

## ORIGINAL ARTICLE

# A Study on Prevalence and Associated Risk Factors for Type-2 Diabetes Mellitus in the Individuals Aged 20 Years and Above in Guntur City

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## Abstract

**Background:** Diabetes Mellitus is emerging as a major health problem owing to its serious complications. It is important to assess the various factors contributing to the occurrence of the diseases so that by limiting these factors the progression of the disease in patients can be controlled. Hence, the present study was undertaken to determine the risk factors for T2DM amongst individuals aged above 20 years in Guntur city, Andhra Pradesh. **Methods:** Community based descriptive cross sectional study was carried out at The subjects included in the present study were the people aged 20 years and above residing in the 17 administrative wards of the total 52 administrative wards in Guntur city. **Statistical analysis:** chi-square test, proportions was used to study the association of different risk factors with prevalence of type 2 DM. *p*-values <0.05 was considered as statistically significant. **Results:** Age, occupation, Body Mass Index, diet, smoking, alcohol, truncal obesity and family history of DM were significantly associated with T2DM Interpretation and conclusion: The prevalence of T2DM was influenced by predictors such as age, occupation, BMI, diet, Smoking, alcohol consumption, truncal obesity and family history of diabetes. **Conclusion:** The prevalence of T2DM was 21% the highest prevalence was seen in the age group of 50-59 years, but there was no difference in the prevalence gender wise. The prevalence of hypertension is higher in diabetics compared to non-diabetics and the difference is statistically significant.

**Keywords:** Prevalence, Type-2 Diabetes, Guntur City

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## Introduction

Type 2 Diabetes Mellitus (T2DM) is a non-autoimmune, complex, heterogeneous and polygenic metabolic syndrome condition in which the body fails to produce enough insulin, characterized by abnormal glucose homeostasis, a state of chronic hyperglycemia causing disturbance of carbohydrate, fat and protein metabolism. Its pathogenesis appears to involve complex interactions between genetic and environmental factors. Diabetes is undoubtedly one of the most challenging health problems in the 21<sup>st</sup> century. India with more than one fifth (20%) of the world's population is facing an epidemiological transition accompanied by health transition, which has resulted in an epidemic of NCD's. Non communicable

diseases especially cardiovascular disease, diabetes mellitus, stroke and chronic lung disease have emerged as major public health problem in India, due to increase in aging population and environmentally driven changes in behavior. The premature morbidity and mortality in most productive phase of life is posing a serious challenge to Indian society and economy [1]. Many studies have been done in different parts of the country; however, no studies have been done on Diabetes in Guntur, especially the urban area. Hence, a community based study has been carried out in Guntur city to collect base line information on diabetes prevalence, risk factors and complications and then put forth recommendations based on conclusions, for prevention and control of Diabetes Mellitus in the community. Hence, the

prevalence and risk factor assessment study is planned to assess its prevalence among the Guntur urban population. Such data is extremely important to plan the public health policies with specific reference to implementation of National Diabetic Control Program. The present study will be helpful in increasing the awareness about diabetes and its complications in the Guntur city population. So this study is intended to access the various predisposing factors for type 2 diabetes mellitus in urban population of Guntur, Andhra Pradesh.

## Materials and Methods

This study was a community based descriptive cross-sectional study in order to determine various risk factors associated with type 2 diabetes mellitus in urban population along with socio-demographic profile of people in Guntur, District of Andhra Pradesh. For this purpose 52 administrative wards in Guntur city were listed in ascending order and 17 wards were selected (1/3<sup>rd</sup>) randomly using random numbers table. To get the sample of 700, from 17 administrative wards around 40 subjects were randomly selected by systematic random sampling from each ward. As per the information from Guntur municipal cooperation, each administrative ward contains approximately around 400 houses (400/40=10). So, every 10<sup>th</sup> house was selected by systemic random sampling for the study. In the selected household, after explaining the purpose and nature of study and getting their consent, all individuals 20 years and above were selected as study subjects. Individuals were interviewed and anthropometric measurements taken. Random blood glucose estimation was done in all the subjects. Inclusion Criteria Individuals with typical symptoms of T2DM, physician diagnosed patients as T2DM (RBS  $\geq$ 200 mg/dl), individuals who were 20 years and above Exclusion Criteria Individuals who declined for informed consent, not available at home after repeated visit, pregnant women/who had delivered a baby weighing  $>$ 4.5 kg, by women who had gestational diabetes, individuals with psychological and endocrinal disorders.

### Sample Size and Sampling Method

Before start of the study one of the

administrative ward was selected to do pilot study and the prevalence of the area was established to be 20%. The sample size was calculated based on data from prevalence study from pilot study, the prevalence of 20% was considered with due precision of 3% and confidence interval of 95%, the sample size was estimated to be 683, rounded off to 700.

### Criteria for diagnosis

American diabetic association (ADA) criteria for diagnosing diabetics is followed American diabetic association (ADA) criteria for diagnosing diabetics was followed [2]

### Anthropometrical Measurements

Anthropometric measurements include height, weight, waist circumference and hip circumference (WHO, 2000) [3]. Weight was recorded by using a standard Krups weighing scale kept on firm horizontal surface. Weight was recorded to the nearest 500 g. Height was recorded by using a measuring tape to the nearest 1 cm.

A strong familial aggregation of diabetes is observed among Asian Indians, with high prevalence among the first-degree relatives and vertical transmission through two or more generations [4].

### Body Mass Index

BMI was calculated using the following formula:  $= \text{Wt (Kg)} / \text{Ht}^2 (\text{m}^2)$

**Below Normal BMI**  $<$  18.5 kg/m<sup>2</sup>

**Normal BMI** 18.5 – 22.9 kg/m<sup>2</sup>

**Above Normal** -BMI  $>$ 22.9 kg/m<sup>2</sup>.

### Waist Circumference

Waist circumference was measured using a non stretchable fiber tape. The subjects were asked to stand erect in a relaxed position with both feet together. One layer of light clothing was accepted. Waist girth was measured at the midpoint between iliac crest and lower margin of the ribs. Waist circumference was measured to nearest centimeter. Waist Circumference  $\geq$  94 cms for Male  $\geq$  80 cms for Females impairs the subjective quality of life and can reduce life expectancy and constitute a very specific close relationship between excessive body weight and the risk of diabetes.

### Hip circumference

Hip circumference was recorded at the level of greater trochanter (the widest portion of the hip)

on both sides. Measurements were recorded to nearest centimeter.

#### **Waist Hip Ratio**

Waist circumference/hip circumference Ratio >0.89 for men and >0.81 for women was taken as above normal [5]

#### **Blood Pressure Measurement**

Blood pressure was measured on the left arm in sitting posture, with the subject in a relaxed state. Standardized mercury sphygmomanometer (Diamond deluxe BP apparatus, Pune India) with adult size cuff was used. Average of two blood pressure readings is taken, which were measured 5 minutes apart.

#### **Socioeconomic Status**

The participants were interviewed with a pre-tested questionnaire regarding identification, demographic details, and behavioral components, social and biological variables. Education was classified based on International Standard Classification of Education (UNESCO, 1997) [6]. The occupation of study subjects was classified as workers and non-workers as per census of India 2001. Further workers were subdivided based on their occupation such as Skilled-I to Skilled –IV. Non-workers included house-wives and elderly persons who have stopped working. Statistical analysis was done with package for Social Science (SPSS) version 16.0. P-value >0.05 was considered significant.

## **Results**

Among the study population the highest percent were in the age group of 50-59 years and about one fifth each were in the age groups of 30-39, 40-49, and more than 60 years. Considering gender wise distribution, 327(46.72%) were men and 373(53.28%) were women. In the study, 48% were unemployed and 26.14% were unskilled workers. About 11% constitute professionals and skilled workers and 14.71% were semiskilled workers. Majority of the study subjects were illiterates (48.99%) followed by subjects who had primary level of education (23.85%). Nearly 20% completed secondary and higher secondary level while graduates and post graduates were only 6.42% which was far different to the current literacy rate of Guntur district (67.99%) [7]. Among the study subjects, upper and middle income group were equally

distributed and most were in the lower income range.

## **Discussion**

In the study, the prevalence of Diabetes increases with advancing age above up to 59 years and the highest prevalence were seen in the age group of 50-59 years and there was no significant difference in the prevalence of diabetes in men and women. Ramaiah KL et al; in their study in 1990 reported that the prevalence rate of type 2 diabetes was 21% in 40-54 year age group and 41% in 55-64 year age group [8]. In the study, there was no significant difference in the prevalence of diabetes in men and women and this study matched with Population based multicentric studies like CURES [9] and PODIS [10] who reported similar prevalence of diabetes in males and females. The highest prevalence of diabetes was seen among the semiskilled workers followed by unemployed and the lowest prevalence was seen in unskilled workers. The highest prevalence was seen among the study subjects who have completed secondary education and lowest among those who had completed higher education

The prevalence of Hypertension was higher among the Diabetics compared to the non-Diabetics and the difference was statistically significant ( $p=0.0004$ ) matches with Zimmet PZ et al; study which revealed that hypertension as a risk factor for development of diabetes [11]. The association of diabetes with the family history was significant in the study which matches with Ramachandran A et al; in 2001 who described that prevalence of diabetes was significantly higher in those with the family history (28.1%) than those without family history (11.4%). The association of diabetes with the degree of the relative with diabetes was significant with high percent of diabetics (29.93%) had first degree relatives who were diabetics. [12] G.Vijaykumar et al; (2007) in a cross sectional study conducted among 1990 adults in rural central Kerala, showed that there is strong association between family history and development of type 2 diabetes mellitus [13]. Gautier JF et al; stated that T2DM occurs in families so that those with a first – degree relative with diabetes have an almost 50% life - time risk [14].

**Table 1: Socio-demographic details and correlation of various risk factor with prevalence of T2DM**

Demographic Characteristics			Correlation of Different Risk Factors and Prevalence of T2DM	Association of T2DM and Risk Factors by Chi-square Test
Variable	Category of Variable	Frequency Distribution (%)	T2DM Prevalence (%)	
Age	20-29	12.14	01.17	P<0.001
	30-39	20.14	12.06	
	40-49	23.14	26.54	
	50-59	25	43.43	
	60	19.57	7.30	
Gender	Male	46.72	47.62	P>0.05
	Female	53.28	52.38	
Education	Illiterate	48.99	49.65	P=0.1921
	1 <sup>o</sup>	23.85	21.76	
	2 <sup>o</sup>	11.42	16.32	
	Inter	9.28	5.44	
	Degree	4.85	5.44	
Occupation	PG	1.57	1.36	P=0.02
	Unemployed	48	53.06	
	Unskilled	26.14	16.33	
	Semiskilled	14.71	19.73	
	Skilled	9.85	10.2	
SES	Professional	1.28	1.36	p=0.392
	Upper	15.71	21.82	
	Upper middle	5.71	32.5	
	Lower middle	21.14	18.92	
	Upper lower	37.42	19.47	
BMI	Lower	20	22.14	P=0.8302
	<18.5	9.85	10.2	
	18.5-22.9	20.85	19.05	
HTN	>22.9	69.3	70.75	
	Absent	89.29	88.44	
Family h/o DM	Present	10.71	11.5	P<0.05
	Absent	25.71	62.59	
Degree of Family relative with h/o DM	Present	74.29	37.41	P<0.001
	1 <sup>o</sup>	18.6	29.93	
	2 <sup>o</sup>	2.57	2.04	
	3 <sup>o</sup>	4.57	5.44	
Pattern of fat distribution	None	74.3	62.59	P>0.05
	Android	24.29	20.41	
	Gynoid	35.71	34.69	
Waist Hip Ratio	Normal	40	44.9	P<0.05
	<1	90.43	85.71	
Duration of Physical Activity	>1	9.57	14.29	P>0.05
	<150min/wk	91	87.76	
Freq.of Physical Activity	>150min/wk	9	12.24	P>0.05
	<3/wk	86.71	82.99	
Diet Control	>3/wk	13.29	17.01	P>0.05
	Yes	18.14	44.9	
	No	81.86	55.1	P<0.001

Viswanathan M et al; in their study on family history of 976 South Indian type 2 diabetics, recorded in a questionnaire based survey, found that in 10.6% families both parents were diabetic, in 43.3% families one parent was diabetic and 46.1% families had no parental history of diabetes [15]. For Indians the cut off for overweight as per BMI is 22.9. In the study, about 69.3% of the study subjects have BMI above 22.9 kg/m<sup>2</sup> and are, therefore, at increased risk for developing various non-communicable diseases. The prevalence of overweight was slightly higher among the diabetics compared to the non-diabetics and the difference was however statistically not significant. Ali H et al; (2001) in their study on prevalence of obesity and diabetes among U.S adults found that there was an increased risk for diabetes among adults with a BMI of 40 or higher compared with adults with normal weight [16]. The association between the shape of the body and diabetes was statistically not significant. A higher percent of the diabetics had 'normal' shape of their body compared to the non-diabetics who in fact had a higher prevalence of both Gynoid and Android type of body. A higher percent of the diabetics were seen with a waist hip ratio of more than 1 compared to the non-diabetics and this difference was statistically significant. Even though a slightly higher percent of diabetics were doing physical exercise for more than 150 minutes per week compared to the non-diabetics and the difference was not statistically significant. There was no much difference between diabetics and non-diabetics involving in physical activity for more than 3 times per week. The statistically association of diabetes with the diet control was highly significant with a higher percent of diabetics (44.9%) exercising diet control while only 11.03% of the non-diabetics were on diet control.

**Conflict of interest:** None

**Source of support:** Nil

**Ethical Permission:** Obtained

## Conclusion

The prevalence of T2DM was 21% with two new cases. The highest prevalence was seen in the age group of 50-59 years, but there was no difference in the prevalence gender wise. The prevalence of hypertension is higher in diabetics compared to non-diabetics and the difference is statistically significant. The association of diabetes with the

family history and with the first degree of the relative was significant. The difference in the prevalence of Diabetics who had a waist hip ratio of more than 1 compared to the non-diabetics was statistically significant. The statistically association of diabetes with the diet control was highly significant with a higher percent of diabetics exercising diet control.

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