Research Article

Sociodemographic and anthropometric factors influencing diabetes mellitus in an urban population of district Bareilly: A cross-sectional study

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Received: February 04, 2020; **Accepted:** February 25, 2020

ABSTRACT

Background: Diabetes mellitus (DM) is a common non-communicable disease even in a developing country like India. Diabetes in all its forms imposes unacceptably high human, social, and economic costs on countries at all income levels. **Objective:** The objective of this study was conducted to assess the sociodemographic and anthropometric factors influencing DM in an urban population of district Bareilly. **Materials and Methods:** A cross-sectional, community-based study was conducted from February 2014 to February 2015 among adults in the age group of 30 years and above residing in the area covered under the Urban Health Training Centre of Bareilly City. A simple random sampling technique was adopted to achieve the desired sample size. House to house survey was done for collecting data. Data tabulated and subjected to statistical analysis. **Results:** Education status more than high school level were more prone for DM and maximum frequency of DM was also found in postgraduates and the minimum occurrence of DM was found those were having education up to primary school level. Body mass index increases the proportion of DM increases. The maximum number of diabetic individuals was found in obese Class II, followed by obese Class I and pre-obese. The pervasiveness of DM and impaired fasting glucose was more in those who were having a high waist-hip ratio. **Conclusion:** The study showed that in spite of having health-care facilities nearby, the indiscretion of healthiness was a major concern. The higher proportion of DM patient is prominent in who is from nuclear family, having sedentary lifestyle. There is a high proportion of obesity among them.

KEY WORDS: Type 2 Diabetes Mellitus; Sociodemographic; Anthropometric

INTRODUCTION

Diabetes mellitus (DM) is a major public health problem all over the world.[1] The magnitude of DM is increasing globally at an alarming rate. About 150–170 million people were suffering from this disease worldwide in the year 2000, and the prevalence of diabetes is expected to be double by 2025 as per the World Health Organization (WHO) reports.[2] DM is a common non-communicable disease even in a developing country like India. It affects the life of nearly 40 million people in India and of equivalent magnitude in other developing countries. India is known as diabetes capital. Epidemiological evolution has led to rise of diseases such as diabetes, obesity, and connected metabolic disorders.[3-5] Among these, DM comprises the main part. Diabetes its forms enforces inappropriately high human, economic, and social costs on countries at all income levels. The WHO figures, worldwide, an predictable 422 million adults were existing with diabetes in 2014, compared to 108 million in 1980. The worldwide prevalence of diabetes has almost doubled since 1980, rising from 4.7% to 8.5% in the adult people. About 1.5 million deaths have been attributed to this fatal disease. The load is rising rapidly among the lower and middle class

Access this article online	
Website: http://www.ijmsph.com	Quick Response code
DOI: 10.5455/ijmsph.2020.02022202025022020	

earning countries like India.[6] Beginning of diabetes among Indians happens a decade earlier than compared to the western world.[7,8] Enhanced health concern, before time detection, and timely treatment is an extra effective approach for dropping the impact of diabetes. Access to sufficient health-care plays an even greater role in managing diabetes, preventing the progress of complications, and avoiding diabetes connected mortality. Apart from medical issues affecting, a little social, economic, and psychological issues also manipulate the outcome of DM. Some straight economic factors such as cost of insulin, and oral hypoglycemic drugs, cost of health cover and cost of health care and not direct factors such as loss of work and economic wages also bring about considerable impact.[9,10] Hence, this study was conducted to assess the sociodemographic and anthropometric factors influencing DM in an urban population of district Bareilly.

MATERIALS AND METHODS

The design for the current study was a descriptive cross-sectional community-based study.

Study Unit

The study subjects consisted of males and females in the age group of 30 years and above and belonging to Bareilly city.

Sampling Frame

The sampling frame consisted of urban wards (slum and non-slum locality) of Bareilly City. All men and women aged 30 years and above in selected localities were included in the sampling frame of our study.

Sample Size

The study conducted by Anjana *et al*.[11] "Prevalence of diabetes and pre-diabetes in urban and rural India. The study revealed that the overall prevalence of diabetes in Chandigarh was 13.6%, 10.4% in Tamil Nadu, 8.4% in Maharashtra, and in Jharkhand 5.3%. 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%. Hence, Chandigarh was considered for calculating the sample size. Using the formula 4pq/d2, i.e., p is 14.2%, d is 20% relative error, so 580 sample size came out then adding 10% non-respondent, i.e., 58, 638 came out taking round figure, sample size came out to be 640.

Methodology

The present study was carried out in the area covered under Urban Health Training Centre (UHTC). UHTC covered both slum area and non-slum area.[1] Slum area was selected and one non-slum area was selected through simple random sampling for obtaining the desired sample size.

Ethical Consideration

The study was approved by the Institutional Research Committee and the Institutional Ethics Committee.

House to house survey was done, and information about the purpose of the study was given to all study subjects, and verbal consent was taken from them, before taking sociodemographic information using a pre-tested interview schedule. Houses were selected using simple random sampling. All eligible individuals in the visited house were included in the study. The subjects were briefed about the procedure of investigation and advised to remain fasting until their blood sample for blood sugar examination was collected. Kuppuswamy's[12] scale used to calculate socioeconomic status.

Inclusion Criteria

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

Exclusion Criteria

Type 1 diabetes patients, pregnant females, those who were seriously ill, non-cooperative subjects were excluded from the study.

Anthropometric Measurement

Weight

Subjects weight was recorded using weighing machine to the nearest 100 g without footwear and light clothing.

Height

For assessing the height, subjects were asked to stand upright without shoes with their back against the walls, heels together, and eyes directed forward. The investigator stood on the subject's left side and firmly holds the chin of the subject with the left hand, with a ruler placed horizontally in the sagittal plane overhead of the subject applying a slight pressure to reduce the thickness of the hair. This point was then marked on the wall with the help of a pencil. The reading was noted to the nearest 0.1 cm.

Physical Activity: Assessed Based on World Health Organization India-Indian Council of Medical Research[13]

Body mass index (BMI)

BMI was calculated using the formula: weight in (kg)/height in meter.[2]

Waist and hip circumferences

Waist and hip circumferences were measured using flexible, not stretchable tape to an accuracy of 0.1 cm. Waist

circumference is measured at the midpoint between the lower border of rib cage and the iliac crest. Hip circumference was measured by taking the largest circumference around the hip. Waist-hip ratio (WHR) is an approximate index of intra-abdominal fat mass and body fat. WHR >1.0 in men and >0.85 in women indicate abdominal fat accumulation.

Statistical Analysis

The data thus collected were entered and analyzed in Microsoft Office Excel. This study reports the means and proportions of the variables under study. Sociodemographic and anthropometric characteristics were tabulated as descriptive statistics, group statistics explained by frequency and percentages, Chi-square test, and independent samples test.

RESULTS

Table 1 shows the association of sociodemographic and behavioral factors with DM and impaired fasting glucose (IFG). In which, there was no such great difference in IFG in males (9.9%) and females (9.1%). Maximum number of diabetics was found in nuclear family (16.2%), followed by three generation family (15.0%) and joint family (13.2%). The prevalence of IFG was more in Muslims (13.33%) compared to Hindus (9.24%). In caste maximum respondents were from general category, and the prevalence of diabetes (19.13%) was also highest in general category. Majority of individuals were married 536 (83.8%), out of these 79 (14.7%) were having diabetes where 42 (6.6%) were unmarried and in them 5 (11.9%) were having diabetes. 62 (9.7%) were widowed or divorced and they were having maximum prevalence of DM, i.e. 13 (20.9%). Maximum individuals having IFG were from widowed/widower/ divorced category 8 (12.9%) while minimum 3 (7.1%) from unmarried category. Those who were having education status more than high school level were more prone for DM and maximum prevalence of DM was also found in postgraduates (25.0%). The prevalence of IFG was also higher in educated individuals. The prevalence of DM was found almost similar among professionals, semi-professionals, and shop-owners (23.0%, 20.0%, and 21.9%, respectively). Lower prevalence was seen in skilled, unskilled, and semiskilled (11.25%, 9.0%, and 8.1%, respectively) worker. This value came out to be statistically significant. The prevalence of IFG was higher among professionals and shop-owners (15.3% and 14.8%, respectively), while minimum was shown in unskilled workers (4.91%). Proportion of DM was high in subjects who were taking <5 servings (15.4%) as compared to those who were taking >5 servings (13.4%) of fruits in a week. Similar trend was seen in IFG that those were taking <5 servings of fruits their prevalence was came out to be (12.3%) than those were taking >5 servings of fruits (8.9%). Occupation and caste are shown association with DM [Table 1].

Table 1: Association of sociodemographic and behavioral factors with diabetes mellitus and impaired fasting glucose

Variables	Diabetics	Impaired fasting glucose	Normal	*p* value
Gender				
Male	52 (16.6)	31 (9.9)	230 (73.4)	0.543
Female	45 (13.7)	30 (9.1)	252 (77.0)	
Education				
Postgraduate	7 (25.0)	5 (17.9)	16 (57.1)	0.121
Graduate	20 (18.7)	13 (12.1)	74 (69.1)	
Intermediate	23 (17.1)	13 (9.8)	98 (73.1)	
High school	15 (20.0)	8(10.7)	52 (69.3)	
Middle school	7 (8.9)	5 (6.3)	67 (84.8)	
Primary school	4 (7.69)	3 (5.8)	45 (86.5)	
Illiterate	21 (12.72)	14 (8.4)	130 (78.8)	
Occupation				
Professional	6 (23.0)	4 (15.3)	16 (61.5)	0.006
Semi professional	16 (20.0)	9 (11.2)	55 (68.8)	
Shop owner	28 (21.9)	19 (14.8)	81 (63.2)	
Skilled worker	9 (11.2)	5 (6.2)	66 (82.5)	
Semi-skilled	2 (9.0)	1 (4.54)	19 (86.3)	
Unskilled	10 (8.1)	6 (4.91)	106 (86.9)	
Unemployed	4 (23.5)	3 (17.6)	10 (58.9)	
House-wife	22 (13.3)	14 (8.4)	129 (78.1)	
Religion				
Hindu	90 (15.1)	55 (9.2)	450 (75.6)	0.652
Muslims	7 (15.5)	6 (13.3)	32 (71.1)	
Caste				
General	71 (19.1)	41 (11.0)	259 (69.8)	0.005
OBC	21 (10.5)	17 (8.5)	162 (81.0)	
SC	5 (7.2)	3 (4.3)	61 (88.4)	
Family type				
Nuclear	65 (16.2)	38 (9.4)	298 (74.3)	0.919
Joint	29 (13.2)	21 (9.6)	169 (77.1)	
Three generation	3 (15.0)	2 (10.0)	15 (75.0)	
Marital status				
Unmarried	5 (11.9)	3 (7.1)	34 (80.9)	0.450
Married	79(14.7)	50 (9.3)	407 (75.9)	
Widowed/widower/ divorced	13 (20.9)	8 (12.9)	41 (66.1)	
Unmarried	5 (11.9)	3 (7.1)	34 (80.9)	
Serving fruits				
<5	85 (15.4)	49 (8.9)	417 (75.7)	0.197
≥5	12 (13.4)	11 (12.3)	66 (74.1)	

Table 2 shows that 373 individuals were sedentary workers, 227 were moderate worker, and 40 were vigorous worker. The prevalence of DM among sedentary workers was found to be high as 16.9% in moderate workers (14.1%) and vigorous workers (5%). It can be seen that as physical

activity increases the prevalence of diabetes decreases. The difference was statistically insignificant. Like the trend prevalence of DM with physical activity, the prevalence of IFG was found high in sedentary worker (9.3%), followed by moderate worker (10.6%). Minimum prevalence was seen in vigorous worker (5%) [Table 2].

Table 3 shows as the BMI increases the prevalence of DM increases. The maximum number of diabetic individuals (30.4%) was found in obese Class II followed by obese Class I (23.5%) and pre-obese (19.8%), whereas the minimum number of diabetic individuals (8.7%) was in underweight class.

Similar trend was seen in IFG prevalence. Maximum was from obese Class II (34.8%), followed by (16.1%) in obese Class I and in pre-obese (8.0%) and the minimum was from underweight category (3.4%). The association was found statistically significant between DM and BMI [Table 3].

Table 4 shows that 341 individuals were having high WHR out of that of 59 (17.3%) were diagnosed diabetic, 37 (10.9%) as IFG and 245 (71.9%) were normal. Whereas, 299 were having normal WHR out of that 38 (12.8%) were diagnosed as diabetic, 24 (8.0%) as IFG and 237 (79.2%) were normal. It can be seen that the prevalence of DM and IFG was more in those who were having a high WHR. However, this difference was statistically insignificant [Table 4].

Table 2: Association of diabetes mellitus and impaired fasting glucose according to physical activity

Physical activity	Diabetic *n* (%)	Impaired fasting glucose *n* (%)	Normal	Total
Sedentary	63 (16.9)	35 (9.3)	275 (73.8)	373
Moderate	32 (14.1)	24 (10.6)	171 (75.3)	227
Vigorous	2 (5)	2 (5)	36 (90)	40
Total (%)	97 (15.2)	61 (9.5)	482 (75.3)	640 (100.0)

Chi-square value=6.029, df=4, *P*=0.1969

Table 3: Association of diabetes mellitus and impaired fasting glucose according to their body mass index

Body mass index	Diabetes mellitus (%)	Impaired fasting glucose (%)	Normal (%)	Total
<18.5 (underweight)	5 (8.7)	2 (3.4)	51 (87.9)	58
18.5–24.9 (average)	32 (10.4)	25 (8.1)	248 (81.3)	305
25–29.9 (pre-obese)	37 (19.8)	15 (8.0)	134 (72.0)	186
30–34.9 (obese Class I)	16 (23.5)	11 (16.1)	41 (60.2)	68
35.0–39.99 (obese Class II)	7 (30.4)	8 (34.8)	8 (34.7)	23
Total	97 (15.2)	61 (9.5)	482 (75.3)	640

Chi-square value=47.233, df=8, *P*=0.00

In Table 5, negative binomial regression shows more association of DM with BMI increases the prevalence of diabetes increases. WHR and caste also associated with DM show the strength of association of DM with these factors [Table 5].

DISCUSSION

Community factors of health are the conditions in which the persons are born, grow, live, work, and age.[14] This cross-sectional study was conducted to study the sociodemographic and anthropometric factors influencing DM. With regard to gender, while our study showed that the prevalence of DM in males was high in comparison to females, but there was no such great difference in IFG in males and females, the study by Patel *et al*.[15] found males to be 62% of the total, which is higher than our study. This makes an interesting finding the reasons for which needs to be explored. There

Table 4: Association between waist-hip ratio and diabetes mellitus and impaired fasting glucose among study subjects

Waist-hip ratio	Diabetes mellitus (%)	Impaired fasting glucose (%)	Normal (%)	Total (%)
High	59 (17.3)	37 (10.9)	245 (71.9)	341 (53.2)
Normal	38 (12.8)	24 (8.0)	237 (79.2)	299 (46.8)

Chi-square value=4.714, df=2, *P*=0.09

Table 5: Prevalence ratio from negative binomial regression

Variables	B	Exp. (B)	95% CI	p value
Body mass index				
<18.5 (underweight)	−0.447	0.675	0.385–1.287	0.037
18.5–24.9 (normal)	−0.689	0.789	0.778–1.288	0.025
25–29.9 (overweight)	−0.889	0.899	0.675–1.222	0.042
30–34.9 (obesity 1)	−0.498	1.124	0.786–1.675	0.031
35–39.9 (obesity 2) (Ref.)	-	-	-	-
Occupation				
Professional	1.347	3.219	2.330–4.223	0.023
Semi professional	0.957	2.339	1.345–2.989	0.014
Shop owner	0.853	1.999	0.433–2.299	0.042
Skilled worker	0.759	1.189	0.350–1.800	0.056
Semi-skilled	0.689	1.009	0.278–1.999	0.069
Unskilled	0.399	1.001	0.389–1.239	0.231
Unemployed	0.479	2.267	0.471–3.289	0.021
House-wife (Ref.)	-	-	-	-
Waist hip ratio				
High	0.564	3.456	2.341–4.564	0.004
Normal (Ref.)				
Caste				
General	1.489	2.113	0.449–2.929	0.001
OBC	0.389	1.001	0.287–1.118	0.932
SC (Ref.)	-	-	-	-

is a difference in the educational status of the patients in our study and other studies. In our study showed that those who were having education status more than high school level were more prone to DM, and the maximum prevalence of DM was also found in postgraduates and the minimum prevalence of DM was found those were having education up to primary school level. While Patel *et al*.[15] observed that the majority of their patients had graduate education and illiterates formed a mere one percent in their study. A study by Tol *et al*.[16] had an important opposite association between the educational status of the population and the risk of obstacles in diabetic patients. Patil *et al*.[17] reported that out of 140 diabetic patients studied females were predominant 78 (55.71%). The majority of the present study sample were married 130 (92.85%). 66 (47.14%) were Muslim followed by 60 (40.85%) were Hindus. Approximately half of the respondents, 75 (53.57%) were from nuclear family.

In addition, our study showed that the maximum number of diabetics was found in the nuclear family followed by three-generation family and joint family besides this prevalence of DM among Hindus as well as Muslims was noted almost similar prevalence. The majority of individuals were married; out of these 14.7% were having diabetes, in which 6.6% were unmarried and in them 11.9% were having diabetes. With regard to the nutritional status the findings of our study showed as the BMI increases the prevalence of DM increases. The maximum number of diabetic individuals was found in obese Class II, followed by obese Class I and pre-obese, whereas the minimum number of diabetic individuals (8.7%) was in underweight class. Similar trend was seen in IFG prevalence. While Patel *et al*.[15] more than half of our patients were in the obese category as per their BMI, whereas in the study by Patel *et al*. almost 70% of their patients were in obese category. It is noteworthy here that both the studies have used the new criteria for defining obesity because of which we see large proportion of patients in obese category. A study by Shrivastava *et al*.[18] from Rewa city in Madhya Pradesh showed that 55% of their patients were obese and another 22% were overweight.

A study by Shekar *et al*.[19] among the South Indian diabetic population showed mean BMI to be more among females. The study by Maria *et al*.[20] in Punjabi diabetics showed that the mean BMI was almost equal in both genders. The mean WHR was higher (0.96 among females and 1.05 among males) in a study by Maria *et al*.[20] in North Indian type 2 diabetic patients whereas it was found to be lower (0.92 among males and 0.83 among females) in the South Indian diabetic patients studied by Shekar *et al*.[19] While our study shows that 341 individuals were having high WHR, out of that of 59 (17.3%) were diagnosed diabetic, 37 (10.9%) as IFG and 245 (71.9%) were normal. Whereas, 299 were having normal WHR out of that 38 (12.8%) were diagnosed as diabetic, 24 (8.0%) as IFG and 237 (79.2%) were normal. It can be seen that the prevalence of DM and IFG was more in those who were having a high WHR.

CONCLUSION

The study concluded that in spite of having health-care facility nearby, the indiscretion of healthiness was a major concern. The higher proportion of DM patient is prominent in who is from nuclear family, having sedentary lifestyle and obese. The health system needs to be further strengthened to deliver an effective, reliable, and affordable package of intervention and services for people with diabetes.

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How to cite this article: Khan MS, Gupta SB, Singh AK, Saxena S, Ahmad A. Sociodemographic and anthropometric factors influencing diabetes mellitus in an urban population of district Bareilly: A cross-sectional study. Int J Med Sci Public Health 2020;9(4):267-272.

Source of Support: Nil, **Conflicts of Interest:** None declared.