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MESSAGE FROM THE DESK OF EDITOR IN CHIEF

The Chief Editor and Editors of the advance research journal of Management, Engineering, Law, Paramedical Science, Nursing, Basic Science, Education, Physical Education and Yoga, Special Education, Clinical psychology and Liberal Arts i.e. IUT Journal of Advanced Research and Development (JARD) would take it as their duty to express the deep gratefulness to the contributors and readers of current volume.

We feel proud to bring the present issue of the online IUT Journal of Advanced Research and Development. We consider that the contribution in this multidisciplinary will help in the inclusive and sustainable growth process. Keeping in tune with this dignified idea, the current issue of IUT-JARD has addressed some current issues covering diversified field.

This issue needs an integrative and a holistic approach to the solution. Finally, the information contains in this journal volume has been published by the IUT obtains by its authors from various sources believed to be reliable and correct to the best of their knowledge, and publisher is not responsible for any kind of plagiarism and opinion related issues.

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BANK CREDIT AND CAPITAL INVESTMENT IN NIGERIA (1981-2019): AN ARDL ANALYSIS IN THE PRESENCE OF STRUCTURAL BREAKS

Gbenga Festus BABARINDE[1]

[1]Lecturer, Department of Banking and Finance, ModibboAdama University, Yola, Nigeria; Email: liftedfgb@gmail.com (corresponding author)

Mamoud Abdul JALLOH[2]

[2]Finance and Administrative Manager, Camusat SL Ltd., Freetown, Sierra Leone; Email: abdulmoud99@gmail.com

ABSTRACT

Globally, capital investment is a key contributor to economic growth and could be derived from many sources, with the chief source often being the banking sector. However, the extent to which the sector has been able to perform this function has not been empirically clarified in extant studies. Hence, this study attempts to evaluate the short run and long-run impact of bank credit on capital investment in Nigeria using Autoregressive Distributed Lag (ARDL) model and pairwise Granger causality test approaches, with additional insights from structural break analysis. The findings of this study suggest that while bank credit has short-run, positive and significant impact on capital investment in Nigeria; bank credit, does not seem to promote long-run growth of capital investment in the country in the study period. This implies that bank credit is promoter of capital investment in Nigeria only in the short-run, for in the long-run capital investment is shown to be inversely related to bank credit. This is may be attributed to the fact that deposit money banks (being the dominant banks in the Nigerian banking system) are geared towards giving short term to medium term credit facilities with little or no provision for long-term facilities to spur long-run fixed capital formation in the economy. This study also uncovers a unidirectional causality flow from stock market development to bank credit and government revenue, which suggests that stock market development promotes bank credit and government revenue in Nigeria. Furthermore, the results of the Bai-Perron breakpoint tests identified five structural breaks in the years 1986, 1992, 2000, 2007 and 2015. This study concludes that bank credit is only a short-run promoter of capital investment in Nigeria, for in the long-run, bank credit and capital investment are inversely related. It is therefore recommended Nigerian deposit money banks should be re-engineered and empowered to provide long-term credit facilities capable of stimulating capital formation in Nigeria.

Keywords: Bank credit, Banking, Capital investment, Autoregressive Distributed Lag, Gross fixed capital formation, Dummy variable, Structural breaks, Bai-Perron test.

INTRODUCTION

The banking system is a network of institutions, frameworks, people, infrastructure, operators, regulatory agencies, processes and procedures that ensure intermediation of money from the

surplus economic units to the deficit units through the provision of banking products and services like deposit acceptance, extension of loans and credits, provision of payment services, as well as other financial services to customers. The banking sector comprises of commercial banks, microfinance banks, merchant banks, mortgage banks and other banks, which are licensed by the Central Bank to provide business of banking services to customers.

Banks have always been perceived as an engine of growth in an economy because they perform resource allocation function, by mobilizing and channelling resources from surplus economic units to deficit units and they also help in stimulating the level of economic activities in various sectors of the economy (Omankhanlen, 2012). At the same time, a well-functioning banking sector and other financial institutions play many other important roles. For example, they reduce the cost of transactions, asymmetric information, and moral hazard problems. They help to reduce the exposure of investors to risk through the process of risk-sharing and diversification, playing an important role in specifying the most efficient investment projects and improving corporate governance mechanism (Eltayeb & Osman, 2020).

Nwani (2019) posits that commercial credit lending is an essential service in the financial sector; one that is to be managed and not avoided since credit lending is as much a pivotal banking management activity as is deposit mobilization. The banking system is the engine of growth in any economy, given its function of financial intermediation and through this function, banks facilitate capital formation, lubricate the production engine turbines and promote economic growth. However, banks' ability to engender economic growth and development depends on the health, soundness and stability of the banking system itself (Omankhanlen, 2012). The functions of commercial banks include provision of international trade services, brokerage services, and foreign exchange services; safekeeping of valuable assets; debt factorizing; accepting deposits of money; granting of loan and advances; acting as agents for transfer of funds; and creating demand-deposit money.

Conceptually, capital formation of any nation is the net addition to the total capital stock after depreciation. Capital formation captures all the real value-added to the economy in real asset terms which will lead to further enhancement of savings, investment and generation of more wealth in future (Omankhanlen, 2012). At the domestic level, investment is categorized into public and private sector investments. Private sector investment refers to investment by individual people or firms as opposed to the government as an entity which is referred to as

public sector investment. Economic theories have shown that some critical factors influencing private sector investment are those of credit to the private sector, the cost of capital, the rate of return, public sector investment, exchange rate. The broad objectives of credit policies in Nigeria, over the years, have been the enhancement of availability, reduction of cost and access of credit to the private sector as well as the stimulation of growth in the productive sectors of the economy (Okorie & Chikwendu, 2019). Private sector credit refers to financial resources provided by deposit taking corporations except central banks to the private sector.

The central objective of the study is to empirically investigate the role of Nigerian banks credit in gross fixed capital formation (capital investment). By so doing, we specifically analyzed the impact of banks' credit to private sector on gross fixed capital formation in Nigeria and also investigated the impact of government expenditure as well as stock market development on capital investment in Nigeria.

LITERATURE REVIEW

Financial intermediation theory provides a basis for the assessment of the role of banks and other financial institutions as it relates to their core function of establishing link between deficit unit and surplus unit of the economy, vis-à-vis different economy indicators such as capital formation (capital investment). Aside deposit mobilization, lending – the provision of credit facilities, is a key function of banks and as such in line with the tenets of financial intermediation, these credit facilities are to be sourced by banks from the surplus economic units (savers) and made available to the deficit economic units (borrowers) for productive purposes of trade, investment and business. The link between bank credit and capital formation (capital investment) has been examined by some past studies. A case in point is Omankhanlen (2012) which investigated the role of banks in capital formation and economic growth in Nigeria. The study found a positive impact of commercial banks' deposit liabilities and credits on Gross Fixed Capital Formation (GFCF) in Nigeria. Akpansung and Babalola (2012) also examined the relationship between banking sector credit and economic growth in Nigeria. They found evidence that private sector credit impacted positively on economic growth while lending rate impeded economic growth. In a similar study, Anthony (2012) found among others, a positive relationship between private sector credit, public sector credit, and economic growth in Nigeria.

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Onodugo et al (2013) assessed the effect of financial intermediation on economic growth in Nigeria. The study suggests that financial savings as a ratio of real gross domestic product has a negative influence on private investments in Nigeria. Furthermore, the study reveals that the level of private investment in Nigeria is stimulated by the level of credit extended to private sector by deposit money banks. In 2013, Aliyu and Yusuf studied the impact of private sector credit on the real sector of Nigeria. The study finds that there is a positive significant impact of credit to private sector on the real sector of Nigeria.

On their part, Aruomoaghe and Olugbenga (2014) discovered that the banks have contributed much in financing capital investments and stock market development in Nigeria. Onodugo et al (2014) assessed the impact of bank credit on private sector investment in Nigeria. The study shows that banks loans and advances and foreign direct investment have positive significant effect on private investment in Nigeria.

In 2015, Nwokoye et al. examined the impact of Nigeria's banking sector on domestic investment. Findings of the study reveal that bank credit negatively and significantly impacted domestic investment in the long run while its short run impact is positive and significant. In another study, Olowofeso et al. (2015) examined the impacts of private sector credit on economic growth in Nigeria. The study confirmed a positive and significant effect of private sector credit on output, while increased prime lending rate was inhibiting growth in the study period.

Furthermore, Ojimadu et al. (2016) investigated the impact of bank credit on capital formation in Nigeria and found a positive but non-significant impact of bank credit on capital formation in the country. The author attributed the non-significance effect to the stringency of rules on credit allocation by banks which prevented proper allocation of funds in the Nigerian financial system. In their investigation, Ezeudu and Nwaocha (2017) employed Ordinary Least Squares regression technique to determine the impact of lending rate and commercial bank loans on gross fixed capital formation in Nigeria. The study established among others that commercial bank loan exerts significant positive impact on investment financing in Nigeria.

In another study, Okorie and Chikwendu (2019) investigated the extent to which private sector credit impacts private sector investment in Nigeria. From the analysis, the empiric established that private sector credit has positive and significant impact on private sector investment in the short run, but in the long run, the effect private sector credit is positive and insignificant.

From the foregoing, it is very clear that the banking sector plays a key role in capital formation of Nigeria but the extent and direction of the impacts in the literature are still ambiguous and blink. For instance, in addition to the divergent findings of positive impact (Omankhanlen (2012), Onodugo et al (2013)**,** Aruomoaghe and Olugbenga (2014), Onodugo et al (2014), Ezeudu and Nwaocha (2017)), negative impact (Nwokoye et al. (2015)) and non-significant impact (Ojimadu et al. (2016)) of bank credit on capital formation reported in previous empirical studies; it was also discovered that none of those studies accounted for the influence of structural breaks in their studies. Therefore, using recent macro data between 1981 and 2019, we examined how bank credit to private sector affects capital formation (capital investment) in Nigeria. This will clarify some mixed results in previous studies and will also help to determine whether there exist structural breaks as well as its influence on the studied variables in the study periods.

METHODS

This research is based on *ex-post facto* research design. Hence, past annual time series data obtained from secondary source were analyzed in order to determine the impact of bank credit on capital investment (gross fixed capital formation) in Nigeria. The variables of study as described in Table 1 were obtained from Central Bank of Nigeria (2019)'s statistical bulletin (CBN) and World Bank (2019)'s World Development Indicators (WDI). The study covered the period between 1981 and 2019.

Table 1: Description of Variables

Notation	Variable Description	Proxy for	Source	Supporting Literature
GFCF	Gross fixed capital formation (% of GDP)	Capital investment	WDI	Aruomoaghe and Olugbnega (2014)
DCPSB	Domestic credit to private sector by banks (% of GDP)	Bank credits	WDI	Aruomoaghe and Olugbnega (2014)
VOSTR	Value of transactions at the Nigerian Stock Exchange(% of GDP)	Stock market development	CBN	Aruomoaghe and Olugbnega (2014)
GOVREV	Total federally collected government revenue (oil and non-oil) (% of GDP)	Government revenue	CBN	Lucky and Kingsley (2016)

Source: Authors' compilation from literature review.

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Model Specification and Estimation Techniques

The Autoregressive Distributed Lag (ARDL) technique proposed by Pesaran et al. (2001) was used to determine the impact of bank credit on capital investment in Nigeria. In addition, pair wise Granger causality test and structural breaks analysis were also carried out.

In order to account for the potential impact of structural breaks on the model of this study, this study introduced dummy variable into the ARDL model. The doctrine of dummy variables often shows the presence or absence of an attribute by constructing an artificial variable which takes on the value 1 for the presence of the qualitative attribute and 0 for its absence (Gujarati & Porter, 2010; Oyeniyi, 2012; Gujarati, 2017). The dummy variable approach is advantageous in that no degree of freedom is lost occasioned by splitting the data. In the same vein, a single regression model with dummy variable incorporated can be used to test different hypotheses.

Consequently, six comparative models were specified and estimated in this study. The first model assumes that there is no structural break while in the other five models, dummy variables were introduced. The five years (1986, 1992, 2000, 2007 and 2014) identified by Bai-Peron breakpoint test as the years of structural breaks are the basis of inclusion of dummy variables in Models 2 to 6.

In this study, capital investment is expressed as a function of bank credits, stock market development and government revenue and the ARDL models of the functional relations among the variables are as specified in equations (1) to (6).

$$\left[\frac{GFCF}{GDP}\right]_t = \alpha + \sum_{i=1}^{n} \beta_{1i}\,\Delta\left[\frac{GFCF}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{2i}\,\Delta\left[\frac{DCPSB}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{3i}\,\Delta\left[\frac{VOST}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{4i}\,\Delta\left[\frac{TGR}{GDP}\right]_{t-1} + \Psi_1\left[\frac{GFCF}{GDP}\right]_{t-1} + \Psi_2\left[\frac{DCPSB}{GDP}\right]_{t-1} + \Psi_3\left[\frac{VOST}{GDP}\right]_{t-1} + \Psi_4\left[\frac{TGR}{GDP}\right]_{t-1} + u_t \quad (1)$$

$$\left[\frac{GFCF}{GDP}\right]_t = \alpha + \sum_{i=1}^{n} \beta_{1i}\,\Delta\left[\frac{GFCF}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{2i}\,\Delta\left[\frac{DCPSB}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{3i}\,\Delta\left[\frac{VOST}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{4i}\,\Delta\left[\frac{TGR}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{5i}\,\Delta D_{1986} + \Psi_1\left[\frac{GFCF}{GDP}\right]_{t-1} + \Psi_2\left[\frac{DCPSB}{GDP}\right]_{t-1} + \Psi_3\left[\frac{VOST}{GDP}\right]_{t-1} + \Psi_4\left[\frac{TGR}{GDP}\right]_{t-1} + \Psi_5 D_{1986} + u_t \quad (2)$$

$$\left[\frac{GFCF}{GDP}\right]_t = \alpha + \sum_{i=1}^{n} \beta_{1i}\,\Delta\left[\frac{GFCF}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{2i}\,\Delta\left[\frac{DCPSB}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{3i}\,\Delta\left[\frac{VOST}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{4i}\,\Delta\left[\frac{TGR}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{5i}\,\Delta D_{1992} + \Psi_1\left[\frac{GFCF}{GDP}\right]_{t-1} + \Psi_2\left[\frac{DCPSB}{GDP}\right]_{t-1} + \Psi_3\left[\frac{VOST}{GDP}\right]_{t-1} + \Psi_4\left[\frac{TGR}{GDP}\right]_{t-1} + \Psi_5 D_{1992} + u_t \quad (3)$$

$$\left[\frac{GFCF}{GDP}\right]_t = \alpha + \sum_{i=1}^{n} \beta_{1i}\,\Delta\left[\frac{GFCF}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{2i}\,\Delta\left[\frac{DCPSB}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{3i}\,\Delta\left[\frac{VOST}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{4i}\,\Delta\left[\frac{TGR}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{5i}\,\Delta D_{2000} + \Psi_1\left[\frac{GFCF}{GDP}\right]_{t-1} + \Psi_2\left[\frac{DCPSB}{GDP}\right]_{t-1} + \Psi_3\left[\frac{VOST}{GDP}\right]_{t-1} + \Psi_4\left[\frac{TGR}{GDP}\right]_{t-1} + \Psi_5 D_{2000} + u_t \quad (4)$$

$$\left[\frac{GFCF}{GDP}\right]_t = \alpha + \sum_{i=1}^{n} \beta_{1i}\,\Delta\left[\frac{GFCF}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{2i}\,\Delta\left[\frac{DCPSB}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{3i}\,\Delta\left[\frac{VOST}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{4i}\,\Delta\left[\frac{TGR}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{5i}\,\Delta D_{2007} + \Psi_1\left[\frac{GFCF}{GDP}\right]_{t-1} + \Psi_2\left[\frac{DCPSB}{GDP}\right]_{t-1} + \Psi_3\left[\frac{VOST}{GDP}\right]_{t-1} + \Psi_4\left[\frac{TGR}{GDP}\right]_{t-1} + \Psi_5 D_{2007} + u_t \quad (5)$$

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$$\left[\frac{GFCF}{GDP}\right]_t = \alpha + \sum_{i=1}^{n} \beta_{1i}\,\Delta\left[\frac{GFCF}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{2i}\,\Delta\left[\frac{DCPSB}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{3i}\,\Delta\left[\frac{VOST}{GDP}\right]_{t-i} + \sum_{i=0}^{n} \beta_{4i}\,\Delta\left[\frac{TGR}{GDP}\right]_{t-1} + \sum_{i=0}^{n} \beta_{5i}\,\Delta D_{2014} + \Psi_1\left[\frac{GFCF}{GDP}\right]_{t-1} + \Psi_2\left[\frac{DCPSB}{GDP}\right]_{t-1} + \Psi_3\left[\frac{VOST}{GDP}\right]_{t-1} + \Psi_4\left[\frac{TGR}{GDP}\right]_{t-1} + \Psi_5 D_{2014} + u_t \quad (6)$$

Where; Δ denotes first difference operator; α = the drift component; μ_t = the error term; β_1 - β_5 = the parameters of the short-run dynamics of the model; Ψ_1 - Ψ_5 corresponds to parameters of the long-run relationship; $\left[\frac{GFCF}{GDP}\right]_t$ is the capital investment (GFCF) at time t; $\left[\frac{DCPSB}{GDP}\right]_t$ corresponds to bank credit (DCPSB) at time t; $\left[\frac{VOST}{GDP}\right]_t$ represents stock market development (VOSTGDP) at time t; $\left[\frac{TGR}{GDP}\right]_t$ is government revenue (GVRGDP) at time t; and $D_{(1986,1992,2000,2007,2014)}$ denotes dummy variable, 1 for years 1986, 1992, 2000, 2007 and 2014 respectively while each of the other years in the study period in each of the models takes on value 0.

RESULTS AND DISCUSSION

Descriptive Statistics

The data described in form of summary statistics presented in Table 2 reveals that, except for value of securities traded (VOSTGDP) whose mean is less than its standard deviation (std. dev), which can be considered to be relatively volatile (widely dispersed), all other variables have their mean value exceeding their std. dev and therefore are considered relatively stable over the study period. The skewness coefficients indicate all the variables to be positively skewed while the kurtoses are less than 3, hence the leptokurtic nature of the distribution. Since the variables are not mesokurtic (kurtosis ≠3), and the skewness are not equal to zero, non-normality may be

inferred therefrom. A look at the formal test of normality for the series, (Jarque-Bera statistics) shows gross fixed capital formation (GFCF) and government revenue (GVRGDP) to be normally distributed at one percent and five per cent respectively while value of securities traded (VOSTGDP) and domestic credit to private sector by banks (DCPSB), in agreement with inference from kurtosis and skewness earlier made, fail normality test.

Furthermore, the summary statistics show that GVRGDP has the highest maximum of 99.1366% among the four variables of study; followed by GCFC (89.3861%), DCPSB (19.6035%) and VOSTGDP (4.2881%) respectively. The minimum of contribution of gross fixed capital, credit to private sector by banks, value of shares traded and government revenue to gross domestic product is 14.17%, 4.95%, 0.04% and 6.41% respectively.

Table 2: Summary Statistics

	GCFC	DCPSB	VOSTGDP	GVRGDP
Mean	35.9434	9.1432	0.7844	38.3923
Maximum	89.3861	19.6035	4.2881	99.1324
Minimum	14.1687	4.9480	0.0406	6.4058
Std. Dev.	19.3904	3.5457	0.9500	31.1446
Skewness	1.0270	1.2087	2.0199	0.7960
Kurtosis	3.7179	4.0782	7.1155	2.0501
Jarque-Bera	7.6935	11.3861	54.0451	5.5852
Probability	0.0213	0.0033	0.0000	0.0612
Observations	39	39	39	39

Source: Authors' computation.

Visual Description of the Variables of Study

The line graphs of the four variables (Gross fixed capital formation (GFCF), domestic credit to private sector by banks (DCPSB), government revenue (GVRGDP), and value of securities traded ratio (VOSTGDP)) studied in this research are presented in Fig, 1. The line graphs suggest that almost all the four variables show some symptoms of unpredictability in more than one point/year.

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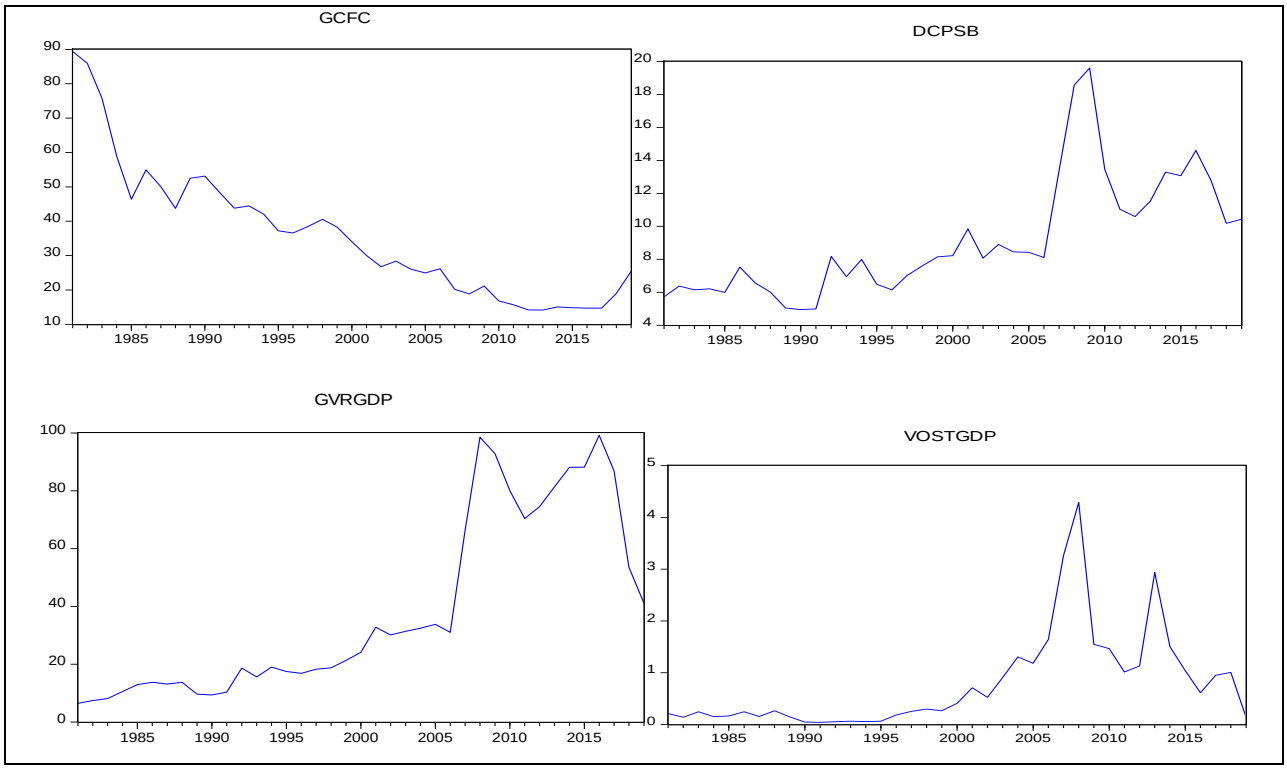

Fig.1: Visual description of the variables of study

Source: Authors' computation.

Unit Root Tests

In determining the stationarity or otherwise of the variables, both conventional (Augmented Dickey-Fuller without breakpoint) (ADF)) and Dickey-Fuller test with break point (ADF-BP) were applied. The results of the ADF test presented in Table 3 reveal that gross fixed capital formation (GFCF) is stationary at level while other variables (DCPSB, VOSTGDP and GVRGDP) attain stationarity after first difference.

Conventional Unit Root Test

Table 3: Augmented Dickey-Fuller (ADF) Test Statistics

Variable	ADF Test at Level	ADF Test at First Difference	I(d)
GCFC	-3.6170[0.0100]**		I(0)
DCPSB	-2.3071[0.1751]	-5.6825[0.0000]*	I(1)
VOSTGDP	-2.3927[0.1504]	-6.4571[0.0000]*	I(1)
GVRGDP	-1.1422[0.6882]	-4.8342[0.0004]*	I(1)

Source: Authors' computation.

Note: * rejection of null hypothesis of unit root at 1% since the p-value is less 0.01; Values in [] are probability values.

Breakpoint Unit Root Test

In structural break analysis in this study, each variable was examined using the Dickey-Fuller breakpoint (ADF-BP) unit root test and Bai-Peron multiple breakpoints test was also applied to the variables. This was necessary because the conventional Dickey-Fuller-type unit root test due to their low power, do not perform well in the face of structural break(s) in the series; and as such 'they fail to reject the unit root null hypothesis when it is incorrect' (Brooks, 2014, p.365).

The results of the ADF-BP test presented in Table 4 indicate gross fixed capital formation (GFCF) to be stationary at first difference with an associated breakpoint date of 1985. Similarly, the value of shares traded (VOSTGDP) also attains stationarity at first difference and a structural break was associated with it in year 2008. However, credit to private sector by banks (DCPSB) and government revenue (GVRGDP) attain stationarity at level and both variables are subjected to structural break in year 2006.

Table 4: Dickey-Fuller Breakpoint Unit Root Test

Variable	Level		First Difference		
	ADF test	Break date	ADF test	Break date	
GCFC	-4.1226[0.1196]	1999	-7.2954[< 0.01]	1985	I(1)
DCPSBB	-5.7942[< 0.01]	2006			I(0)
VOSTGDP	-3.3510[0.4727]	2002	-8.3116[< 0.01]	2008	I(1)
GVRGDP	-7.3529[< 0.01]	2006			I(0)

Source: Authors' computation. Note: Values in [ ] are probability values

Structural Breaks Analysis

The results of the Bai-Perron (1998, 2003)'s breakpoint test applied to the model are presented in Table 5. According to this result, both sequential F-statistic determined breaks and Significant F-statistic largest breaks criteria identified five structural breaks at 1986, 1992, 2000, 2007 and 2014. These dates are associated with certain economic, financial, and political events in Nigeria

and at the international scene which are perceived to be likely influential on the variables of study. For instance, 1986 coincided with the economic liberation policy of the Structural Adjustment Programme (SAP) in Nigeria with the neo-liberal philosophy aimed at deregulating the economy and financial system. In year 1986, bank credit and capital investment had a jump of about 26% and 19% respectively from their 1985 figures.

In 1992, unlike bank credit that increased to roughly 64%, capital investment reduced to 10% from the 1991 values in Nigeria. Year 2000 marked a reform in the Nigerian banking sector that saw to the evolution of the universal banking system, where banks were branded as a one-stop financial supermarket for all range of financial serviceslikетraditional banking services, insurance, marketing, underwriting, issuing houses services. A very small increase of about 1% was experienced in bank credit in year 2000 in Nigeria unlike capital investment which witnessed a reduction of about 11% in the same year from their 1999 values. 2007 precedes the 2008 stock market crash and world economic crisis and in the same year, (2007), bank credit witnessed an increase of about 65% unlike the 23% shrinkage recorded in respect of gross fixed capital formation in the same year compared with 2006 figures. Finally, 2014 almost coincided with 2015 presidential election in Nigeria. About 15% and 7% rise in bank credit and capital investment (GFCF) respectively were recorded in year 2014 relative to their 2013 values.

Table 5: Bai-Perron Multiple Breakpoint Tests

Bai-Perron tests of 1 to M globally determined breaks					
Breaking variables: DCPSB VOSTGDP GVRGDP C					
Break test options: Trimming 0.15, Max. breaks 5, Sig. level 0.05					
Sequential F-statistic determined breaks:				5	
Significant F-statistic largest breaks:				5	
UDmax determined breaks:				3	
WDmax determined breaks:				3	
		Scaled	Weighted	Critical	
Breaks	F-statistic	F-statistic	F-statistic	Value	
1 *	91.01940	364.0776	364.0776	16.19	
2 *	265.5966	1062.386	1249.095	13.77	
3 *	353.3532	1413.413	1880.292	12.17	

4 *	282.3881	1129.553	1694.852	10.79	
5 *	238.7643	955.0571	1701.031	9.09	
UDMax statistic*		1413.413	UDMax critical value**		16.37
WDMax statistic*		1880.292	WDMax critical value**		17.83
* Significant at the 0.05 level.					
** Bai-Perron (Econometric Journal, 2003) critical values.					
Estimated break dates:					
1: 1995					
2: 1986, 2001					
3: 1986, 1995, 2007					
4: 1986, 1995, 2007, 2014					
5: 1986, 1992, 2000, 2007, 2014					

Source: Authors' computation

VAR Lag Order Selection Criteria

The unit root tests which indicate the variables to be of mixed order of integration one and zero, supports the application of Autoregressive Distributed Lag (ARDL) model in this study. However, because of the sensitivity of the ARDL to lag length, this study applied the Vector Autoregression (VAR) lag order selection criteria test to determine the optimum lag for the model estimation. The result of the test presented in Table 6 reveals that all the information criteria (sequential modified likelihood ratio (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ)) recommends one lag order as the optimum for the model. This implies that lag one (1) is the optimum in the model lag length formation in this study. The optimum lag is the information criterion with the minimum value. Thus, in this study, both ARDL model and Granger causality equations are estimated at lag one.

Table 6: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-388.7488	NA	35169.24	21.81938	21.99532	21.88079
1	-294.0634	163.0693*	447.5049*	17.44797*	18.32770*	17.75502*
2	-284.9406	13.68417	679.8209	17.83004	19.41355	18.38273

3	-264.4510	26.18122	581.4455	17.58061	19.86792	18.37894
* indicates lag order selected by the criterion						

Source: Authors' computation.

F-Bounds Cointegration Test

The F-Bounds cointegration test was conducted to determine the existence or non-existence of long-run relationship among the variables of study. The results of the test as presented in Table 7 uncover the existence of long-run relationship between bank credit and capital investment in Nigeria in each of the six models of this study.

Table 7: F-Bounds Cointegration Tests

Model 1:	**F-statistic:4.7743***	**Bounds/ Signif.**	**10%**	**5%**	**1%**
DV:GFCF	K:3	I(0)	2.37	2.79	3.65
IVs: DCPSB,VOSTGDP,GRVGDP		I(1)	3.2	3.67	4.66
Model 2:	**F-statistic: 7.2637***	**Bounds/ Signif.**	**10%**	**5%**	**1%**
DV:GFCF	K: 3	I(0)	2.2	2.56	3.29
IVs: DCPSB,VOSTGDP,GRVGDP,D1986		I(1)	3.09	3.49	4.37
Model 3:	**F-statistic: 4.6971***	**Bounds/ Signif.**	**10%**	**5%**	**1%**
DV:GFCF	K: 4	I(0)	2.2	2.56	3.29
IVs: DCPSB,VOSTGDP,GRVGDP, D1992		I(1)	3.09	3.49	4.37
Model 4:	**F-statistic:4.5805***	**Bounds/ Signif.**	**10%**	**5%**	**1%**
DV:GFCF	K:4	I(0)	2.2	2.56	3.29
IVs: DCPSB,VOSTGDP,GRVGDP, D2000		I(1)	3.09	3.49	4.37
Model 5:	**F-statistic:4.4618***	**Bounds/ Signif.**	**10%**	**5%**	**1%**
DV:GFCF	K:4	I(0)	2.2	2.56	3.29
IVs: DCPSB,VOSTGDP,GRVGDP,D2007		I(1)	3.09	3.49	4.37
Model 6:	**F-statistic: 4.4596***	**Bounds/ Signif.**	**10%**	**5%**	**1%**
DV:GFCF	K:4	I(0)	2.2	2.56	3.29
IVs: DCPSB,VOSTGDP,GRVGDP, D2014		I(1)	3.09	3.49	4.37

Source: Authors' computation.

Note: * denotes rejection of no levels relationship among the variables since the F-statistic exceeds all the three critical values at the upper bound I(1) at 10%, 5% and 1% levels respectively.

ARDL Model Estimation

The results of the long-run and short-run regression models are summarized in Tables 8 and 9 respectively. Considering all the models' coefficients of determination (R-squared), Model 2 (both long-run and short-run) whose R^2 is the highest can be said to have the highest predictive power in so far all the models' overall statistical significance indicator (F-statistic) are statistically significant. The dummy variables in long-run Model 2 are significant. Aside long-run Model 3 whose dummy is also statistically significant, the dummies in other models are not significant statistically. The traces of parameter instability depicted by the CUSUM of Squares test of Model 1 (without dummy) is corrected in Models 2, 5 and 6. Going by aforementioned points, it is clear that, relatively, Model 2 becomes the preferred model among all the five models with dummies. In other words, the basis of interpretation and recommendations in this study is Model 2 (the model which accounted for structural break in year 1986).

ARDL Long-Run Estimation

The ARDL long-run estimates (without dummy) in Table 8 (Panel A) show credit to private sector by banks (DCPSB) (that is, bank credit) to be positively signed (1.5600) and statistically significantly related (p=0.0180) to capital investment in Nigeria. One-year lag of bank credit is however, negative (-1.5196) but statistically and significantly (p=0.0190) associated with capital investment in Nigeria. Therefore, the net effect of bank credit (0.0504) on capital investment is still positive and significant. This suggests that bank credit has positive and significant impact on capital investment in Nigeria in the long run when structural break is ignored. Furthermore, the effect of value of shares traded (VOSTGDP) (that is stock market performance), is negative but non-statistically impactful on capital investment in Nigeria in the long-run. Government revenue (in level) (GVRGDP) is negative but its one-year lag (GVRGDP (-1)) is positively related with capital investment in Nigeria and both are statistically significant. The net effect of government revenue on gross fixed capital formation in Nigeria in the long-run, however is negative. The result is worrisome as it suggests the impairing role of government revenue in capital investment in Nigeria in the long-run.

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Discounting the potential influence of structural break in Model 2 (Panel B, Table 8), this study reveals that bank credit (in level) is still positively signed (1.2168) and statistically and significantly (p=0.0322) impactful on capital investment in Nigeria but the one-year lag of the bank credit is negative (-1.5030) and statistically significant (p=0.0087) in its long-run impact on capital investment in Nigeria. The net effect of bank credit (-0.2862) on capital investment in Nigeria in the long-run is therefore negative and statistically significant. This finding is in line with the Nwokoye et al. (2015)'s states that bank credit has negative and significant impact domestic investment in the long run. Our finding does not agree with that other studies which established a positive significant ((Omankhanlen (2012), Onodugo et al (2013), Aruomoaghe and Olugbenga (2014), Onodugo et al (2014), Ezeudu and Nwaocha (2017)) and positive but non-significant (Ojimadu et al. (2016)) link between bank credit and capital formation/capital investment.

Further results from long-run Model 2 show that value of shares traded ratio (stock market development) exerts long-run positive but statistically insignificant impact on capital investment in Nigeria. The net long-run effect of government revenue on capital investment in Nigeria is positive and statistically significant in the model. The net effect of the of the long-run dummy is positive and statistically significant.

Table 8: ARDL Long-Run Estimates

	A	**B**	**C**	**D**	**E**	**F**
	Model 1	**Model 2**	Model 3	Model 4	Model 5	Model 6
Variable	GCFC	**GCFC**	GCFC	GCFC	GCFC	GCFC
GCFC(-1)	0.8017[0.0000]	**0.9917[0.0000]**	0.7126[0.0000]	0.7608[0.0000]	0.7984[0.0000]	0.8030[0.0000]
DCPSB	1.5600[0.0180]	**1.2168[0.0322]**	1.7569[0.0079]	1.5502[0.0105]	1.5485[0.0148]	1.6289[0.0198]
DCPSB(-1)	-1.5196[0.0190]	**-1.5030[0.0087]**	-1.3959[0.0271]	-1.4439[0.0073]	-1.4785[0.0108]	-1.6863[0.0325]
VOSTGDP	-0.0785[0.9468]	**0.6068[0.5558]**	-0.3510[0.7613]	0.5151[0.5984]	-0.1208[0.8787]	-0.2737[0.7838]

GVRGDP	-0.3660[0.0048]	**-0.3278[0.0036]**	-0.3704[0.0036]	-0.3747[0.0045]	-0.3691[0.0062]	-0.3727[0.0042]
GVRGDP(-1)	0.3049[0.0135]	**0.3599[0.0018]**	0.2677[0.0269]	0.3210[0.0108]	0.2926[0.0165]	0.3343[0.0183]
D1986		**16.7453[0.0008]**				
D1986(-1)		**-8.1263[0.0246]**				
D1992			-3.9370[0.1006]			
D2000				-3.6540[0.0349]		
D2007					0.7931[0.6790]	
D2014						-1.1311[0.5274]
Constant	7.6731[0.0613]	**-8.2710[0.2439]**	12.6711[0.0137]	9.7314[0.0298]	7.8791[0.0512]	7.9803[0.0438]
R-squared	0.9601	**0.9732**	0.9636	0.9631	0.9601	0.9603
Adjusted R^2	0.9524	**0.9658**	0.9551	0.9545	0.9508	0.9510
F-statistic	124.4056[0.0000]	**131.6822[0.0000]**	113.4783[0.0000]	112.0618[0.0000]	103.3345[0.0000]	103.6721[0.0000]

Source: Authors' computation.

Note: ***, ** and * Significant at 10%, 5% and 1% respectively; Values in [] are probability values

ARDL Short-Run and Error Correction Model Estimation

The results of the ARDL short-run and Error Correction Model (ECM) for the six comparative models in this study are presented in Table 9. The short-run estimates in Model 1 (without dummy) (in Panel G, Table 9) indicate bank credit to have positive (1.5600) and significant effect (p=0.0051) on capital investment in Nigeria. Government revenue, however, has negative and significant short-run impact on capital investment in Nigeria. The indicator of the error adjustment mechanism of the model, the error correction term (ECT) of -0.1982 with a probability value of 0.0000 suggests that the short-run disturbance to the short-run equilibrium is

corrected at a rate of about 20% per annum to bring about long-run equilibrium relationship among the variables in the long-run model.

From the short-run findings based on Model 2 (with dummy 1986) (in Panel H of Table 9), this study discovered that bank credit has positive (1.2168) and significant effect (p=0.0099) on capital investment in Nigeria in the short-run. This finding is not in consonance with the finding of Nwokoye et al. (2015) that bank credit has positive and statistically significant impact on Nigerian domestic investment in the short run.

Moreover, government revenue has negative and significant short-run impact on capital investment in Nigeria. The error correction term (ECT) of the model is negative (-0.0082) and statistically significant which implies that the short-run disturbance to the short-run equilibrium is corrected at a rate of about 1% per annum to bring about long-run equilibrium. Just like in the long-run, the short-run dummy is also positive and statistically significant.

Table 9: ARDL Short-run and Error Correction Regression Estimates

	G	H	I	J	K	L
	Model 1	**Model 2**	Model 3	Model 4	Model 5	Model 6
Variable:	D(GCFC)	**D(GCFC)**	D(GCFC)	D(GCFC)	D(GCFC)	D(GCFC)
D(DCPSB)	1.5600[0.0051]	**1.2168[0.0099]**	1.7569[0.0013]	1.5502[0.0040]	1.5485[0.0055]	1.6289[0.0036]
D(GVRGDP)	-0.3660[0.0004]	**-0.3278[0.0002]**	-0.3704[0.0002]	-0.3747[0.0002]	-0.3691[0.0004]	-0.3727[0.0004]
D(D1986)		**16.7453[0.0000]**				
ECT	-0.1982[0.0000]	**-0.0082[0.0000]**	-0.2873[0.0000]	-0.2391[0.0000]	-0.2015[0.0000]	-0.1969[0.0000]
R-squared	0.5123	**0.6723**	0.5549	0.5495	0.5130	0.5145
Adjusted R^2	0.4845	**0.6434**	0.5295	0.5238	0.4851	0.4867

Source: Authors' computation. Note: Values in [] are probability values

Post-Estimation Diagnostic Tests

The post-estimation diagnostic tests in Table 10 reveal from both Durbin-Watson and Breusch-Godfrey Serial Correlation LM tests that Models 1 and 2 are free from serial correlation problem. In the same vein, Jargue-Bera test of normality of Models 1 and 2 indicate that the models passed normality test. Breusch-Pagan-Godfrey heteroscedasticity test confirms the homoscedastic nature of the models and the results of the Ramsey RESET test implies no misspecification of the functional forms of the models.

Table 10: Post-Estimation Diagnostic Tests

Test	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Durbin-Watson	1.8621	**1.9179**	1.8741	1.9412	1.8711	1.8849
Jargue-Bera	8.2355	**15.3281**	2.3684	6.3652	8.0376	7.8114
	[0.0612]	**[0.0804]**	[0.0429]	[0.0414]	[0.0179]	[0.0200]
Breusch-Godfrey Serial Correlation LM	0.0247	**0.0629**	0.0005	0.0429	0.0162	0.0075
	[0.8760]	**[0.8037]**	[0.9816]	[0.8373]	[0.8994]	[0.9314]
Breusch-Pagan-Godfrey Heteroskedasticity	1.3539	**0.9197**	3.6253	1.8913	1.1656	1.1106
	[0.2639]	**[0.5147]**	[0.0000]	[0.1062]	[0.5312]	[0.3821]
Ramsey RESET	1.1467	**2.3797**	2.4092	3.4441	1.0670	1.1159
	[0.2928]	**[0.5067]**	[0.1083]	[0.0460]	[0.2948]	[0.2736]

Source: Authors' computation.

Note: Values in [] are probability values

Also, the stability tests' results by ways of CUSUM test and CUSUM of Squares test for Models 1, 2, 3, 4, 5 and 6 are depicted in figures 2a&b, 3a&b, 4a&b, 5a&b, 6a&b and 7a&b respectively. The CUSUM test of stability in Fig.2a attests to the stability of the estimates of the variables in Model 1. Contrarily, the CUSUM of Squares test of parameter stability of the same model (Model 1) in Fig. 2b reveals that there is some evidence of parameter instability in the model. This suggests the existence of structural breaks in the model which requires correction.

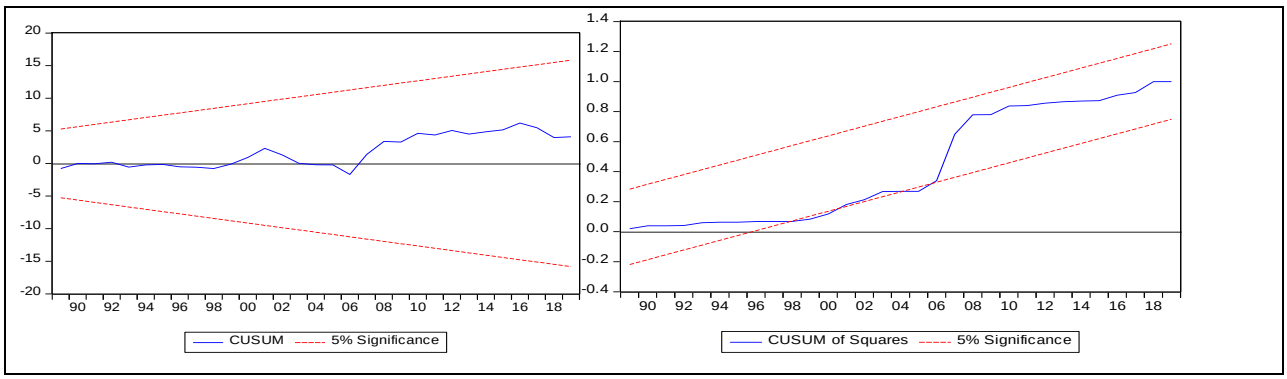

Fig.2a: CUSUM Test for Model 1 **Fig.2b: CUSUM of Squares Test for Model 1**

Source: Authors' computation.

The correction of structural breaks in Model 1 has necessitated the estimation of other five comparative models with dummy. Both CUSUM test (in Fig.3a) and CUSUM of Squares test (in Fig.3b) for Model 2 confirm that the parameters of Model 2 display stability in the study period.

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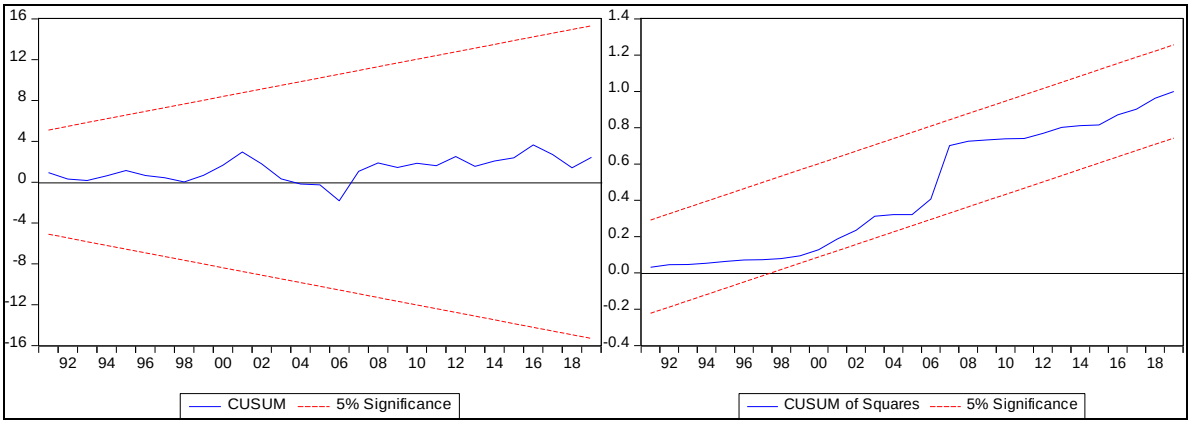

Fig.3a: CUSUM Test for Model 2 **Fig.3b: CUSUM of Squares Test for Model 2**

Source: Authors' computation.

Finally, just like in Model 2, the results of CUSUM of Squares test of parameter stability for Models 3 and 4 reveals that the parameters of the models are not relatively stable over. However, the results of CUSUM test and CUSUM of Squares test (in Fig.6a&b and Fig.7a&b) for Models 5 and 6 suggest the existence of parameter instability in the models.

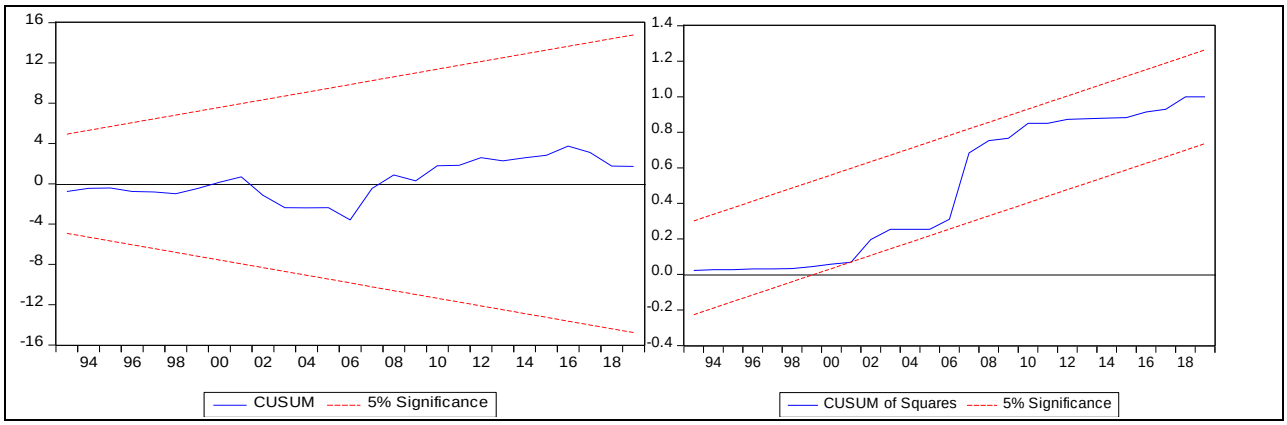

Fig.4a: CUSUM Test for Model 3 **Fig.4b: CUSUM of Squares Test for Model 3**

Source: Authors' computation.

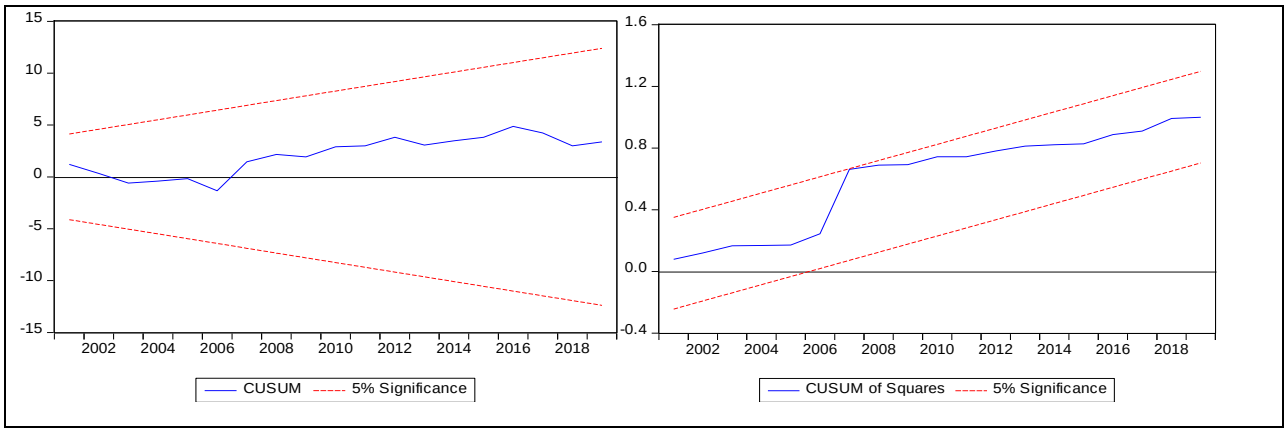

Fig.5a: CUSUM Test for Model 4 **Fig.5b: CUSUM of Squares Test for Model 4**

Source: Authors' computation.

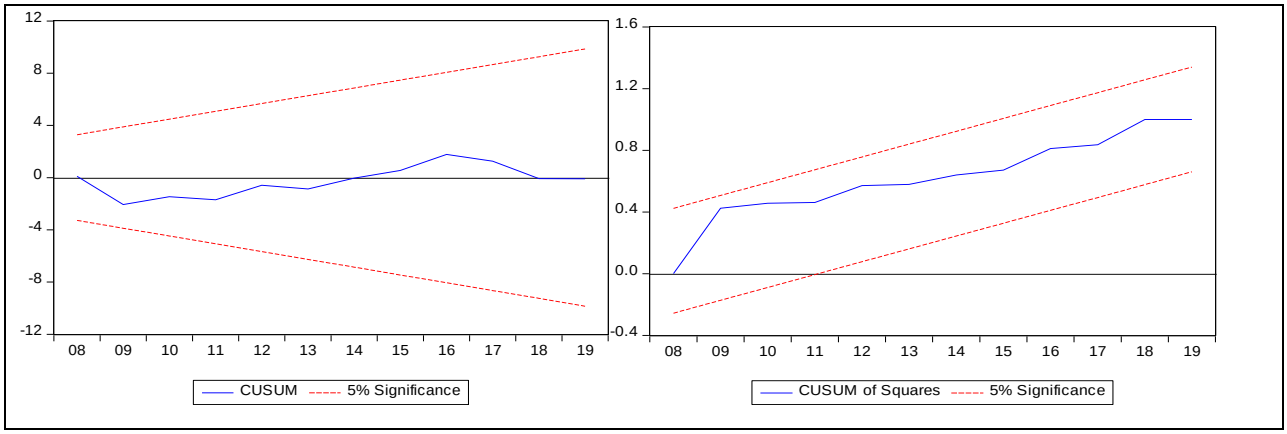

Fig.6a: CUSUM Test for Model 5 **Fig.6b: CUSUM of Squares Test for Model 5**

Source: Authors' computation.

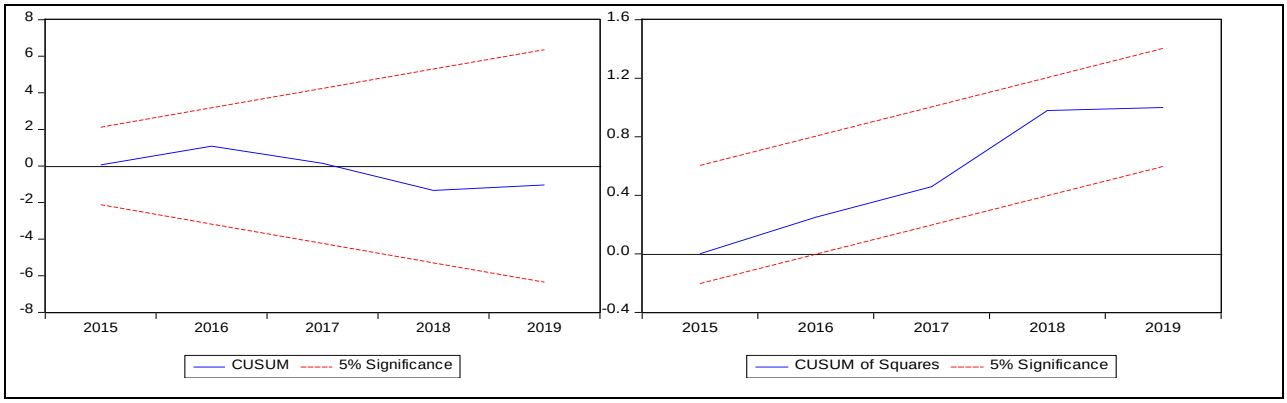

Fig.7a: CUSUM Test for Model 6 **Fig.7b: CUSUM of Squares Test for Model 6**

Source: Authors' computation.

Pairwise Granger Causality Tests

The results of the pairwise Granger causality test conducted at first-order difference (Lag 1) are presented in Table 11. From the causality analysis, this research confirms no causality between credit to private sector by banks (DCPSB) and Gross Capital Formation (GCFC) in Nigeria in the study period. However, there is a unidirectional causality flow from value of shares traded ratio (VOSTGDP) to credit to private sector by banks (DCPSB) in Nigeria and value of shares traded ratio (VOSTGDP) also granger-cause government revenue in a unidirectional manner. This suggests that stock market development promotes both bank credit and improves government revenue in Nigeria in the study period.

Table 11: Pairwise Granger Causality Tests

Lags: 1			
Null Hypothesis:	Obs.	F-Statistic(Prob.)	Decision
DCPSB does not Granger Cause GCFC	38	2.54173(0.1199)	Accept
GCFC does not Granger Cause DCPSB	38	2.49183(0.1234)	Accept
VOSTGDP does not Granger Cause GCFC	38	0.70657(0.4063)	Accept
GCFC does not Granger Cause VOSTGDP	38	1.77982(0.1908)	Accept
GVRGDP does not Granger Cause GCFC	38	1.50451(0.2282)	Accept
GCFC does not Granger Cause GVRGDP	38	1.11115(0.2991)	Accept
VOSTGDP does not Granger Cause DCPSB	38	35.5401(9.E-07) *	Reject
DCPSB does not Granger Cause VOSTGDP	38	0.18094(0.6732)	Accept
GVRGDP does not Granger Cause DCPSB	38	2.18470(0.1483)	Accept
DCPSB does not Granger Cause GVRGDP	38	0.14729(0.7035)	Accept
GVRGDP does not Granger Cause VOSTGDP	38	0.01104(0.9169)	Accept
VOSTGDP does not Granger Cause GVRGDP	38	11.6645(0.0016) *	Reject

Source: Authors' computation.

Note: * denotes rejection of null hypothesis at 1%. Value in ( ) are probability values.

CONCLUSION AND RECOMMENDATIONS

In this study, we modelled the impact of bank credit on capital investment in Nigeria between 1981 and 2019 using ARDL model with consideration of the potential effect of structural breaks via dummy variable approach. From the analysis, we found that bank credit has long-run positive and significant impact on capital investment in Nigeria when structural break is ignored. Discounting the influence of structural break, the long-run effect of bank credit on capital

investment in Nigeria turns negative and statistically significant. In the short-run, however, whether structural break is factored in or ignored, the result proved that bank credit has positive and significant impact on capital investment in Nigeria.

The net effect of bank credit on capital investment in Nigeria in the long-run established in this study to be negative and statistically significant suggests that bank credit, particularly, credit from deposit money banks in Nigeria do not seems to promote long-run growth of fixed capital formation in Nigeria in the study period. Bank credit short-run, positive and significant impact capital investment in Nigeria implies that bank credit is a short-run promoter of capital investment in Nigeria. This is perhaps, deposit money banks credit which form the bulk of the bank credit in Nigeria is geared towards giving short term to medium term financial accommodation and therefore the provision of long-term financial accommodation (credit) by the banks are somehow constraint by certain legal and institutional impediments which tend to primarily limit deposit money banks to provision of majorly short-term credit facilities.

This research from the dummy variable regression, shows stock market development to have long-run positive but statistically insignificant impact on capital investment in Nigeria in the study period. Moreover, government revenue has positive and significant impact on capital investment in Nigeria in the long-run and short-run in the study period.

Finally, from the pairwise Granger causality tests result, this research confirms no causality between bank credit and capital investment in Nigeria. However, there is a unidirectional causality flow from stock market development to bank credit and government revenue, which suggests that stock market development promotes credit to private sector by banks and also improves government revenue in Nigeria.

This study concludes that bank credit is a short-run promoter of capital investment in Nigeria for in long-run bank credit tends to act otherwise. Other determinant of capital investment in Nigeria is government revenue. It is therefore recommended that Nigerian deposit money banks should be re-engineered and empowered to provide long-term credit facilities capable of stimulating capital formation in Nigeria. In that light, government should empower the banking industry further in the area of funding, policy friendliness, and general macro-economic environment that that are pro-banking. The banking industry, particularly the deposit money banks sub-sector

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should be encouraged via various policy initiative such tax incentives, government guarantee of commercial loans granted by deposit money banks, to further enable the banking industry provide long term credit facilities in addition to their core mandate of providing short to medium term credit facilities. Government should further invest in the banking industry so to develop the bank credit market through the provision of infrastructural facilities in the sector.

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SWEET GRAPE PRODUCTION IN BANGLADESH BY ADJUSTING PRUNING CYCLE

Mohammed Ataur Rahman

Professor: College of Agricultural Sciences, IUBAT—International University of Business Agriculture and Technology, Uttara, Dhaka-1230, Bangladesh.

Email: marahman@iubat.edu,www.iubat.edu

Abstract

After 21 years of the trial, it has become successful to produce sweet grapes in IUBAT. The experiment was started in 1997 while the author had been working at James Finlay Limited, Balisera, Sremangal. Both normal flowering and pruning induced flowering were under trial during the long study period to attain a stable result. Seasonal shifting of monsoon rain had been destabilizing the pruning adjustment to fruiting, and ripening phases of the grapes. The trial parameters were: Normal flowering without pruning, late winter pruning, spring pruning, monsoon pruning, and autumn pruning. At all the parameters flowering and fruiting were observed and fruits were tasted. Although autumn (September) and late winter (February) pruning showed some sweetness in the grapes in the next trials grapes were sour. However, monsoon pruning resulted in very sweet grapes and was confirmed by repeated trials. Both spring and monsoon pruning showed luxuriant vine growth but in other parameters, vegetative growth was less. The present pruning time 'the first week of August' has already been practiced earlier and now confirmed the sweetness of the grapes in the IUBAT Agricultural field condition.

Introduction

Grape is one of the most popular fruits consumed in both fresh and dry conditions from time immemorial in Bangladesh. The fresh one is usually consumed as a table grape and the dry grapes or raisin is used with prepared or cooked sweets, Polao, and Biryani, etc. Table grapes and grape juice are served preferably as a diet for the patients, and weak people to provide energy and nutrients. In many countries, grapes are used for making wine. Grape is one of the favourite fruit in Bangladesh. The people of Bangladesh are consuming grapefruit since time immemorial although sweet grapes are not produced here. Bangladesh has been spending huge foreign currency every year importing thousands of tons of grapes. Table grapes, raisins, juice, and many grape products are being consumed here.

For a long time, Bangladeshi farmers have been seeking to grow grapes alongside other high-value crops; many have tried their hardest and come close to success, but only a handful has truly succeeded. Scientists have also continued to work hard to overcome challenges; regularbusi

nessfarming has also continued. Someone named Barik in 2005 has proven that grape cultivation is doable in Bangladesh. The author started working with grapes in 1997 in Balisera, Srimangal. After changing a job from a tea estate, he continued growing grapes on the IUBAT campus in 2009. During his long-time experiment, he consulted The Grape Guy Mr. Danie Wium, and Professor Dr. SN Dutta of South Africa and India respectively, and continually experiment with locally available seeded black variety. In 2013, two cuttings were collected from Portugal which is dark black and seeded.

Objectives

1. The objectives of the present study are as follows
2. To confirm the production of sweet grapes by adjusting the pruning time.
3. To adjust the growing phases with the desired climatic conditions by manipulating the physiological behaviour through mechanical stress.
4. Adjustment of pruning cycle.
5. Grow some new plants by cutting

Literature Review

Grape is one of the world's most important fruit crops. It's also one of the oldest crops known to mankind. Hyams (1954) dates it back to 7000 BC and claims that it was associated with humanity as a cultivated plant even before grains were invented (FAO, 2001). According to DeCandolle (1886), Egypt has been cultivating grapes since 4000 BC.

Grapes are an important fruit and play a good role in the healthy development of the human body and are often referred to as the "Queen of the Fruits" (Khan, 2019). Although, grapes are known as a Mediterranean crop, and it is considered that the climate of Bangladesh is not favourable but now grapes are cultivated in the similar climatic conditions of South India, Thailand, and Vietnam by adjusting the pruning cycle.

The crop is adaptable to a variety of climatic conditions andagro-ecological settings and can be grown in temperate, subtropical, and tropical climates.Traditional wine-growing regions are found in temperate climatic zones and only allow for the production of grapes once a year.

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India, Thailand, Venezuela, and Brazil have all produced tropical wines.

For example, in the northeastern part of Brazil, grapevines can produce two or three crops peryea r, depending on the cycle of different grape kinds (Kok, 2014). Countries with tropical climates, such as Thailand, Myanmar, and Vietnam, which have weather conditions similar to Bangladesh, produce grapes, boosting grape development tremendously (FAO, 2001).

By trimming the buds of the canes, they can be forced to sprout at any time of year, resulting int wo to three crops each year from a single vine.

Growers in Thailand, on the other hand, prune their vines twice a year and harvest two crops, one during the rainy season (May to October) and the other during the drought season (November to April).

Because of its increased sugar content and better appearance, the latter is preferred. Grapes are produced under the ditch and dyke system in theCentral Plain area. The pruning can also be carried out at any time of the year (Nilnond, 2001). As the planting and pruning can be done at any time of the year, the harvest can be timed as desired.

Critical Factors for Sweet Grape Production: The critical factors for grape production are long sunshine hours minimum of seven hours a day; moderate rainfall of less than 1500 mm per year; a dry period during maturation to ripening and right pruning (FAO, 2001). Hence Bangladesh can be an ideal place for grape cultivation if the critical conditions are met by adjusting to a proper pruning cycle. With this aim, this study was conducted to confirm the pruning time.

Materials and Methods

Experimental site and Location: The experiment was conducted at the Permaculture Field of the International University of Business Agriculture and Technology (IUBAT), 4 Embankment Drive Road, Sector 10,Uttara Model Town, Dhaka 1230, Bangladesh during the period from January 2019 to December 2019. It was part of a continuous study on different pruning times to find a suitable time when the grapes become sweet. Geographically the experimental field is

located at 23.8883° N latitude and 90.3907° E longitude with an elevation of 4 meters from the sea level. The texture of the soil was sandy loam and the pH was 6.5.

Climatic conditions: The climate of the area is characterized by high temperature and medium rainfall with an annual rainfall of 1190-1450 mm from April to August and little or no rainfall from October to March. The average monthly temperature recorded in 2019

Experimental design: The experiment was conducted in top headed design method. Plant to plant distance is two meters and row to row three meters. Arbors were made with bamboo posts using tying wire for support and trellis. Pruning and de-budding were practiced and the data were recorded.

Experimental materials: Local grape variety (black and green), spade, pruning shear, watering pot, Khurpi, analytical balance, poly bags, etc.

Collection of cutting and sapling: The first sapling was collected from Srimangal in 1997 and was grown in different Bungalows of Finlay Estate's Kalighat and Lakhaichora of Balisera valley. Saplings are then transferred to the IUBAT permaculture field. Two saplings were collected from Portugal (black & round). 10 saplings were collected from BADC farm Kashimpur and four saplings were collected from Sumi nursery, Taltola, Lohar bridge, Uttara, Dhaka. The details of planting materials are6 years old plants Black Variety 4 Nos Portugal origin; 2 years old plant Green Variety 4 Nos Local; Green Variety (Planted on31st March 2019) 4 Nos Local; Black Variety (Planted on31st March 2019), 3 Nos Local, and 20 New Cuttings are Set.

Intercultural Operations

Watering: Watering was done in plants, generally once a day with a watering can during dry days when water stress is observed. No watering was done during the six weeks ripening time from 1st October to 7th November.

Fertilizer application

Grape plants required a substantial quantity of fertilizer. Compost, Urea, TSP, MOP, Zink, Boron, etc. were applied twice a month as a method of ring placement

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Controlling diseases and insects: Grapevine leaf rust was observed in small dark, angular spotting on the upper surface of grapevine leaves with yellow spots on the underside of leaves of the grape plants. Bordeaux mixture was applied for controlling rust disease. Disulfoton was applied to prevent leafhopper.

Pruning: Pruning was done on the first of august 2019 with the help of a shear pruner. All the secondary branches were pruned back leaving three nodes of the canes. It was cleared by removing all the leaves and the green canes (Fig. 1).

Fig 1 Pruning grapevines

Flowering: Bud breaking started within five days of pruning and within ten days the flowers bloomed (Fig. 2). Grapes are self-pollinated, but many bees were observed during the flowering time. The inflorescences were 10-15 cm long with many flowers.

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Fig. 2 Flowering stage

Fig. 3 Fruit development stage

Maturing: Berries were developing to full-size quickly within a month. After forty days of flowering, the fruits started to change their colour from green to black (Fig. 4). At this stage, watering was stopped. It took twenty days to turn black colour.

Fig.4Matured grapes before changing to black

Ripening: Close observation was made during this stage to taste the berries at their optimum ripened stage(Fig 5) when the berried started to soften and it took another six to ten days. At this stage, the grapes are picked and tasted. During the ripening stage additional precaution was made to protect the grapes from birds and also from dew and fog with netting and covering with a polythene bag.

Fig.5 Ripe grapes

Harvesting and Tasting: Harvesting of ripe grapes started on 30th October and continued up to 7th November 2019. The berries were counted, weighed, and tested by the MAMRI officials, VC, Pro-VC, Treasurer, and Registrar and they found them very sweet. Average berries 38 per cluster and weight 110 gm a cluster were recorded

Results and Discussion

Weather Data Collection during the study period showed in the following table

Parameters	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp Max ˚C	39	36	37	34	32	34	35	34	29
Temp Min ˚C	25	26	27	27	27	27	25	21	17
Rainfall mm	166	331	368	353	274	273	150	27	11

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Sunshine Hour	8	7	4.5	4	4.5	5	7.5	8	8

The previous studies reveal that the author has been trying to grow grapes since 1997 and adjusting the pruning cycle to get an optimum time for sweet grape production in Bangladesh condition. Traditional pruning was practiced in February and continued till 2004 but grapes were sour. Then visited and consulted Dr. SN Dutta of Bidhan Chandra Krishi Bishwabidyaloya, West Bengal in 2004 but failed to collect saplings from India. Locally available Jat planted in IUBAT Field in 2009 and studying different FAO literature and some other important publications,vines are pruned in September 1st and 2nd week got slightly sweet grapes for two years but later dew and fog the grapes sweetness no more sustained and then by adjusting pruning 1stweek of August 2018 and got very sweet and delicious grapes harvested in late October, tasted in SCPM. For the confirmation trial, this time the pruning was done on the 1st August of 2019 and harvested from 30th October to 7th November, and the grapes are found very sweet which confirms the previous trial. In this study, six plants were pruned to confirm the sweetness of the grape berries. It proves from the many trials and experiments that the critical dry period is a factor for sweet grape production as the sugar conversion occurs dry. Getting the critical four weeks of dry condition during maturation to ripening is highly important to produce sweet grapes in this tropical climate and this research confirms the first week of August is the ideal time for pruning to get sweet grapes from late October to the first week of November.

Grape in Climate Change: A rise of 2°C would cause 56% loss of vineyard land, while 4°C would wipe out 85%; the white grape variety is expected to lose 76% of its suitable growing area; the red grape is predicted to lose 31% of the area currently deemed suitable for growing the variety--The Guardian 27 Jan 2020. In this situation, grape production in Bangladesh can help the grape growers' industries sustainably.

Conclusion

Sweet grapes were successfully produced in the IUBAT field in 2017, 2018, and 2019 and confirmed the right pruning time is the first week of August and harvested in late October and early November. Sweetness and flavour have been tested and found successful. It will open a

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new door for more research and commercial cultivation in Bangladesh. This success will encourage large-scale grape growth and that will save huge foreign currency.

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EMPLOYEE STRESS IN BUSINESS ORGANISATION AND COPING STRATEGIES AT WORKPLACE

Prof. (Dr.) Shankar Kumar Jha

Uttaranchal University, Dehradun

ABSTRACT

Corporate lifestyle is very stressful. Modern automation, competitiveness globally, competitive stress or constraints, have increased the distress of employees currently. In the cutting- edge of corporate climate, stress or pressure has become a lifestyle – an acceptable workplace risk. For this reason of internal pressures emerging from disruptive thinking, impractical assumptions, incapability to delegate etc. and external pressures deriving from time-limit, personnel problems, high volume of workloads etc., employees develop many syndromes of stress which can affect their job performance. Today, managing of employee stress is motivating increasingly awareness and attentiveness particularly concerning to the workplace. Currently, there is nothing of the kind as a stressorof a job. Everyone in the workplace experiences some type of annoyance, nervousness and distress concerned to the job or work assigned to them or to the normal working employment conditions. Employee stress is an increasing interest for businesses presently and can be described as a dynamic conditions in which individual confront pressures or restrictions, favourable circumstances and disappearance of something they wish and for which outcome is both understandable along with pivotal.The present study is an attempt to provide invaluable insights on employee stress and also examine the various copying strategies at workplace in the business organisation. This paper is purely on the basis of second-hand accessible information.The finding of the study reveals that employee stress management being extensive and challenging issues. There are yet various perspectives and scopes which can be examined.

KEY WORDS: Business, corporate, coping, employee, experience, individual, job, organization, stress, strategies, work, workplace,

INTRODUCTION

"Stress is a term emerged from the Latin word 'stringere' meaning to draw tight' (Arnold, J. 2005)". A word 'stress' had created from Selye, H. in the year 1936, which elucidated "the non-specific response of the body to any demand, whether it is caused by or results in pleasant or unpleasant conditions".

"Stress" broadly involves strain individual perceive within lifestyle (Davis, K. 1998)." The recent analysis about stress in today's workplace described as a "Employees are working longer hours, taking on the work once done by laid-off colleagues, meeting tighter deadlines and cutting back on expenses combine this with the double-entry income family demands of monthly

mortgage, childcare issues and aging parents, and the result for many is anxiety, sleeplessness, irritability, physical and mental deterioration (Sara Zaff, Geber, 1996)". Consequently, these pressures, individual progress many syndromes about stresses which may affect theirs working efficiency.

Stresses may causes bodily disorderliness due to this internalize group of organs and tissues alters into attempt toward confront along stresses. "Most job stress researchers believe that unfavourable working environment may impact job holder's healthiness including wellbeing (Cooper and Wright, 1994)". "Stresses emerged as a result connected with and an overall reaction toward the activity and condition which locates specific bodily and mental needs and each toward an individual (Jex, S.M. 1998)". Thus, by definition, pressure/or Strain engages as well as interactivity about an individual as well as an atmosphere.

"Stress is a dynamic conditions in which an individual is confronted with an opportunity, constraint, or demand related to what he or she desires and for which the outcome is perceived to be both uncertain and important (Schuler, R.S., 1980)".

"Cooper, C. L. recited Harrison's aspect as: Stress arises when 1. The environment doesn't provide adequate supplies to meet a person's needs; 2. The abilities of the person fall short of demands that are prerequisites of receiving supplies (Cooper, C.L. 1978)".

Thus, employee activities in whatever business organization in the current times are significant experiences in any sense of stress as the claims at the workplace are ever-changing growing. The complication of the works or jobs and the competitiveness of the distinct product are placing high-tech pressured on the employee to utilize more innovativeness and creation which is causing to a perception of burnout which is a stage of exhausting or fatigue.

Augmenting urbanization, industrialization, and the augment in the scope of activities in the community are leading stress. Employee experiences stress as they perceive that they have lack of self- control over anything is occurrence to them in way of living.

Employees being individuals by itself and clearly distinct from one another and also presumed to be affected by different individual and organizational determinants which lead to stress and

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burnout. Moreover, individuals in a business organization can experience communication overload as well as communication under load, which may impact their level of job satisfaction.

Individual along the greater ratio on chronic condition or psychological strain related to work can't do fulfilled along theirs work and thus an individual won't enjoy functioning within organization. An individual can perceive disappointed and burnout as an individual act as keeping issues along subordinates. It can discourage the adversely affect to the businesses themselves.

Understanding their consequences is extremely essential because the business organization as employees comprise its actual competitive advantage as well as a noteworthy efforts and costs associated in their advancement.

There are numerous of work environments/ or job conditions which commonly lead to stresses toward an individual, a highest pressure of work, investigator find this poor working disorders may impact employees healthiness and wellbeing. Across the globe, business organisation have continuous to confront with the queries regarding alongside a solemnity on stresses within workplace as well as engaged into copying theirs an individual's stresses.

Various tactics became emerged toward cope the stresses within business organisation. Some of the strategies for individual, other are focused on organisation.

LITERATURE REVIEW

“Stress is an adaptive response to an external situation that results in physical, psychological and /or behavioural deviations for organizational participants (Luthan, F. 1998; p. 330)”. Thus, work stresses emerged as people's reaction toward disrupting determinant within working situation as well as an impact about any response.

“Ahsan, et al., (2009) observed that job life is one of the vital parts of daily life, which cause a great deal of stress. Due to the competitive nature of the job environment most of the people in the world are spending their time for job related work purposes, ignoring the stress that are influencing their work and life. Usually people are more worrying about the outcome of their work that can even affect the way they treat other people and how they communicate with their peers and customers”.

"Employees in an organisation can confront occupational stress through the role stress that management rendered. Role stresses signify anything about an organizational role that produces adverse consequences for the individual (Kahn and Quinn; 1970)".

"Management will have their own role that stands as their related. Role related are concerned with how individuals perceive the expectations others have of them and also due to role ambiguity and role conflict (Alexandros-Stamatios, et al., 2003)". According to Lasky (1995), "demand associated with family and finance can be a major source of 'extra- organisational ' stress that can complicate, or even precipitate, workplace stress."

" AI- Aameri, A.S. (2003),cited with their research which "one of the six factors of occupational stress is the pressure originating from workload; and also argued that ' factor intrinsic to the job' means explore workload, variety of tasks and rates of pay." " A study in United Kingdom indicated that the majority of the employees were unhappy with the current culture where they were required to work extended hours and cope with large workloads while simultaneously meeting production targets and deadlines (Townley, 2000)".

"Fast changing global scenario is increasing the pressure of employees to perform maximum output and increase competitive advantage. In fact, to perform better to their job, there is a requirement for employees to perform multiple tasks in the workplace to keep abreast of changing technologies (Cascio, 1995; Quick, 1999)". "Eventual outcomes about that stress became identified likely only the significant determinants impacting work pressure within job (Cahn et al., 2000)".

"Jackson & Schuler (1985) and Muchinsky (1997) have discovered roles uncertainty for cause alike adverse effects for reduced trust, feeling hopelessness, uneasiness and desperation. " According to " Vinokur-Kaplan (1991) , indicated that organisation determinants like workloads as well as functioning conditions was critically as well work satisfied. " According to "Fletcher & Payne (1980) recognised the dissatisfaction possibly an inception about stresses, but greater satisfied may mitigate an impacts about stresses. "

Hence, various researches keep observed which work pressure affects this employee's work satisfied as well as theirs holistic performances toward theirs working. Now, greatest about this business organisations exist as increased needing toward this work consequences. Long

back, Coleman (1976) has said, "The modern times is the age of anxiety and stress". Thus, the stresses independently impacted from the numerous activities."

RESEARCH METHODOLOGY

This paper aims to study with reference to secondary accessible data such as review of literature, articles, various journals, text-books and searching various websites used.

CAUSES OF JOB- OR WORK-RELATED STRESS

Conditions or disorders which likely lead to stresses known as stress- meter. It means bodily and mental needs through an atmosphere which leads to pressure act as stress- meter. Albeit like an alone activity can lead to big pressure, normally stressor unite toward strain the people into the diverse forms till stress develops. These cause come from both the internal and external side of the organisation, from the group's which employees are impacted by, and from employees oneself.

Indeed, numerous working environments which constantly lead to strain toward an individuals. Including, typical stressful conditions facing employee at job according to " Kay, 1974; Kearns, 1973; Safer, 1970) are : Excessively and extremely low working; short deadlines as well as fitting; retaining for creating too numerous judgements; attempting toward manage alterations which impact this work; regarding of an expenditure into financial as well as careers in conditions about thinking errors; Extreme as well as inappropriate employment day; Extremely monotonous job; Essential toward act speedily; Decrease in payment inequality; possibility about redundance or surplus and underway compelled to untimely retirements; Inequality within existing authorities as well as administration entrusted within work; A perception concern underway captured into the work except more prospect about acquiring an alike and greater work to another place; The sensed inconsistency amid performances to work related with cost advantage protected; and reservation regarding a worth about a work into sharing toward production abd well- being about an organisation".

A Research from (NIMH) study reports shown crucial causes about stresses for working people are evenly divided between the job and the environment.

CONSEQUENCES OF WORK STRESS

Strain can impact every individual whatever an employee act as executive and an employee, youthful and old. According to (Zaleznik, Kets de Vires and Howard, 1977) reported as "managers showed the low occurrence about strain response compared to employees with functioning workforce. The workforce groups reported a greater incidence about heart illness gastric distress. The operational group had the highest incidence of mental pressure, medicinal utilization, as well as allergenic breathing problems. "

A psychologist concluded that a manager reported lesser pressure syndrome due to people became better cognizant of organisational procedures as well as thus have better manage themselves. They were better equipped to tolerance uncertainties about time as well as roles uncertainty which succeed an organisational reorganisation. Authority and control more theirs working conditions increased theirs confidence with self- reliance, providing oneself fewer vulnerable to the impact of pressure. Conversely, employees in staff and operation positions, with little or uncontrolled over organisational processes, had lower self- esteemed and autonomy and less tolerance of role ambiguity.

"Managers were also found to feel less threatened by the performance appraisal process. Staff and operations personnel have high accountability for results, outcomes that can be quantified for their evaluations. For many staff and operations people, lack of authority is clearly stressful situation (Schultz et al., 1998)".

PHYSIOLOGICAL PROBLEMS DUE TO WORK STRESS

Greatest about awareness with primary investigation for many periods failure focused to influence that strain holds upon healthiness. According to "Herbert and Cohen (1994), there are various possible pathways through which stress could produce physical problem. Direct influence could occur through the effect of stress in nervous and endocrine systems as well as on the immune system (Barannon, et al., 2000)". "The highest levels about pressure was associated from hypertension with excessive saturated fatty acid as well as many also results into cardiac illness (Thomas, G. et al., 1974)".

Some other physical symptoms of work/or Job stress are : Arthritis; Asthma; Back pain; chest pain; constant tiredness; Dry mouth; Excessive Drinking; Headache; Neck pain; Stomach problem; Ulcer and so on.

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PSYCHOLOGICAL PROBLEMS DUE TO JOB STRESS

Mental effects about job strain associate for psychological well-being as well as employee's mental health and wellness. Whenever employee experiences excessive tension near workplace, employee can get to be discouraged and may identify oneself hypersomnia and insufficient sleeping. "Stress can even lead to families' issues as well as sexuality troubles (K.Bammer et al., 1981)". Following are the different mental syndromes about work pressures:

- Worry
- Emotional incapable to confront
- Unconcerned toward living
- Depression
- Obsessional problems
- Loss of sense of humour
- Emotion of neglect
- Emotion of failures
- Emotion of ugliness
- Anger
- Irritability

BEHAVIOURAL PROBLEMS DUE TO JOB STRESS

Behavioural outcomes about pressure emerge as reactions which can harmfulness for an individual's over stressed and others. Directly behaviours which can associate higher stages of stresses comprise over fasting and overeating, enhance puffing with consuming, alcoholic addiction. Other behavioural consequences may include accident, violence, proneness and appetite disorders.

ORGANISATIONAL PROBLEMS DUE TO JOB STRESS

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Certainly, any of the employee outcomes fairly analysed may still impact the business organisation. Also another consequence of job stress, however, had been excessive command impacts to the organisation. Some of the major organisational symptoms according to "(Quick & Quick, 1979) are the following:

- High absenteeism
- High labour turnover
- Industrial relation
- Poor quality control and difficulties
- Prolonged strikes
- Apathy
- Feeling of being failure Accident
- Poor quality control Taking long launch break."

JOB STRESS AND JOB PERFORMANCE RELATIONSHIP

Mostly, it can be presumed that low stress led to high job performance and high job stress led to low job performance. Although subsequently study revealed that it was a false presumption. Stressed worker or employee or managers may provide high job performance or low job performance or only average job performance. Therefore, stress and job performance relationship is extremely complicated, being affected by various intervening variables. Some correlations have been found between job stress and job performance, but these often are small and not statistically significant. Furthermore, there is a question whether job stress leads to poor job performance or poor job performance leads to job stress.

Stress can be either helpful or harmful to job performance, depending upon the amount of it (Sylvia, A. et al., 1989)". Figure presents a stress performance.

Figure: Job Stress and performance Relationship

Figure indicates an association among stresses and work performances:

• While on-the-job, without pressure, work difficulties remains not at work as well as performances become small.

• While pressure enhances, performances become enhance due to stresses support an individual call to mind sources for considering a necessary skill.

• While a stress reaches at peak which correlation around along the employee's highest point everyday work efficiency. Instantaneously, other stresses do not cause excessive improvement and

• Eventually, whether stresses progress as well, performances initiate toward drop. Immoderate stresses, employee may hit and become sick.

Hence, be able to generalize which working efficiency toward leading below low level about stresses. Excessive stresses lead to employee towards temporarily ineffective with too little stress cause employee to become sluggish with incautious. An optimal level about strain become called a good stress – an assertive drive within its alive which is equivalent of finding excitement and challenges in the life (Agarwal, R. 2001)".

COPING STRATEGIES

Stress doesn't is becoming need perceived while an evil activity, in-order-to nearby act as unique type about employee except conflict- the lifeless. Nevertheless, excessive tension become detrimental as well as actions need to be adopted for confront itself along an aspiration about finally minimizing itself (Wood Men et al., 2001)". Various tactics became evolved for help cope stresses within workplace. Few of the coping approaches or tactics toward an employees and another is focused on organisation.

COPING JOB STRESS WITH INDIVIDUAL STRATEGIES

Aggravating or worsening issue becomes an insufficiency about strength needed to perform. Hence, instead of dawdling, stewing, as well as murmuring regarding issues, everyone need to increase strength toward perform assignment.

"Living possibly formed much low frustrating through easily attempting toward enhance ours internalize sources to managing each qualitative as well as quantitative (Agarwal, R., 2001)". Some individual based stress management techniques are following:

• Physical Exercise:"Individual who do physical exercising always emerges as lower possible to meet cardiac arrest, low stress as well as tension become increased self-reliant also indicate a higher enthusiasm. Individual who do not do physical exercise regularly, on the other hand feel more stress, are more likely to be depressed, and so forth (Agarwal, R. , 2001)".

• Relaxation :" Relaxation can be accomplished in a different approaches such as listening to music, going for walk, vocation, biofeedback (or mind-body technique), or meditation. Some scientific data indicates much meditating accept the advantageous on bodily, psychological affect toward an individual (Robert, K. et al., 1972; Terri Schultz, 1972)".

• Doing something different at different speed :"Pestonjee, D. M. ,(1992) has related toward ' change gear' Whether an individual owned the heavy workloads, an individual must attain the break as well as leave with take measures fully distinct by their job.

• Effective planning: Many about them become poorest into managing period. An outcome become emotion about workload, ignored time-table as well as assistant strain. This act as which many daily pressures can be relaxed or removed whether an individual perform the greater work about effective planning. This still stimulates delegating low significant experiences toward another's.

• Social Networking: "An individual require as well as would benefits through societal assistance (Terri, Schultz, 1972)". Applying as a strategy to minimize job stress. Helpful ally and family can also support us in managing with normal stress at regular intervals.

• Some other Techniques :Acupuncture and Reiki; Ayurvedic way; cognitive therapy; Behavioural self- control; Role management; Self- management approach; pampering oneself; Yoga and meditation (e.g. Zen meditation, Transcendental meditation etc.).

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ORGANISATIONAL COPING STRATEGIES

"Organisational adaptive strategy support to minimize negative impacts about stresses into threefold: 1. identifying as well as next alter and remove working activity 2. Support an individual's modifying his/her perceptions as well as awareness about job pressure; and 3. Support employees manage better effectively along an outcomes of stress (Don Hellriegel, et al., 2001)".

Business organisations are understanding that they should be engaged in managing their employee's pressure. Corporate adaptive tactics is planned and developed from administration toward eliminating and monitor corporate levelled aggressor with a focus on to stop and minimize work related stresses to the people. Following are the strategies which management might wait to consider include:

• Training on Stress Management: Training on stress management related to training strategy planned for render an individuals along greater self-management, for instances, by T-Group, muscles relaxants, as well as cognitive behavioural therapy. Employees report fewer symptoms subsequent training on stress than monitor/comparison groups and always report power somatic complaints.

In this training, the employees are intimated concerned to the backbone about stresses. They are cautioned regarding an adverse impact about stresses, its mental base shocks the relationships among distress and work.

• Stress Intervention Practice: Stress intervention refers to those organisational interventions, which are aimed at lowering the levels about stressor knowledgeable through employees. Intervention and aimed by:

- Changing Job Design;
- Changing Organisational Structure;
- Changing Leadership Practices;
- Job enrichment and so on and various others dimensions of work setting happen day -to-day.

"Jackson, S.E. (1983), was one of the first to report a stress reduction intervention in organisational literature. She assigned employees of a hospital out patient's facility either to a particular or no intervention control group."

• Employee Assistance Programme (EAP):"EAP is an employee well-being being programme which renders services toward an individual's experiences psychological issues influenced through work and families (Kirk & Brown, 2003)". "This exists as the mental services provided for an individual for the significant method about psychological strain and managing (Kirk & Brown, 2003)". Thus, "EAP is the approach of rendering counselling services. Besides, some other organisational strategy may utilize fir cope with job associated stresses suggested by Ekin & Rosch (1990). He summarizes a purposeful spectrum of possible organisational directed strategies to reduce work related stress:

- Analysis job description with defining objectives;
- Build cohesive teams;
- Motivate industrial democracy;
- Create fair employment policies;
- Develop adaptable activity plans;
- Reformulate a job environment;
- Reformulate an assignment;
- Involve an individual with occupational advancement programmers;
- Render community services with evaluation; and
- Share the rewards."

• Fitness and wellness programmes:

Fitness programmes usually known as Health promotion programmes, towards the employee's throughout the physiological and psychological wellness. Basically said, any activities an organisation involved in that is design to identifying as well as help in preventing and correcting

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specific health issues, health risks, and bad health practices undergo fitness programmes. Thus," wellness programmes is an operations which organisations sponsored toward encourage great healthiness practices and for recognize as well as rectify un-healthiness (K.G. Lim, 1996)".

There are three main types of wellness programmes (Gebhart, D. L. et al., 1990)". The first programmes aimed at increasing consciousness and rendering information. The second kind of wellness programme engages employees in sustained effort to adjust their style of living. And the third kind of wellness programs has as its aim is the creating healthy environment which will help employees to maintain the healthier style of living improved in another programmes.

• Eliminating work over load and under load:

Suitable personnel recruitment as well as instruction programmes, impartial promotions judgments, equal sharing about activity and good fitting about activity needs along an individual competence may support to remove heavy workload with over burden as stressors.

FINDINGS

The discussion and result reveals that employee pressure management being an extensive and challenging issues. There are various perspectives which can be examined. These perspectives relate to the stress framework of employees working in various environmental industries with respect to determinants like age group, employment type, employment history, nature of works or jobs, role and responsibilities in the business organisation and their consequences on the employees. The study also indicated that when an employee is frequently disclosed to challenging and exhausting work related employment conditions or working environment it is adverse to them and it may have a adversely effect on their productivity and efficacy.

Moreover, employee stress plays a key role in adverse impact to the business organisation increased medical claims, large percentage of sick leave and employee turnover/or attrition rate, increased proportion of on-the-job casualty and decreased efficiency.

CONCLUSION AND SUGGESTION

In the cutting-edge corporate climate, employee stress or pressure has become a lifestyle -an acceptable workplace risk. Work can be a harmful place, not only for the blue-collar collar

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employees who must use dangerous apparatus/or tools and materials, but also for the white-collar employees as well. While stress is seldom detrimental particularly in case of business organisation.

Whether the stress is positive, the outcome may be more active, eagerness and extremely motivated driven. It has observed that every employee requires the moderated volume of pressure to be active as well as competent about working efficiently. But excessive of all is poor, work-related stress can't be the exceptional. High work-related stress can bring bodily, mental and behavioural as well as organisational issues.

Individual and organisational stress coping strategies can significantly support with the issues of work-related stress. Business organisation should be cognizant of and adopt those issues of the work-related stress exists, attempt to recognised the issues, try to resolve the issues and still determine the techniques of coping with work related stress.

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A DESCRIPTIVE STUDY TO FIND THE RELATIONSHIP BETWEEN SELF ESTEEM AND ACADEMIC PERFORMANCE AMONG ADOLESCENTS STUDYING IN A SELECTED HIGH SCHOOL, TEZPUR ASSAM

Subhra Bhowmik, Psychiatric Nursing, LGBRIMH, Tezpur Assam,
E-mail: bhowmiksubhra07@gmail.com

Dr. Nurnahar Ahmed, Department of Psychiatric Nursing, LGBRIMH, Tezpur Assam,
E-mail: anurnahar@gmail.com

ABSTRACT

Adolescents as an age group usually tend to be subsumed under the categories of either youth or children. An important part of individual development is self-esteem. Self esteem impacts every major aspect of our lives especially and also links academic success and achievement. The aim of the study was to find out the relationship between self esteem and academic performance. A non experimental quantitative research approach was adopted. The study sample was constituted of 105 adolescents aged 13-16 years studying in Emmanuel Christian School of Tezpur Assam. Purposive sampling technique used for the selection of the sample. The data were collected by using a socio demographic proforma comprise of 12 items, and Rosenberg self esteem comprise of 10 items and academic performance was assessed with the percentage of last year exam result. The mean and standard deviation of self esteem was 17.45±3.83 and mean and standard deviation of academic performance was found to be 62.28±15.454. There was no significant correlation was found between academic performance and self esteem (r=-0.054, p=0.584). Significant association was found between religion (χ^2 = 9.577, p= 0.003), type of family (χ^2 = 5.069, p= 0.024) and resident (χ^2 = 6.070, p= 0.014) with the self esteem of the participants. There was significant association between gender (χ^2 = 10.367, p= 0.001), resident (χ^2 = 4.197, p= 0.040), birth order (χ^2 = 4.257, p= 0.03) with the academic performance of the participants. There was no significant correlation between self esteem and academic performance among adolescents.

Key words: adolescents, self esteem academic performance.

INTRODUCTION AND NEED OF THE STUDY:

Adolescent is a transitional developmental period between childhood and adulthood which is characterized by a host of biological, psychological and social role changes. Although this period is typically viewed as spanning the age range of 10-20 years. The primary developmental task of

adolescence is building a sense of self. Achievement of the task results in a sense of confidence, sense of self worth, emotional stability and self concept which has major impact on the future achievement and life satisfaction of the adolescents.

Self-esteem has two interrelated aspects: it entails a sense of personal efficacy and a sense of personal worth. It is the integrated sum of self-confidence and self-respect. Self esteem considered to be as key indicator of psychological well being. The development of self-esteem in young children is heavily influenced by parental attitudes and behaviour. Self esteem is an indicator of psychological health and social life adjustment. Its links with academic success and achievement, emotional well-being, and social involvement and relationships have been emphasized in decades of theory and research.

Academic achievement or academic performance is the extent to which a student, teacher or institution has attained their short or long-term educational goals. Academic achievement influences the level of self esteem. Successful academic performance enhances self esteem and similarly poor academic performance tends to erode students' level of self-esteem. Students with low levels of academic achievement attribute less importance to school related areas and reveal less favourable attitudes towards school. In literature it was found that there was significant positive correlation between self-esteem and academic achievement and also found that the student who has low self esteem had a low performance in academic activities and this lead to stress related problems.

Objectives of the study:

To assess socio demographic variables of the adolescents.

To assess the self esteem among the adolescents.

To assess academic performance among adolescents.

To find out the relationship between self esteem and academic performance.

To find out the association of selected socio demographic variables with assertive self esteem and academic performance.

MATERIALS AND METHODS:

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Research approach: Non experimental quantitative research approach.

Research design: Non experimental descriptive research design

Variables: Research variables: Self esteem and academic performance.

Demographic variables: Demographic variables of the present study was age, gender, religion, type of family, resident, education of father, education of mother, occupation of father, occupation of mother, presently staying, birth order and any illness last year before exam.

Settings of the study: The present study was conducted at Emmanuel Christian SchoolTezpur, Assam, India.

Sample: Adolescents13-16 years of age group studying in a selected high school of Tezpur, Assam.

Sample size: 105 adolescents 13-16 years of age group studying in an Emmanuel Christian School.

Sampling Technique: Purposive sampling technique

Sample selection criteria:

Inclusion criteria:

Adolescents aged from 13-16 years, both girls and boys studying in the selected high school, Tezpur Assam

Adolescents who are available at the time of data collection.

Adolescents who can read and write English

Exclusion criteria:

If they complain physical discomfort during data collection.

Description of the tool:

Section-A: Consisting 12 items seeking information of socio demographic variables of adolescent's i.e. includes-age, gender, religion, type of family, resident or habitant, education of father, occupation father, and education of mother, occupation of mother, presently staying with parents, birth order, and any illness last time before final exam.

Section-B: Consisting of 10 items of Rosenberg self assessment inventory among adolescents.

Section-C: Academic performance was assessed with the last year final exam result. Percentage of the mark was taken from the total marks according to the respective class i.e. class-VII, class-VIII, class-IX and class-X.

Data Collection Procedure: Written Permission was taken from the Institutional Ethics Committee (IEC) of LGBRIMH and scientific advisory committee and Head master School in Tezpur to carry out the study.Informed Consent was obtained from the participants parents. Nature and need of the study was explained to the subject and written informed assent was obtained from the participants.Data collection was done class wise i.e. from class VII to class-X. Period for data collection was from the month of august to September in the year 2017. Pilot study was conducted before the main study. Data was collected by using socio demographic proforma, Rosenberg self esteem scale and last year academic performance. Confidentiality and anonymity of the study subject had been ensured.

RESULTS:

The data analysis and interpretation of the study was based on the study objectives. Data were analyzed by using SPSS version 18.

Section I: Descriptive Analysis:

Description of socio-demographic variables of adolescents 13-16 years of age group.

Description of self esteem

Description of academic performance

Section II: Inferential Statistics:

Description of relationship between self esteem and academic performance of the adolescents.

Description of association between selected socio-demographic variables with self esteem and academic performance of the adolescent.

SECTION-I: Table 1(a): Distribution of Frequency and Percentage according to the age, gender, religion and type of family. n=105

Variables	Category	Frequency	Percentage (%)
Age	13 years	43	41
	14 years	35	33.3
	15 years	16	15.2
	16 years	11	10.5
Gender	Male	52	49.5
	Female	53	50.5
Religion	Hindu	87	82.9
	Islam	10	9.5
	Christian	8	7. 6
Type of family	Nuclear	66	62.9
	Joint	39	37.1

Data presented in table 1(a) shows that majority 41% (f=43) of the participant were 13 years of age group, 50.5% (f=53) of the participants were female.Majority 82.9%% (f=87) of participants were Hindu by religion and 62.9% (f=66) of the participants were from nuclear family.

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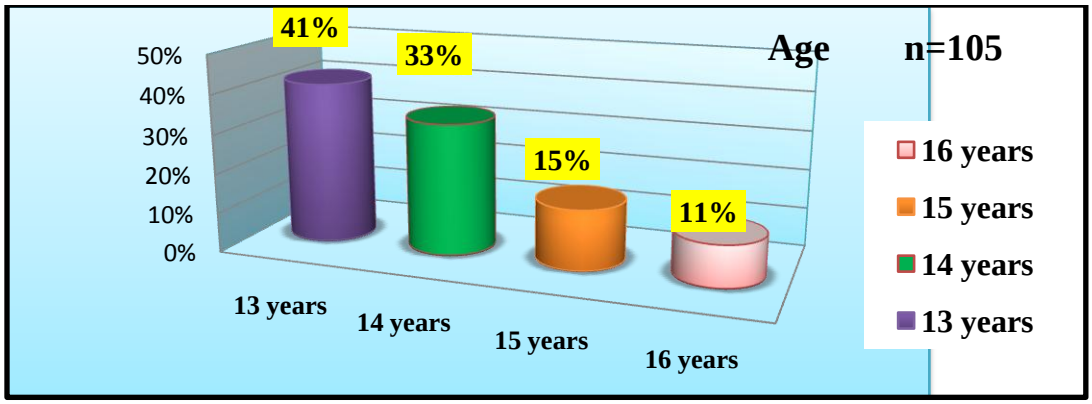

Figure 1: Stacked cylinder showing percentage distribution of age.

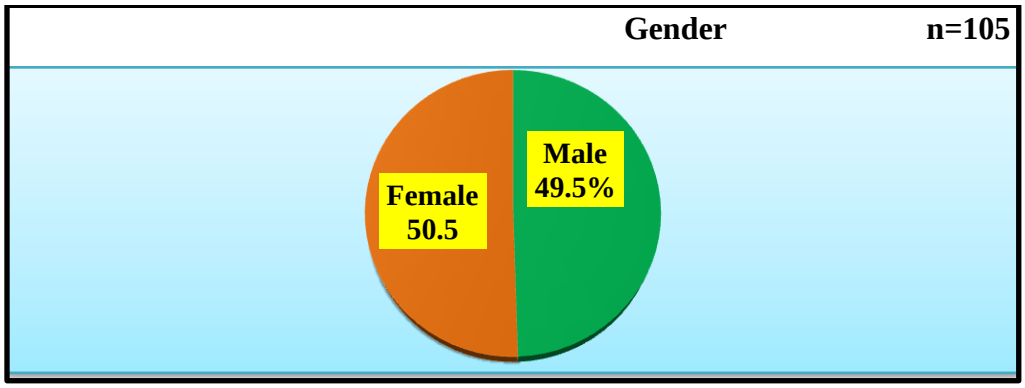

Figure 2: Pie diagram showing percentage distribution of gender.

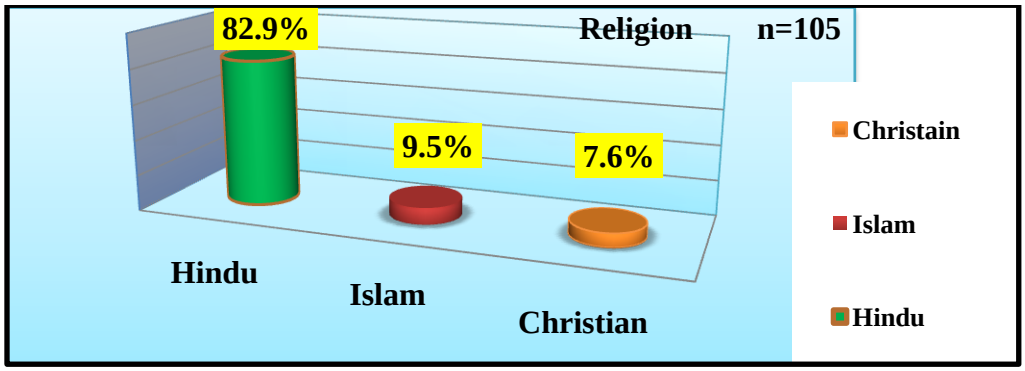

Figure 3: 3-D cylinder showing percentage distribution of religion.

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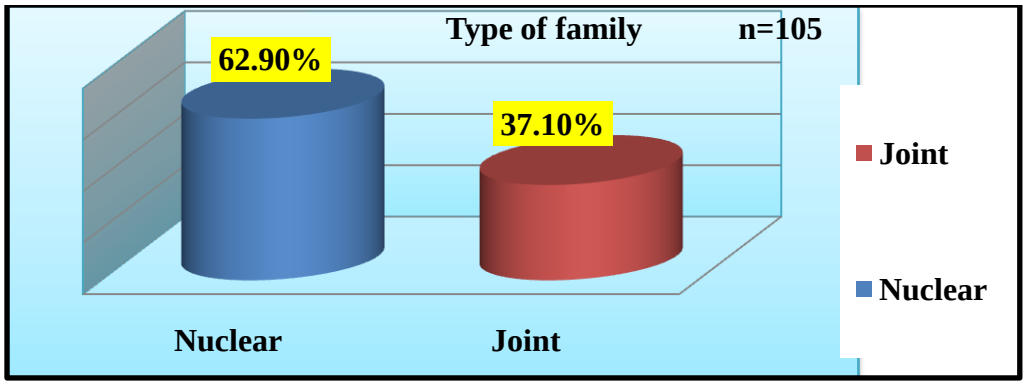

Figure4: Stacked cylinder showing percentage distribution of type of family.

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Table 1(b): Distribution of frequency and percentage according to the resident, education of father and mother and occupation of father and mother n= 105

Variables	Category	Frequency	Percentage (%)
Resident	Rural	52	49.5
	Urban	21	20
	Semi urban	32	30.5
Education of father	Upto matric	35	33.3
	Upto class XII	17	16.2
	Upto graduate	20	19.0
	Graduate and above	23	21.9
	Professional education	6	5.7
	No formal education	4	3.8
Occupation of father	Government employee	38	36.2
	Private employee	16	15.2
	Business	40	38.1
	Daily wager	5	4.8
	Cultivation	1	1.0
	Other	5	4.8
Education of mother	Under matric	41	39.0
	Under class XII	29	27.6
	Under graduate	17	16.2
	Graduate and above	13	12.4
	Professional education	1	1.0
	No formal education	4	3.8
Occupation of mother	Government employee	7	6.7
	Private employee	8	7.6
	Business	3	2.9
	Daily wager	2	1.9
	Home maker	85	81.0

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Data presented in table 1(b) shows that majority 49.5% (f=52) of the participants were hailing from rural background. 33.3% (f=35) of the participants Father's education were up to matric level and 38. 1% (f=40) were working as businessman.39% (f=41) of the participants mother education were up to matric leveland majority 81.0% (f=85) were working as home maker.

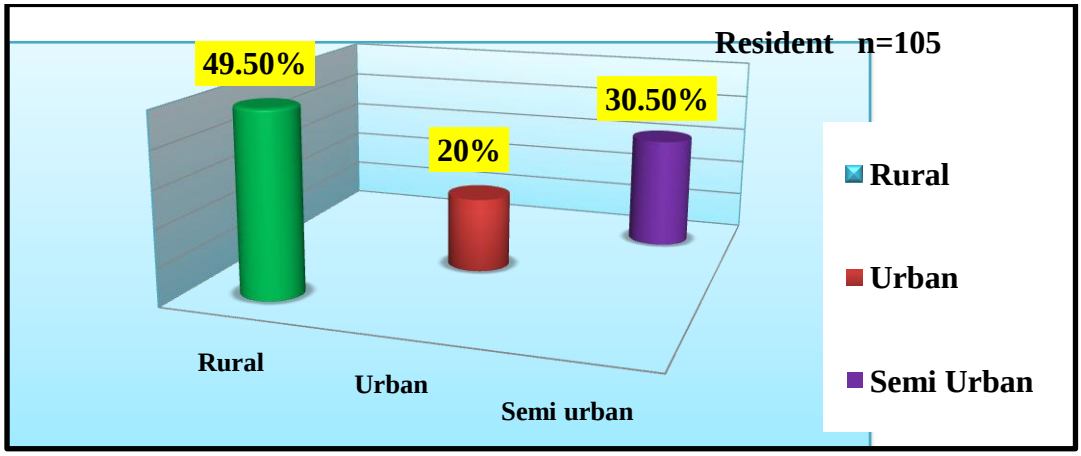

Figure 5: 3-D cylinder showing percentage distribution of resident.

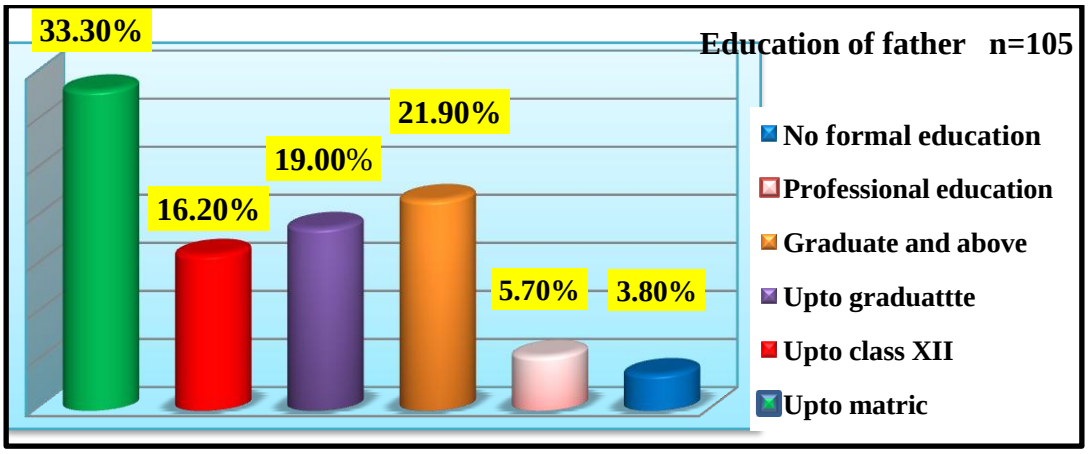

Figure 6: Clustered pyramid showing percentage distribution of education of father.

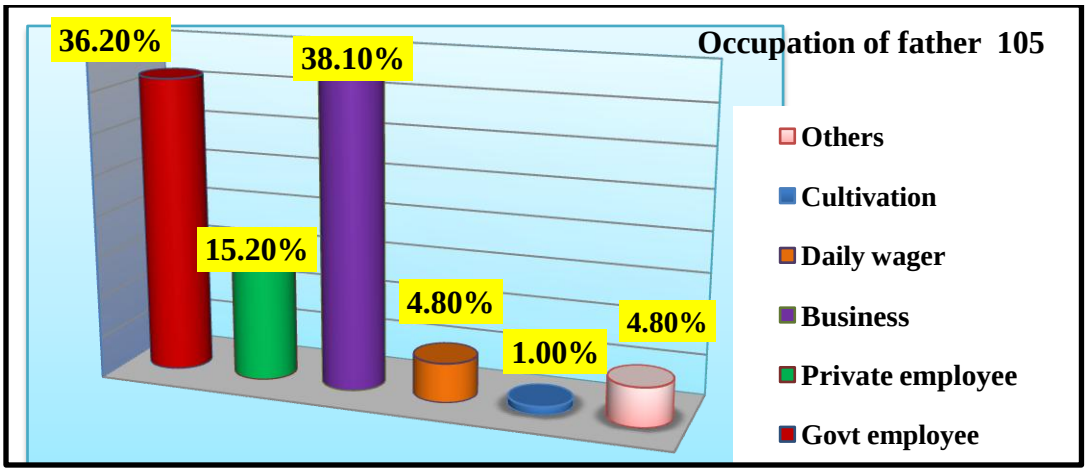

Figure 7: Stacked cylinder showing percentage distribution of occupation of father.

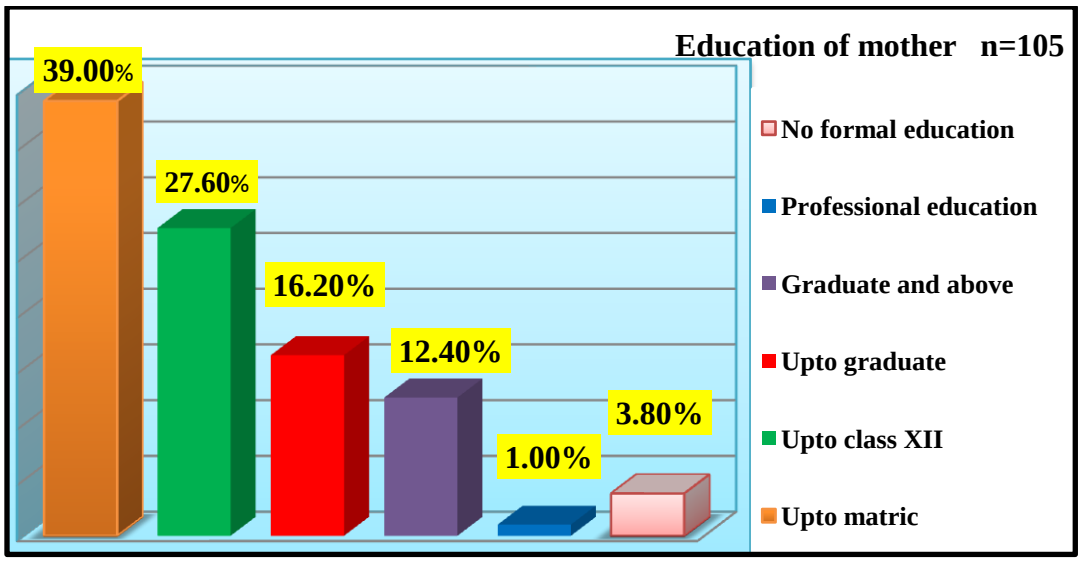

Figure 8 Stacked column in 3-D showing percentage distribution of education of mother

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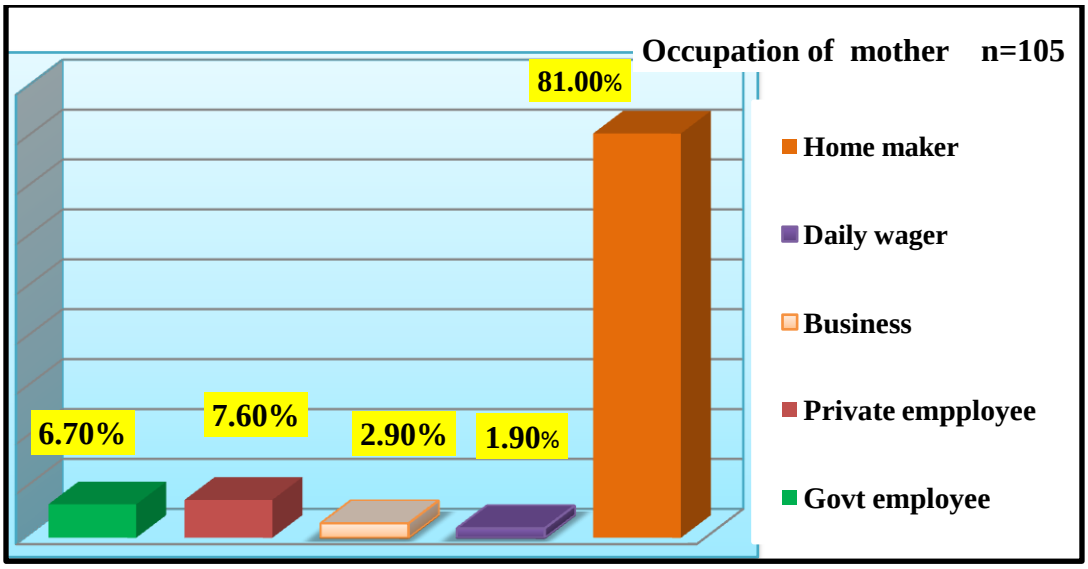

Figure 9: Stacked column in 3-Dshowing percentage distribution of occupation of mother.

Table 1 (c): Distribution of frequency and percentage according to the presently staying, birth order and any illness last year before exam. n= 105

Variables	Category	Frequency	Percentage(%)
Presently staying	Both parents	92	87.6
	Only with mother	6	5.7
	Only with father	1	1.0
	Other than parents	6	5.7
Birth order	First child	61	58.9
	Middle child	10	9.5
	Last child	34	32.4
Any illness before exam	No illness	94	89.5
	Illness	11	10.5

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Data presented in table 3(c) shows that majority 87.6% (f=92) of the participants were staying with both parent. Majority 58.1% (f=60) of participants were first child. Majority 89.5% (f=90) of the participants had no illness last year before the final exam.

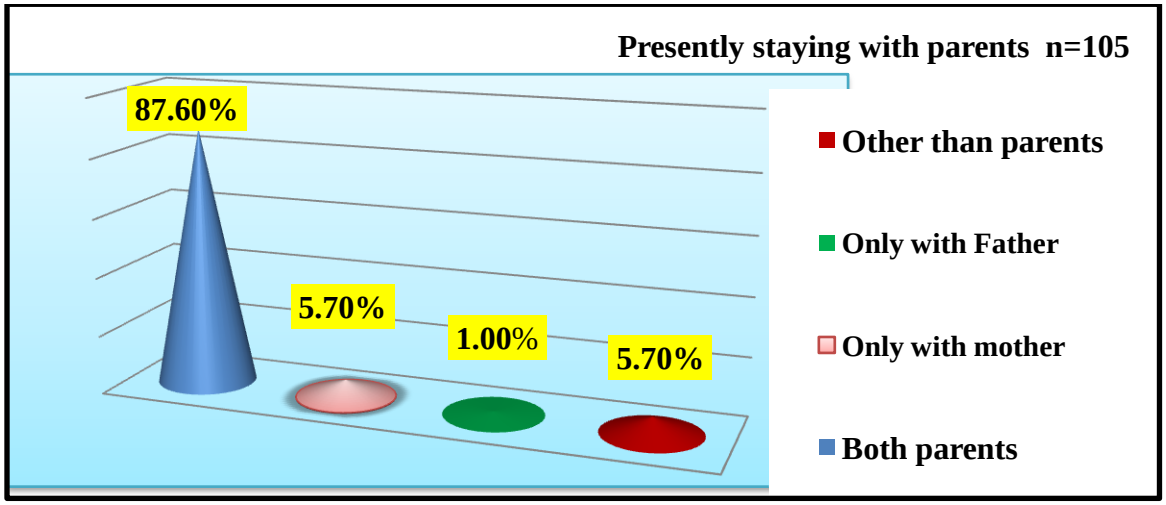

Figure 10: Stacked cone showing percentage distribution of presently staying with parents.

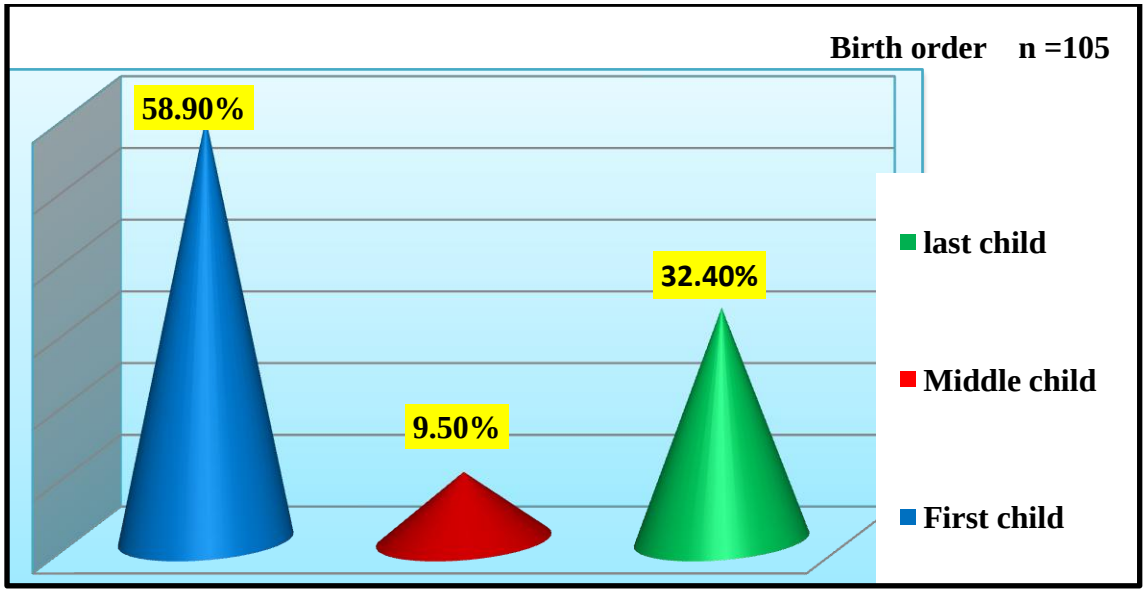

Figure 11: Stacked cone showing percentage distribution of birth order of the participants.

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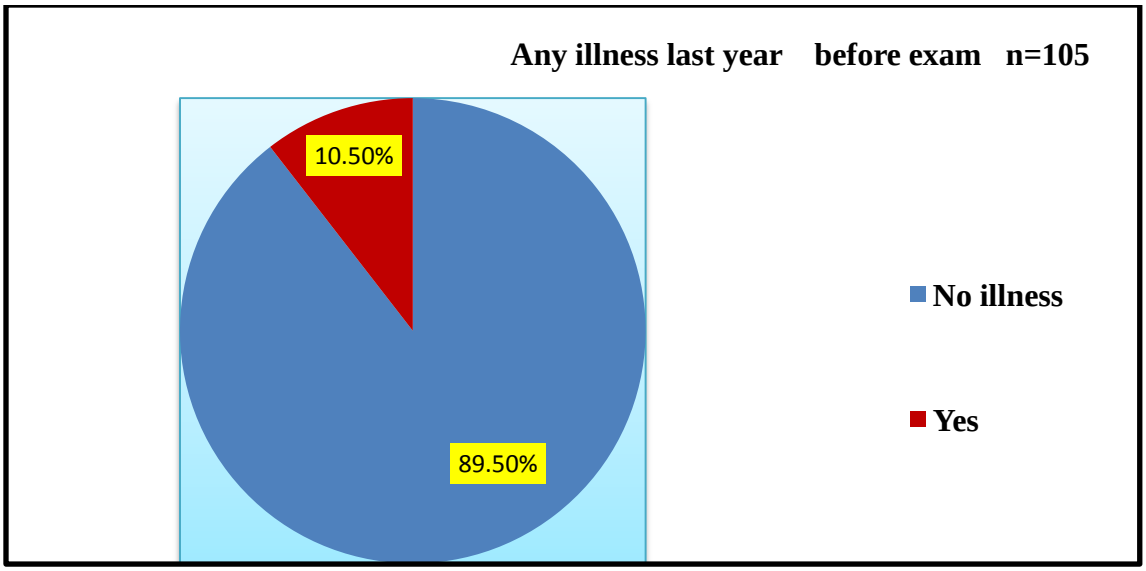

Figure12 : Pie diagram showing percentage distribution of present of any illness last year birth order of the participants

Table 2(a): Mean and standard deviation of the, self esteem and academic performance of the adolescents n=105

Variables	Range		Mean	Standard Deviation
	Minimum	Maximum		
Self esteem	9	27	17.45	3.83
Academic performance	21%	93%	62.28%	15.45

Data presented in table the mean and standard deviation of self esteem of participants was 17.45±3.83. The mean and standard deviation of academic performance was found to be 62.28±15.454.

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Table 2(b): Description of self esteem of the adolescent n=105

Category	Frequency	Percentage (%)
Very high self esteem	7	6.666
High self esteem	32	30.476
Moderate self esteem	61	58.095
Low self esteem	5	4.761

Data presented in the table 2 (b) shows that, in terms of self esteem 58.095% (f= 61) of the participants were having moderate self esteem, followed by 30.476% (f=32) high self esteem, 6.666% (f=7) participants very high self esteem, and 4.7615% (f=5) adolescents were found to have low self esteem.

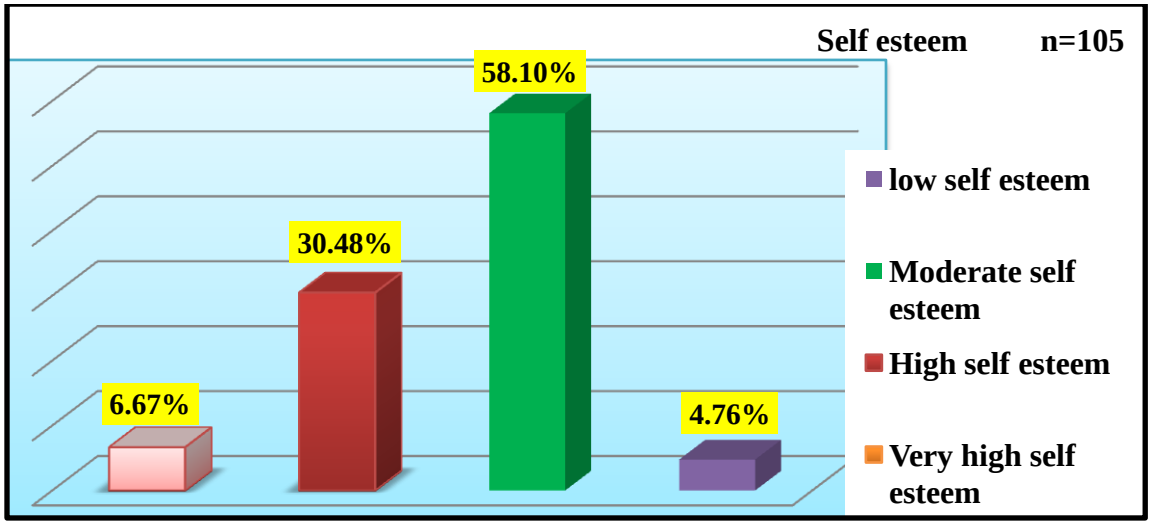

Figure 13:3D stacked column showing percentage distribution of self esteem of the participants

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Table 2(c): Description of academic performance among adolescents n=105

Academic Performance		Frequency	Percentage
Mean	<62	53	50.5%
	≥62	52	49.5%

Data presented in the table 2 (c) shows that, in terms of academic performance almost equal 50.5%% (f= 53) of the participants have score less than average and 49.5% (f=52) more than average of the last year final exam

SECTION II: INFERENTIAL STATISTICS

Table3: Correlation between self esteem and academic performance of adolescents

n= 105

Variables		
	Pearson correlation coefficient (r)	p value
Self esteem	-0.054	0.584
Academic performance		

***S= significant< 0.05 levelNS= Not significant**

Data presented in table 3 shows that there was no significant correlation (r=-0.054, p=0.584) between self esteem and academic performance.

ASSOCIATION BETWEEN SELECTED SOCIO-DEMOGRAPHIC VARIABLES WITH SELF ESTEEM OF THE PARTICIPANTS

Table 4(a): Chi-square (χ^2) values showing association between selected socio demographic variables participants. n= 105

Socio-demographic variable of the adolescents		**Self esteem**		**Calculated χ^2 values**	**df**	**p value**	***S/NS**
		<17	**≥17**				
Age	<14	19	24	0.010	1	0.921	NS
	≥14	28	34				
Gender	Male	19	33	2.818	1	0.093	NS
	Female	28	25				
Religion	Hinduism	33	54	9.577	1	0.003	***S**
	Non Hindu	14	4				
Type of family	Nuclear	24	42	5.069	1	0.024	***S**
	Joint	23	16				
Resident	Rural	17	35	6.070	1	0.014	***S**
	Urban	30	23				
Education of father	Up to matric	19	19	0.661	1	0.416	NS
	Matric and above	28	39				
Occupation of father	Employee	20	29	0.578	1	0.447	NS
	Others	27	29				
Socio-demographic variable of the adolescents		**Self esteem**		**Calculated χ^2 values**	**df**	**p value**	***S/NS**
		<17	**≥17**				
Education of mother	Up to matric	20	25	0.003	1	0.955	NS
	Matric and above	27	33				
Occupation	Employee	5	8	0.238	1	0.626	NS

of mother	Others	42	50				
Presently staying	With parents Other than parents	46 1	53 5	2.032	1	0.221	NS
Birth order	First child Middle child Last child	26 4 17	35 6 17	0.764	2	0.290	NS
Any illness before exam	No Yes	44 3	50 8	1.520	1	0.338	NS

***S= significant at < 0.05 level** **NS= Not significant**

Data presented in table 4(a) shows that there was significant association between religion(χ^2 = 9.577, p= 0.003), type of family(χ^2 = 5.069, p= 0.024) and resident(χ^2 = 6.070, p= 0.014)with the self esteem of participants.

ASSOCIATION BETWEEN SELECTED SOCIO-DEMOGRAPHIC VARIABLES WITH ACADEMIC PERFORMANCE OF THE PARTICIPANTS

Table 4(b): Chi-square (χ^2) values showing association between selected socio-demographic variables with academic performance of adolescents. n= 105

Socio-demographic variable		**Academic performance**		**Calculated χ^2 values**	**df**	**p value**	***S/NS**
		<62	≥62				
Age	<14 ≥14	22 30	21 32	0.078	1	0.780	NS
Gender	Male Female	34 18	18 35	10.367	1	0.001	***S**
Religion	Hinduism Non Hindu	44 8	43 10	0.224	1	0.636	NS

Type of family	Nuclear Joint	33 19	33 20	0.016	1	0.899	NS
Resident	Rural Urban	31 21	21 32	4.197	1	0.040	***S**
Education of father	Up to matric Matric and above	20 32	18 35	0.230	1	0.631	NS
Occupation of father	Employee Others	23 29	26 27	0.246	1	0.620	NS
Education of mother	Up to matric Matric and above	22 30	23 30	0.013	1	0.910	NS
Occupation of mother	Employee Others	8 44	5 48	0.857	1	0.355	NS
Presently staying	With parents Other than parents	49 3	50 3	0.001	1	1.000	NS
Birth order	First child Middle child Last child	25 6 21	36 4 13	4.257	2	0.03	***S**
Any illness before exam	No Yes	44 8	50 3	2.646	1	0.123	NS

***S= Significance at < 0.05 levelNS= Not significant**

Data presented in table 4(b)that there was significant associationbetween academic performance of the participants with gender (χ^2 = 10.367, p= 0.001), resident (χ^2 = 4.197, p= 0.040) and birth order (χ^2 = 4.257, p= 0.03) of the participants.

DISCUSSION:

This section included the findings of the study and discussion of the results with others related studies. Findings of the study were discussed under following headings based on the objectives-

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Objectives of the study:

To assess socio demographic variables of the adolescents.

To assess the self esteem among the adolescents.

To assess academic performance among adolescents.

To find out the relationship between self esteem and academic performance.

To find out the association of selected socio demographic variables with self esteem and academic performance.

SECTION-I DESCRIPTIVE STATISTICS

In the present study majority 41% (f=43) of the participant were 13 years of age group.The study finding was consistent with the study conducted by Sudha where the researcher found that majority 60.0% (f=36)of the adolescent's were 13 years of age group. Participants were almost equal were 50.5% i.e.female (f=53) and 49.5% i.e. (f= 52)male, finding was consistent with the study conducted by Chako where the researcher found that equal participants were found from male 50% (f=75) and female 50% (f=75) gender. Majority i.e.82.9% (f=87) of the participants were from Hindu religion. According to the 2011 census, majority 79.8% of the population of India practices Hinduism in comparing to other religion. Study findings was consistent with the study conducted by Sriharsha where the researcher found that majority of the adolescents were from Hindu religion. Majority62.9% (f=66) of the participants were from the nuclear family and 49.5% (f=52)of the participants were hailing from rural background. Finding was consistent with the study conducted by Sudha where the researcher found that 60.0% (f=36)of the adolescent s from nuclear family. 33.3% (f=35) of the participants Father's education were up to matric and 39% (f=41) of the participants mother education were up to matric level. Finding was consistent with the study conducted by Sriharsha[54] where the researcher found that majority of the participants mother education was up to matric. 38. 1% (f=40)of the participant's father were working as businessman. Consistent with the study conducted by Jasmine[16] where the researcher majority of the parents 96.0% (f=480) were found to have unskilled worker. Majority i.e. 81.0% (f=85)of the participants mother were working as home maker. Majority i.e. 87.6% (f=92) of the adolescent were staying with both parents. Finding was consistent with the study conducted by

Sriharsha. Majority 58.1% (f=60) of the adolescents were first child and finding consistent with the study conducted by Sriharshawhere the researcher found that 58.33% (f=35)of the adolescents were first born child. Majority i.e.89.5% (f=90) of the adolescents had no illness before the last year final exam and 10.5% (f=11) had illness before the last year final exam. Majority 58.095% (f= 61)of the adolescents were had moderate self esteem and was consistent with the study conducted by Jasminewhere the researcher found that, 57.2% (f=286) of the adolescents were had moderate level of self-esteem.Academic performance almost equal 50.5%% (f= 53) of the participants have score below average and 49.5% (f=52) above average.The current study findings was contrast with the study conducted by Elmawhere the researcher found that 58.82% (f=30) of the participants have academic performance above average and 41.18% (f=21) have academic performance below average.

SECTION-II INFERENETIAL STATISTICS

Correlation between self esteem and academic performance

Study findings revealed that there was no significant relationship(r= -0.054, p=0.584) between self esteem and academic performance of the adolescents.Findings was consistent with the study conducted by Chako and Abraham where the researcher found that adolescents with academic performance 80% or above (average score of 41.72%, SD score 30.367) and academic performance below 80% (average score of 33.64% and SD score was 33.033) not associated with positive self esteem.

Association between selected socio demographic variables and self esteem

Study findings reveals that there was significant association (χ^2 = 9.577, p= 0.003) between religion with the self esteem of adolescents and was consistent with the study conducted by Sherina et. al. where the researcher found that there was significant association (χ^2 = 9.533, p= 0.02) between self esteem and religion. The present study finding was contrast with the study conducted by Shanmugan and Kathyayini where the researcher found that there was no significant association (χ^2 = 0.65).between self esteem with religion. There was significant association between type of family (χ^2 = 5.069, p= 0.024) with the self esteem of adolescents. It is seen that due to the size of the family, presence of emotional bonding and other such factors like authority, independency, and recognition given to the children of the family and also support

of the family members to the children for taking decisions differs accordingly to the type of family. This may be the reason for association between type of family and self esteem among adolescents in the present study. The present study finding was inconsistent with the study conducted by Shannmugan and Kathyayini where the researcher found that there was no significant association (χ^2=0.31) between self esteem and type of family type of family. There was significant association between resident (χ^2 = 6.070, p= 0.014) with the self esteem of adolescents and was contrast with the study conducted by Jasmine[16] where the researcher found that there was significant association (χ^2=7.01, p=0.002) between self esteem and area of residence.

Study finding reveal that there was no significant association between self esteem score of participants and selected socio-demographic variables i.e. age (χ^2=0.010, p=0.921), gender (χ^2=2.818, p=0.093), education of father (χ^2=0.66, p=0.416), occupation father (χ^2=0.578, p=0.447), and education of mother (χ2=0.003, p=0.955), occupation of mother (χ^2=0.238, p=0.626), presently staying with parents (χ^2=2.032, p=0.221), birth order (χ^2=0.764, p=0.290)and any illness last time before final exam (χ^2=1.520, p=0.338). Finding of the present study was supported by the study conducted by Shannmugan and Kathyayn,[27]where the researcher found that there was no significant association between the self esteem with the age (χ^2=0.74), gender (χ^2=0.54), education of father (χ^2=1.63), education of mother (χ^2=0.23), occupation of father (χ^2=0), occupation of mother (χ^2=0.42), type of family (χ^2=0.31) and area of residence (χ^2=0.01).

ASSOCIATION BETWEEN SELECTED SOCIO DEMOGRAPHIC VARIABLES AND ACADEMIC PERFORMANCE

Findings of the present study reveals that there was significant association between gender (χ^2 = 10.367, p= 0.001) with the academic performance of adolescents. It may be due to fact that in India expectation and support from family and society, parenting style and role modelling, life goals, cognitive ability, skills and coping strategies, differs from male and female children in terms of academic performance and achievement goals. This finding was consistent with the study conducted by Joshi and Srivastava,where the researcher found that there was significant association between gender and academic performance. There was significant association (χ^2 = 4.197, p= 0.040) between resident with the academic performance of adolescents. The fact that

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various factors like availability of educational institutions, resources, study material, teachers, coaching facilities etc varies between different residential backgrounds may be the reason for the association. This finding was contrast with the study conducted by Joshi and Srivastava,where the researcher found that there was no significant association between resident and academic performance of the adolescents. There was significant association (χ^2 = 4.257, p= 0.03) between birth order with the academic performance of adolescents. Finding of the present study was consistent with the study conducted by Nissenbaum, where the researcher found that there was significant association between birth order and academic performance among adolescents. There was no significant association between academic performance of participants and selected socio-demographic variables i.e. age (χ^2=0.078, p=0.780), religion (χ^2=0.224, p=0.636), type of family (χ^2=0.016, p=0.899), education of father (χ^2=0.230, p=0.631), occupation father (χ^2=0.246, p=0.620), and education of mother (χ2=0.013, 0.910), occupation of mother (χ^2=0.857, p=0.355), presently staying with parents (χ^2=0.001, p=1.000) and any illness last time before final exam (χ^2=2.646, p=0.123).

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HEALTH BANK - A WORKBENCH FOR DATA SCIENCE: APPLICATIONS IN HEALTH CARE

Smita Ghosh (M.sc Mathematics), WEST BENGAL SCHOOL DEPARTMENT

e-mail : smitaghosh04@gmail.com

Abstract :

Data science is rapidly growing to occupy all the industries of the world today. Medicine and healthcare are two of the most important part of our human Lives. Traditionally, the medicine solely relied on the discretions advised by the doctors. "Information is the oil of the 21st century, and analytics is the combustion engine." Data generated by every Human Body is 2 TB per day. I am going to let you know how data science touches our daily lives. Everyone would be amazed to know how data Science is transforming our lives through the healthcare sector. Our mission le to educate, inspire and empower leaders to apply exponential technologies to address humanity's grand challenges. clinical Data Repository is a real time database that consolidates data from Ola variety of clinical sources to present a unified view of a single patient. I believe that HEALTH BANK has the potential to promote a growing industry around the development of data science applications. Aggregated data will be fed into a pipeline for open e- access, while non-aggregated data will be provided to researchers within an ethical permission frame work.

Introduction :

IMO 2012 report "Best care of Lower cool": The Path to continuously Learning Health it cares in America."

- Generated and apply the best evidence for the collaborative healthcare choices of each patient and provider
- Drive the process of discovery as a natural outgrowth of patient care
- Ensure innovations, quality, Safety and value in health care. Requires fundamental commitments to incentives, culture and leadership that foster continuous learning.

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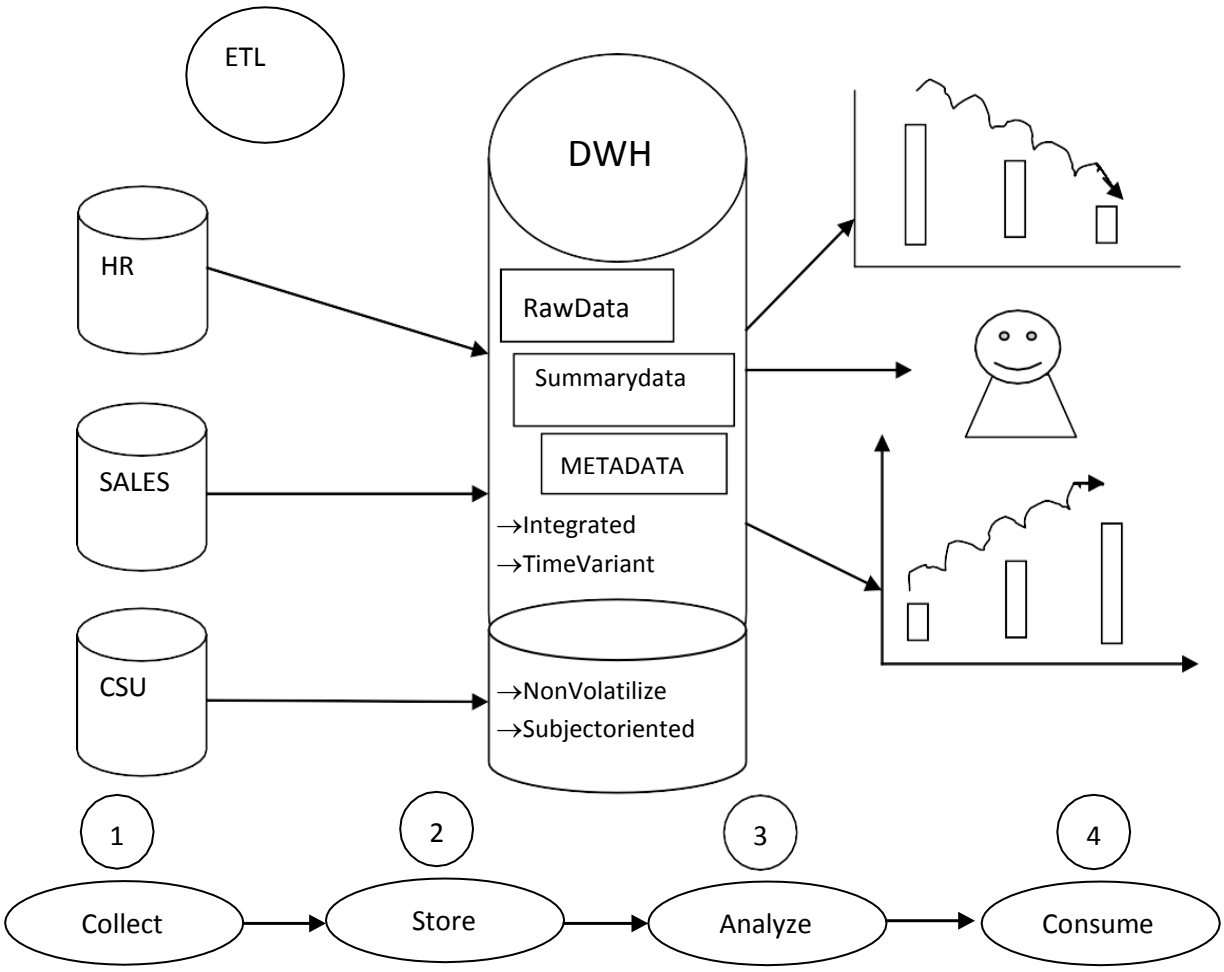
Clinical Data Warehouse

What is Data ware house?

Data ware house is the place where valuable data assets are tire Stored. A data ware house is tee Single source of Data truth.

Defining features of a data warehouse

Subject - Oriented⟶ In data ware house. data is stored by Subject o not by application



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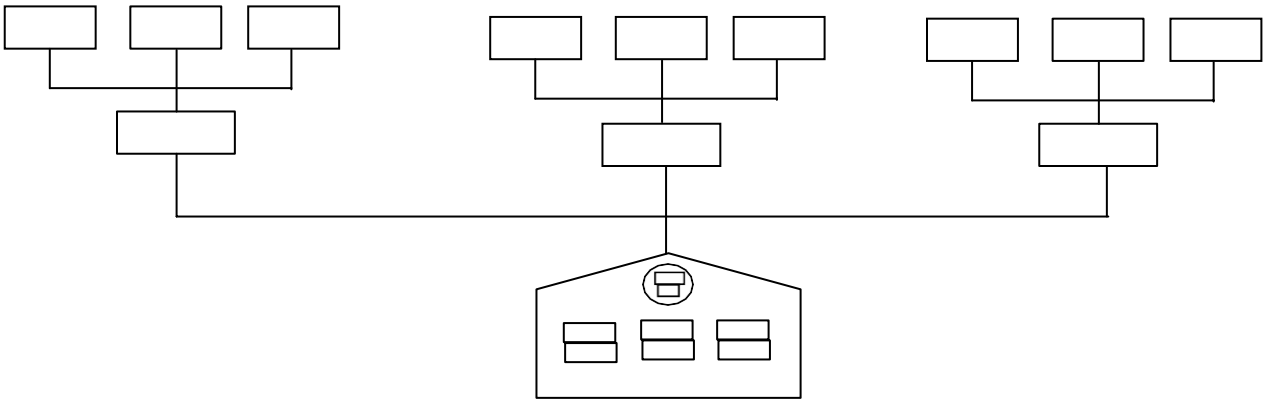
314 e brings Muspell CDR, an integrated FHIR based solutions suite that provides seamless access to all of the patient's data at the point of care in one easy-to-use interface. As you transit to a new EHR, Misspell helps in data archival and data migration in a Seams manner.

SINGLE SOURCE OF TRUTH:

Structuring all the best quality data in one place.

INTEQRATED:

Master Data Governance



It is a large massive computing and storage system that combines information from several sources into one comprehensive database. Example: Cloud data ware house (Oracle, Microsoft, Azure, Google, Big Query)

TIME – VARIANT :

Report from 5 or 10 years ago. (Historical data)

NON VOLATILE:

Can’t be changed, can’t be deleted

Summarized:

Aggregated or segmented for analysis and reporting.

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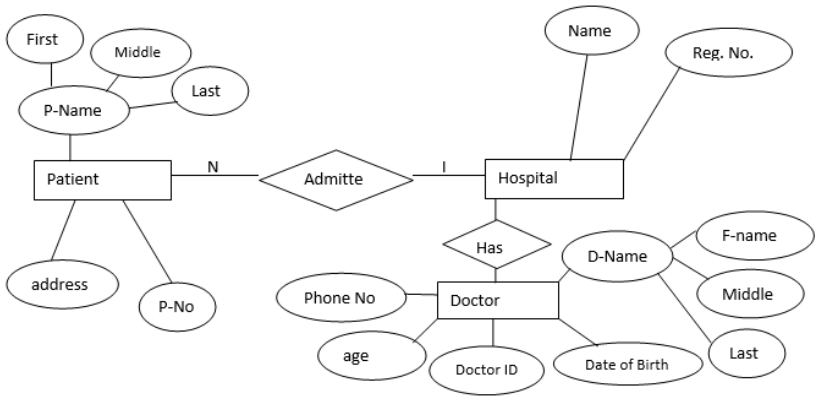

Hospital ER Diagram (Entity Relationship Diagram)

Entity Relationship model as a tool of conceptual design entities and entity set, set relationship and relationship set, attributes, mapping.

What is the reality?

Different hospitals utilize varying EHR from different HIS provident. Gap in clinical data exchange with organization that do not share similar platforms. Healthcare data interoperability is the ability of different information technology systems and software applications to communications exchange date and use the information that has been exchanged.

Data - Warehouse is a structural and non-volatile Single Source of truth.

FUNDAMENTAL:

Healthcare informatics, relates to the ecosystem of data and Systems that support operational and clinical workflows rather than the analysis of data found there in

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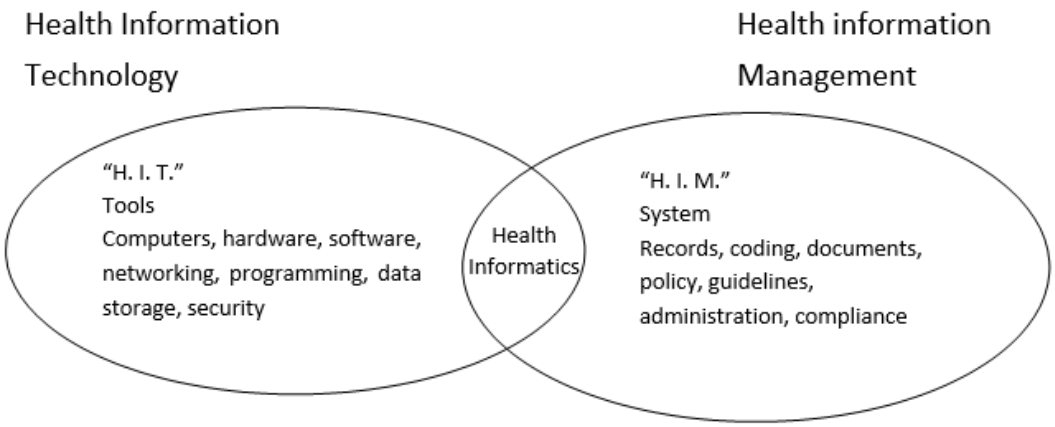

There is a lot of excitement about Data Science and health.

- Artificial intelligence, predictive analytics, precision medicine are all hot areas with huge potential
- A wealth of data is now available in every area of public health and medicine, from new machines and assays, Smart phones, Smart Watches.
- Already, there have been good successes in data science in pathology radiology and other diagnostic Specialties.

Healthcare Analytics :

- Analysis of the data to inform decisions, improve quality and performance of the healthcare origination.
- Increase access to care and decrease costs using business analytic. Overcome reimbursement challenges using smart algorithm.
- Improve patient outcomes using big data analytics. Optimize resources using descriptive analytics Conduct research using advanced analytics.
- Improve clinical quality using operational analytics. Detect fraud using proscriptive and real time analytics.

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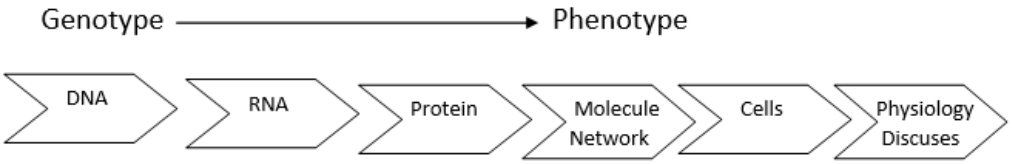
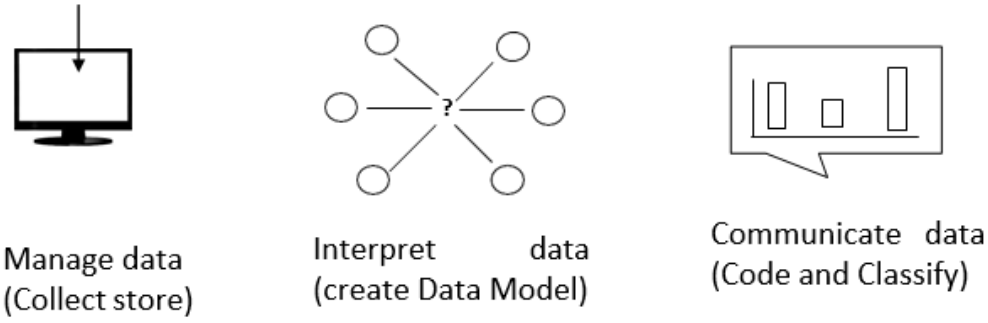
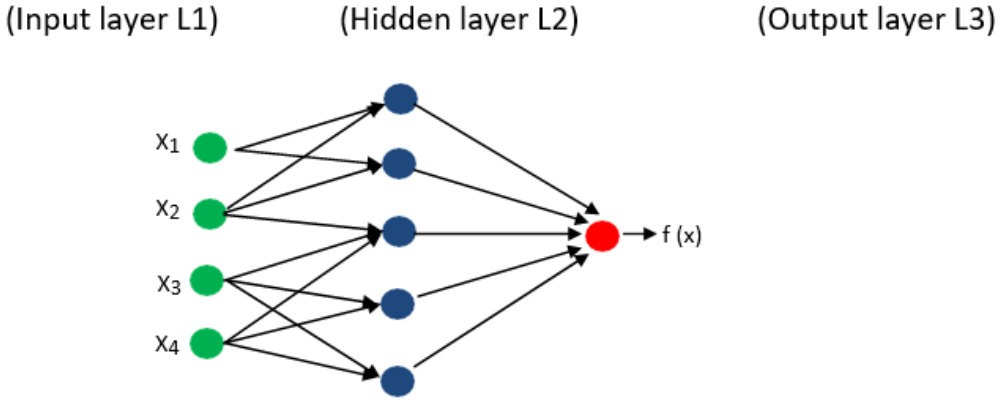
The Biology in Bioinformatics Genotype:



Given DNA and genome sequences, how can we find the genes in the vast genome? How can we compare? What are the Synthetic regions between two genomes are differentially expressed between two Organs or tissues, between tumour and normal tissues, or between two different development stages? At the level of proteins, how do you identify?



Deep Nets /Deep Learning



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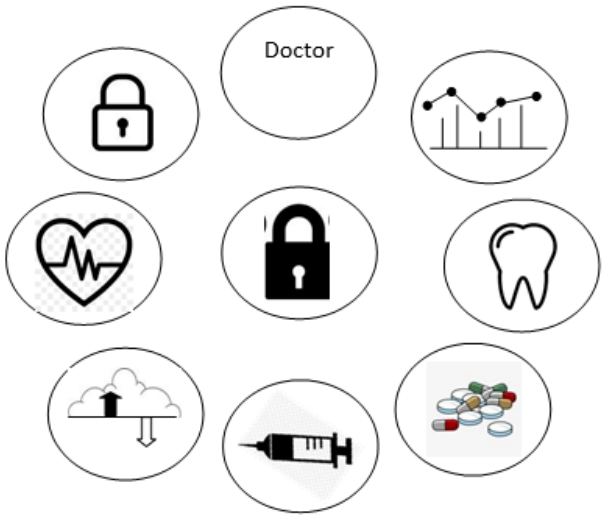
Neural network diagram with a single hidden layer. The hidden layer derives transformations of the inputs - nonlinear transformations of linear combinations - which are then used to model the output



.

The whole cycle is about Of Epidemiology, Statics, Mathematics, Informatics, computer Science. Health Systems are under pressure to "do more with less ".

- Many more patients needing care.
- Shift to value based care.
- Growing shortage in nurses and physicians.
- Increasing consumer expectations of quality and the overall experience

Implications:

Challenges with Conventional Approaches :

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Increase the effective capacity of the health system-new building, expanded facility, extended hours more people.

Keys to Accelerating Operational Excellence:

1. **Velocity Matters :**

Excellent service processes have short cycle time.

2. **Demand profiles can be shaped :**

We can bend beams-demand curves can't be harder.

3. **Begin with individual departments :**

Optimize the nodes before worrying about the interconnections.

4. **Co-exist with the existing E H R :**

Build operational optimization on top of the HER not inside it.

5. **Sophists Mathematics is needed :**

It requires serious data science to solve these problems.

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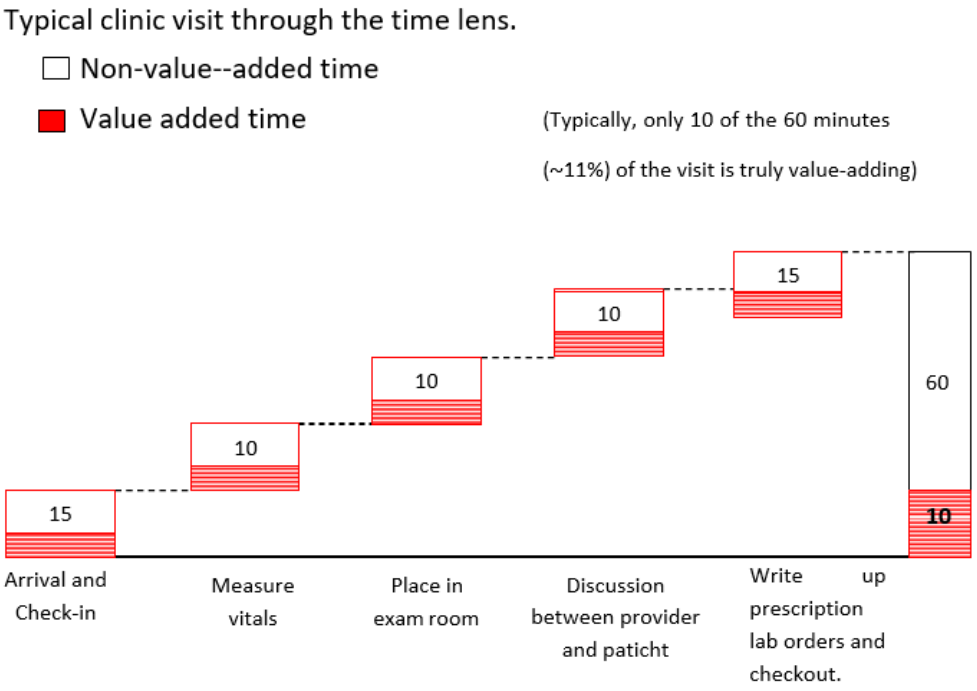
Velocity Matters

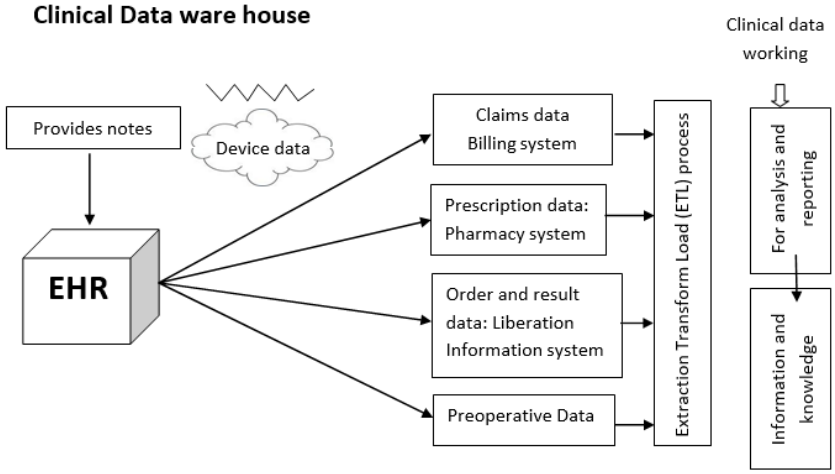
Example:



Outcomes of review and research direction :

Improvement leverage is from reducing non-value-added time NOT attempting to make value-adding steps move.

For Clinical use (patient care):



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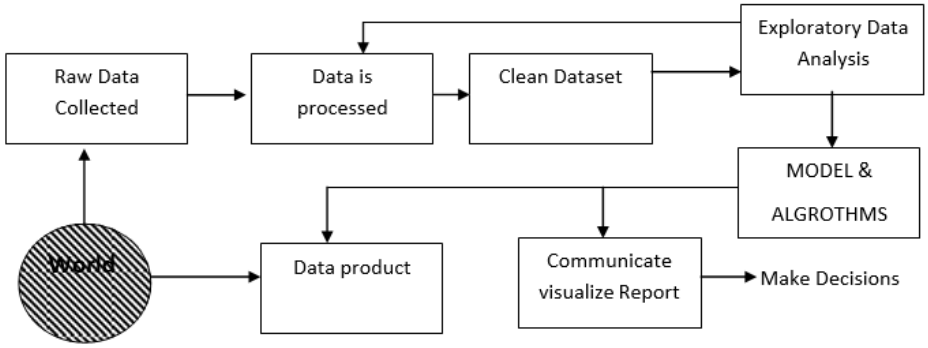
- Aggregates data for a patient from multiple sources.
- CWD used for analysis and reporting , not clinical care.
- Requires an extraction-transform-load process

"The discovery of meaningful patterns in data , and is one of the steps in the data life cycle of collection of raw data, preparation of information analysis of patterns to synthesize knowledge and action to produce value" (NIST Big Data, 2015)

Data Science Process :



- Entire process of data collection, extraction, transformation analysis, interpretation and reporting.
- The analytics processes tee synthesis of Knowledge from information.

Improvement of diagnostic system :

Diagnostic failures are the reasons for the death of many patients.

In many cases early diagnosis is the key for survival.

Image analysis of the CT scans, x-rays, etc.

Genetic Research :

- Finding relationship between DNA and diseases.

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- Use of Personal genome data.
- Huge data.

Computational drug discovery:

- Drug discovery is time Consuming
- Computational techniques are being used for designing compounds and analysing chemical interactions.
- Also used for pre-clinical tests and clinical trials using machine learning algorithm.

Early warning signals :

- Colleting important health related data using Wearable.
- Continuously analyse this data to detect potential health issues.

Clinical trials :

- Predicting bioactivity and identify patients characteristics.
- Faster delivery of trial results

Automation of repetitive processes :

- Automating administrative task.
- Less error prone.
- Faster and more reliable.
- Low cost.

Personalized health Services :

- Collection of clinical and molecular data.

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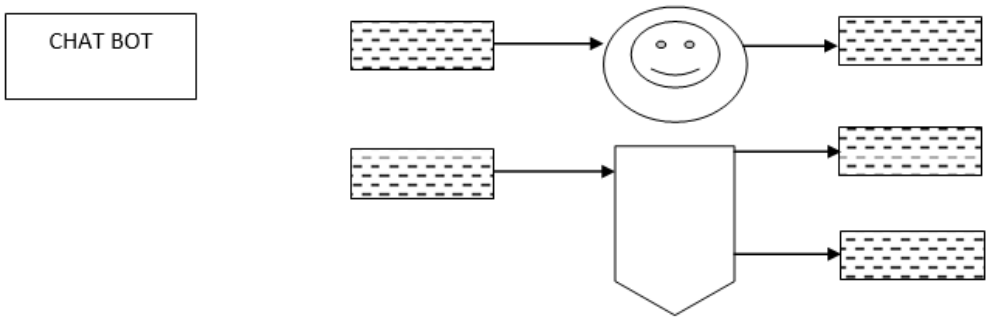
- Algorithm based treatment
- Belter insights available for the doctors.

Virtual Assistance for Patients and customer Support. AI powered mobile app doing great job.



Tell your symptoms; it analyses your detection and medication.

Benefits of data Science :

- Facilitates the easy workflow of the health care system.
- Reduces the risk of treatment wane failure.
- It helps to provide proper treatment on time.
- Early detection of symptoms.
- Remote monitoring of op symptoms by clinicians.
- Avoid unnecessary emergency due to the unavailability of doctors.
- Reduce the waiting time of patients.

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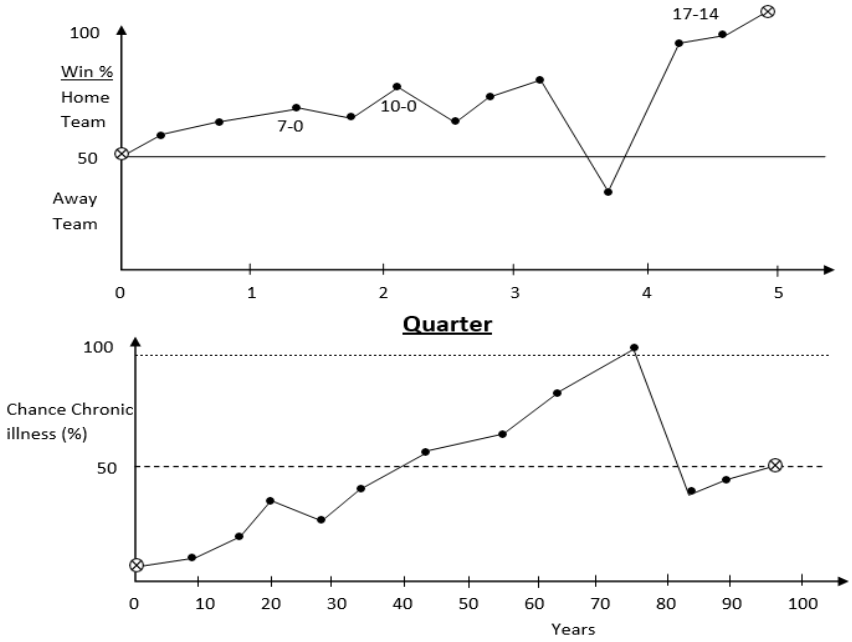
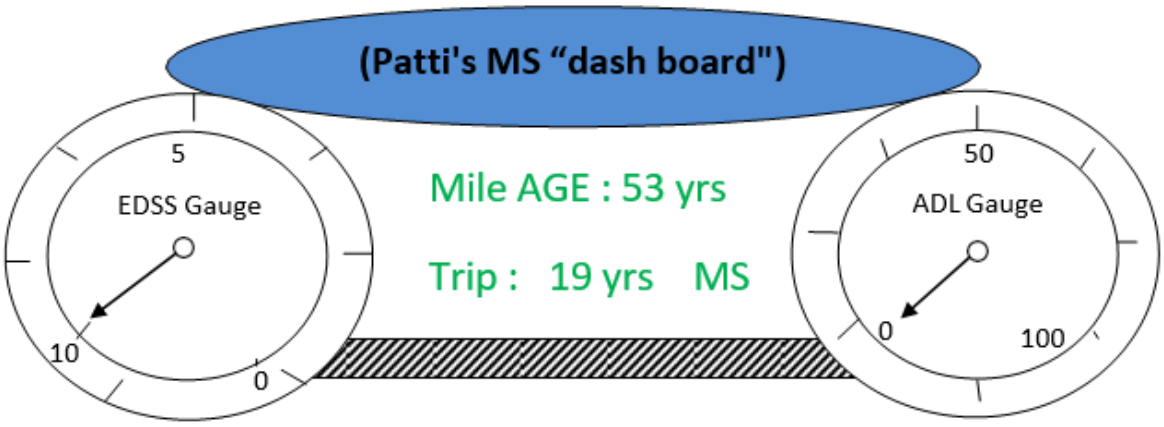


PREDICTALYTICS

Personal Dashboard for Disease Prediction & Management.



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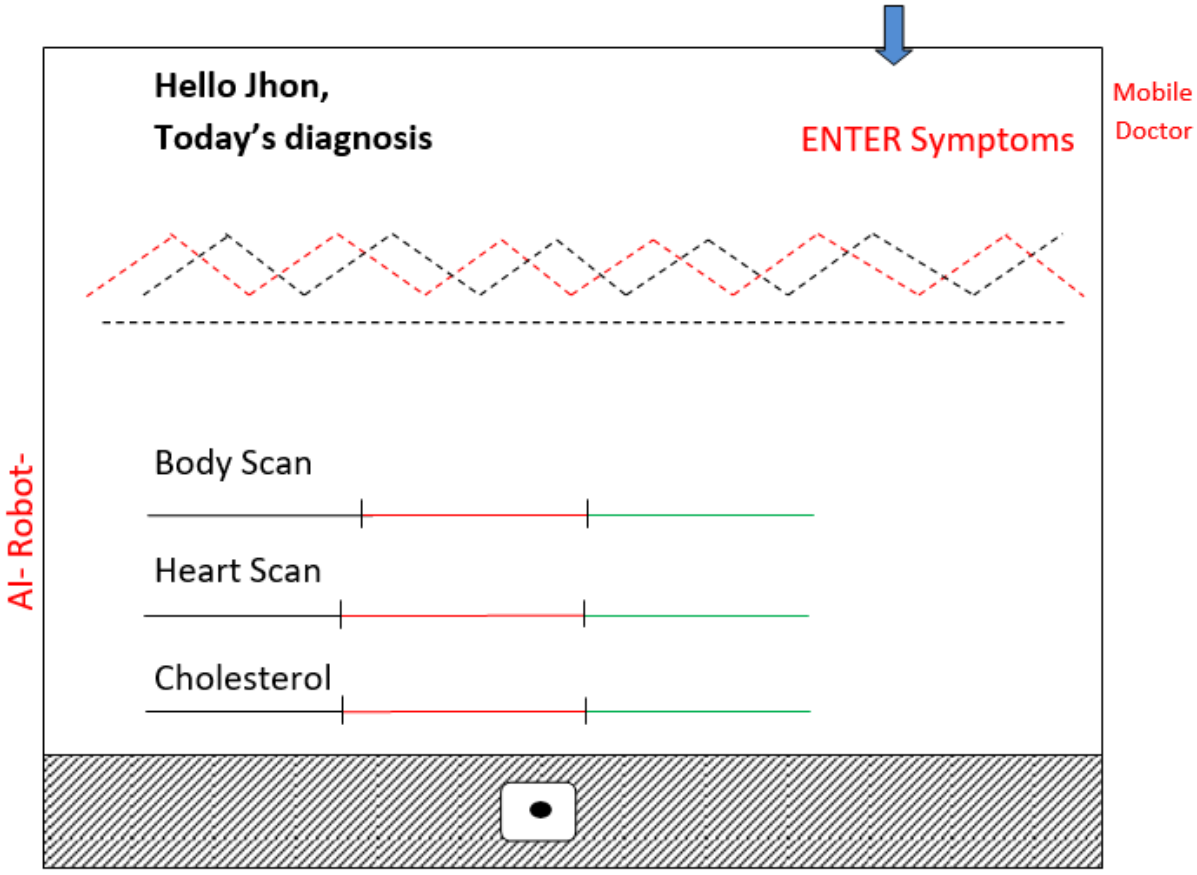

Patients only using this apps and get instant a treatment by own. MR Guided Focused Ultrasound for Image Guided Robotic Acoustic Surgery.

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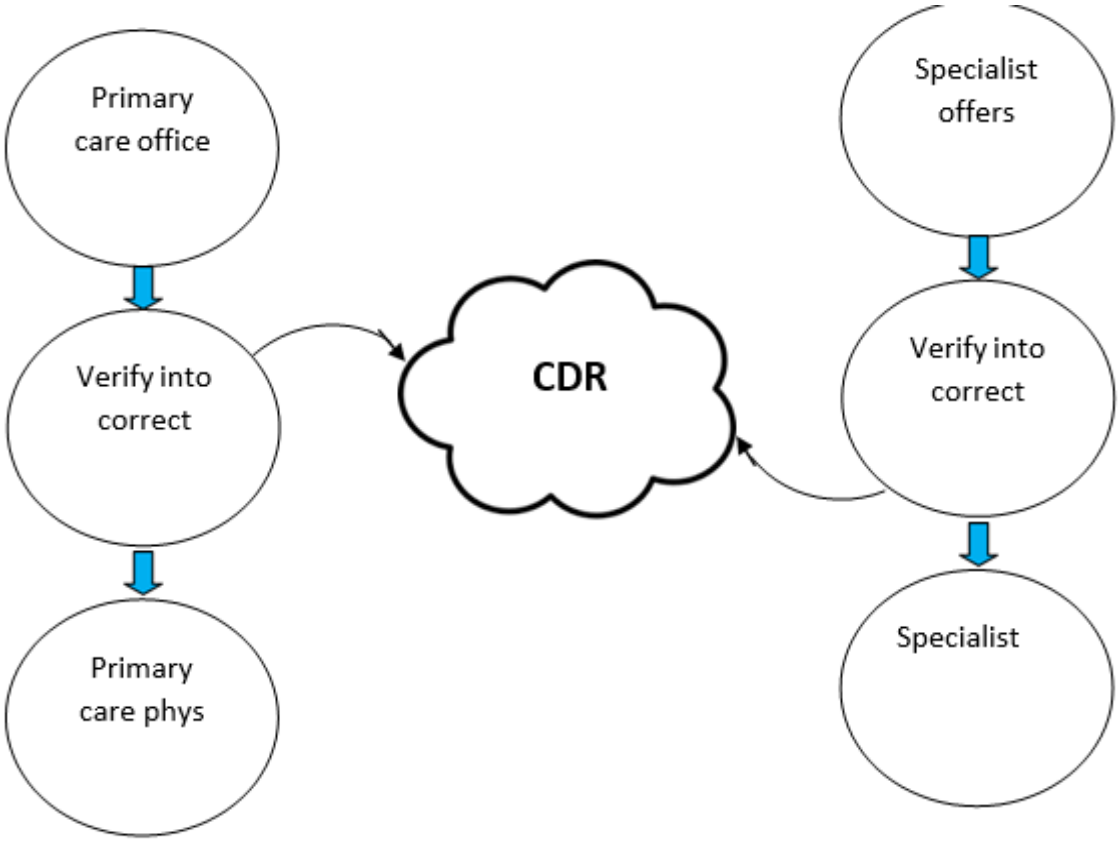
THE SOLUTION:

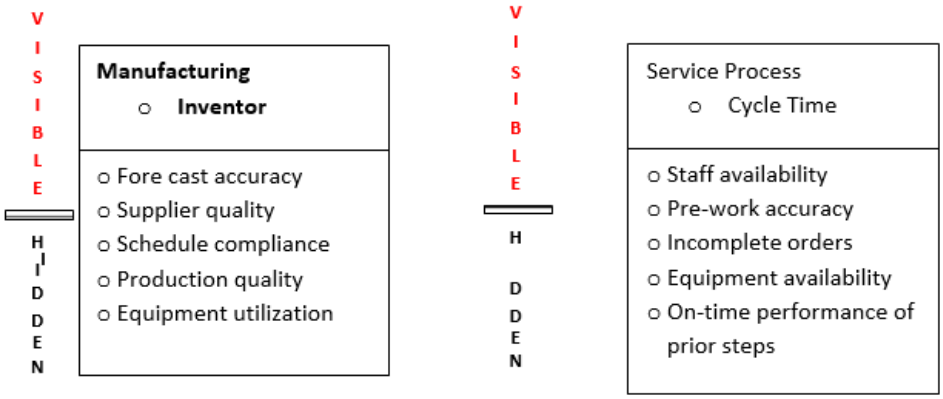


Building blocks (information components) are transmitted electronically for use in many formats-when assembled, they provide the overall health picture of an individual at a point in time.

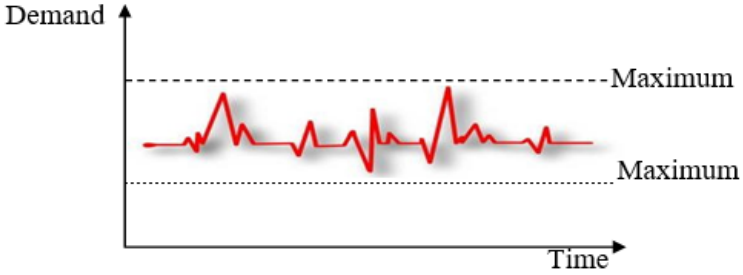
Privacy and Security :

- The CDR complies with state and federal security and privacy requirement.
- The CDR has been externally audited for HIPAA and SOC_2 (Service operation Centre) national security standers.
- The level of staff CDR access is based on their role.
- CDR data is classified as normal restricted or very restricted.

Velocity Matters :



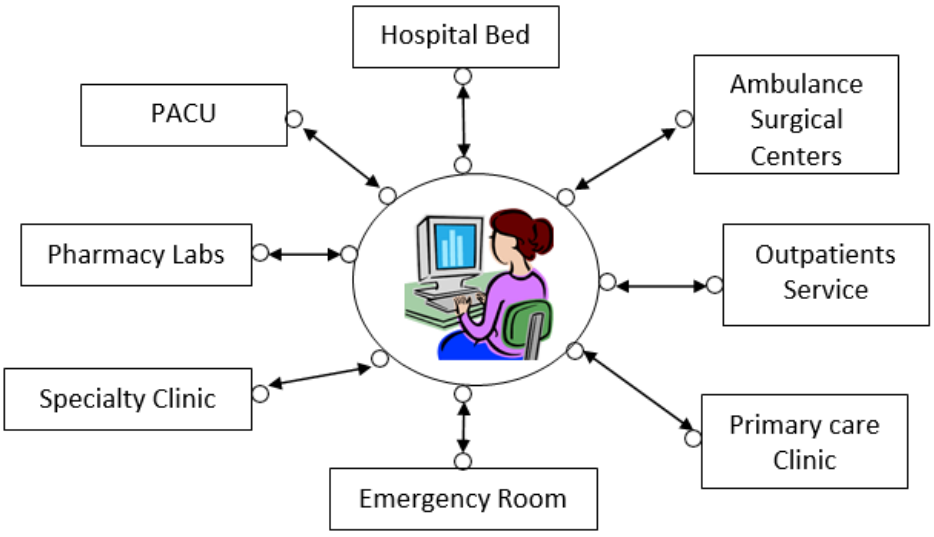
Demand Profile can be shaped:



Forecast the daily demand volume, mix and timing based on historical demand data

Fatten demand profile the Using the lean principle of Heijunka.

Being with individual departments :



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Conclusion:

Data Science plays a pivotal role in monitoring patient's health notifying necessary steps to be taken in order to prevent potential diseases from taking place. Data Scientists are using powerful predictive analytical tools to detect chronic diseases at an early level. In many extreme cases, there are instances where due to negligibility, diseases are not caught at an early stage.

This proves to be highly detrimental to not only the patient's health but also the economic carts as the disease grows, the cost of curing it also increases. Therefore, data science plays a huge role in optimizing the economic Spending in health care. The emergence of smart phones, mobile apps, ubiquitous, high speed internet and remote monitoring devices (e.g., Sensors) coupled with health System's implementation My study have recognized some limitation. The future work could be help to improvise the ability of researchers in the field of science, epidemiological studies, personalized me medicine etc. Data science provides aid to process manage, analyse and assimilate the large quantities of fragmented, structured and unstructured data created by healthcare Systems.

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1 RANKED Among Top Engineering Colleges of Tripura CSR - GHRDC Ranking 2020

2 RANKED Top Engineering Colleges of Excellence (Govt. & Pvt.) in India CSR - GHRDC Ranking 2020

27 RATING Top 100 Engineering Colleges 2021 siliconindia

32 RANKED By INDIA TODAY MDRA Best Universities Survey 2020

8 RANKED 'Beginner' under the category University & Deemed to be University (SELF-FINANCE/PRIVATE/TECHNICAL) ARIIA 2021

About The University

ICFAI University, Tripura was established in 2004 through an Act of State Legislature (Tripura Act 8 of 2004). The University has been approved by the University Gants Commission, under section 2(f) of the UGC Act, 1956 and the University is empowered to award degrees under section 22 of UGC Act, 1956.

Accreditations

- University Grants Commission (UGC)
- National Assessment and Accreditation Council (NAAC)
- Bar Council of India (BCI)
- National Council for Teacher Education (NCTE)
- Distance Education Bureau (DEB)
- Rehabilitation Council of India (RCI)
- Tripura Nursing Council (TNC)
- Indian Nursing Council (INC)
- MSME(HI/BI), Govt of India has recognised as Host Institute to Support for Entrepreneurial and Managerial Development of MSMEs through Business Incubators
- Established Skill Management & Accreditation of Training centre (SMART) recognised by Ministry of Skill Development & Entrepreneurship, NSDC, Govt of India.

Membership

- Member of the Association of Indian Universities, New Delhi, India
- Member of the Association of Commonwealth Universities,London, UK.
- Member of Institute of Engineers (India)
- Members of Association of Management Development Institutions in South Asia (AMDISA)
- Registered Member with Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India
- Member of Confederation of Indian Industry (CII).
- Member of Vijnana Bharati.
- Member of Academy of Hospital Administration, Govt of India.
- National Cyber Safety and Security Standards (NCSSS)
- National HRD Network (NHRDN), Gurgaon
- Inter- University National Cultural Board (IUNCB)
- Amazon Internet services Pvt. Ltd for AWS (Cloud Computing) Program
- Oracle Academy bearing ID No.: 23681394
- Indo-Australian Chamber of Commerce
- VMware IT Academy

Ranking/Certificates

- Ranked 7th among the Top Engineering Colleges of Excellence (Govt. & Pvt) in India by CSR GHRDC- Engineering Ranking 2020.
- ICFAI University Tripura is ranked 32 by India Today- MDRA Best Universities Survey 2020
- Ranked 27 in the Top 100 Engineering College ranking survey 2020 and ranked 3rd in the Top 10 Engineering colleges 2020 region wise ranking announced by Silicon India.
- Department of Chemistry of ICFAI University Tripura Nature Index ranked is 82nd in India as on 25th April, 2020.
- Established 'Institute Innovation Council (IIC) as per norms of Innovation Cell, Ministry of MHRD, Govt. of India
- Registered with NGO Darpan, Niti Ayog, Govt. Of India
- Certified by ISO 9001: 2015
- Best Universities & Colleges 2018-19 awarded to ICFAI University Tripura in the special category by Rubber Skill Development Council (RSDC).
- ICFAI University Tripura certified by Directorate of Social Welfare & Social Education.
- ICFAI Univesity Tripura got AAA rating in Northeast India by Careers360 Magazine– India's Best Engineering Colleges 2020
- ICFAI Law School got AA+ rating by Careers360 Magazine among India's (East Zone) best law Colleges 2021
- ICFAI University Tripura is recognized in the band "BEGINNER" under the category "University & Deemed to be university(Private/Self Financed)(Technical)" in ARIIA 2021

Science and Technology Programs

- B.Tech (CE, ME, ECE, EEE, CSE)
- B.Tech (Lateral Entry)
- BCA
- Integrated MCA
- MCA
- M.Tech

Basic Science Programs

- B.Sc (Hons) Physics
- B.Sc (Hons) Chemistry
- B.Sc (Hons) Mathematics
- M.Sc Physics
- M.Sc Chemistry
- M.Sc Mathematics

Education Programs

- B.Ed
- M.A (Education)
- M.Ed

Liberal Arts

- B.A-English (Hons.)
- B.A-psychology (Hons.)
- M.A (English)
- M.A-psychology

Nursing Program

- ANM (Auxiliary Nursing Midwifery)

Allied Health Science Programs

- BSc. in Emergency Medical Technology
- BSc. in Cardiac Care Technology
- BSc. in Dialysis Therapy Technology
- Bachelor in Health Information Management
- Bachelor in Science in Medical Laboratory Technology (BMLT)
- Master of Science in Medical Laboratory Technology (MMLT)

Management & Commerce Programs

- BBA
- B.Com (Hons.)
- MBA
- MHA (Master of Hospital Administration)
- M.Com

Law Programs

- BA-LLB (Hons.)
- BBA-LLB (Hons.)
- LL.B
- LL.M (2 Years)

Special Education Programs

- B.Ed Spl. Ed (ID)
- D.Ed.Spl Ed (ID)
- M.Ed Spl. Ed (ID)

Physical Education & Yoga

- B.P.Ed
- D.P.Ed
- PGD in Yoga
- B.P.ES
- B.P.ES (Lateral Entry)
- MPES

Clinical Psychology Program

- M.Phil in Clinical Psychology

Library Science Program

- M.Lib.I.Sc (Integrated) - 2 Year
- M.Lib.I.Sc - 1 Year
- B.Lib.I.Sc - 1 Year

Certificate Programs

- French
- Data Science
- HR Analytics & HR Audit

Programs Offered at ICFAI University Tripura

Science and Technology

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B. Tech (CE, CSE, ECE, ME, EEE)	4 Years	Pass in 10 + 2 (Phy/Chem/Math) with minimum 45%, (40 % in case of SC/ST/ OBC)aggregate marks	50,000	57,500	IT,ITEs, Manufacturing,Companies, Corporates, Telecom, Banks, Govt. Services
B. Tech - Lateral Entry (CE, CSE, ECE, ME, EEE)	3 Years	Pass in 3 - year diploma course with minimum 45 % (40 % in case of SC/ ST/ OBC) aggregate marks	50,000	57,500	IT,ITEs, Manufacturing,Companies, Corporates, Telecom, Banks, Govt. Services
BCA	3 Years	Pass in 10 + 2 (any Discipline) examination	29,000	32,000	IT,ITEs, Corporates, Banks,Govt. Services, NGO's.
Integrated MCA	5 Years	Pass in 10 + 2 (any Discipline) examination	29,000	32,000	IT,ITEs, Corporates, Banks,Govt. Services, NGO's.
MCA	2 Years	Graduation in any discipline, with 40% and above aggregate marks.	30,000	33,000	IT,ITEs, Corporates, Banks, Govt. Services, NGO's, Research
M.Tech	2 Years	Valid GATE Scorer with B.Tech /B.E in Civil Engineering or B.Tech /B.E in Civil Engineering with 60% marks	60,000	65,000	Research, consultant to Pvt. Organization in the field of flood forecasting, flood inundation, flood disaster management, Entrepreneur.

Basic Science

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B.Sc. Physics (Hons.)	3 Years	Pass in 10 + 2 with 40 % marks in Physics & pass in maths	29,000	31,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate
B.Sc. Chemistry (Hons.)	3 Years	Pass in 10 + 2 with 40 % marks in Chemistry	29,000	31,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate
B.Sc. Mathamatics (Hons.)	3 Years	Pass in 10 + 2 with 40 % marks in Mathematics	27,000	29,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate
M.Sc. Physics	2 Years	Graduate with 45 %(40 % in case of SC/ST/ OBC) marks in Physics	35,000	37,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate
M.Sc. Chemistry	2 Years	Graduate with 40 % marks in Chemistry from a recognized University	35,000	37,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate
M.Sc. Mathematics	2 Years	Graduate with 40 % marks in Mathematics	28,000	30,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate

Liberal Arts

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B.A - English (Hons.)	3 Years	Pass in 10 + 2 (any Discipline) with 40 % marks in English	25,000	27,000	Jobs in Govt., Teaching in Schools/Educational Administrators/ Corporate, Banks, Telecom, Media, Journalism
M.A - English	2 Years	Graduate in any Discipline with minimum 45 % (40% in case of SC/ST/ OBC) aggregate marks	26,000	28,000	Jobs in Govt., Teaching in Schools/Educational Administrators/ Corporate, Banks, Telecom, Media, Journalism/ Research
B.A - Psychology (Hons)	3 Years	Pass in 10 + 2 (any Discipline) with 50 % (45% in case of SC/ST/ OBC) marks	22,000	24,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate
M.A - Psychology	2 Years	Graduate with 45 %(40 % in case of SC/ST/ OBC) marks in Psychology	24,000	26,000	Teaching in Schools/ Colleges/ Educational Administrator/ Corporate

Library And Information Sciences

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B.Lib.I.Sc	1 Year	Graduate in any discipline	21,000	23,000	School/ College/ University/ district/ State / National Librararies, Bank, Govt. Services, NGO's, Research
M.Lib.I.Sc- Integrated	2 Years	Graduate in any Discipline	21,000	23,000	School/ College/ University/ district/ State / NationalLibrararies, Bank, Govt. Services, NGO's, Research
M.Lib.I.Sc	1 Year	Graduate with B.Lib.I.Sc	21,000	23,000	School/ College/ University/ district/ State / NationalLibrararies, Bank, Govt. Services, NGO's, Research

Law

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
BBA-LLB Integrated	5 Years	Pass in 10 + 2 with minimum 45 % (40 % in case of SC/ST, 42% in case of OBC) aggregate marks	30,000	32,000	Corporates, Banking, Judiciary, Legal Practice, NGO's IPR
BA-LLB Integrated	5 Years	Pass in 10 + 2 with minimum 45 % (40 % in case of SC/ST, 42% in case of OBC) aggregate marks	30,000	32,000	Corporates, Banking, Judiciary, Legal Practice, NGO's IPR
LLB	3 Years	Graduate in any Discipline with minimum 45 % (40 % in case of SC/ST, 42% in case of OBC) aggregate marks	32,000	34,000	Corporates, Banking, Judiciary, Legal Practice, NGO's IPR
LLM	2 Years	Graduate with LLB degree (Recognised by BCI)	35,000	40,000	Corporates, Banking, Judiciary, Legal Practice, NGO's IPR, Research

D* = Domicile: Students from North East States (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura). **ND**= Non-Domicile: Students from states other than North East states.

Management Studies

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B.Com (Hons.)	3 Years	Pass in 10 + 2 examination in commerce or Science with 45% (40% in case of ST/ SC/OBC) marks	26,000	28,000	Banks, Financial Services, Corporates
BBA	3 Years	Pass in 10 + 2 (any Discipline) examination with minimum 40% marks	30,000	32,000	Banks, Financial Services, IT, Insurance, Telecom, Corporates, Consulting Companies.
MBA	2 Years	Graduate in any discipline with minimum 50 % (45 % in case of SC/ST/OBC) aggregate marks	65,000	75,000	Banks, Financial Services, IT, Insurance, Telecom, Corporates, Consulting Companies, Research
M.Com	2 Years	B.com (Pass or Hons) from any recognized University/ Institution with 45% marks in aggregate Or equivalent grades. 5% relaxation will be given to SC, ST, and OBC candidates.	26,000	28,000	Banks, Financial service, Corporate, Tax consultants, Finance Advisor/Planner, etc
Master of Hospital Administration(MHA)	2 Years	Graduate with 50% aggregate marks (Preference will be given to MBBS, BDS, BHMS, B.Sc Nursing, BPT, BAMS, B.Sc Allied Health Science, Veterinary Sciences & B.Sc Pharma)	65,000	75,000	Hospitals(Government /Private), NUHM, NRHM, NRLM, Healthcare consultancy firm, Hospitality industry, Medico-legal consultancy firm, Insurance sector (Government/ Private)

Allied Health Sciences

Program	Duration	Eligibility	Program Fee Per Semester(Rs)	Career Prospects Employment Opportunities
Bsc. in Emergency Medical Technology	4 Years	Pass in 10 + 2 (Science Discipline) with 45% marks in PCB (5% relaxation for SC/ST/OBC Candidates)	35,000 (3 years/6 semester) & 10,000 (Last 1 year/ 2 semester)	Opportunity in Government /Private hospital having ICU/ITU/Critical care unit, Demand in disaster management team for both state/central government, army/navy/airforce. Eligible for Post graduation courses.
Bsc. in Cardiac Care Technology	4 Years	Pass in 10 + 2 (Science Discipline) with 45 % marks in PCB (5% relaxation for SC/ST/OBC Candidates)	35,000 (3 years/6 semester) & 10,000 (Last 1 year/ 2 semester)	Opportunity in Government /Private Hospitals in cardiology department, different cath- labs or diagnostic centers. Eligible for postgraduate courses.
Bsc. in Dialysis Therapy Technology	4 Years	Pass in 10 + 2 (Science Discipline) with 45 % marks in PCB (5% relaxation for SC/ST/OBC Candidates)	35,000 (3 years/6 semester) & 10,000 (Last 1 year/ 2 semester)	Opportunity in Government /Private hospitals, NRHM, NUHM, NGO, clinics/healthcare setup offering dialysis treatment. Eligible for Post Graduation courses in dialysis.
Bachelor in Health Information Management	4 Years	Pass in 10 + 2 (any Discipline) with 45 % marks (5% relaxation for SC/ST/OBC Candidates)	35,000 (3 years/6 semester) & 10,000 (Last 1 year/ 2 semester)	Opportunity in Government / Private hospitals, diagnostic centers, NRHM/NUHM, legal firms,Healthcare consultancy .Eligible for Post Graduate courses.
B.Sc. Medical Lab Technology (BMLT)	4 Years	Pass in 10 + 2 (Science Discipline) with 45% marks in PCB (5% relaxation for SC/ST/OBC Candidates)	26,000 (3 years/6 semester) & 10,000 (Last 1 year/ 2 semester)	Opportunity in Government /Private hospital having ICU/ITU/Critical care unit, Demand in disaster management team for both state/central government, army/navy/airforce. Eligible for Post graduation courses.
M.Sc. Medical Lab Technology(MMLT)	2 Years	Candidate must have passed degree, e.g. B.Sc. MLT/ B.Sc. Physiology/ Microbiology/ Biotechnology/ Biochemistry or equivalent B.Sc. Biosciences from a recognized University	60,000 (D*) 65,000 (ND)	Opportunity in Government / Private sector, Lab Technician, Medical Lab Incharge, Research and Development Manager (Laboratory), Technical Officer etc. Can pursue research or can flourish in academics as well

Education

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B.Ed.	2 Years	Graduate or post graduate in any discipline with minimum 50 % (45 % in case SC/ST/ OBC) aggregate marks	45,000	47,000	Teaching in Secondary level
MA - Education	2 Years	Graduate in any discipline	20,000	22,000	Teaching in Schools/Educational Administrators/ Research
M.Ed.	2 Years	B.Ed. (1/2 years)/ B.EL.ED/B.Sc.B.Ed./ B.A B.Ed./ D.EL.Ed./D.Ed. with a Bachelors degree. 50% marks at all the levels	48,000		Teaching in Teacher Education

Physical Education and Yoga

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B.P.Ed	2 Years	Graduate or post graduate in any discipline with minimum 50 % (45 % in case SC/ST/ OBC) aggregate marks	22,000	24,000	Jobs in Schools/ Colleges/ University , Physical Trainer
D.P.Ed	2 Years	Pass in 10+2 or equivalent with 50% of marks in any stream	20,000		Jobs in Schools/ Colleges/ Physical Trainer
PGD in Yoga	1 Year	Any graduate	16,000	21,000	Yoga Teacher in Schools, Yoga Therapist/ Yoga Psycologist/ Yoga Inspector in MNC's, Health Club, Yoga Club
B.P.E.S	3 Years	Pass in 10 + 2 examination or equivalent from any recognised education Board/ University	20,000		Jobs in Schools/ Colleges/ University , Physical Trainer
B.P.E.S(Lateral Entry)	1 Year	Pass in two years diploma in Physical education	20,000		Jobs in Schools/ Colleges/ University , Physical Trainer
M.P.E.S	2 Years	Candidates must have passed with at least 50% marks for Gen/OBC and 45% for ST/SC category. B.P.Ed (4yrs. Integrated)/ B.PEd. (1yr or 2 yr)/ BPE(3yrs)/ B.Sc (Physical Education)/ BPES (3yr).	30,000	35,000	Jobs in Schools/ Colleges/ University , Physical Trainer/Sports/Job in Govt. and Private sector as teacher,instructor, coach etc.

Science and Technology

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
B.Ed. Spl.Ed. (ID)	2 Years	Graduate or post graduate in any discipline with minimum 50 % (45 % in case SC/ST/ OBC) aggregate marks	40,000	42,000	Teaching in Secondary level and at special schools
D.Ed.Spl.Edu (ID)	2 Years	Pass in 10 + 2 (any Discipline) with minimum 50% marks	25,000		Special schools, Sarva Siksha Abhiyan/ Resource teacher in General School/ Integrated/ Inclusive setup
M.Ed.Spl.Ed(ID)	2 Years	B.Ed. Spl. Ed (ID) / B.Ed. General with D.Ed. Spl. Ed (ID) with 50% marks (RCI).	37,500		Professional preparation of teacher educators-engaged in continuous professional development of teachers
M. Phil in Clinical Psychology	2 Years	M.A. / M.Sc degree in the Psychology with 55% marks in aggregate, Preferably with special paper in Clinical Psychology.	72,000		Qualified professional & extensive inputs & widesp-read Clinical experience to acquire the necessary skills in the area of Clinical Psychology

Nursing Science

Program	Duration	Eligibility	Program Fee Per Semester(Rs) (D)*	Program Fee Per Semester(Rs) (ND)*	Career Prospects Employment Opportunities
ANM	2 Years	Pass in 10 + 2 (any Discipline)examination	43,000		Hospitals(Government /Private), NUHM, NRHM, NRLM, Healthcare consultancy firm, Hospitality industry, Medico-legal consultancy firm, Insurance sector (Government/ Private)

Certificate Program

Program	Duration	Eligibility	Program Fee (Rs)
Data Science	6 Months	Minimum graduation in Science or Engineering.	25,000
HR Analytics & HR Audit	4 Months	Graduation with Computer Literacy	35,000
French	6 Months	Minimum pass in 10+2 (in any discipline)	15,000








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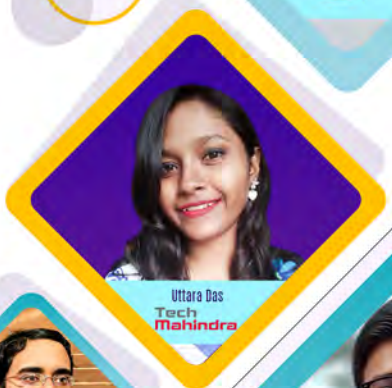

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Our Resources

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- Smart Class Rooms
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- Enriched Library
- Hostels
- Full Campus is Under cctv Surveillance
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- Medical Centre
- Gymnasium
- Soccer Field
- Basket ball court
- 24 x7 Ambulance Service
- 24 hours Power Generator back-up etc.
- Full Campus is Covered by Jio wifi, BSNL wifi, ICFAI wifi
- Badminton court

Unique Features

- Fee concession for students from North Eastern States
- N J Y Memorial Scholarships
- Merit Scholarships during Admission and also during study at University
- Signed MOA with IIT Bombay for setting up North Eastern Region Spoken Tutorial FOSS HUB at ICFAI University Tripura
- French & Chinese Language as Elective Course for all Programs
- Setup Virtual Lab in Collaboration with IIT, Delhi.

ICFAI University Tripura
Campus-Kamalghat, Mohanpur,
Agartala -799210, Tripura (W), India
Ph: +91381-2865752/62, +918787845302, 7085574556, 9612640619, 8415952506 Fax No; +91381-2865754

Agartala City Office
Colonel Chowmuhani, House no. 226797,
Palace Compound, Agartala -799001, Tripura (W), India
Ph: +91381-2329198, 7005302245

Guwahati Office
Uma Bora Complex, 1st. Floor, Bora Service Bylane, G.S. Road, Guwahati,Assam - 781007, Ph: +913613595807, 9854116517, 7086011651

Manipur Office
Uripok polem Leikai, Mahum Building 3rd Floor,
Imphal West, Pin- 795001, Manipur.
Ph: 7422916755, 7085789234, 9362807590

Silchar Office (Assam)
2rd Floor of Gurukul Junior College, Arts & Commerce,
N.S. Avenue, Hailakandi Road,
near Gupta House (OppositeDas Colony), Silchar-788005
Ph: 76379 68599, 7002115455

Kolkata Office
195, Canal Street,
Shreebhumi Bus Stop, Near Vivekananda Statue
Shreebhumi, Kolkata-700048
Phone:- 7003634670 / 9883791321 / 03340042837

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