to pay the children and themselves, lack of financial independence, debt and bank loans, poor family backgrounds etc.

The reasons that led to opening of enterprises:
The results brought a diversity of reasons that dictated the entrepreneurs into business. Of the 25 entrepreneurs surveyed 32% say they entered the business world because they want to gain more experience and income. At the same time acquire the freedom to decision making. However 42% say that the great motivation that led them to the entrepreneurial world is that the monthly income they earn is not enough to cover the expenses of their daily life and financial independence. And 18% belongs to the groups of unemployed.

Social and economic situation after starting enterprises:
The data shows that the largest number of entrepreneurs who entered the world of entrepreneurship affirmed that their family income rose significantly. 90% of entrepreneurs stated that the family income rose and 10% say that income remains the same, that is, there were no change. The money management that comes from the business depends on the needs of each of the entrepreneurs.
Women entrepreneurs claim that the entrepreneurship helped them a lot to have a quality education for their children, and for themselves. Entrepreneurship for them is everything. If on the one hand the women recognize that with the entrepreneurship they can cover the expenses of the house in terms of the education and health of the children; on the other hand some of these entrepreneurs complain that they cannot possibly make some savings because they not only have to pay the expenses as well as repayment of the credit granted.
80% of the entrepreneurs consider that after entering the entrepreneurship has gained more consideration in the family as well as in the society in which they live. Therefore, these entrepreneurs consider themselves happy because they have already gained a certain social status as a result of the economic empowerment they have conquered. Another part of entrepreneurs that is 20% of the entrepreneurs says that they were little considered in their families.
The data obtained from the interview show that the entrepreneurs interviewed recognize that entrepreneurship changed their lives. The entrepreneurship gives them possibility of self-management, autonomy, and exemption from having to ask favors from anyone to have the money. The women entrepreneurs want to be an equal footing with man; intend to work with man as a development partner and progress social and economic development. On the other hand it should be noted that the entrepreneurship also helped to create a woman's ability to define her own decisions, recognizing and respecting the rights of others, in a process of seeking better living conditions.

CONCLUSIONS:

The paper had as objective to analyze how the entrepreneurship can help the woman to reach the social and economic empowerment. The results showed that this is possible since, the greater the part of the entrepreneurs surveyed stated that they find great satisfaction with the development of entrepreneurship. Thus, it is believed

that the encouragement of cooperative initiatives that integrate the work of women, with the support of the government can help to develop decent and sustainable employment, increase family savings and investments, improve well-being economic and social cohesion, taking into account the need to eliminate all forms of discrimination and contribute to sustainable human development.

ACKNOWLEDGEMENT:

I owe a debt of gratitude and profound thankfulness to my supervisor and guide Dr. N J Saleena, Rt. Principal and research Guide, Nirmalagiri College, Kuthuparamba for her expert guidance, the patience with which she had gone through my humble work for the constructive criticism that helped me to reform my work and for the love and care.

I also express my sincere thanks towards my family members who have sustained me during the period of study are beyond words.

Above all, I remember God Almighty for the abundant blessings bestowed on me without which I would not have completed.

SUNITHA JOSEPH

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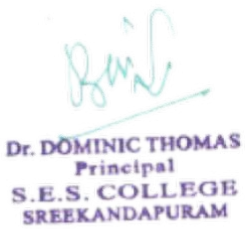

Available online at www.elixirpublishers.com (Elixir International Journal)

Human Resource Management

Elixir Human Res. Mgmt. 88 (2015) 36602-36605

ISSN: 2229-712X

Measuring Entrepreneurial Orientation towards Health Care Sector in Kerala, India

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ARTICLE INFO

Article history:

Received: 14 September 2015;

Received in revised form:

19 November 2015;

Accepted: 25 November 2015;

Keywords

Entrepreneurship,

Health-Care Executives,

Health Care Sector.

ABSTRACT

This paper focuses on the skills, characteristics and personality traits of owner's managers. Many countries are working on the realization of a new sort of public management, which is less governmental and more market oriented. As a consequence the role of health-care managers is changing. They are increasingly addressed as (social) entrepreneurs. This article is based on the results of a survey sent to health-care executives in Kerala,India.The aim of the survey was to explore how the new discourse affects the practice of management. The results show that entrepreneurship is a construction and a contested concept. Nevertheless, executives are very sensitive to the concept. It certainly confuses them and can make them feel more vulnerable. However, new expectations can also perform an important function as a catalyst for executives to rethink their role and their position. From that point of view the phase of multiinterpretable expectations and vague discourse can be seen as a necessary phase in realizing health-care reform.

Introduction

This study is about what entrepreneurship in health care means. The central argument is based on two perspectives: that of policymakers and their policy plans and that of health-care executives (end-responsible managers of health-care organizations).The aim is to provide more insight into the relationship between new policy ideals on the one hand and managerial practice on the other. The central question is: How do Kerala health-care executives cope with the new ideal of entrepreneurship? The broader question, of course, is about the function of expectations and discourse (language use) in policy reform. Entrepreneurship is often described as the ability to create ventures from new or existing concepts, ideas and visions. There has been significant entrepreneurial response to the changes in the scientific and social underpinnings of health care services delivery. A hospital is a crucial organization that stands unique and incomparable to any other business enterprise. It is unique and special because it deals with life of mankind. Patients are not just attracted by high-tech hospitals rather the demand for devoted doctors, accurate diagnostic facilities, qualified nurses and supporting services are important. Establishment of a hospital requires careful planning.

Kerala has to its credit a fairly developed healthcare infrastructure and Kerala has a long history of organized health care. When the State was founded in 1956, the foundation for a sound health care system had already been laid. Thereafter, there was remarkable growth and expansion of government health services. The number of beds in government hospitals rose from 13,000 in 1960 to 38,000 in 1996. The annual compound rate of government expenditure on health during that period was higher than the compound rate of total government expenditure and higher than the annual compound rate of growth of the state domestic product .The easy accessibility and coverage of medical care facilities has played a dominant role in shaping the health status of Kerala. Some of the hospitals in Kerala are more than 50 years old. Health had been a major area of spending in the budget from early years in Kerala.(Gangadaharan,2005).

The growth of health facilities in Kerala offers many lessons in development. The active role of the state government has seen a key factor in the expansion of health care facilities. The initial period of rapid growth in health facilities was dominated by the public sector up to the 1980s. By the mid 1980s because of fiscal and other problems, there was a slow down n the growth of government health institutions. This affected not only the growth in absolute number of beds, but probably the maintenance of quality as well. However, by this time, the private sector was paired for growth and it took the lead in the growth of health care facilities in Kerala. The growth of the private sector in Kerala should not be seen as independent phenomena. The public sector paved the way for its development by sensitizing the population to the need for sophisticated care and creating demand. The government continues to play leadership role in the training of all strata of health professionals, who are then largely absorbed by the private sector. Factors outside the health field, such a growing income, improvement of literacy and population ageing all contributed to this trend. Kerala knows for its model of 'Good Health at Low cost' achieved through universal availability, accessibility and performance of government healthcare delivery system to even poorer sections of the society. Competition from govt. facilities often serves as an impo

Literature Review

Chrimule &Amaradha (1998) try to identify the factors influencing decisions regarding the type of health services to be used, and to study the preferences to the people regarding the choice of health care provider in relation to their socio economic background to identify necessary interventions for increasing the reach of health services to the poor people. The study concluded that the utilization pattern of health services is determined by many factors such as cost, quality of services, their availability, etc. However quality of services plays a dominant role in

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people's decision about seeking medical help. The study shows that due to the inefficiency of the Public Health Centers people prefer seeking treatment from private practitioners.

Banerji (1994) conducted a study in the development of health services in India. The main theme of this paper is to place issues concerning health services in India with in the South Asian context. There continue to be numerous serious problems in the field of health and health services in this region. Over the years, particularly in the recent past, there has been a tendency among some responsible international organizations and aid agencies to paint the conditions prevailing in this region in colors which are darker than those warranted by available evidence. Their database is often dubious, their analysis superficial and highly skewed and above all, they are patently a historical in arriving at their conclusions. However, an enormous amount of work has been undertaken by scholars in this region in studying health and health services in a broader context.

Comparative studies of health facility cost and efficiency have to overcome the difficult methodological problems arising from the wide diversity of health care activities produced by alternative providers and the effects that such heterogeneity has on resource use, cost, and efficiency. The case mix approach attempts to standardize hospital output according to the mix of cases actually treated in the hospital. The case mix denotes composition as well as complexity of cases while measuring hospital cost, these two aspects are of utmost importance and need to be considered. Bruning & Register (1987) in their comparative study of efficiency between profit and non-profit oriented U S hospitals have used an alternative method for dealing with case mix, since the information on case mix of individual hospitals was not available .Case mix proxies are used to limit the confounding effects of case heterogeneity on efficiency measures. They assumed that rural and urban hospitals differ in their case mix and therefore confined to only urban hospitals in their study. All long-term (older) federal hospitals are also eliminated from the sample to reduce heterogeneity. Hospitals that provide a specified set of services are retained, thus eliminating all hospitals, which are too 'basic' or 'high tech'. It is noted that hospital size, measured by the number of beds, is also associated with the case mix .Therefore, they limited their sample to hospitals within the range of 100 to 200 beds. To verify their hypothesis that hospital size is associated with case-mix, the authors group the sample hospitals by size and compare the groups on the basis of bed-to doctor and bed-to-nurse ratios .The differences in ratios are interpreted as differences in case mix .However, it should be noted that the above procedure might introduce a bias in their analysis because bed-to-labor ratios may reflect not only case mix but also efficiency differences. The authors have also estimated technical efficiency using multiple-output production function approach. This estimation method allowed them to control case mix composition, while the previous procedure of restricting the sample could control the case complexity as well.

Bridgeman (1974) discussed the role of hospitals in the past, presents and predicted into the future. He developed different model systems for a hospital with particular reference to developing countries where financial and manpower resources are restricted. He suggests that hospitals have to widen the scope of their activities in becoming an essential tool in delivering total healthcare to the community.

Nabae (1997) in his article has analyzed the past accomplishment and new challenges faced by the health care system in Kerala. He also suggests some measures to overcome the challenges faced by the public sector over the private sector. He suggests that, Kerala must invest in the public sector to revitalize the system. To achieve this, tax revenue must be increased. Second, Kerala must streamline the system through decentralization. Third, Kerala must take a step to revamp the health care system in a way that the public and private sectors effectively co-operate and complement each other to meet the needs of the people.

Panikar(2004) in his special article had examined the achievements of Kerala in the health field .His primary focus is on the rural population ,who generally constitute the predominant majority. The conclusion to which this case study leads is that given proper policies and priorities, lack of resources need not be an impediment to improve health status even in low income countries.

Gangadharan(2007) have examined the success indicators of health in Kerala with that of the national health and the issues connected with the health care investments and morbidity prevalence in Kerala. The study has great relevance in the present socio economic and environmental contest. The state Kerala which has been considered as a state with advanced human development index and better health status is now ailing from acute morbidities of different communicable and chronic illness. Since high morbidity prevalence in the basic issue of the Kerala's health sector, greater attention is needed to reduce the intensity morbidity prevalence private health care can only be a complementary to public institution and not as a substitute to achieve health for all at least in the near future. To attain the status of health for all, aged population has to be properly rehabilitated and efforts should be made to augment the utilization of health services among the marginal deprived and venerable sections of the society. Moreover there should be better of safe drinking water sanitation and utmost care should be provided for better environmental cleaners both in the urban and rural areas.

Significance of the Study

Kerala has a long history of organized health care. When the State was founded in 1956, the foundation for a sound health care system had already been laid. Kerala has a vast health care infrastructure under Allopathy, Ayurveda and Homoeopathy system of medicine. In the health sector the role of Allopathy stream is very important and the major participation is focused in the Allopathic sector which has hospitals both in the private and public sector .Therefore the paper proposed to conduct a detailed study of the entrepreneurial orientation towards Health care sector in Kerala, India

Objectives of the Study

- To provide insight in to the meaning of entrepreneurship in health care ,especially from the point of viewof health care executives

Hypotheses of the Study

The Hypotheses of the entire study was designed as follows.

- Executives who perceive themselves as entrepreneurs are more likely to behavein an entrepreneurial way.
- Entrepreneurship (role perception and managerial practice) is likely to be shaped by managerial background.
- Entrepreneurship (role perception and managerial practice) is likely to be shaped by sector characteristics

Research Methodology

The research is designed as both explorative and descriptive. So the major data source is primary in character. The secondary data were elicited from books, reports, monographs and the official record of the government. The three types of executives were tested for differences in managerial

practice, managerial background and sector. To find associations, chi-square was used.

Population for the Study

Entrepreneurs in the private hospitals operating in Kerala over the 14 districts stretching from Thiruvanthapuram to Kasargod constituted the population and the samples are drawn from them.

Sampling Design

The sample units for the study is selected by multi stage stratified random sampling. First of all the total population is divided into two strata based on region and based on bed strength of each selected hospitals. Based on regions sample units are selected from the Northern, Southern and Central part of Kerala. Kannur district is representing northern region. Ernakulam district representing central Kerala and Thiruvanthapuram district from the southern region constitutes the sample district. Then the total number of hospitals in private sector is being listed by assigning serial numbers.The bed strength ranging below50, between 51-150, and above 150 forms the group. After stratifying the population on bed strength, the sample entrepreneurs are drawn randomly by lot method for the purpose of the study. From each division samples are selected in such a way as to ensure that at least 10 percentages of the units are chosen as the sample.

Results and Discussions

In order to unravel how the ideal of entrepreneurship affects health-care executives and their work, the interaction between executives' role perceptions and managerial practice needs to be investigated, as well as the role played by managerial background and sector. In conceptual terms, this means exploring the correlations among the variables' role perceptions, managerial practice, sector and managerial background, which appear to be crucial for understanding how health-care executives cope with new role expectations

Entrepreneurially minded executives are more likely to behave in an entrepreneurial way

Do entrepreneurs, liaisons and strategists behave differently and does this behavior seem consistent with their role perceptions? In order to find out what executives meant by 'entrepreneurship', no expectations were formulated about managerial behaviour.

Most executives seem to behave in line with their frame of reference. There is evidence that entrepreneurs behave differently from strategists and liaisons, although differences between entrepreneurs and strategists are sometimes subtle. Entrepreneurs are the most active leaders of professionals: they show little patience and little sympathy with professionals and have the least trust in professional self management. Entrepreneurs realize most changes in organizational structures and in the strategic apex. They have the most outward orientation and are likely to take part in more national committees but spend the least time with subordinate managers. Liaisons spend much time in the organization and on organizational matters of an operational nature. They show more consideration in regard to professional practices and are more careful about unsettling management interventions, such as changes in organizational structure. The strategists are the most puzzling. In their actions they look a lot like Entrepreneurs but are less extreme. The main difference between entrepreneurs and strategists is their relationship with subordinate managers. Strategists spend significantly more time with subordinate managers than entrepreneurs do. The impression arising from the research is that strategists take more time to make changes than entrepreneurs do and they might steer in an indirect way. The most striking finding is that there was no single difference in competitive behavior. Entrepreneurs did not act more aggressively, nor were they more likely to interpret production information as an indication for their competitive position.

The results support the hypothesis that executives who perceive themselves as entrepreneurs are more likely to behave in an entrepreneurial way. The results suggest that in practice, entrepreneurship mainly means 'an active style of managing professionals', 'changing organizational structures' and 'focusing on issues of an external and strategic nature'.

Entrepreneurship is likely to be shaped by managerial background

Entrepreneurs followed significantly more management courses than the others did and started significantly earlier in their career in a management position. Moreover, it appears that entrepreneurs have the most diverse experience as managers: they had the most job changes and had the most experience in end-responsible positions and in different kinds of organizations, including some outside of health care (although these last differences were not significant). closer look at the outcomes (including the non-significant ones) gives the impression that liaisons are likely to be trained on the job. In health care, this is mostly in the same sector, in one and the same organization and with fewer management positions. Strategists do not stand out in any specific way; on most issues they hold themiddle ground between liaisons and entrepreneurs.

The results show that 'to have attended several managerial courses' and 'to have acquired experience in a range of management positions' are indicators for an entrepreneurial mind. This means that there is evidence that role perception is shaped by managerial background. The study shows that the more '(recently) educated' and the more '(diversely) experienced' executives are also the more 'active' executives: the more plans they have for change, the busier they are with the competitive position of the organization, the more active they are in external, national committees and other organizations, the more they participate on supervisory boards. The most experienced executives concentrate more on strategic issues

Relationship between managerial practice and managerial background

Taking into account the outcomes shown in Tables 3 and 4, it becomes clear that entrepreneurs are likely to be those who have the most managerial training and the most experience as managers and that this is related to a very active management style. The outcomes support the hypothesis that entrepreneurship is likely to be shaped by managerial background

Entrepreneurship is likely to be shaped by sector

No single relationship was found between role perception and sector. Executives from different types of organizations held the same ideas about their role, which is remarkable because they do not act the same. Sector is correlated with managerial practice in many ways, with the sector being typified by the way executives of a specific type of organization stand out (are more or less likely to think or do something) in relation to executives of other types of organizations.

The outcomes support the 'sector logic' that organizational customs and traditions differ by sector. Executives of health-care organizations are situational leaders. In different sectors, with different professionals, executives approach professionals differently. In different sectors, with different stakeholders, the urge to merge and to introduce new services differs, and executives focus on different external parties. It is interesting that executives do not seem to be conscious of this; no relationship was found between role perception and sector

characteristics. It is possible that this is because role perception and sector are related to different aspects of managerial practice. Rather than supporting executives' actions, it could be possible that sector characteristics elicit actions that interfere with executives' intentions. In conclusion, despite the proof of a 'sector logic', hypothesis three ('entrepreneurship is likely to be shaped by sector characteristics') must be dismissed. Although sector characteristics do influence managerial practice, they do not support entrepreneurs in their intended actions.

The study reveals that

- executives prove to be very sensitive about the opinions and ideals pressed upon them by policymakers and the media. Although the ideal of entrepreneurship is still vague, executives widely believe that the appropriate perception of their role is to see oneself as an entrepreneur.
- Entrepreneurship is more than discourse alone. The ideal of entrepreneurship is evident in their actions. Entrepreneurially minded executives are more active and involved managers, not only in managing professionals, but also in meeting the outside world, and they have more of an eye for strategic issues. They engage in more changes (especially regarding organizational structures) than other executives do.
- Confirm executives in their 'culturally shaped and socially constructed beliefs about their role. More and broader work experience appears to enhance an executive's 'antenna' for the appropriate behaviour. The combination of more work experience and managerial training supports executives in an active management style, an external orientation and more attention to strategic issues. Experienced and well-trained executives (like the entrepreneurs in this study) are more 'on the ball' in a rapidly changing environment than strategists and liaisons are.
- Executives are situational leaders. Sector characteristics influence managerial practices in many ways, but this 'sector logic' can prove hard to resist and might interfere with executive's intentions. As a consequence, executives in different types of organizations are likely to cope with entrepreneurship differently.

Conclusion and Limitations of the Study

It can be concluded from this study that entrepreneurship in health care is a construction and a contested concept. The entrepreneurial discourse is vague. It combines persuasive optimism with realism about changes that may be feasible in the near future. At first glance, it appears to result in confused executives. Interpretations of the concept differ even among the executives themselves. However, this study alsoshows that discourse can have an important function as a catalyst by making executives rethink their role, their function, their personal qualifications, which position to take and which actions to make. Last, it is important to realize that in the new system the position of health-care executives is no longer legitimized by policy plans formulated by government bodies. Instead, legitimization must come from clients and other stakeholders like insurers, banks, etc. These other parties in health care may have different interests, and they are likely to operate in another 'logic' with different rules and habits..The major limitation for this study is that it has not covered the other types of institutions in the health sector such as Ayurvedic, Homeopathic, and Unani etc and it has become difficult for the researcher to collect data from different hospitals. Perceptions of the respondents are measured through observation, personal interview, questionnaire and schedules. The power structure in India may cause respondents to answer with partially frank acknowledgement of feelings. It became very difficult to meet and elicit opinion of administrators due to their busy schedules. Majority of administrators are under the impression that research on management means probing in to their internal affairs especially in health care sector .With this opinion they hesitated in providing required data. Another limitation is that the above analyzed data is not sufficient to study about the entrepreneurship in healthcare in Kerala.

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Contents lists available at www.innovativejournal.in

JOURNAL OF BUSINESS MANAGEMENT AND ECONOMICS

Homepage: http://innovativejournal.in/jbme/index.php/jbme

ISSN: 2347-5471

Social Responsibilities of Hospital Entrepreneurs in Kerala, India

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DOI: http://dx.doi.org/10.15520/jbme.2015.vol3.iss8.135.pp08-12

Abstract: Entrepreneurship as an economic activity includes search for a new business opportunities, arrange for its exploitation, undertake the risk of uncertainties and initiate innovations for the betterment of results from the available sources. An entrepreneur possesses basic characteristics of ability to discover and identify a business opportunity, capacity to organize an enterprise and confidence to undertake the risk of uncertainty. The magnitude of entrepreneurial activity depend to a certain extend up on the social responsibilities and status of an entrepreneur. The status of a person is directly connected with their economic position, which in turn depends on the opportunities available to them to participate in social activities. Further, the social responsibilities of a person are now recognized as an indication of society's stage of development. Therefore, this paper seeks to investigate the social responsibilities of the hospital entrepreneurs in Kerala on the basis of the selected variables. A hospital is a crucial organization that stands unique and incomparable to any other business enterprise. It is unique and special because it deals with life of mankind. The study reveals that the social responsibilities of hospital entrepreneurs in private and co-operative hospitals differ markedly in most of the social aspects. They are similar in some of the aspects. On the basis, the main hypothesis stating that there is no significant difference in the various dimensions of the social status and social responsibilities undertaken by the entrepreneurs of various hospitals is partially accepted or rejected.

Keywords: social responsibility, Hospitals, Entrepreneurs

INTRODUCTION

Establishment of hospitals and other institutions for providing curative services represents an interesting facet of various cultural, socio- economic and political phases which has influenced the making of health services in India today. Historically these services were developed to cater mostly to the needs of certain special strata of the population and because of these they are located in urban areas. Hospitals of modern India act as the index of development both in scientific and technological sense of the term (Sheela, 1997). Until 1835 there were no allopathic medical colleges and schools in India. Even later there were no native doctors or native students in the existing hospitals. It was difficult for a common or a poor man to go for medical education and the treatment. The medical colleges and schools had grown from 3 to 14 within a period of 50 Years, from 1864 to 1900. The doctor- patient ratio was far below at a ratio of 1:30000 till 1900. The patient-bed ratio was less than 0.24 beds per 1000. There were no primary health centers in British India (Khan,1999).

Kerala has a long history of organized healthcare. Some of the government hospitals in the state are about 150 years old. Health has been a major expenditure head in Kerala's budget from its early years. Kerala's health care infrastructure includes 15,409 health institutions and 1, 26,013 beds, besides there are 5094 sub centers each covering a population about 47000 during 2001-02. The hospital in the public sector control 17.7 percentage of the institutions 41.4 percentage of the beds and 13.6 percentage of the doctors while 81.9 percentage of the institutions, 56.3 percentage of the beds and 85.7 percentage of the doctors are in the private sector and the remaining are in the co-operative sector.(Economic review,2011 Govt of Kerala.).

The growth of health facilities in Kerala offers many lessons in development. The active role of the state government has seen a key factor in the expansion of health care facilities. The initial period of rapid growth in health facilities was dominated by the public sector up to the 1980s. By the mid 1980s because of fiscal and other problems, there was a slow down n the growth of government health institutions. This affected not only the growth in absolute number of beds, but probably the maintenance of quality as well. However, by this time, the private sector was paired for growth and it took the lead in the growth of health care facilities in Kerala. The growth of the private sector in Kerala should not be seen as independent phenomena. The public sector paved the way for its development by sensitizing the population to the need for sophisticated care and creating demand. The government continues to play leadership role in the training of all strata of health professionals, who are then largely absorbed by the private sector. Factors outside the health field, such a growing income, improvement of literacy and population ageing all contributed to this trend. Kerala knows for its model of 'Good Health at Low cost' achieved through universal availability, accessibility and performance of government healthcare delivery system to even poorer sections of the society. Competition from govt. facilities often serves as an important factor in determining treatment cost in private hospitals (Aravindan, 2000)

The expectation about health status and health care are higher in Kerala. Further the Kerala population rapidly ageing the demand for health care among the elderly population is very high. Hence the conditions are favorable for an increase in demand for health care over time in the state. The private health sector seems to have benefited from this demand or scenario. The recent Kerala Sasthra

Sahithya Parishad study find out that better facility is the reason for preference of private sector while economic consideration is the major reason for seeking care from a government hospital. Rising disposable income and lack of barriers in establishing private hospital has led to a surprising growth of the private health care sector. (Kunhikannan, 2000)

Private hospitals make more money through over-investigating patients in their own laboratories than from providing care to the patient. Profit at any cost is the watchword. Doctors in the government sector also gain through the nexus between the industry and the profession. The government has made no attempt to regulate the healthcare industry, and often goes out of the way to provide them with more concessions and soaps. The Kerala Sasthra Sahithya Parishad's (KSSP's) studies further revealed that at least 15 percent families spend over 30 percent of their income on healthcare alone. While private healthcare costs exceed Rs.55 billion per annum, the government expenditure is falling steadily. (Soman, 2007)

LITERATURE REVIEW

Gangadharan (2007) has examined the success indicators of health in Kerala with that of the national health and the issues connected with the health care investments and morbidity prevalence in Kerala. The study has great relevance in the present socio economic and environmental contest. The state of Kerala which has been considered as a state with advanced human development index and better health status is now ailing from acute morbidities of different communicable and chronic illness. Since high morbidity prevalence is the basic issue of the Kerala's health sector, greater attention is needed to reduce the intensity of morbidity prevalence. To attain the status of health for all, aged population has to be properly rehabilitated and efforts should be made to augment the utilization of health services among the marginal deprived and venerable sections of the society.

Dilip (2008) tries to understand the characteristics of private hospitals and their equity in assessing their services, using secondary data available for the period 1986-2004. The data indicates that private hospitals did not expand in numbers but a strong consolidation by large hospitals has taken place .Public policy favoring increased private sector participation in medical education coupled with opening of super specialty hospitals has led to a situation where small hospitals or nursing homes are losing their significance and a large number of them have been phased out .Analysis also shows that the duration of hospitalization is lesser if treated in a private hospitals than in a government hospital and that the charity component in the so called " charitable hospitals" is disappearing

Banerji (1994) conducted a study in the development of health services in India. The main theme of this paper is to place issues concerning health services in India with in the South Asian context. There continue to be numerous serious problems in the field of health and health services in this region. Over the years, particularly in the recent past, there has been a tendency among some responsible international organizations and aid agencies to paint the conditions prevailing in this region in colors which are darker than those warranted by available evidence. Their database is often dubious, their analysis superficial and highly skewed and above all, they are patently a historical in arriving at their conclusions. However, an enormous amount of work has been undertaken by scholars in this region in studying health and health services in a broader context.

Chrimule &Amaradha (1998) try to identify the factors influencing decisions regarding the type of health services to be used, and to study the preferences to the people regarding the choice of health care provider in relation to their socio economic background to identify necessary interventions for increasing the reach of health services to the poor people. The study concluded that the utilization pattern of health services is determined by many factors such as cost, quality of services, their availability, etc. However quality of services plays a dominant role in people's decision about seeking medical help. The study shows that due to the inefficiency of the Public Health Centers people prefer seeking treatment from private practitioners.

Chattarjee (2002) argued that there are large numbers of factors which promote the growth of the health care institutions in private sectors in India; there are equally a large number of factors, which frustrate the growth of the private health care institutions in India. Hence efforts are being made to see reasons and allow the private sector health care institutions to grow in the interest of the community .The rate at which the current population is being affected by diverse diseases, it will be essential that the total load of treatment be shared both by public and private sector health institutions in future.

Rodney et al. (1986) examines the role of one of the largest consumer service sectors- the hospital industry in interregional trade and to assess its impact on a regional economy. The analysis demonstrates the export share of revenue, the extent of local purchasing, and the income and employment generating capacity of the hospital sector in a large metropolitan area. Hospitals usually account for 3-5percentage of total employment in large metropolitan areas. Many hospitals are among the largest individual employers with in regional economies. Because of this magnitude even limited interregional sales of hospital services could result in significant income generation. This research has demonstrated the service sector role in interregional trade by examining the hospital sector role in interregional trade by examining the hospital sector in a large metropolitan economy. The study concluded that the high proportion of labor and other local inputs that comprise typical service sector expenditure patterns can generate significant amounts of regional income and employment from a modest share of exports in a very large volume of output.

SIGNIFICANCE OF THE STUDY

Kerala is characterized by the co-existence of an almost stagnant economy and a good quality life. The state's achievement in the field of health care still remains a conjecture. Kerala is well and truly on top of all the other Indian states in terms of health indicators of its population. Kerala has a long history of organized health care. When the

State was founded in 1956, the foundation for a sound health care system had already been laid. Kerala has a vast health care infrastructure under Allopathy, Ayurveda and Homoeopathy system of medicine. In the health sector the role of Allopathy stream is very important and the major participation is focused in the Allopathic sector which has hospitals both in the private and public sector .Therefore the paper proposed to conduct a detailed study on the social responsibilities of hospital entrepreneurs in Kerala on the basis of some variables .

OBJECTIVEs OF THE STUDY

a. To analyze the social responsibilities undertaken by the hospital entrepreneurs in Kerala, India.
b. To examine the hospital entrepreneurs both in the private and co-operative sectors witness any significant change in their social responsibilities while making comparison.

HYPOTHESES

a. There is no significant difference in the various dimensions of the social responsibilities undertaken by the entrepreneurs of various hospitals in Kerala.

RESEARCH METHODOLOGY

The research is designed as both explorative and descriptive. So the major data source is primary in character. The secondary data were elicited from books, reports, monographs and the official record of the government. For the purpose of analyzing the data scaling techniques and chi-square test are used.

Population for the study:

Hospitals in the co-operative, government and private sectors operating in Kerala over the 14 districts stretching from Thiruvanthapuram to Kasargod constituted the population. In Kerala there were 2,711 government hospitals, 65 co-operative hospitals and 12,383 hospitals in the private sector as on 31-3-2010 and the samples are drawn from them.

Sampling Design:

The sample units for the study is selected by multi stage stratified random sampling. First of all the total population is divided into three strata based on region, based on ownership and based on bed strength of each selected hospitals. Based on regions sample units are selected from the Northern, Southern and Central part of Kerala. Kannur district is representing northern region. Ernakulam district representing central Kerala and Thiruvanthapuram district from the southern region constitutes the sample district. Sample population from each region is further stratified into different sectors on the basis of ownership of hospitals such as private sector, public sector and co-operative sector. Then the total number of hospitals in each sector is being listed by assigning serial numbers. After listing the hospitals under each sector it is again stratified according to their bed strength. The bed strength ranging below50, between 51-150, and above 150 forms the group. After stratifying the population on bed strength, the samples are drawn randomly by lot method for the purpose of the study. From each division samples are selected in such a way as to ensure that at least 10 percentages of the units are chosen as the sample. Responses were got from 41 private hospital entrepreneurs and 9 from co-operative hospital authorities.

RESULTS AND DISCUSSIONS

The magnitude of entrepreneurial activity depend to a certain extend up on the social responsibilities and status of an entrepreneur. The status of a person is directly connected with their economic position, which in turn depends on the opportunities available to them to participate in social activities. Further, the social responsibilities of a person are now recognized as an indication of society's stage of development. Entrepreneurship is the key to development which enhance the social responsibilities of person. The present section seeks to investigate the social responsibilities of the hospital entrepreneurs in Kerala on the basis of selected variables.

Variables used for the study:

To investigate the social responsibilities of hospital entrepreneurs, the following variables are used viz involvement of entrepreneurs in social activities, type of involvement of entrepreneurs in social activities, driving forces for involvement in social activities and extent of support received by the hospital from their family members etc.

Ho: There is no significant difference in the various dimensions of the social status and social responsibilities undertaken by the entrepreneurs of various hospitals in Kerala.

Involvement of entrepreneurs in social activities:

Hoa: There is no significant difference in the level of involvement of entrepreneurs of various hospitals in social activities.

Table 7.2: Involvement of entrepreneurs in social activities

	Private	**Co-operative**	**Total**
Very High	8 (19.51)	3 (33.33)	11 (22.00)
High	11 (26.83)	4 (44.44)	15 (30.00)
Moderate	22 (53.66)	2 (22.22)	24 (48.00)
Total	41 (100.00)	9 (100.00)	50 (100.00)
Pearson Chi-square: 2.92354, df=2, p=.232			

Values in parentheses are percentage
Source: Compiled from field survey

Involvement in social activities is an effective driving force for a person to become an entrepreneur, as entrepreneurship adds good value to their social standing. Participation in social activities gives them mental peace, development of public contacts and exchange of ideas as it will help in business development. It also gives them an opportunity to serve the society financially and physically. Further, some people have chosen the path of entrepreneurship as a part of extension of their social activities. The response of entrepreneurs as to their involvement in social activities given in Table 7.2 depicts that the majority of entrepreneurs in private hospital (53.66 percentage) are moderately

involving in social activities. Out of 41 sample hospitals 11 respondents are highly involving in social activities and 8 respondent's involvement is very high. The table further describes that among co-operative hospitals 3 respondents reveals a very high involvement, 4 respondents showing high involvement and 2 respondents are moderately involving in social activities. Chi square test statistics revealed that the result is not significant (P>.05) at 95 percent confidence interval, ie, there is no significant difference in the level of involvement of entrepreneurs of various hospitals in social activities. Hence Hoa is **accepted**.

Type of involvement of entrepreneurs in social activities:

Hob: There is no significant difference in the type of involvement of entrepreneurs of various hospitals in social activities

Table 7.3: Type of involvement of entrepreneurs in social activities

Involvement	Private	Co-operative	Total
Charitable Institutions	9 (21.95)	0 (0.00)	6 (14.63)
Welfare Society like Blood Doners, Eye Doners etc	6 (14.63)	0 (0.00)	4 (9.76)
As leader of political parties	0 (0.00)	9 (100.00)	7 (17.07)
No social activity	20 (48.78)	0 (0.00)	20 (48.78)
Involved in local social activities	6 (14.64)	0 0.00	4 (9.76)
latoT	41 (100.00)	9 (100.00)	41 (100.00)

Pearson Chi-square: 35.1632, df=4, p=.000
Values in parentheses are percentage

The type of involvement in social activities depends on several factors, viz financial position of hospital entrepreneurs, previous occupation, achievements in business, reputation enjoyed, family status, availability of time, personal interest, purpose etc .The relevant data related to this are presented in the table

It can be noticed from the table that most of the entrepreneurs in the private hospitals were not a member of any institution (48.78 percentage).Out of the sample unit 9 (21.95 percentage) respondents have membership in charitable institutions. Further 6(14.63 percentage) respondents represent member of welfare society and involved in local social activities. Among co-operative hospitals cent percentage of respondents were rather members or leader of political parties. Chi square test statistics revealed that the result is significant (p<.05) at 95 percent confidence interval, ie, there is significant difference in the type of involvement of entrepreneurs of various hospitals in social activities. Hence Hob is **rejected**.

Reason for involvement of entrepreneurs in social activities:

Hoc: There is no significant difference in the reason for involvement of entrepreneurs of various hospitals in social activities.

Table 7.4: Reasons for involvement of entrepreneurs in social activities

Reasons	Private	Co-operative	Total
Social commitment	6 (28.57)	7 (77.78)	12 (40.00)
Psychological satisfaction	6 (28.57)	2 (22.22)	8 (26.67)
Social commitment & mental satisfaction	4 (19.05)	0 (0.00)	4 (13.33)
social commitment & social status	2 (9.52)	0 (0.00)	2 (6.67)
Mental satisfaction & social status	1 (4.76)	0 (0.00)	1 (3.33)
social commitment, mental satisfaction & social status	2 (9.52)	0 (0.00)	2 (6.67)
Total	21 (100.00)	9 (100.00)	30 (100.00)
Pearson Chi-square: 8.96825, df=6, p=.175			

Entrepreneurs engage in social activities due to various reasons. Some successful entrepreneurs usually get offers to occupy a good position in government sponsored organization or other welfare organizations which give them high social status, psychological satisfaction, better public contact etc

Table7.4 depicts the reasons for involvement of entrepreneurs in social activities. From the analysis of the table it is clear that, out of total sample units 28.57 percentage respondents are involving in social activities for psychological satisfaction while 28.57 percentage are involving for the reason of social commitment. Further 19.05 percentage respondents are involving for social commitment as well as psychological satisfaction, 9.52 percentage for social commitment and social status, another 9.52 percentage are for social commitment, psychological satisfaction and social status, 4.76 percentage for psychological satisfaction and social status. Among co-operative hospitals majority of the respondents (77.78 percentage) are involving in social activities on account of social commitment and 22.22 percentage are involving for psychological satisfaction. Chi square test statistics revealed that the result is not significant (P>.05) at 95 percent confidence interval, i.e. there is no significant difference in the reason for involvement of entrepreneurs of various hospitals in social activities. Hence Hoc is **accepted**.

Extent of support received by the hospital entrepreneurs from their family members:

Support of family members and need for achievement are found to be the initial requirements to start a business unit. The study shows the extend of support received by the hospital entrepreneurs from their family members.

Table 7.5: Extent of support received by the Hospital entrepreneurs from their family members

Type of support	Private	Co-operative	Total
Carry on the work as livelihood	1 (2.44)	0 (0.00)	1 (2.44)
Continue the hospital service as a casual job	7 (17.07)	0 (0.00)	7 (17.07)
Supported the idea of having associated with the hospital	22 (53.66)	0 (0.00)	22 (53.66)
Financial support	8 (19.51)	0 (0.00)	8 (19.51)
No support	3 (7.32)	0 (0.00)	30 (7.32)
Total	41 (100)	0 (0.00)	41 (100)

Values in parentheses are percentage
Source: Compiled from field survey

The table7.5 explains the extent of support received by the hospital entrepreneurs from their family members. Majority of the hospital entrepreneurs ie 53.66 percentage have received the idea of starting the hospital from their family members.19.51 percentage entrepreneurs received financial support from their family members and 7.32 percentage entrepreneurs did not have any support from their family members. Besides this 2.44 percentage entrepreneurs carry on the work as livelihood and 17.07 entrepreneurs continue the engagement in hospital service as a casual job.

CONCLUSION AND LIMITATIONS

A hospital is a crucial organization that stands unique and incomparable to any other business enterprise. It is unique and special because it deals with life of mankind. The study reveals that the social responsibilities of hospital entrepreneurs in private and co-operative hospitals differ markedly in most of the social aspects. They are similar in some of the aspects. On the basis, the main hypothesis stating that there is no significant difference in the various dimensions of the social status and social responsibilities undertaken by the entrepreneurs of various hospitals is partially accepted or rejected. The major limitation for this study is that it has not covered the other types of institutions in the health sector such as Ayurvedic, Homeopathic, and Unani etc and it has become difficult for the researcher to collect data from different hospitals. Perceptions of the respondents are measured through observation, personal interview, questionnaire and schedules. The power structure in India may cause respondents to answer with partially frank acknowledgement of feelings. It became very difficult to meet and elicit opinion of administrators due to their busy schedules. Majority of administrators are under the impression that research on management means probing in to their internal affairs especially in health care sector .With this opinion they hesitated in providing required data. Another limitation is that the above analyzed data is not sufficient to study about the pricing procedure followed by the healthcare sector in Kerala.

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