

STUDY OF PREVALENCE OF DIABETES MELLITUS AND IMPAIRED FASTING GLUCOSE IN A RURAL POPULATION

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ABSTRACT

There are wide variations in prevalence rate of diabetes mellitus in various parts of our country. Recent reports from PODIS representing a survey of large number of people from rural as well as urban population of India, reported that prevalence of diabetes and impaired fasting glucose (IFG) is lower in rural population compared to the urban population. However, the information on prevalence of diabetes in rural areas especially from different parts of the country is required for planning preventive and therapeutic strategies. The main aim of the present communication is to estimate the prevalence of diabetes mellitus and IFG in Suttur Village, Karnataka State. A cross sectional survey was carried out in this village to estimate the prevalence of diabetes and IFG. Blood samples were collected with a minimum of eight hours fasting. Estimation of blood sugar was done by GOD/POD method. The ADA 1997 criteria was adopted for diagnosis of impaired fasting glucose (IFG) and Diabetes mellitus (DM) The prevalence rate (percent) of diabetes mellitus for persons above the age of 25 years was 3.77%. The prevalence in males was 4.58% and in females it was 2.66%. Impaired fasting glucose was 2.82% in male and 2.78 % in female. The maximum prevalence was observed in the age group of 56 to 65 in both males and females. There was no significant difference in the prevalence of IFG among the three different communities; the study has highlighted the association of age, sex and community, with prevalence of diabetes.

Key words: Type-2 diabetes; Impaired fasting glucose; Prevalence.

INTRODUCTION

Prevalence of diabetes mellitus and impaired fasting glucose are reported to be highly variable among rural and urban population in India. Numbers of epidemiological studies with varying samples sizes have reported prevalence of diabetes at different geographical areas ranging from 1.6% to 12.4% (1-3). The present study is planned to look in to the

prevalence of diabetes mellitus and IFG in a rural population, which comprised of three different communities with distinct differences in cultural practices, food habits and physical activity.

The study was carried out in Suttur village situated 24 km south-east of Mysore city in Karnataka. The village had a total population of 4365 with three major communities, who practiced slightly different cultural practice, food habits and physical activity pattern. Suttur village is adopted by JSS Medical College of Mysore for health care purpose. Ninety percent of the population stays at Suttur village proper and majority of these are involved in agricultural works. A Project called "Model health village programme of Suttur (MHVPS)" was initiated and a health survey of entire population was undertaken to record the base line health status of the population. The material for this study was drawn from MHVPS data.

MATERIAL AND METHODS

The persons aged above 25 years were included in the study. The health data and collection of blood sampling was done by house-to-house visit by team of doctors and trained technicians. The eligible persons (persons above the age of 25 years) were requested to remain fasting till the blood sample was drawn. Blood sampling was done with minimum of 8 hours fasting. Trained personnel collected blood samples using vacutainers and were immediately transported to biochemistry laboratory of JSS Medical College. The plasma glucose was estimated by using semi auto-analyzer with GOD/POD method. The study was carried out during Jan 2004-Jan 2005.

Diagnosis of diabetes mellitus was based on ADA 1997 criteria (4). The persons with fasting blood sugar with ≥ 126 mg% were classified as diabetes mellitus. Impaired fasting glucose was diagnosed if the blood glucose ranged between 111-125 mg%. The study also classified IFG according to ADA 2003, with blood glucose of 101-125mg%.

χ^2 tests was utilised to study the significant differences between groups.

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RESULTS

Total population of Suttur village was 4365, 2158 persons were above the age of 25 years, the study covered 1961 (91%) with 991 male and 970 females. (Table 1)

Table 1: Study Coverage According to Sex

Sex	Persons above age 25 years in study population	Persons above 25 years of age covered in the study	Percentage of persons covered in the study
Male	1083	991	91.51
Female	1075	970	90.28
Total	2158	1961	90.87

The age and sex distribution of the persons covered in the study showed a declining trend in the age distribution with advancement in age in both males and females the sex ratio was 978 females per 1000 males (Table 2).

Table 2: Age and Sex Distribution of Persons Covered in the Study

Age(years)	Male		Female		Total	
	No.	Percent	No.	Percent	No.	Percent
25-35	378	38.14	402	41.44	780	39.78
36-45	259	26.14	227	23.40	486	24.78
46-55	152	15.34	144	14.85	296	15.09
56-65	112	11.30	111	11.44	223	11.37
66+	90	9.08	86	8.87	176	8.98
Total	991	100.00	970	100.00	1961	100/00

The prevalence of diabetes mellitus with blood glucose of more than 126 mg was 3.77 % among the persons above the age of 25 years. It was 4.58% among male and 2.66% among female. Male to female ratio of prevalence was 1:0.58. There was significant difference in the prevalence rate between males and females (Table 2). The prevalence rate of IFG (111-125mg %) for the total persons covered was 2.80% with 2.82% in males and 2.80% in females which was not significantly different ($p > .05$). There was no significant difference in the prevalence of diabetes mellitus and IFG when both the sexes were combined, however among males the significance was observed at 0.05 level ($p = .05$) (Table 3)

Table 3: Sex Specific Prevalence Rate (Percentage) of Diabetes and IFG (ADA: 1997 criteria)

Sex	Total	No. with DM	Prev. rate %	No with IFG (111-125 mg%)	Prev. rate %	P value
Male	991	45	4.58	28	2.82	$P = .05$
Female	970	26	2.66	27	2.78	$p > .05$
Total	1961	71	3.77	55	2.80	$p > .05$
DM: $\chi^2 = 4.86$ ($p < .05$)		FG: $\chi^2 = 0.01$ ($p > .05$)				

The age specific rates in diabetes mellitus indicated an increasing trend as age advances up to 56-65 years and there was a small drop in the prevalence rate for persons above 66 years of age. The maximum prevalence was observed in persons with 46-55 years of age. The age specific rate of IFG (111-125mg%) showed an increasing trend up to the age of 46-55 years and there was a drop in the prevalence rate in the age of 56-65 years with a slight increase in persons with age 66 years and above. There was significant difference in the prevalence with respect to age in both diabetes mellitus and IFG (111-125mg %). No significant difference was observed between the diabetes mellitus and IFG in any of the age groups (Table 4).

Table 4: Age Specific Prevalence Rate (Percentage) of Diabetes Mellitus and IFG (ADA: 1997 criteria)

Sex	Total	No. with DM	Prev. rate %	No with IFG (111-125 mg%)	Prev. rate %	P value
25-35	780	7	0.89	11	1.41	$p > .05$
36-45	486	19	3.90	16	3.29	$p > .05$
46-55	296	20	6.75	13	4.39	$p > .05$
56-65	223	17	7.62	8	3.58	$p > .05$
66+	176	8	4.54	7	3.97	$p > .05$
Total	1961	71	3.77	55	2.80	$p > .05$
DM : $\chi^2 = 35.01$ ($p < .01$)		IFG: $\chi^2 = 10.11$ ($p < .01$)				

As there was significant differences in age and sex in the prevalence rate of diabetes, the analysis was carried out to study whether there was any trend in the age and sex specific prevalence rates. It was

observed that except in the age group 46-55 which had significant difference ($p < .05$) other age groups did not indicate any significant differences in the age and sex (Table 5).

Table 5: Age and Sex Specific Prevalence Rate (Percentage) of Diabetes Mellitus (ADA: 1997 criteria)

Age (in yrs)	Male			Female			P value
	No. covered	No. with DM	Prev. rate (%)	No. covered	No. with DM	Prev. rate (%)	
25-35	378	05	1.32	402	2	0.49	> 0.05
36-45	259	14	5.40	227	5	2.20	> 0.05
46-55	152	15	6.57	144	5	3.47	< 0.05
56-65	112	08	7.14	111	9	8.10	< 0.05
66+	90	03	3.33	86	5	5.81	> 0.05
Total	991	45	4.58%	970	26	2.66%	

The age specific prevalence rate of IFG (101-125mg%), as per the criteria ADA 2003 indicated an increasing trend with age advancement up to 56-65 age group when both sexes were combined. There was no clear trend in the age specific prevalence rates in males and in females it was similar to both sexes combined. The maximum prevalence was observed in 56-65 years of age when both sexes were combined. A significant difference was observed between the age specific prevalence rates. No significant difference was observed between males and females (Table 6).

Table 6: Age Specific Prevalence Rate (Percentage) of Impaired Fasting Glucose (FBS: 101-125 mg %) ADA-2003

Age (in yrs)	Male			Female		
	No. covered	No. with DM	Prev. rate (%)	No. covered	No. with DM	Prev. rate (%)
25-35	378	09	2.38%	402	12	2.98%
36-45	259	18	6.94%	227	13	5.72%
46-55	152	9	5.92%	144	11	7.63%
56-65	112	8	7.14%	111	9	8.10%
66+	90	5	5.55%	86	7	8.13%
Total	991	49	4.9%	970	52	5.3%

Age: $\chi^2 = 14.16$ ($p < .01$)

Sex: $\chi^2 = 0.16$ ($p > .05$)

As mentioned earlier, the major three communities in Suttur village were Nayak, Veerashiva and others (SC/ST). The prevalence rate of diabetes mellitus ranged from 3.03% to 3.79% between the three communities which was found to be not significant ($p > .05$) similarly the prevalence of IFG (111-125mg %) ranged from 2.25% to 3.78% which was also not significant ($p > .05$). Excepting in the Veershiva community where there was a slight high prevalence rate in females than the other two communities. However, none of the differences between gender showed significance ($p > .05$) (Table 7)

Table 7: Community Specific Prevalence Rate (Percentage) of Diabetes Mellitus and IFG (111-125mg %)

Community	No. covered	No. with DM	Prev. rate (%)	No. with IFG (111-125mg%)	Prev. rate %
Nayak	844	32	3.79%	19	2.25%
Veerashaiva	396	12	3.03%	15	3.78%
Others(SC/ST)	721	26	3.60%	21	2.90%

DISCUSSION

According to WHO estimate, India has largest number of people with diabetes and the trend will continue in future (5). The available prevalence rate from different studies in our country cannot be extrapolated to the whole population as there is heterogeneity in our population with respect to cultural and behavioral practices. PODIS study data which is one of the largest epidemiological studies (1) provided the prevalence estimate of type 2 DM for the rural and urban population our country. The present study has estimated the prevalence of diabetes and IFG in a rural population. Suttur village has three different communities which practiced different cultural practices and dietary habits. With use of 1997 ADA criteria, this study showed a prevalence of 3.77% and IFG prevalence of 2.8%. The age standardized rate with respect to 1991 population age distribution for the present study was 3.9%, this prevalence is higher when compared to prevalence rate shown in PODIS data. Globally there are more women with diabetes than men. Recent studies have estimated that there are 73 million females with diabetes compared to 62 million males (6). In contrast to this, in the present study, males had a significantly higher prevalence compared to females. It was 4.58% in male when compared to 2.66% in females, whereas in PODIS

there was no significant gender difference. The observed difference in gender needs to be explored with further studies. The prevalence rate of IFG was almost equal in females (2.78%) and males (2.82%) and is similar to PODIS study. When IFG was considered with revised criteria at blood sugar range of 101-125mg%, the overall prevalence was 5.1% and marginally higher in females (5.3%) when compared to males (4.9%). A Study from suburb of Mumbai reported 5.9% prevalence with WHO criteria (7).

The prevalence rate of DM among the different communities of the village was not significant.. It was least among other community. The female population of Nayaka and other community had lower prevalence of DM than the male counterparts, where as it was marginally higher among females of Veerashaiva community. One possible explanation is the females of Veerashaiva community do not sustain significant physical activities when compared to that of the other two communities who accompany the males to work in the fields.

This paper reports the prevalence of DM and IFG using ADA 1997 criteria. There could be 25% decrease in estimated prevalence by using the fasting ADA criteria as compared to using WHO criteria (1). The prevalence rate of known diabetics of 1.6% reported from Eluru (8) is not comparable as that study has observed prevalence of only known diabetics. The difference in the prevalence rate between PODIS data and our study may indicate variation in prevalence rates even among different group of rural population in our country. The present study used venous plasma sampling when compared to PODIS data where, meters and strips were used. This may or may not make any significant impact on prevalence. The higher prevalence of IFG among females when compared to males may indicate a possible increase in diabetes among females in future.

In conclusion, diabetes prevalence in a rural population was 3.77% and IFG 2.8% which is lower than reported from other studies involving urban population and is higher than reported for rural areas in PODIS study. The observation in the present study indicates the need of more studies from rural areas.

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