Burden of Diabetes in Rural Indiaand Its Association with Social Anddietary Factors

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Abstract

Background: Diabetes is a major public health challenge in the present phase of socio-demographic and epidemiological transition leading to various complications causing high mortality and morbidity. Diabetes is often not diagnosed in early phase especially in rural areas. This study was carried out to observe changing trends, prevalence of diabetes and its association with major risk factors in rural community.

Methods: A community based cross sectional study was carried out among 700 individuals (306 men and 394 women) aged 18-65 years living in villages under rural field practice area of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Chinaoutpally, Krishna district, Andhra Pradesh. Information on socio-demographic data, dietary habits and life style was obtained. Height, weight,blood pressure and capillary blood glucose were measured.

Conclusion: The prevalence of diabetes is about 22.6% of the study subjects of whom 11.9% are known and 10.7% are newly diagnosed. The prevalence of Diabetes is increasing at an alarming rate even in rural population and nearly half of them aren't aware of their diabetes status. Diabetes when detected early can prevent lot of complications and improve the quality of life of the individual.

Key Words: *Cross Sectional Study, Diabetes, Hypertension, Non Communicable Diseases, Prevalence, Rural.*

Introduction

Diabetes, once considered as a mild disorder of the elderly has now become one of the major causes of morbidity and mortality affecting people of all age groups. Over the past decade it has been obvious that the prevalence of NCD's is increasing rapidly. Industrialization, urbanization, economic development, market globalization led to a change in diet and life style which had a significant impact on health and nutritional status of population, leading to the development of behavioral risk factors in the population.

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Diabetes mellitus is one of the non-communicable diseases which have become a major health problem with the prevalence rapidly rising all over the globe at an alarming rate, in both urban and rural areas, irrespective of socio-economic status.[1]It is important to note that the rise in prevalence is seen in all six inhabited continents of the globe.It was estimated in the year 2019, that 463 million people worldwide are diabetic of whom two thirds were living in the low and middle income countries.[2] If these trends continue, by 2030,578 million people or nearly one in ten individuals will have diabetes, of whom 478 million people will reside in emerging economies compared with a mere 100 million in developed countries.[3,4]In 2015, as per ICMR INDIAB study, India has 62.4 million people with diabetes and 77.2 million people with pre-diabetes.[5]India currently has 77 million people with diabetes which in current phase could witness 101million by 2030.[2] Diabetes mellitus is one of the leading causes of premature death worldwide along with other non-communicable diseases, e.g. cardiovascular diseases (CVD) and cancer.[6]

Objectives:

Ø To determine the socio- demographic profile of the study participants.

Ø To estimate the prevalence and to identify various risk factors for type 2 diabetes mellitus

Methodology

STUDY DESIGN:

This study was carried out as a **"community based cross- sectional study".**

STUDY AREA:

Rural field practice area of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Chinnaoutpally, Andhra Pradesh covering 9 villages with a population of 31,420.

STUDY DURATION:

The study was conducted during May 2019 to February 2020.

STUDY POPULATION:

People aged between 18 years to 65 years, residing in the study area.

Inclusion criteria:

1) Individuals aged >18 years to <65 years residing in the identified unit of study (household)

2) People willing to participate in the study and get their Fasting Blood Sugar (FBS) done.

Exclusion criteria:

1) Individuals aged <18 years and >65 years

2) Pregnant women

3) Previously diagnosed with conditions that causes secondary diabetes.

(eg.: Polycystic ovarian disease(PCOD), Acromegaly, Phaeochromocytoma, Adenocarcinoma, Cushing's syndrome, hemochromatosis, pancreatitis, cystic fibrosis, etc)

4) Mentally challenged

5) Sick individuals (Infections).

6) People not present at the time of visit.

ESTIMATION OF SAMPLE SIZE:

As per studies conducted in Andhra Pradesh to know the prevalence of diabetes mellitus, the prevalence of diabetes in Godavari is 13.2%.[7]

The above data reflects the prevalence of diabetes in rural communities of Andhra Pradesh.

Sample size was calculated using the formula, $\boldsymbol{n=4pq/L^2}$.[8]

p= 13.2%

q = 86.8 (i.e., 100 - p)

L = 20% (allowable error)

The sample size comes to **657**, and it was rounded to 700 considering non responders.

SAMPLING TECHNIQUE:

The sample to be studied from each village is done by Probability Proportion to Size (PPS) method. The first house is selected by lottery method and then onwards each house is selected by systematic random sampling until the desired sample is reached in each village.

Procedure methodology

After obtaining informed oral consent from the study subject, a pre tested and semi structured questionnaire was used to record data. The questionnaire included socio-demographic characteristics such as age, gender, occupation, socio economic status, marital status, literacy status, height, weight, physical activity, food habits, lifestyle habits like smoking and alcohol and family history of Diabetes. Height and weight were recorded using standardized methods.[9]Socio-economic status was classified using modified B.G. Prasad scale 2019. BMI was calculated using quetelet index. Blood pressure was recorded in the sitting position in the left upper arm using the electronic OMRON-HEM 7120 machine (Omron Corporation, Tokyo, Japan). The study subject was asked to sit quietly and rest for 15 minutes with his/her legs uncrossed and three readings were taken with a minimum interval of 3 minutes and the mean of the second and third reading was taken as the blood pressure and are classified basing on JNC VII criteria.[10,11]The study participants were asked to be on fasting at least for a period of 8 hours before the testing was done. The FBS was estimated by taking capillary blood using a glucometer [12](One Touch Ultra, Lifescan, Johnson & Johnson, Milpitas, CA).

Ethical issues

Ethical clearance was obtained from the institutional ethical committee prior to the start of study. Written informed consent was obtained after explaining the importance of the study in detail. Questionnaire does nothave any identification details of the participant and confidentiality was maintained throughout the study.

Statistical analysis

Data entry and statistical analysis was done using SPSS v 16 (trial version). The results were explained in simple proportions. Difference between groups was assessed using chi square test for their statistical significance. P value less than 0.05 was considered significant.

Results & Discussion

The mean (SD) age of the study population was 40.35 +13.309 years. The prevalence of diabetes is about 22.6% of the study subjects of whom 11.9% are known and 10.7% are newly diagnosed. (Table 1)The results were closely related to the findings of Asraret. al., [13] Menon et. al., [14] Gupta et. al., [15] and Ramchandranet. al., [16]The prevalence was a little higher compared with the findings of Prabakaran et. al., [17] , Mohan et.al., [18] and Anjana et.al., [19]. The high prevalence of diabetes in the study area could be attributed to cultivation of commercial crops and industrialization of the area. The mean BMI for male participants in the study was 23.78+4.63 and for female participants was 24.25+5.23.The study observed an overall prevalence of hypertension to be 28.71% (201).Gender wise distribution of the population in the study is such that 306 (43.6%) being males and 394 (56.4%) being females. Majority of the study participants were Hindus ie; 63% , followed by Christians 25.1% and Muslims 11.9%. Majority of the

study participants were married ie; 80.3% of them. 10.1% of the participants were widowed and 0.9% of the participants were separated. 8.7% were unmarried study participants. 43.7% of the widowed, turned out to be diabetic.24.3% of the study population constitute farmers and 17.9% of the participants were daily laborers working in farms or industries. 35% of the participants constitute house wives, dependents and unemployed. 8.4% of the participants were employees and 4.4% of the participants were into business. Whereas rest of the 10% of the participants are into their familial occupations.The risk of diabetes is highly significant with increasing age, occupation, socio economic status, marital status and literacy status of the study subjects.(Table 2)The prevalence of diabetes was observed to be reducing with increase in educational standards. This could be due to increase in awareness about the risk factors in the educated persons. The risk of type 2 diabetes is almost nil in young individuals who are unmarried. Whereas the risk is very high for diabetes in unemployed, house makers and dependents who are leading a sedentary life. Risk is also observed to be almost nil in class 5 socio economic status individuals.(Table 2)The prevalence of diabetes was significantly low in high socio economic groups and this finding is in contrast to all the studies. This could be due to low sample size of class V socio economic group. The relation between diabetes and socio economic status has showed high statistical significance in the study. Only 17.3% of the study participants are smokers. Females in the study area do not smoke whereas 1% of them are passive smokers. Only men in the study participants smoke (121 out of 306) ie; almost 39.5% of the men have the habit of tobacco usage. 11.7% of the total study participants are alcoholics. Only men in the study area consume alcohol (82 out of 306) ie; 27% of the men. 35.4% of the study subjects had the habit of daily consumption of coffee.Majority of the study participants (39.9%) have moderate physical activity at home and work, while 38% of the participants have mild physical activity at home and work and 6.2% of the participants have vigorous physical activity. 15.9% of the study participants were leading a sedentary life style.All the study participants have the habit of consuming vegetables daily in their diet. 94.7% of the study participants take mixed diet, whereas 5.3% of them are strict vegetarians. 32.3% of the study participants have the habit of including at least one fruit in their daily meal and 27.1% of the study participants consume a fruit at least once in a week, whereas the rest 40.6% of the study participants consume fruits occasionally.68.1% of the study participants do not have any family history of D.M, whereas 14% of these presented with diabetes. 17.1% of the study participants had at least one diabetic parent and of these 29.2% presented with diabetes. 3.5% of the study participants had both diabetic parents and of these 70.8% presented with diabetes. 9% of the study participants had diabetic siblings and of these 47.6% of them presented with diabetes, 2.3% of the study participants had either/both parents and siblings with diabetes and of these 56.2% presented with diabetes. There was significant association between diabetes and coffee consumption, fruit consumption, obesity, waist circumference, increasing age, physical inactivity, family history and status of hypertension which is almost similar in all the above studies. The relation between diet, life style, family history and status of diabetes among study participants is shown in Table 3.

Table 1: Status of Diabetes Mellitus in study subjects

STATUS OF DM	No. OF SUBJECTS	PERCENTAGE
Normal	542	77.4
Known DM	83	11.9
Newly Diagnosed DM	75	10.7
TOTAL	700	100.0

TABLE 2: Socio demographic profile of the study participant's v/s status of DM

	FBS			Chi-Square value	P-value
	Normal	IFG	DM		
Age	%	%	%		
18-24	93.50%	6.50%	0%	174	<0.01
25-34	66.40%	18.10%	15.40%		
35-44	50.30%	23.30%	26.40%		
45-54	36.00%	21.60%	42.40%		
55-65	29.30%	22.00%	48.80%		
Sex					
Male	64.40%	13.10%	22.50%	7.21	0.027
Female	56.90%	20.60%	22.60%		
Occupation					
Unemployed/HouseMaker/ Dependant	42.90%	23.30%	33.90%	67.37	<0.01
Daily Laborer	67.20%	24.00%	8.80%		
Farmer	69.40%	10.00%	20.60%		
Employee	72.90%	6.80%	20.30%		
Business	58.10%	22.60%	19.40%		
Others	75.70%	8.60%	15.70%		
Socio Economic Status					
Class 1	51.00%	17.20%	31.70%	21.91	<0.01
Class 2	57.70%	18.70%	23.70%		
Class 3	64.50%	19.50%	16.00%		
Class 4	69.60%	7.60%	22.80%		
Class 5	100.00%	0%	0%		
Marital Status					

TABLE 2: Socio demographic profile of the study participant's v/s status of DM

Unmarried	96.70%	3.30%	0%	70.42	<0.01
Married	60.50%	17.10%	22.40%		
Divorced	66.70%	16.70%	16.70%		
Widowed	25.40%	31.00%	43.70%		
Literacy Status					
Illiterate	53.80%	21.80%	24.40%	22.87	0.01
Primary	55.90%	17.10%	27.10%		
Secondary	63.50%	15.70%	20.80%		
Higher Secondary	62.50%	14.30%	23.20%		
Graduate	77.60%	12.10%	10.30%		
Post Graduate	89.50%	0%	10.50%		
Total	60.10%	17.30%	22.60%		

Table 3: Dietary Habits, Lifestyle, Family history v/s Status of DM

	FBS			**Chi-Square value**	
Habit Of Tobacco Usage	**Normal**	**IFG**	**DM**		
	%	**%**	**%**		
Yes	57.90%	17.40%	24.80%	3.04	0.55
No	60.70%	17.50%	21.90%		
Passive Smoking	57.10%	0%	42.90%		
Habit Of Alcohol Usage					
Yes	61.00%	18.30%	20.70%	0.2	0.9
No	60.00%	17.20%	22.80%		
Frequency Of Coffee Consumption					
No	66.40%	16.70%	16.90%	25.84	<0.01
Daily	51.20%	16.10%	32.70%		
Occasional	57.40%	25.00%	17.60%		
Frequency Of Fruit Consumption					
Daily	65.50%	18.60%	15.90%	17.4	<0.01
Weekly	65.30%	15.30%	19.50%		
Occasional	52.50%	17.60%	29.90%		
Frequency Of Meat Consumption					

Cont... **Table 3: Dietary Habits, Lifestyle, Family history v/s Status of DM**

No	37.80%	27.00%	35.10%	9.86	0.13
Daily	66.70%	16.70%	16.70%		
Weekly	61.80%	16.30%	21.90%		
Occasionally	54.10%	24.30%	21.60%		
Frequency Of Sweet Consumption					
No	46.90%	12.50%	40.60%	17.12	<0.01
Daily	73.70%	8.80%	17.50%		
Weekly	71.60%	9.00%	19.40%		
Occasionally	58.10%	19.50%	22.40%		
BMI					
Under weight	84.10%	7.90%	7.90%	80.94	<0.01
Normal	68.30%	13.80%	18.00%		
Over weight	51.80%	17.50%	30.70%		
Obese	25.80%	37.60%	36.60%		
Physical Activity					
Sedentary	27.00%	19.80%	53.20%	99.99	<0.01
Mild	56.40%	22.20%	21.40%		
Moderate	74.60%	12.50%	12.90%		
Severe	75.00%	11.40%	13.60%		
Blood Pressure					
Normotensive	78.40%	11.90%	9.70%	134.3	<0.01
Pre hypertensive	61.10%	20.60%	18.30%		
Hypertension	30.30%	22.90%	46.80%		
Family History Of DM					
No	71.90%	14.00%	14.00%	127.6	<0.01
Either Parent	50.00%	20.80%	29.20%		
Both Parents	12.50%	16.70%	70.80%		
Siblings	17.50%	34.90%	47.60%		
Parents+Siblings	25.00%	18.80%	56.20%		
Total	60.10%	17.30%	22.60%		

Conclusion

The prevalence of Diabetes is increasing at an alarming rate even in rural population and nearly half of them aren't aware of their diabetes status. Diabetes when detected early can prevent lot of complications and improve the quality of life of the individual. The people should be educated in knowing the early signs and symptoms of diabetes, importance of physical activity, good dietary practices and get screened for

the condition at least once in every six months to diagnose the condition at very early stage.

Conflicts of Interest: Nil

Source of Funding: Self

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