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PREVALENCE OF DIABETES MELLITUS AMONG ADULTS IN TIRUPATI AND ITS ASSOCIATION WITH CERTAIN SOCIO-DEMOGRAPHIC FACTORS

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HOW TO CITE THIS ARTICLE:

S. Govindu, B. Gopi Krishna, G. Ravi Prabhu. "Prevalence of Diabetes Mellitus among adults in Tirupati and its Association with Certain Socio-Demographic Factors". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 28, April 06; Page: 4822-4828, DOI: 10.14260/jemds/2015/699

ABSTRACT: BACKGROUND: The National Urban Diabetes Survey in India (2010) has reported an age standardized prevalence of diabetes to be 12.1%. The prevalence of diabetes mellitus is known to vary with many socio-demographic factors. **AIMS & OBJECTIVES:** The present study was conducted to find out the prevalence of diabetes mellitus among adults and its association with certain socio-demographic factors like age, gender, type of family, occupation, socioeconomic status and educational status. **MATERIAL & METHODS:** This present study is a cross sectional and analytical study carried out in 900 adults in the age group of 30 years & above during June 2014 to December 2014. A random blood sugar test was conducted among the selected study subjects and the prevalence of diabetes mellitus is estimated using the cut off level of 180 mg%. Those subjects who were already known to be diabetics with or without treatment were also classified as diabetics. The findings were analyzed using Epiinfo software 7 version (CDC, Atlanta, USA). **RESULTS:** The prevalence of diabetes mellitus in the present study was found to be 12.4%. The proportion of diabetes was found to be significantly higher among those aged 50 & above (27.0%), males (16.8%), professional occupation (22.7%) and joint families (15.7%). The prevalence was similar with regard to socio-economic as well as educational status of the subjects. **CONCLUSIONS:** The prevalence of diabetes mellitus showed significant association by age group, gender, occupation and type of family. **KEYWORDS:** Prevalence, Diabetes Mellitus, Adults, Employees, socio-demographic factors.

INTRODUCTION: The global prevalence of diabetes in 2014 was estimated to be around 9% among adults aged 18 years & above.^{1,2} In 2012, an estimated 1.5 million deaths were directly caused by diabetes. More than 80% of the deaths occurred in low and middle income countries.³ WHO projects that diabetes will be the 7th leading cause of death in 2030.⁴ There are around 347 million diabetics in the world. Type 2 diabetes mellitus accounts for around 90% of all diabetes worldwide. Reports of type 2 diabetes in children, previously rare, have increased worldwide. In some countries, it accounts for almost half of newly diagnosed cases in children and adolescents. Diabetes has become one of the major causes of premature illness and death in most countries, mainly through the increased risk of cardiovascular disease (CVD). The burden of diabetes is increasing globally, particularly in developing countries. The causes are complex but the increase is in large part due to rapid increases in overweight, including obesity and physical inactivity. Although there is good evidence that a large proportion of cases of diabetes and its complications can be prevented by a healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco, this evidence is not widely implemented. Coordinated international and national policies are needed to reduce exposure to the known risk factors for diabetes and to improve access to and quality of care.⁵ As per Centre's for Disease prevention (CDC), the prevalence of diabetes is increasing over time from 1980-2011 in all

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age groups. The prevalence increases with age being lowest in less than 44 years age group (1.6%) and higher in 45-64 years age group (21.8%) and 75 and above age group (20.0%).⁶

Globally, the prevalence of diabetes is similar in men than women but it is slightly higher in men less than 60 years age and in women at older ages. Overall, the prevalence is higher in men but there are more women with diabetes than men. The most important demographic change related to diabetes appears to be an increase in the proportion of people aged 65 years & above.⁷ The National Urban Diabetes Survey has reported an age standardized prevalence of diabetes and impaired glucose tolerance to be 12.1% and 14.0% respectively with no gender difference. The prevalence showed positive and independent association with age, family history, monthly income and sedentary physical activity.⁸ A study in Western India found an age standardized prevalence of 8.6% in urban population⁹ while in a study in rural Maharashtra,¹⁰ it was found to be 9.3%. A community based cross sectional study in urban areas of Ernakulum, Kerala¹¹ has found a high prevalence of 19.5%. The Chennai Urban Rural Epidemiological study¹² found an age standardized prevalence of 14.3%. Thus the various prevalence studies conducted in India had reported prevalence from 8% to 20% due to differences in the period of study and region. The prevalence of diabetes mellitus is known to vary with many socio-demographic factors.

In this context, this present study was conducted to find out the prevalence of diabetes mellitus among adults aged 30 years & above and its association with certain socio-demographic factors like age, gender, occupation, type of family, socioeconomic status and educational status in an urban area of Tirupati town, Andhra Pradesh.

MATERIALS AND METHODS: This present study is a cross sectional and analytical study carried out in 900 adults in the age group of 30 years & above of both sexes among the families of employees working in Tirumala Tirupati Devasthanams, Tirupati. The sample size is calculated using the following formula at 95% confidence intervals with an allowable error of 20% of the assumed prevalence.

$$N = \frac{4 PQ}{L^2}$$

Where N = Sample size; P= Assumed prevalence = 10%.

(Several studies conducted in India among adults aged 20 years & above had revealed the prevalence to be from 8.0 % to 20.0%).

Q = 100 – P = 80%.

L = Allowable error = 20% of assumed prevalence (10%), i. e 20% of 10 = 2.

By substituting the values, we get;

$$N = \frac{4 \times 10 \times 90}{2^2} = \frac{3600}{4} = 900.$$

The study was conducted during June 2014 to December 2014 including data collection and report writing. The necessary information including socio-demographic profile was collected by making house to house visits in the residential quarters using a predesigned, pretested interview

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schedule. The first house in the residential aggregation is selected randomly by the following method. At the centre of the residential quarters, all the lanes are numbered serially and one lane is selected randomly using random number generated in MS excel 2010 software. Within the selected lane, the sub-lanes are numbered serially and one sub-lane was selected randomly using a random number generated in MS excel software. Within each sub-lane, the number of households was estimated and the first house to be included for the study is selected using random number. Using the rand hand principle, the rest of the households was selected till the desired number of subjects was interviewed.

All the adults aged 30 years & above of both sexes in the selected households were requested to participate in the study after explaining the purpose of the study and obtaining a written consent from each participant. All the requested subjects had participated in the study with a response rate of 100%. The house was revisited if the eligible person was not available at the time of visit to the household. In this way, a maximum of three visits was made to each household for interviewing the eligible study subjects.

The socioeconomic status of the subjects was determined using updated BG Prasad classification¹³ based on per-capita monthly income of families using updated All India Consumer Price Index for July 2014 (1167).¹⁴

A random blood sugar test was conducted among the selected study subjects and the blood sugar was determined and the prevalence of diabetes mellitus is estimated using the cut off level of 180 mg%. Those subjects who were already known to be diabetics with or without treatment were classified as diabetics. Wherever possible, the authentic medical records were obtained to ascertain the known diagnostic status of diabetes mellitus.

The findings were analyzed using Epiinfo software 7 version (CDC, Atlanta, USA). The differences in the proportions were analyzed using Chi-square test and a P value of 0. 05 is considered to be statistically significant.

RESULTS: Overall, there were 434 (48.2%) male and 466 (51.8%) female subjects in the study. Majority of them were in the age group of 30-39 (40.6%) and 40-49 years (31.3%). It was found that there were 112 (12.4%) diabetic subjects in the study. The proportion of diabetes was found to be highest among 50-59 years (27.5%) followed by 60 & above years (26.9%). The differences were also found to be statistically significant (Table 1). Significantly higher proportion of diabetes was found in males (16. 8%) compared to that in females (8.4%) (Table 2). Significantly higher prevalence was found with regard to professional (22.7%), semi-professional (19.5%) and semiskilled occupations (14.9%) (Table 3). The prevalence was also found to be significantly higher in relation to joint family (15.7%) compared to that of nuclear family (10.2%). (Table 4). Although a higher prevalence was found with regard to lower socioeconomic status (13.7%) compared to middle (12.8%) and upper socioeconomic status (7.6%), the differences were however were not statistically significant (Table 5). The prevalence of diabetes was found to be highest in illiterate group (15.7%) and lowest in those with higher secondary level of educational status (9.6%). However the differences in the prevalence among the various educational levels were not statistically significant (Table 6).

DISCUSSION: The present study has found the overall prevalence of diabetes mellitus to be 12.4%. This was comparable to the national survey of diabetes conducted in six major cities (12.1%)⁸ and Thiruvananthapuram (12.4%).¹⁵ A lower age and sex standardized prevalence of 8.2% was found in a

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study among Bhutanese men and women¹⁶ while a high prevalence of 18.8% was found in a study in urban slum of Delhi.¹⁷ A study among elderly Indians residing in Singapore¹⁸ has found an age standardized prevalence of 17.2%. The differences in the prevalence may be due to differences in the time period of study, methodology used and other regional differences.

The current study has found a significantly higher prevalence of diabetes mellitus in males (16.8%) compared to that in females (8.4%). Thiruvananthapuram study¹⁵ has also found the age standardized prevalence of diabetes to be higher in males (9.2%) than in females (7.4%). A study in Bhutan¹⁶ also found a higher prevalence in males (8.6%) compared to that in females (7.7%). In contrast, a higher prevalence was reported in females (20.5%) than that in males (19.2%) in a study at Delhi.¹⁷ A study in Chennai has also found the prevalence to be significantly higher in females than in males.¹⁹ No difference in the prevalence by gender was found in the National Diabetes Survey in six cities.⁸ Thus the prevalence of diabetes mellitus had not shown any consistent results in various studies with regard to gender.

In the present study, the prevalence of diabetes mellitus increased steadily with age being lowest in 30-39 years' age (2.2%) to 50-59 years (27.5%). National Health Survey 2010 has also found that the age specific prevalence rates increased steadily from 1.0% in 18-29 years to a maximum of 29.1% in 60-69 years age group.¹⁷ A higher prevalence with age may be due to the fact that diabetes mellitus is a degenerative metabolic disease with increasing number of people getting screened for diabetes mellitus in higher age groups.

In the present study, a higher prevalence was found in relation to professional occupation (22.7%), lower socio-economic status (14.0%), and illiteracy (14.9%). A study in southern India²⁰ also found a lower prevalence in low income group compared to middle income group. Another study in Chennai¹⁹ also found a lower prevalence in lower socio-economic group (12.6%) compared to high income group (24.6%).

CONCLUSION: The prevalence of diabetes is 12.4% in the present study with significantly higher prevalence in higher age groups, males, professional occupation and those belonging to joint families. The prevalence had not shown any variation with socio-economic status and education of the subjects. Due to improvements in the standard of living of communities, it can be expected that diabetes prevalence may be similar in various socio-economic groups.

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Age group (Years)	Diabetes		Total (%)
	Yes (%)	No (%)	
30 – 39	8 (2.2)	357 (97.8)	365 (100.0)
40 – 49	35 (12.4)	247 (87.6)	282 (100.0)
50 – 59	41 (27.5)	108 (72.5)	149 (100.0)
60 & above	28 (26.9)	76 (73.1)	104 (100.0)
Total	112 (12.4)	788 (87.6)	900 (100.0)

Table 1: Prevalence of diabetes by age group

$\chi^2=86.3$; $P<0.001$; S.

Sex	Diabetes		Total (%)
	Yes (%)	No (%)	
Male	73 (16.8)	361 (83.2)	434 (100.0)
Female	39 (8.4)	427 (91.6)	466 (100.0)
Total	112 (12.4)	788 (87.6)	900 (100.0)

Table 2: Prevalence of diabetes by Sex

$\chi^2=14.0$; $P<0.001$; S.

Occupation	Diabetes		Total (%)
	Yes (%)	No (%)	
Professional	15 (22.7)	51 (77.3)	66 (100.0)
Semiprofessional	24 (19.5)	99 (80.5)	123 (100.0)
Skilled	6 (8.2)	67 (91.8)	73 (100.0)
Semiskilled	24 (14.9)	137 (85.1)	161 (100.0)
Unskilled	43 (9.0)	434 (91.0)	477 (100.0)
Total	112 (12.4)	788 (87.6)	900 (100.0)

Table 3: Prevalence of diabetes by occupation

$\chi^2=19.3$; $P<0.001$; S.

Type of family	Diabetes		Total (%)
	Yes (%)	No (%)	
Joint	58 (15.7)	311 (84.3)	369 (100.0)
Nuclear	54 (10.2)	477 (89.8)	531 (100.0)
Total	112 (12.4)	788 (87.6)	900 (100.0)

Table 4: Prevalence of diabetes by type of family

$\chi^2=5.65$; $P=0.002$; S.

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Occupation	Diabetes		Total (%)
	Yes (%)	No (%)	
Upper	11 (7.6)	133 (92.4)	144 (100.0)
Upper middle	17 (12.1)	124 (87.9)	141 (100.0)
Lower middle	18 (13.5)	115 (86.5)	133 (100.0)
Upper lower	50 (13.6)	318 (86.4)	368 (100.0)
Lower	16 (14.0)	98 (86.0)	114 (100.0)
Total	112 (12.4)	788 (87.6)	900 (100.0)

Table 7: Prevalence of diabetes by socio-economic status

$\chi^2=3.92$; $P=0.42$; NS.

Occupation	Diabetes		Total (%)
	Yes (%)	No (%)	
Illiterate	21 (14.9)	120 (85.1)	141 (100.0)
Primary	10 (13.0)	67 (87.0)	77 (100.0)
Secondary	40 (14.4)	237 (85.6)	277 (100.0)
Higher secondary	10 (9.6)	94 (90.4)	104 (100.0)
Degree & above	31 (10.3)	270 (89.7)	301 (100.0)
Total	112 (12.4)	788 (87.6)	900 (100.0)

Table 6: Prevalence of diabetes by educational status

$\chi^2=3.85$; $P=0.43$; NS.

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Date of Submission: 10/03/2015.
Date of Peer Review: 11/03/2015.
Date of Acceptance: 23/03/2015.
Date of Publishing: 04/04/2015.