

Original Research Article

Correlates of type-2 diabetes mellitus in urban slums population Moradabad

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Received: 14 March 2018

Revised: 21 April 2018

Accepted: 23 April 2018

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ABSTRACT

Background: Epidemiological transitions in India in the 21st century have led to non-communicable diseases becoming a major public health problem of growing magnitude. One of the important diseases in this respect is diabetes, which is considered a “disease of urbanization”. Risk factors for type 2 diabetes mellitus are: age, gender, ethnicity, family history, obesity, inactivity, gestational diabetes, hypertension, cardiovascular diseases, high blood glucose on previous testing, impaired glucose tolerance and glycated hemoglobin $\geq 5.7\%$.

Methods: A community based cross-sectional study was conducted in urban slums which are the field practice area of Community Medicine department under the head of Teerthanker Mahaveer Medical College and Research Center, Moradabad. The final analysis was conducted on 640 participants. Each interview began with a general discussion to build rapport with the participants. Repeat visit was made on the consecutive day early in the morning to measure fasting blood glucose level with the help of Glucometer.

Results: The overall prevalence of diabetes mellitus in the present study was found to be 15.6%. Maximum prevalence of diabetes mellitus was found between the age group of 60-69 years i.e. 44 (28.0%) followed by 26 (19.6%) in 50-59 years and 22 (18.1%) in 40-49 age group. In socioeconomic status, the prevalence of diabetes mellitus was 18 (21.6%) and 26 (25.2%) in class I and class II respectively.

Conclusions: Based on study findings it has been observed that there was statistically significant association between socio-demographic variables like age, sex, education, socioeconomic status and type 2 diabetes mellitus.

Keywords: Diabetes, Prevalence, Socio-demographic variables

INTRODUCTION

Epidemiological transitions in India in the 21st century have led to non-communicable diseases becoming a major public health problem of growing magnitude. One of the important diseases in this respect is diabetes, which is considered a “disease of urbanization”.¹⁻³ Diabetes mellitus was first described in India in the ancient texts of Charaka and Sushruta (1500 BCE). India is second only to China which is the home to 92.3 million diabetics.⁴ Diabetes mellitus (DM) is a syndrome characterized by a

state of chronic hyperglycemia causing disturbance of carbohydrate, fat and protein metabolism, associated with absolute or relative deficiency in insulin secretion or insulin action.⁵

In 2012, non-communicable diseases (NCDs), also known as chronic diseases, killed over 38 million people in the world, and 1.5 million of all deaths were attributed to diabetes. With over 1.25 billion people, India has a little lower prevalence of diabetes (among adult population) than the global level (India: 7.8% vs

worldwide: 8.5%).⁶ While recognizing the increasing prevalence of type 2 diabetes in urban Indian adults, it is important to note that the prevalence of undiagnosed diabetes in the community is also high. The prevalence of Diabetes and IGT are high in urban Indian population.⁷ Risk factors for type 2 diabetes mellitus are: age, gender, ethnicity, family history of type 2 diabetes mellitus, obesity, inactivity, gestational diabetes, macrosomia, hypertension, decreased high-density lipoprotein cholesterol, increased triglycerides, cardiovascular diseases, micro-polycystic ovary syndrome, high blood glucose on previous testing, impaired glucose tolerance and glycated hemoglobin $\geq 5.7\%$.⁸ In addition, socioeconomic factors act as potential confounders of diabetes, driven by forces that include ageing, rapid unplanned urbanization and the globalization of unhealthy lifestyles. Few data on diabetes and associated risk factors are available from Moradabad Mandal. Therefore, to enable predictions of the future prevalence of diabetes in urban slums in Moradabad area, Uttar-Pradesh, this study aimed to identify prevalence of diabetes mellitus and associated risk factors

Objectives

- To determine the prevalence of type 2 diabetes mellitus in study population.
- To determine the association of participants at high risk for developing diabetes with various risk factors.

METHODS

Study area

A community based cross-sectional study was conducted in urban slums which are the field practice area of Community Medicine Department under the head of Teerthanker Mahaveer Medical College and Research Center, Moradabad. The study was conducted from April 2015-December 2015. Ethical clearances was taken from the institution.

Sample size

The study conducted by Anjana et al, prevalence of diabetes and pre-diabetes in urban and rural India, revealed that overall prevalence of diabetes in Chandigarh was 13.6%, 10.4% in Tamil Nadu, 8.4% in Maharashtra and in Jharkhand 5.3%.⁹ In Chandigarh, a city of North India, the prevalence was 14.2% in urban areas and in the rural areas, the prevalence was 8.3%. So, Chandigarh was considered for calculating the sample size.

$$\text{Sample size} = 3.8416pq/d^2$$

Where p= Positive character (14.2%),

q= 100 - Positive character= (85.8%)

d= Allowable error (20%)

Sample size= 580.

Assuming 10 percent loss to sample because of non-response, final sample size was calculated 638. The final analysis was conducted on 640 participants.

Inclusion criteria

All individuals 30 years of age and above irrespective of disease status were screened for diabetes.

Exclusion criteria

Exclusion criteria were type 1 diabetes patients; pregnant females; those who were seriously ill; non co-operative subjects.

Sampling technique

The present study was carried out in area covered under Urban Health Training Centre. UHTC covered both slum and non-slum areas selected by simple random sampling. All participants aged 30 years and over in each household were included in the study. House-to-house visits were conducted, covering the houses one after the other lane wise. The participants were fully informed regarding the purpose of the study and verbal consent was obtained. The subjects were briefed about the procedure of investigation and advised to remain fasting till their blood sample for blood sugar examination was taken. Each interview began with a general discussion to build rapport with the participants and gain their confidence. Repeat visit was made on the consecutive day early in the morning to measure fasting capillary blood glucose level with the help of Accue Check- Glucometer. Quetelet's index used to calculate BMI. It was checked by using the formula weight in (kg)/ Height (meter)².

During each house visit, data were collected using the World Health Organization (WHO) Stepwise approach to surveillance (STEPS), which includes three steps for assessment of risk factors. The three steps are as follows:

- *Step 1:* A predesigned, pretested proforma was used to collect data from the study participants; this included information on socio-demographic characteristics, family history of diabetes etc.
- *Step 2:* Anthropometric measurements were taken for all study participants. Measurements included height, weight, waist circumference and hip circumference.
- *Step 3:* Biochemical testing, i.e. random capillary blood glucose was done.

Data analysis

The data was entered in MS-Excel, critically analyzed and tabulated using SPSS- 20 version software.

Appropriate statistical tests of significance were applied to test and validate the findings of the study.

RESULTS

The overall prevalence of diabetes mellitus in the present study was found to be 15.6%. Of these, almost half (6.25%) were newly diagnosed while the remaining were known diabetics. 9.37% of the study population were found to have impaired fasting glucose (Table 1).

With respect to age, maximum prevalence of diabetes mellitus was found between the age group of 60-69 years i.e. 44 (28.0%) followed by 26 (19.6%) in 50-59 years

and 22(18.1%) in 40-49 age group whereas in the age group of ≥ 70 years, a decline in prevalence of diabetes mellitus was seen i.e. just 3 (12.5%). In relation to gender, 83 (19.8%) male were having diabetes as compare to 17 (7.69%) females. While comparing education, prevalence of diabetes was found 63 (26.1%) amongst educated up-to secondary class and just lowest 8 (6.8%) which is in Illiterate group. In socioeconomic status, the prevalence of diabetes mellitus was 18 (21.6%) and 26 (25.2%) in class I and class II respectively followed by 30 (15.1%) in class III, 21 (9.9%) in a class IV and 5 (11.1%) in class V. The association between biosocial characteristics and diabetics' status was found to be statistically significant (Table 2).

Table 1: Prevalence of type-2 diabetes mellitus and impaired fasting glucose among study population.

	Diabetes mellitus		Prevalence of type II DM	Impaired fasting glucose	Normal	Total
	Known diabetic	Newly diagnosed				
Number	40	60	100	71	469	640
%	6.25	9.37	15.6	11.1	73.2	100

Table 2: Biosocial characteristics and their association of study subjects according to their diabetic status.

Socio-demographic Variables	Diabetics (100) (%)	IFG (71) (%)	Normal (469) (%)	Total (640)	Chi-square test
Age in years					
30-39	5 (2.4)	16 (7.7)	185 (89.8)	206	Chi-square value=61.64, df=8, p=0.00
40-49	22 (18.1)	21 (17.3)	78 (64.4)	121	
50-59	26 (19.6)	16 (12.1)	90 (68.1)	132	
60-69	44 (28.0)	13 (8.2)	100 (63.6)	157	
≥70	3 (12.5)	5 (20.8)	16 (66.6)	24	
Gender					
Male	83 (19.8)	46 (10.9)	290 (69.2)	419	Chi-square value=16.35, df=2, p=0.00
Female	17 (7.69)	25 (11.3)	179 (80.9)	221	
Education					
Illiterate	8 (6.8)	9 (7.6)	100 (58.1)	117	Chi-square value=37.4, df=6, p=0.00
Up to primary education	19 (11.0)	21 (12.2)	132 (76.7)	172	
Up to secondary education	63 (26.1)	29 (12.0)	149 (61.8)	241	
Higher education	10(9.0)	12 (10.9)	88 (80.0)	110	
Socio economic status (Kuppuswami socio economic status)					
Class I	18 (21.6)	14 (16.8)	51 (61.4)	83	Chi-square value=24.12, df=8, p=0.00
Class II	26 (25.2)	15 (14.5)	62 (60.1)	103	
Class III	30 (15.1)	17 (8.5)	151 (76.2)	198	
Class IV	21 (9.9)	20 (9.4)	170 (80.5)	211	
Class V	5 (11.1)	5 (11.1)	35 (77.7)	45	

Table 3: Association between family history and diabetic status among respondent.

Family history	Diabetes mellitus (%)	IFG (%)	Normal (%)	Total	Chi-square value
Absent	50 (10.0)	27 (5.4)	422 (84.5)	499	Chi-square value=152.4, df=4, p=0.00
One parent	32 (33.3)	29 (30.2)	35 (36.4)	96	
Both parent	18 (40.0)	15 (33.3)	12 (26.6)	45	
Total	100 (15.6)	71 (11.1)	469 (73.2)	640	

Table 4: Association between body mass index and diabetics status of study participants.

Body mass index	Diabetes mellitus (%)	IFG (%)	Normal (%)	Total	Chi-square value
<18.5 (underweight)	6 (10.5)	3 (5.26)	48 (84.2)	57	Chi-square value=38.50, df=8, p=0.00
18.5-24.9 (average)	36 (12.5)	20 (6.99)	230 (80.4)	286	
25-29.9 (pre obese)	31 (17.2)	25 (13.8)	124 (68.8)	180	
30-34.9 (obese class I)	18 (19.3)	16 (17.2)	59 (63.4)	93	
35.0-39.99 (obese class II)	9 (37.5)	7 (29.1)	8 (33.3)	24	
Total	100 (15.6)	71 (11.1)	469 (73.2)	640	

Table 5: Correlation between waist circumference and diabetics status of respondents.

Waist circumference, (cm)	Diabetes mellitus	IFG	Normal	Total	Chi-square value
Men <90, women <80	26 (7.7)	21 (6.25)	289 (86.0)	336	Chi-square value=58.76, df=2, p=0.00
Men ≥90, women ≥80	74 (24.5)	50 (16.4)	180 (59.1)	304	
Total	100 (15.6)	71 (11.1)	469 (73.2)	640	

Family history plays a very important amongst diabetics. The persons with both parents positive family history showed maximum prevalence of 18 (40.0%) of DM which was followed by 32 (33.3%) in persons with one parent positive family history in the present study. Association was found statistically significant between family history of diabetes mellitus and prevalence of diabetes (Table 3).

While calculating the body mass index of study population, maximum number of diabetic individuals i.e. 9 (37.5%) were found in obese class II followed by 18(19.3%) in obese class I and 31 (17.2%) in pre obese class, whereas minimum number of diabetic individuals i.e. 6 (10.5%) were in underweight class. The association was found statistically significant between diabetes mellitus and body mass index (Table 4).

In both sexes, a total of 74 (24.5%) had waist circumference ≥90 in men, ≥80 in women and 26 (7.7%) had waist circumference <90 in men and <80 in women respectively. The association between waist circumference and risk status was highly significant statistically (Table 5).

DISCUSSION

The prevalence of diabetes mellitus was found to be 15.6% in the present study. Similar study carried out by Anjana et al reported 14.2% prevalence among urban population of 20 years and above.⁹ The current study noted that, as age increases, the risk for diabetes also increases except in the age group of ≥70 years. Several other studies have noted similar findings.¹⁰⁻¹² Two further studies found a positive association between higher age and undiagnosed diabetes.^{13,14} In the present study 83 (19.8%) male were having diabetes as compare to 17 (7.69%) females. On the contrary, study done by Arora et al noted that more high-risk cases were seen in women

than in men in urban Haryana, and there was a statistically significant association.¹⁵ However, a study done by Misra et al in an urban slum of Delhi showed no statistically significant association between gender.³ While assessing the socio-economic status of participants, prevalence of diabetes mellitus was highest i.e. 26 (25.2%) among middle socio-economic class followed by 18 (21.6%) in upper socioeconomic class and least i.e. 5 (11.1%) in the lower socioeconomic class. Ramachandran et al also reported prevalence of diabetes mellitus to be more among high-income group.¹⁶ Ramchandran et al again in stated that prevalence of diabetes was found to be lower in the low socio-economic group living in urban areas compared with the high income group.¹⁷ However, Mohan et al in found a significant association between diabetes and higher socioeconomic class.¹⁰

Prevalence of diabetes mellitus was maximum i.e. 18 (40.0%) in those having both parents positive family history followed by 32 (33.3%) in one parent positive family history while minimum i.e. 50 (10.0%) prevalence was observed in those negative family history of diabetes. On the other hand a high incidence of diabetes is seen among first-degree relatives where one has diabetes, and the risk of a child with a parental history of diabetes developing diabetes themselves is more than 50%.¹⁸ Two other studies have shown that increased risk for diabetes was associated with a family history of diabetes.^{12,20} Thus, family history of diabetes is one of the major contributors for diabetes. Arora et al noted that the majority of individuals with pre-diabetes had a family history.¹⁵ Similar to present study Hadaegh et al and Wang et al in their studies done in Iranian urban population and in Guangzhou urban community respectively, found an association between undiagnosed cases of diabetes and a family history of diabetes.^{13,14} Kumar et al, Valliyot et al and Kumar et al, also showed that there was strong association with family history and diabetes mellitus. In the present study while calculating

the BMI, it has been observed that prevalence of diabetes was increasing with high BMI.¹⁹⁻²¹ Study done by Pandya et al showed that prevalence of obesity is more in diabetic individuals.²² Another study conducted by Jayawardena et al concluded in his study that higher BMI and high waist hip ratio had increased risk of diabetes mellitus.²³ In both sexes, a total of 74 (24.5%) had waist circumference ≥ 90 in men, ≥ 80 in women and 26 (7.7%) had waist circumference < 90 in men and < 80 in women respectively. The association between waist circumference and risk status was highly significant statistically. Waist circumference is a more powerful determinant of subsequent risk of diabetes mellitus.¹⁰ Several other studies have noted a significant association between waist circumference and undiagnosed diabetes, which is similar to the findings of the present study.^{13,18,25-27}

CONCLUSION

Based on study findings it has been observed that there was statistically significant association between socio-demographic variables like age, sex, education, socioeconomic status and type 2 diabetes mellitus. The family history, BMI and waist circumference were the most common factors found in participants who were at high risk for diabetes. People who are at a high risk of developing diabetes like elderly and those with genetic susceptibility should begin to control their food and activities at a very early stage of life since the onset of diabetes is getting earlier now a days. Measures must be taken to improve awareness among urban population and patient counseling and diabetes education programs can be conducted. Mass communication media could play an essential role in creating awareness among the public about the disease.

ACKNOWLEDGEMENTS

Authors are thankful to the Prof and HOD of Community Medicine department Dr. Anurag Shrivastava, Teerthanker Mahaveer Medical College and Research Center, Moradabad for making suitable arrangements for the research work. Special thanks to the team of MSW for their support in data collection.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Bahal SP, Saxena S, Srivastava A. Correlates of type-2 diabetes mellitus in urban slums population Moradabad. *Int J Community Med Public Health* 2018;5:2425-30.