Original Research Article

A study to assess prevalence of diabetes mellitus and its associated risk factors among adult residents of rural Khammam

K. Nithesh Kumar[1], Sushma Katkuri[2]*, I. Ramyacharitha[3]

Department of Community Medicine, [1]Mamata Medical College, Khammam, [2]Malla Reddy Institute of Medical Sciences, [3]Private Hospital, Hyderabad, Telangana, India

*Correspondence:
Dr. Sushma Katkuri,
E-mail: katkurisushma@gmail.com

ABSTRACT

Background: Type 2 diabetes mellitus is a chronic, debilitating disease characterized by insulin resistance, impaired insulin secretion and hyperglycemia. It represents more than 90% of total prevalence of diabetes in the world and is responsible for 9% of the global mortality corresponding to four million deaths per year. The objective of the study was to assess the prevalence of diabetes mellitus type-2 in a rural population of age 30 years and above.
Methods: A community based cross sectional study carried out in population 30 years and above in rural area of Khammam district in Telangana during the study period from 1st January to 31st December 2015. A total of 910 persons aged 30 years or more were included in study.
Results: Near about 74 (8.1%) were diagnosed as type -2 diabetes mellitus. The prevalence of DM was 16.22% in 30-40 years age group, 24.32% in 41-50 years age group, 43.34% in 51-60 years age group and 16.2% in 61-70 years age group which shows that DM increases with age and the association between age and prevalence of type 2 DM was found to be statistically significant.
Conclusions: There is a need to increase awareness of type–2 diabetes mellitus in the general population. Health education should be given in terms of risk factors of diabetes. They should be made aware about early screening methods.

Keywords: Diabetes mellitus, Risk factors, BMI, Hypertension

INTRODUCTION

According to the International Diabetes Federation (IDF), the number of people globally with type 2 diabetes mellitus (T2DM) will increase to 552 million by 2030, over twice the number in 2000.[1] Nearly 21% of these new cases will be from India, which has the highest number of cases in any country.[1] India currently has 61.3 million diabetics, a figure that is projected to increase to 103 million by 2030.[2] Several studies from different regions of India have shown that prevalence of type 2 DM is increasing from 8.2% in 1992 to 18.6% in 2008 for urban areas, and from 2.4% in 1992 to 9.2% in 2008 in rural areas.[3] The rising prevalence in the developing countries is associated with industrialization, urbanization and socio-economic development indicating the role of not only genetic factors but also environmental factors like quality of life and life style.[4] Obesity is a significant risk factor of diabetes type 2. The association has been repeatedly demonstrated in the different studies.[5,6] Sedentary life style appears to be an important risk factor for the development of type-2 diabetes mellitus. Several prospective cohort study found that type 2 DM mellitus was almost 2.5 times as likely to develop in subjects with

hypertension as in subjects with normal blood pressure.[7-9] An upsurge in number of early-onset diabetes cases is also responsible for the development of various diabetic complications due to longer disease duration; however data on the prevalence on diabetic complications across the whole of India is scarce.[10-12]

The early identification of those person who are at-risk and appropriate intervention to increase physical activity, decrease central adiposity & changes in dietary habits could to a great extent help in preventing or delay in the onset of diabetes mellitus and thus reduce the burden due to its associated complications in India. There is also a need to improve knowledge and awareness about diabetes mellitus in rural as well as urban areas through various IEC activities.

Aims and objectives

1. To determine the prevalence of diabetes mellitus type-2 in a rural population of age 30 years and above
2. To study the association of various risk factors with diabetes mellitus type-2.

METHODS

A community based cross sectional study carried out in population 30 years and above in rural area of Khammam district in Telangana during the study period 1st January to 31st December 2015. The prevalence of type-2 diabetes mellitus in rural population of India is 5.2% reported by WHO. Based on this the sample size was calculated by adopting the formula.

Where P=prevalence rate of the disease, $\sum$ = allowable error 20% of P. After adopting this formula with degree of confidence 95%, the total sample size calculated was 876.

Houses that are having at least one or more person of age 30 years and above were numbered serially. Then house survey was undertaken by systematic random sampling technique. The final sample includes 910 individuals with 461 men and 449 women after selective screening methodology. All the information was recorded in the pre-designed and pre-tested schedule. Consent was taken before taking blood samples, and the objective of the study was clearly explained in local language to the subjects. Study subjects were assessed using a standard questionnaire including information for socioeconomic status, physical activity (duration of work of >90, 60–90, 30–59, and <30 minutes per day as heavy, moderate, mild, and sedentary), diet, smoking, and alcohol intake. Anthropometric assessment (height, weight, and waist and hip circumference) was done. Blood pressure was taken after a 10-minute rest with standard cuffs for adults fitted with a mercury sphygmomanometer in sitting position. Blood pressure was taken twice (in a gap of 10

minutes) and average value was considered. A 12 hour fasting blood sample (10 ml, in two aliquots— one aliquot in EDTA and another without anticoagulant) was collected from each individual by venipuncture maintaining aseptic conditions. Diabetes mellitus was assessed by using fasting blood glucose and oral glucose tolerance test (OGTT). OGTT was performed using 75 gms of glucose in the field settings and diagnostic criteria laid by Indian Council of Medical Research (ICMR) were used to diagnose DM. Data was entered in SPPS 20 version software and analysis was done with proportions and chi-square test was used to assess the test of significance. Informed consent was taken from every study subject.

Table 1: Criteria of Indian Medical Council for diagnosis of diabetes mellitus.

Normal glycaemia	IFG/IGT	Diabetes Mellitus
FPG <110 mg/dl	FPG ≥110 and <126 mg/dl (IFG	FPG ≥126 mg/dl
2-h PG <140 mg/dl	2-h PG ≥140 and <200 mg/dl (IGT)	2 hour PG ≥200 mg/dl symptoms of diabetes and causal plasma glucose concentration ≥200 mg/dl

IFG: impaired fasting glucose; IGT: impaired glucose tolerance test; FPG: fasting plasma glucose; 2-h PG: 2-hour post load glucose test (oral glucose tolerance test).

RESULTS

In the present study the total sample size was 910 and out of these 74 (8.1%) were diagnosed as type -2 diabetes mellitus.

In the present study it was found that study subjects were aged between 18 and 82 years with a mean age of 40.46 ± 14.36 years and median age of 38.5 years. Out of 74 subjects who were diagnosed as diabetes among them 54% were males and 46% were females. In the present study the prevalence of DM was 16.22% in 30-40 years age group, 24.32% in 41-50 years age group, 43.34% in 51-60 years age group and 16.2% in 61-70 years age group which shows that DM increases with age and the association between age and prevalence of type 2 DM was found to be statistically significant. Among the diabetic subjects 75.7% were literate and 24.3% were illiterate and the association of Diabetes Mellitus and literacy was statistically significant.

Out of the total study subjects 51.17% were self-employed, 20.2% were Government employees, 2.6% were retired and 28.7% were unemployed. Among the total diabetics 64.9% self-employed, 10.8% Government employees, 5.4% were retired and 19% were

unemployed. It was observed that the prevalence of diabetes was more in self-employed and the association was statistically significant.

Table 2: Distribution of study participants with socio-demographic profile.

Variable		Type 2 DM (n=74) (%)	Normal (n=836) (%)	P<0.05
Sex	Male	40 (54)	421 (50.3)	p=0.47
	Female	34 (45.9)	415 (49.6)	
Age (years)	31-40	12 (16.1)	262 (32.7)	p=0.0016
	41-50	18 (24.3)	334 (39.9)	
	51-60	32 (43.2)	188 (23.4)	
	61-70	12 (16.2)	52 (6.5)	
Marital status	Married	56 (75.7)	582 (72.6)	p=0.5653
	Unmarried	3 (4.1)	177 (21.17)	
	Divorcee	12 (16.2)	22 (2.7)	
	Separate	3 (4.1)	55 (6.9)	
Type of family	Nuclear	62 (83.8)	721 (89.9)	p=0.1183
	Joint	12 (16.2)	115 (13.7)	
Literacy	Illiterate	18 ((24.3)	279 (34.8)	p=0.0094
	Literate	56 (75.7)	557 (66.6)	
Religion	Hindu	46 (62.1)	591 (70.6)	p=0.0885
	Muslim	6 (8.1)	108 (13.5)	
	Christian	16 (21.6)	92 (11)	
	Others	6 (8.1)	45 (5.6)	
Occupation	Self employed	48 (64.9)	415 (51.7)	p=0.0305
	Govt. employed	8 (10.8)	162 (20.2)	
	Retired	4 (5.4)	19 (2.4)	
	Unemployed	14 (19)	240 (28.7)	

Table 3: Distribution of study participants with modifiable risk factors of diabetes mellitus.

Variable	Type 2 DM (n=74) (%)	Normal (n=836) (%)	P<0.05
Tobacco use			
Yes	62 (83.8)	332 (39.7)	p=0.00001
No	12 (16.2)	504 (81.9)	
Alcohol intake			
Yes	50 (67.6)	339 (40.55)	p=0.00001
No	24 (32.4)	497 (61.9)	
Diet			
Mixed	38 (51.2)	356 (44.4)	p=0.249
Vegetarian	36 (48.8)	446 (55.6)	
Physical activity			
Yes	22 (29.7)	412 (51.4)	p=0.00003
No	52 (70.3)	424 (50.7)	
Body mass index			
<25	26 (35.1)	568 (67.9)	p=0.00001
>25	48 (64.9)	268 (32.0)	
Waist hip ratio			
<0.85	18 (24.3)	548 (65.55)	p=0.00001
>0.85	56 (75.7)	288 (34.44)	
Blood pressure			
Hypertensive	48 (64.9)	198 (23.6)	p=0.00001
Non hypertensive	26 (35.1)	638 (76.3)	

Table 4: Distribution of study participants with non modifiable risk factors for diabetes mellitus.

Variable	Type 2 DM (%)	Normal (%)	P<0.05
Age in years			
<40	12 (16.2)	274 (17)	p=0.0016 S
>40	62 (83.8)	526 (83)	
Sex			
Male	40 (54.1)	398 (49.6)	p=0.47 NS
Female	34 (45.9)	404 (50.4)	
Family history of DM			
Yes	8 (10.8)	32 (4)	p=0.00713
No	66 (89.2)	770 (96)	
Total	74 (8.5)	802 (91.5)	

In the present study among diabetics the use of tobacco was high 83.8% which is a risk factor and the association of tobacco use with type 2 DM was found to be statistically significant.

The consumption of alcohol among diabetics in the present study was 67.6% and the association was statistically significant. Out of total type-2 diabetic 51.2% are non-vegetarians and 48.8% are vegetarians. The prevalence of diabetes among sedentary subjects was 52% and 29.7%. The association between physical activity and DM was statistically highly significant.

Out of total type 2 DM subjects, 64.9% were overweight with body mass index more than 25 and the association between Body mass index and type 2 DM was statistically significant.

The prevalence of systolic hypertension among subjects with type 2 DM was high 64.97% as comparison to normal subjects 35.1%). The association between type 2 DM and systolic Blood pressure was statistically significant.

The prevalence of diastolic hypertension among subjects with type 2 DM was high 62.27%) as comparison to normal subjects 37.8%. The association between type 2 DM and diastolic Blood pressure was statistically significant. The prevalence of type 2 diabetes mellitus was high among subjects having waist hip ratio more than 0.85 which was statistically significant.

The proportion of persons aged 40 years and above and those with a family history of diabetes was significantly higher among diabetics than non-diabetics in the study. The statistical association was found to be statistically significant.

DISCUSSION

In present study the prevalence of type 2 diabetes mellitus was 8.1%. In a study done by Chen et al which was a community based cross sectional study the prevalence of diabetes mellitus was reported as 5.2% in rural area which is less than present study.[12]

In present study out of 74 subjects who were diagnosed as diabetes among them 54% were males and 46% were females which was consistent with other studies done by Chen et al and Amar singher et al were the prevalence of IGT was more in male than female.[12,13] In one study done by Ruhembee et al the prevalence of type 2 diabetes was higher in females.[14]

In present study the prevalence of type-2 diabetes was 43.34% in 51-60 years age group, as the age increases the burden of diabetes increases and the association between age and prevalence of type 2 DM was found to be statistically significant. In other studies done by Ruhembee et al, Akinkugbe et al, the prevalence of diabetes was more in above 40 years of age group which is similar to present study findings.[14,15]

In present study the prevalence of type 2 Diabetes mellitus was high among sedentary subjects. Different studies showed that a physically active lifestyle is associated with a lower incidence of type-2 diabetes. Akinkughbe et al reported in a study that the prevalence of diabetes is more in people who are engaged in light physical activity work, Nyenwe et al study revealed that, less physical activity was significantly associated with increased risk for DM.[15,16] Abebe et al reported in a study physical inactivity were significantly associated with diabetes mellitus.[17]

In present study family history of diabetes was significantly higher among diabetics than non-diabetics in the study and it was found to be statistically significant. In a study done by Amarsingher et al it was found that those individuals with family history of diabetes were diabetic compared to those without family history of diabetes.[13] Similar findings were observed in a study done by Nyenwe et al.[16]

In present study out of total type 2 DM subjects, 64.9%% were overweight with body mass index more than 25 and

the association between Body mass index and type 2 DM was statistically significant. Present study findings were consistent with study done by Nyenwe et al.[16] The prevalence of systolic hypertension among study subjects with type 2 DM was high 64.97% as comparison to normal subjects (35.1%) which was similar in a study done by Katibeh et al.[18]

In present study the prevalence of type 2 diabetes mellitus was high among subjects having waist hip ratio more than 0.85 which was statistically significant. In a study reported by Amarsingher et al those with high waist hip ratio were 2 times (p=0.009) more likely to develop diabetes mellitus.[13] In present study the distribution of type-2 diabetes was high in non-vegetarians (51.2%) than vegetarians (48.8%). Study done Ayana et al reported that the prevalence of type 2 diabetes mellitus was less among those who consumed fruits and vegetables ≥3 days/week as compare to who consumed fruits and vegetables ≤ 2 days /week.[19]

CONCLUSION

This study shows that the prevalence of diabetes is high in the subjects having sedentary lifestyle, those who are overweighed, hypertensive and smokers. Regular exercise and intake of more fibrous diet, vegetable, fruits can reduce the prevalence of type-2 diabetes. This study also shows the high prevalence of type-2 diabetes in subjects with poor literacy status and use of Educational attainment promote an interest in own health and acquisition of knowledge that strongly influence people's ability to reduce risk by successfully adopting a healthier life style. There is a need to increase awareness of type – 2 diabetes mellitus in the general population. Health education should be given in terms of risk factors of diabetes. They should be made aware about early screening methods.

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