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Study of prevalence of diabetes mellitus in the rural areas of Hubballi, Karnataka, India

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ABSTRACT

Background: India is largely a rural nation. The prevalence of diabetes in the rural areas is increasing. The prevalence data is mainly available for urban areas and insufficient data is available for rural areas. Aims and objectives: To estimate the prevalence of diabetes mellitus in rural areas of Hubli taluk, Karnataka, India and also to assess the risk factors associated.

Methods: One village was selected randomly in the taluk. Information was gathered on demographics, personal history, past history, family history of diabetes mellitus and hypertension, life style practices and other parameters pertinent to the study objectives. Blood pressure was recorded and anthropometric data was collected. FBS was recorded and WHO criteria was used for diagnosis.

Results: 15.6% are known diabetic and 84.4% were non diabetic. According to IDRS risk scores, 6.4% subjects belonged to low risk category, 34.9% belonged to medium risk category and 58.7% belonged to high risk category. 11% of people were under weight, 40.4% were normal, 22% were overweight, 22.9% were pre obese and 3.7% are obese. 77.1% of people have normal FBS values, 8.3% had impaired glucose tolerance and 14.7% had impaired fasting glucose. There was significant difference in the mean FBS values (p=0.0001) and mean IDRS risk score (p=0.031) of Normal subjects, Pre-diabetics and Diabetics on ANOVA test.

Conclusions: The total prevalence of Diabetes in the study was 22%. There was significant relationship between the family history of Diabetes among diabetics and non-diabetics (p=0.036).

Keywords: Prevalence, Diabetes mellitus, IDRS risk score, Pre-diabetes

INTRODUCTION

Currently more than 62 million people in India are living with Diabetes. India is now gaining the status of a potential epidemic of diabetes. In 2000, India with the diabetic population of 31.7 million topped the world with the highest number of people with diabetes. This was followed by China occupying the second position with 20.8million diabetics and US occupying the third position with 17.7 million population with diabetes.

India is largely a rural nation. Since more number of studies are done in urban areas, the prevalence data is mainly available for urban areas and insufficient data is

available for rural areas.² Few studies have shown there is increasing diabetes burden in the rural areas and the increasing prevalence of the assumed risk factors for glucose intolerance and diabetes. The reason for this increasing diabetes burden is attributed to modernization and urbanization.³ Majority of the population in India reside in the rural areas approximately 742 million. Hence, the estimation of the prevalence of diabetes in rural India becomes crucial from the point of view of designing the strategies to halt the rising prevalence of diabetes.⁴

Few studies done in India have expressed their concern over rural population. Mininarayan et al., at Tamaka village of Kolar showed a prevalence of 10%.⁵ Little et al., in a rural community in south India showed prevalence of 10.8%.³ Ghorpade et al., at rural Pondicherry found T2DM prevalence of 5.8%.⁶ The ICMR INDIAB study showed rural prevalence of T2DM in rural Tamil Nadu as 7.8%, Maharashtra 6.5%, Jharkand 3%, Chandigarh 8.3%.⁷ This shows that the prevalence of T2DM is more in the South India compared to the North India.

Since, there are less prevalence studies done in rural population and in this part of Karnataka (North Karnataka), we took up this study on prevalence of Diabetes in rural areas of Hubballi taluk with the objective to estimate the prevalence and also to assess the risk factors associated.

METHODS

This was a cross-sectional study done from May to June 2016. Ethical clearance was obtained from institutional ethical committee. Hubballi taluk has many villages out of which, Hebsur village was picked up by simple random sampling. Taking the prevalence of rural women as 5.1% (which was lower than rural men) from the National Family Health Survey-4, 2015 -16, State Fact Sheet Karnataka, error of 5%, the prevalence was 74.14 and adding 10% dropout, it was calculated to be 82. However, 109 subjects were included.⁸

In the study people aged more than 18 years and gave consent were included. Pregnant women, less than 18 year old and those who couldn't come for FBS next day morning/came having tea or breakfast were excluded. The village map was obtained from Gram Panchayat. First house was selected randomly and after that every 5th house was selected. When visited their residencies, the subjects were interviewed to gather information on demographics, personal history, past history, family history of diabetes mellitus and hypertension, life style practices (smoking, tobacco chewing, alcoholism, diet) and other parameters pertinent to the study objectives.

The patients BP were also recorded using Omron BP apparatus (model 7130). Subjects were asked to visit our camp site next day morning without having food and beverages (nil by mouth), and their FBS was recorded that morning. Anthropometric measurements like height, weight, waist and hip circumference) were taken. BMI and IDRS risk scores were calculated for all the subjects. The Omron digital BP apparatus was used to measure blood pressure of the subjects. The Accu check active glucometer was used to measure Fasting blood glucose.

The WHO guidelines were used for diagnosis of diabetes cases. If the FBG lies between 110 to 125 mg/dl then defined as having pre diabetes, more than 126 mg/dl considered as diabetic. Subjects with more than referred normal values for FBS and BLOOD PRESSURE were informed and referred to KIMS Hubballi. All the subjects

were given health education on the causal and preventive aspects of diabetes.

Data analysis

Data collected was entered in MS-Excel 2007 and analyzed using SPSS 21. Fisher exact test, Independent sample t test and ANOVA tests were done.

RESULTS

A total of 109 individuals were interviewed and FBS was done next day morning. 61.5% were males and 38.5% were females. 33.9% were illiterate, 17.4% primary school, 21.1% middle school, 17.4% high school, 8.3% intermediate/puc/diploma, 0.9% graduates and 0.9% post graduates. 55% of them were farmers, 18.3% were unemployed, 11.9% were unskilled workers, 2.8% were semiskilled, 4.6% skilled, 6.4% were semiprofessional, 2.8% were semiskilled and 0.9% were professional. 87.2 % were married, 5.5% unmarried and 7.3% were widows. 45.9% were tobacco consumers and 54.1% were non consumers. 39.1% of them were consuming tobacco daily, 6.4% occasional. 94.5% were non smokers and 5.5% were smokers. 2.8% of them smoked daily and 3.6% occasional. 11% of the study subjects consumed alcohol. 1.8% of them take alcohol daily, 9.2% occasional. 54.1% of the people were vegetarians and 45.9% were having mixed diet.

54.1% of the people consumed fruits for 1-2 times per week, 31.1% people consumed 3-5 times per week, 8.3 % people had fruits for 6 and more times per week, 6.4 % people took fruits rarely. 3.7% people had vegetables in their diet for 1-2 times per week, and 12.8% people had vegetables in their diet for 3-5 times per week, 82.6% people had vegetables in their diet for 6 and more times per week and 0.9% consumed vegetables rarely. 72.5% people never had outside food or rarely ate outside food, 16.5% people had outside food for 1-2 times per month, 6.4% people had outside food for 1-3 times per week, 4.6% had 4-6 days/week and none ate outside food daily.13.8% people had sedentary life style, 33.9% of people did light amount of physical activity, 52.3% people did strenuous amount of physical activity. 23.9% people did regular exercise, 76.9% were not doing any kind of exercise regularly.

15.6% are known diabetic and 84.4% were non diabetic. 3.7% of people had family h/o diabetes in either parent, 0.9% among both parents and 95.4% don't have any family h/o diabetes. According to IDRS risk scores, 6.4% subjects belonged to low risk category, 34.9% belonged to medium risk category and 58.7% belonged to high risk category.

11% of people were under weight, 40.4% were normal, 22% were overweight, 22.9% were pre obese and 3.7% are obese. 77% of people have normal FBS values, 8.3% had impaired glucose tolerance and 14.7% had impaired

fasting glucose. In the study sample, 15.6% were old diabetics. 6.4% were newly detected by Fasting Blood Glucose. Hence, the total prevalence of Diabetes in the study was 22%. The prevalence of Pre-Diabetes was 6.4%.

The mean±SD FBS of Normal subjects were 88.91±9.0mg/dl. The mean±SD of Pre-diabetics was 115.14±4.337mg/dl. The mean±SD FBS of Diabetics was

161.58±75.229. There was significant difference in the mean of the 3 groups on ANOVA test (p=0.0001) (Table 1). The mean±SD of IDRS scores of Normal subjects was 51.92±18.16. The mean±SD of Pre-diabetics was 54.4±11.33. The mean±SD FBS of Diabetics was 62.50±13.27. There was statistical significant difference in the mean of the 3 groups on ANOVA test (p=0.031). (Table 2).

Table 1: Comparison of fasting blood glucose values of normal, pre-diabetics and diabetics.

	Number	Mean	Standard deviation	Standard error	Significance
Normal	78	88.91	9.005	1.020	0.0001
Pre-diabetics	24	115.14	4.337	1.639	- 0.0001 - Significant
Diabetics	7	161.58	75.229	15.356	Significant

Table 2: Comparison of IDRS scores of normal, pre-diabetics and diabetics.

	Number	Mean	Standard deviation	Standard error	Significance
Normal	78	51.92	18.166	2.057	0.021
Pre-diabetics	24	54.40	11.339	4.286	- 0.031 Significant
Diabetics	7	62.50	13.270	2.709	- Significant

There were 0.9% diabetics in age group of <35years, 3.6% in age group 35-49 years and 17.43% in \geq 50 years age group. There was no statistically significant difference between the age groups (χ^2 = 3.593, p = 0.174) (Table 3). 13.7% of males were diabetics and 8.3% of females were diabetics and there was no statistically significant difference between males and females. (χ^2 =0.014, p = 0.90) (Table 4).

Table 3: Distribution of diabetics and non-diabetics according to age.

Age (years)	Non-diabetics	Diabetics	P value
<35	12	1	0.2 (Not
35-49	23	4	significant) $\chi 2 = 3.593$

Table 5 and 6 shows that there was no significant difference in the mean of variables like age, weight, BMI, systolic blood pressure and diastolic blood pressure,

fasting blood glucose, IDRS scores and waist to hip ratio among diabetics and non-diabetics. Table 7 shows the comparison of various risk factors between diabetics and non-diabetics. Tobacco consumption had odds ratio of 1.2(95% CI 0.49, 3.1) and smoking 1.4(95%CI: 0.16, 12.9). Odds ratio of BMI was 1.6(95%CI 0.6, 4.1). Odds ratio for BP was 1.88(95%CI 0.74, 4.75). There was statistically significant relationship with family history of DM among diabetics & non-diabetics (p=0.031). There was statistical significant difference in FBS values between diabetics and non-diabetics (p=0.0001).

Table 4: Distribution of diabetics and non-diabetics according to sex.

Sex	Non-diabetics	Diabetics	P value
Male	52	15	0.90 (Not significant) $\chi 2 = 0.014$

Table 5: Mean difference between non-diabetics and diabetics of the parameters in males.

Males	Normal	Diabetics	P value	SE difference
Age	50.34±12.62	57.93±8.20	0.032	3.46
Weight	60.01±11.85	61.33±10.30	0.699	3.38
BMI	22.38±3.80	22.56±3.50	0.869	1.09
SBP	132.34±22.76	144.53±23.46	0.074	6.71
DBP	85.23±12.60	84.40±12.56	0.823	3.69
FBS	91.50±13.01	158.53±82.60	0.0001	11.73
IDRS	50.0±18.68	60.66±14.37	0.045	5.22
WHR	0.96±0.079	0.99 ± 0.054	0.178	0.021

Table 6: Mean difference between non-diabetics and diabetics of the parameters in females.

Females	Normal	Diabetics	P value	SE difference
Age	49.12±12.44	52.77±10.80	0.428	4.56
Weight	50.18±8.94	57.66±7.96	0.029	3.29
BMI	22.59±3.39	25.22±4.48	0.061	1.36
SBP	138.84±21.85	134.77±13.18	0.599	7.67
DBP	88.9±10.74	84.77±7.77	0.289	3.84
FBS	90.39±8.13	166.66±65.43	0.0001	11.34
IDRS	55.45±15.63	65.55±11.30	0.078	5.59
WHR	0.92±0.072	0.96±0.052	0.139	0.026

Table 7: Comparison of various risk factors in diabetics and non-diabetics.

Variables		Non-diabetics	Diabetics	P value
Sex	Male	52	15	1
sex	Female	33	9	1
	<35	12	1	
Age(years)	35-49	23	4	0.2
	≥50	50	19	
CEC	Upper& Middle	34	10	1
SES	Lower	51	14	1
	Illiterate	28	9	
Education	Primary/Medium/High School	48	13	0.943
	Semiprof/Profession	9	2	
	Unemployed	16	4	
0	Unskilled/Semiskilled/Skilled	17	4	0.002
Occupation	Farmers/Clerical/Shop	46	14	0.983
	Semiprof/Profession	6	2	
M	Married	72	23	0.207
Marital status	Unmarried/Widow	13	1	0.297
m 1	Yes	40	10	0.017
Tobacco consumption	No	45	14	0.817
G 1:	Yes	5	1	1
Smoking	No	80	23	1
	Yes	9	3	0.504
Alcohol	No	76	21	0.724
D' /	Vegetarian	43	16	0.175
Diet	Nixed	42	8	0.175
П '	0-2 times/week	51	15	1
Fruits	≥3 times/week	34	9	1
77 . 11	0-2 times/week	5	0	0.504
Vegetables	≥3 times/week	80	24	0.584
D. d. d.	Rarely (≤2times/month)	15	10	0.025
Restaurant	Frequently(≥1time/week)	70	14	0.025
E 'l l' CDM	Either parent/Both parent	2	3	0.026
Family history of DM	None	83	21	0.036
Dhi14::4	Sedentary/Light	37	15	0.112
Physical activity	Strenuous	48	9	0.112
DMI	Underwight/Normal	46	10	0.257
BMI	Overweight/Obese	39	14	0.357
IDRS	Low risk	6	1	
	Moderate risk	33	5	0.178
	High risk	46	18	
	<110	78	6	
FBS	110-125	7	2	0.0001
	≥126	0	16	
BP	Normotemsives	45	9	0.182
DF	Hypertensives	40	15	0.182

DISCUSSION

In the study, the prevalence of diabetes is found to be 22% which is quite high.15.6% of the study subjects were known diabetics and 6.4% were newly detected based on Fasting blood glucose values. 13.7% of diabetics were males and 8.25% were females. 0.9% diabetics were in <35 year's age group, 3.6% in the 35-49 year's age group and 17.4% were in the \geq 50 year's age group. The prediabetes prevalence is 6.4%.

In a study done by Muninarayana et al on prevalence of DM in rural Tamaka, Kolar, there were 54% females and 46% males, 47% illiterates and 56.3% literates. The prevalence of Diabetes in their study was 10% out of which 71% were males and 29% were females, more males compared to females. In our study, there were 61.5% males and 38.5% females i.e., more number of males participated in our study compared to Muninarayana et al. 33.9% in our study were illiterates and 66.1% literates. The prevalence of diabetes was 22% in our study. 62.5% males and 37.5% females which is comparable to our study.

A study done by Mathew Little et al in a rural community of South India, the mean age of the Normoglycemia, Prediabetes, Newly detected Diabetes and Diagnosed Type 2 Diabetes subjects was 46 ± 14.8 , 48.7 ± 14.1 , 50.5 ± 13.8 and 54.1±12.1 years respectively (p=0.001). Whereas in our study, it was 49.58±12.75, 53.57±9.74, 50±13.55 and 58 ± 6.94 (p=0.05).³ The mean BMI of the above mentioned 4 categories in order in Little et al., study was 21.2 ± 4 , 23.1 ± 3.9 , 24.5 ± 4.6 and 25.3 ± 4.6 (p= <0.001) where as in our study the mean BMI of Normoglycemia, Pre-diabetes, Newly detected Diabetes and Diagnosed Type 2 Diabetes subjects was 22.57±3.67, 21.25±3.01, 23.56 ± 3.40 and 23.56 ± 4.29 respectively (p= 0.493). The mean WHR of Normoglycemia, Pre-diabetes, Newly detected Diabetes and Diagnosed Type 2 Diabetes subjects in Little et al., study was 0.87±0.077, 0.90 ± 0.075 , 0.93 ± 0.10 and 0.92 ± 0.06 respectively(p=<0.001) whereas in our study it was 0.92 ± 0.68 , 0.93 ± 0.05 , 0.94 ± 0.03 and 0.99 ± 0.05 respectively(p=0.035).

In a study done by Madaan H et al. on prevalence of Diabetes in rural Sonepat district of Haryana. ⁴ 18.43% were found to be having diabetes. Gender specific prevalence in males was 19.36% and females 16.98%. Of the total diabetics, 64.03% were males and 35.97% were females which is comparable and similar to our study.

A study by Ghorpade et al. on diabetes in rural Pondicherry estimated a prevalence of 5.8%.⁶ Similar study by Wenying Yang et al., on Prevalence of diabetes in China found the prevalence in rural areas to be 8.2%. ICMR–INDIAB study estimated the rural diabetes prevalence in Tamil nadu to be 7.8%. The higher prevalence in our study could be explained by the inclusion of more number of already diagnosed subjects

during systematic sampling and the smaller sample size of the study.

The mean age and BMI of females among non-diabetics and diabetics (47 ± 14.91 and 55.88 ± 12.87 years; 22.43 ± 4.60 and 23.50 ± 4.90 kg/m²) and of males among non-diabetics and diabetics (50.95 ± 16.80 and 56.99 ± 12.45 yrs; 21.38 ± 3.87 and 22.63 ± 4.57 kh/m²) of a similar study done by Rajput et al. in the rural blocks of Haryana is comparable to the results of our study. ¹⁰

Limitations

The sample size in the study was small. Only one village was involved in the study. The Post prandial blood test was not done.

CONCLUSION

15.6% were old diabetics. 6.4% were newly detected by Fasting Blood Glucose. Hence, the total prevalence of Diabetes in the study was 22%. The prevalence of Pre-Diabetes was 6.4%. There was significant relationship between the family history of Diabetes among diabetics and non-diabetics (p=0.036). There was significant difference between the mean FBS (p=0.0001) and mean IDRS risk score (p=0.031) among non-diabetes, pre-diabetes and diabetes.

Recommendations

Diabetes is an iceberg disease. We noticed a high prevalence in the rural area. More should be done in the rural areas with larger sample size to find out the prevalence of diabetes in the rural areas which is most neglected. Vegetables and fruits should be consumed daily. The inclination towards sedentary lifestyle should not be there. Healthy lifestyle practices (physical activity, consuming fruits and vegetables daily, avoidance of tobacco consumption, alcohol consumption etc.) should be followed.

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