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Original Research Article

An epidemiological cross sectional study for screening of risk factors of diabetes using WHO STEPS guidelines in an urban slum of metropolitan city

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ABSTRACT

Background: Diabetes is rapidly becoming one of the most common non communicable disease worldwide and its prevalence has increased. The risk factors associated with diabetes needs to be studied for its prevention and control.
Methods: Study participants between the age group 25-64, at the community level were interviewed using the WHO steps questionnaire, which included their sociodemographic profile, history about their addiction, diet and physical activity. Their physical and biochemical measurements were also taken.
Results: A total of 400 participants participated in the study. Out of this, 62.8% (251) were seen to be diabetic. Factors seen to be significantly associated with having the disease were age group 35-44 years, having education level above secondary, being unemployed, from nuclear family. Risk factors seen to be associated were being a smoker, having less than 5 servings of fruits, not doing physical activity, being obese and having hypercholesterolemia and hypertriglyceridemia.
Conclusions: Prevention and control of diabetes needs to adopt an approach which aims at changing the lifestyle of individual. Healthier food choices, encouraging regular physical activity right from school level would definitely shape and influence long term behaviour.

Keywords: Diabetes, Risk Factors, Screening, Steps approach

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder resulting from a defect in insulin secretion, insulin action, or both.[1] It is one of four priority non-communicable diseases (NCDs), which is an important public health problem, targeted for action by WHO. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades.[2]

This reflects an increase in its associated risk factors such as tobacco use, alcohol consumption, raised blood pressure, inadequate physical activity and obesity. Over the past decade, diabetes prevalence has risen faster in low- and middle-income countries than in high-income countries.[3]

Vulnerable and socially disadvantaged, urban slum population are at greater risk of being exposed to risk factors for developing diabetes and have limited access to health services.[4]

WHO has developed STEP wise approach to assess risk factors for non-communicable diseases including diabetes.[5]

Prevention of diabetes should focus on minimizing the risk factors associated with it. Thus, the present study aimed to find out the risk factors of diabetes among the slum population using the WHO STEPS approach guidelines.

Objectives

To study the socio demographic profile of people aged 25-64 years. To determine the risk factors related to diabetes among the study population. To assess the co-relation of risk factors with diabetes.

METHODS

Study area

This community based cross sectional study was conducted in an urban slum which is a field practice area of department of community medicine of a medical college in a metropolitan city from January 2018 to December 2018. People aged 25-64 years living in the study area for more than 6 months and willing to participate in the study were included in the study. After obtaining permission from the Institutional Ethics committee, and informed written consent from the participants, the study subjects were interviewed with a questionnaire based on WHO STEPS approach for risk factors of non-communicable diseases.

As per a study done by Ramchandran the prevalence of diabetes was seen to be approximately 20%.[6]

Sample size calculation was done by using the formula $n=4pq/L^2$, where 'n' is the sample size, 'p' is prevalence, p =20%, q = 100 - p = 100 – 20 = 80%,

'L' is admissible error which was 20%,

L=20% of p=4;

So putting the above values in the formula, $n = \frac{4\times20\times80}{4^2}$

n=6400/16=400

So, the sample size of the current study was 400.

The study area was divided into 50 plots and each plot consisted of nearly 180 households. So, to get a sample size of 400, 8 households were selected by simple random sampling technique (table of random numbers) from each plot. If any house was found locked, or inclusion criteria not fulfilled, then the consecutive house was targeted. From each house, one individual was interviewed according to the need.

The study included both males and females in the age group of 25-64 years. The tool used to collect data and measure non-communicable disease risk factors was according to the standardized WHO Steps Guidelines.[5]

Step one: interview schedule

It involves the socio-demographic profile, history of tobacco, smoking, and alcohol use, details about the dietary intake, physical activity, and about the family history of hypertension, diabetes.

WHO has recommended that throughout a week, including activity for work, during transport and leisure time, adults should do at least, ≥150 minutes of moderate intensity physical activity or ≥75 minutes of vigorous physical activity.[7]

Those in the present study who fulfilled the above criteria were labelled as having physical activity and those who did not fulfill the criteria were labelled as not having physical activity.

Step two: physical measurements

It includes height, weight, girth (waist hip ratio), blood pressure.[5]

Measurement of height

To ensure that measurement was as accurate as possible, participants were asked to remove shoes, hats, and other headwear.

They were asked to keep feet flat on the floor, stand straight with back flat against the wall, chin being parallel to the floor. A flat straight object was placed on the head and marked on the wall, or a pencil was held flat against the top of the person's head and marked on the wall directly. The distance from the floor to the spot on the wall was measured to find out the height.

Measurement of weight

Participants were asked to remove footwear. They were also requested to take off any heavy belts and empty out their pockets of mobiles, wallets and coins. They were asked to step onto the measuring scale with one foot on each side of the scale, and were instructed to stand still, facing forward, with arms on the side, and the weight recorded.

Measurement of BMI[8]

Table 1: BMI Classification as per WHO.

Obesity class (BMI)[9]	
Underweight	<18.50
Normal	18.50-24.99
Pre obese	25.00-29.99
Obese class 1	30.00-34.99
Obese class 2	35.00-39.99
Obese class 3	>40.00

Measurement of waist circumference[5]

Waist measurement was done with the help of measuring tape. Measurement was taken without clothing, directly

over the skin, or if not possible, then over light clothing. Waist measurement was taken at the end of normal expiration, with arms relaxed on either side at the midpoint between lower margin of last palpable rib and top of the iliac crest (hip bone).

Measurement of hip circumference[5]

Hip circumference was measured at the maximum circumference over the buttocks with a measuring tape. The participants were asked to stand straight with their feet together, while holding their arms relaxed by their sides, and with light clothing on.

Measurement of waist-hip ratio[5]

For determining the central obesity, waist hip ratio (WHR) was calculated, by the formula:

$$\frac{\text{Waist circumference}}{\text{hip circumference}}$$

WHR in males >1.0 was considered as central obesity.

WHR in females >0.85 was considered as central obesity.

Blood pressure measurement

Blood pressure was measured by mercury sphygmomanometer using appropriately sized cuff by auscultatory method in sitting position. Three recordings were recorded 3 to 5 minutes apart and mean value of all three readings was taken as the final reading.

Step three: biochemical measurements

It includes blood sugar (fasting and post prandial), serum cholesterol, serum triglycerides.

The study participants were called to the urban health centre, attached to the department of community medicine for taking the blood sample for fasting blood sugar, serum cholesterol, serum triglycerides and for 2 hours post prandial sugar level on the same day.

As per Harrisons Principles of Internal Medicine, 18th edition, blood sugar fasting ≥126 and post prandial sugar ≥200 was considered as diabetes.[9]

According to American Heart Association, a total cholesterol of ≥200 was considered as hypercholesterolemia. Serum triglycerides of ≥150 was considered as hypertriglyceridemia.[10]

RESULTS

A total of 400 participants were included in the study. As per the socio-demographic characteristics of the study sample shown in Table 2, majority i.e. 35.5% (142) of the study subjects belonged to the age group of 45-54 years. Distribution as per sex of the participants showed that 57.7% (231) were females, followed by 42.3% (169) males. Religion wise distribution showed 94.5% (378) were Hindus, while 5.5 % (22) were Muslims. As per the education status, it was seen that 48.3% (193) had schooling only up to primary level. Participants in the present study were mostly unemployed i.e. 50.3% (201). Most of them i.e. (58.5%) 234 belonged to nuclear family. According to the modified BG Prasad socioeconomic status scale, 36.8% (147) of the study subjects were from class III.[11]

Table 2: Socio-demographic characteristics of the study sample (n=400).

Variable	Frequency (%)
Age group	
25-34	56 (14)
35-44	138 (34.5)
45-54	142 (35.5)
55-64	64 (16)
Education	
Illiterate	58 (14.4)
Primary	193 (48.3)
Secondary	129 (32.3)
≥Higher Secondary	20 (5)
Occupation	
Unemployed	201 (50.3)
Unskilled and semiskilled	133 (33.2)
Skilled	66 (16.5)
Family type	
Nuclear	234 (58.5)
3 generation	132 (33)
Joint	34 (8.5)
Socioeconomic class	
Class I	24 (6)
Class II	109 (27.2)
Class III	147 (36.8)
Class IV	102 (25.5)
Class V	18 (4.5)

On studying the various risk factors, in this study, it was seen from Table 3, that 33.5% (134) of the study participants were either smokers or were consuming smokeless tobacco. Enquiring about alcohol consumption, showed 24% (96) of them were taking alcohol. Consumption of less than 5 servings of fruits were seen in 71.2% (285) of the study participants, while 99.2% (397) consumed vegetables. Those who did not do any physical activity as per the WHO recommendations were 60.8% (243). On calculation of the BMI, it was seen that 42.2% (169) study participants belonged to pre-obese class, while 53.75% (215) were seen to have central obesity.

As shown in Figure 1, on checking the blood sugar levels, it was found that 62.8% (251) of the participants were having diabetes.

Table 3: Distribution of the study subjects as per risk factors.

Risk factor	Frequency (%)
Smoking and smokeless tobacco	
Yes	134 (33.5)
No	266 (66.5)
Alcohol intake	
Yes	96 (24.0)
No	304 (76.0)
Servings of fruit	
<5	285 (71.2)
>5	115 (28.8)
Servings of vegetables	
0	03 (0.8)
1	397 (99.2)
Physical activity	
Yes	157 (39.2)
No	243 (60.8)
Obesity class (BMI)	
Underweight (<18.50)	16 (4)
Normal (18.50-24.99)	111 (27.8)
Pre obese (25.00-29.99)	169 (42.2)
Obese (>30.00)	104 (26)
Central obesity	
Yes	215 (53.75)
No	185 (46.25)

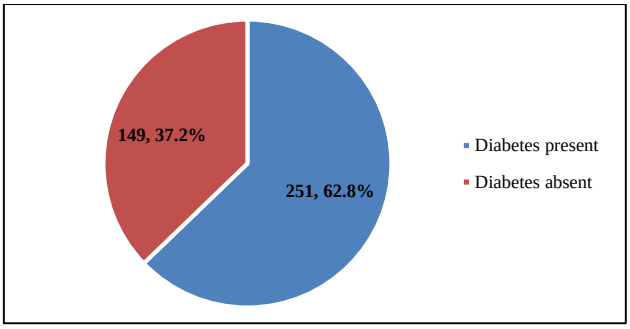

Figure 1: Diabetes status among the study sample (n=400).

On studying the association of diabetes, with various sociodemographic factors, in Table 4, statistical significance was seen with those belonging to age group 35-44 years age group (p=0.01), those with education level more than or equal to secondary schooling (p=0.002), unemployed study participants (p=0.03) and study subjects belonging to nuclear families (p=0.034).

Studying the various risk factors and their association with diabetes, in Table 5 showed significant correlation with those taking less than 5 servings of fruit (p=0.02), not doing regular physical activity (p=0.04). Significance was also seen with those who were obese (p=0.01), those showing hypercholesterolemia (p=0.001) and hypertriglyceridemia (p<0.001).

Table 4: Association of diabetes with sociodemographic profile of the study sample (n=400).

Sociodemographic factors	Diabetes		Chi-square value, p value
	Present	Absent	
Age group (years)			
25-34	32 (12.7)	24 (16.1)	11.262, 3, 0.010, Significant
35-44	97 (38.6)	41 (27.5)	
45-54	92 (36.7)	50 (33.6)	
55-64	30 (12.0)	34 (22.8)	
Education*			
Illiterate	40 (15.9)	18 (12.1)	12.681, 2, 0.002, Significant
Primary	104 (41.4)	89 (59.7)	
≥Secondary	107 (42.7)	42 (28.2)	
Occupation#			
Unemployed	130 (51.8)	71 (47.6)	6.648, 2, 0.036, Significant
Unskilled and semiskilled	73 (29.1)	60 (40.3)	
Skilled	48 (19.1)	18 (12.1)	
Family type			
Nuclear	139 (55.4)	95 (63.8)	6.756, 1, 0.034, Significant
3 generations	84 (33.4)	48 (32.2)	
Joint	28 (11.2)	06 (4.0)	
Socioeconomic class$			
Upper class	87 (34.7)	46 (30.9)	2.714, 2, 0.257 Not significant
Middle class	96 (38.2)	51 (34.2)	
Lower class	68 (27.1)	52 (34.9)	

Table 5: Association of diabetes with the risk factors of the study sample (n=400).

Risk factors	Diabetes		Chi-square, p value
	Present	Absent	
Smoking and smokeless tobacco			
Yes	86 (64.17)	48 (35.83)	0.176, 1, 0.675, not significant
No	165 (62.03)	101 (37.97)	
Servings of fruit			
<5	169 (66.80)	84 (33.20)	4.827, 1, 0.0280, significant
>5	82 (55.78)	65 (44.22)	
Physical exercise			
Yes	89 (56.68)	68 (43.32)	4.063,1,
No	162 (66.66)	81 (33.34)	0.044, significant
Obese (BMI)			
Normal	69 (54.33)	58 (45.64)	5.643, 1, 0.018, significant
Obese	182 (66.64)	91 (33.33)	
Central obesity			
Yes	140 (65.11)	75 (34.89)	1.114, 1, 0.291, not significant
No	111 (60.0)	74 (40.0)	
Hypercholesterolemia			
Yes	132 (71.35)	53 (28.65)	10.894, 1, 0.001, significant
No	119 (55.35)	96 (44.65)	
Hypertriglyceridemia			
Yes	141 (75.40)	46 (24.60)	24.046, 1, 0.000, significant.
No	110 (51.65)	103 (48.35)	

DISCUSSION

In the present study, it was seen that 35.5% (142) of the study participants belonged to the age group between 45-54 years similar to a study done by Solanki et al, Al Mansour et al.[3,12] The study group mostly comprised of females i.e. 57% (231), as seen in study by Garg et al, Solanki et al, while 94.5% (378) were Hindus, similar results seen in study done by Srivastav et al and Abdusattar et. al.[3,13-15] Education of most of the study participants was mostly up to primary level i.e. 48.3% (193). As per the occupation, it was seen that 50.3% (201) of the participants were Unemployed. This finding was similar to the study done by Garg et al and Solanki et al.[3,13] Majority of the participants were from Nuclear families, and belonged to middle socioeconomic class i.e. 36.8% (147). Diabetes was seen among 62.8% (251) of the study participants.

The sociodemographic factors which were seen to be significantly associated with diabetes were increased age (>45 years), as seen in study by Al Mansour, those having education level above secondary level, similar to study by Talukdar et al, being unemployed, as seen in study by Solanki et al and those coming from nuclear family.[3,12,16]

The risk factors significantly associated with diabetes in the current study were taking less than 5 servings of fruits in a day, similar findings seen in study done by Thankappan et al, Garg et al, Aryal et al, Annadurai et al.[13,17-19] These findings could be because, majority of the study population belonged to lower and middle socioeconomic class and could not afford fruits every day. Having no physical activity was another risk factor showing significant association, similar results were seen in study done by Aryal et al, Abdusattar et al, Thankappan et al, Tripathy et al.[15,17,18,20] Being obese was another significant risk factor showing association. Similar findings were seen in study by Aynalem et al, Tripathy et al, Thakur et al, Al Mansour, Solanki et al.[1,3,12,19,21] The study population were seen to be obese and not doing any physical activity, reason could be that they do not having proper awareness about the benefit of exercises and do not have enough open space for exercise in the community, where the study was done. Having hypercholesterolemia and hypertriglyceridemia were other risk factors showing significant association. Similar findings were seen in study done by Mansour,[12] Thankappan et al,[17] Aryal et al,[18] Thakur et al, [21] Zhang et al,[22] Al Mawali et al.[12,17,18,21-23]

In our study, the study area and population were from urban slum of metropolitan city, so the risk factors for non-communicable diseases which we found may not be generalized and applicable for the general population.

CONCLUSION

The participants in the current study were mostly from the age group 45-54 years, were females, Hindu by religion, educated up to primary level, belonged to nuclear families, and class III socioeconomic status. More than half of the study population were seen to be diabetic. Association of risk factors with sociodemographic factors

revealed statistically significant relation with age, higher education level, being unemployed and those from nuclear families. Significant association with risk factors of diabetes were having less servings of fruits, no physical activity, being obese and having hypercholesterolemia and hypertriglyceridemia.

Recommendations

Prevention and control of diabetes needs to adopt an approach which aims at changing the lifestyle of individual. It also requires attempt to reduce the risk at each stage of life through appropriate public health interventions.

Healthier food choices, encouraging regular physical activity right from school level would definitely shape and influence long term behaviour.

Designing and strengthening the community based primary health care strategies for the socioeconomically disadvantaged communities for prevention and control of NCDs in the health care system.

With more emphasis on IEC and preventive activities; people will be benefitted from the programme that will enable prevention, detection and treatment of all NCDs.

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