Short Communication

An Study on Association of Biosocial Factors with Diabetes Mellitus in a Slum Community of Kolkata, West Bengal, India

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Abstract

Introduction: Diabetes mellitus is the Emerging Epidemic of the world of 21st century. It affects both the developed and developing countries of the world. It poses a heavy financial burden to both the affluents and the poor of the world. The population in India has an increased susceptibility to diabetes mellitus. The prevalence of disease in adults was found to be 2.4 percent in rural and 4.0-11.6 percent in urban dwellers(4). This study has been undertaken among the slum population of Chetla (Ward No.82) which is within the field service area of All India Institute of Hygiene and Public Health, Kolkata, with the following objectives.

• To estimate the prevalence of diabetes mellitus among ≥35 years adult slum dwellers of Kolkata (urban slum population of Chetla).

• To determine the association of the biosocial risk factors with diabetes mellitus among the study population.

• To assess the awareness about diabetes mellitus among the study population.

Conclusion: Among the total of 235 study subjects, the number of male was 106 (45.11%) and number of female was 129 (54.89%). Prevalence of diabetes mellitus among the total study subjects was found to be 17.45% with prevalence of 20.93% among the female and 13.21% among the male.

Significant statistical association of diabetes mellitus was observed with age, marital status, tobacco use, alcohol use, physical exercise, diet (green vegetables, fruits, junk foods), family history of diabetes mellitus, obesity (BMI, WHR), hypertension, hypercholesterolaemia.

Keywords: Diabetes; Prevalence; Obesity; Hypertension

Introduction

Diabetes mellitus is the Emerging Epidemic of the world of 21st century. It affects both the developed and developing countries of the world. It poses a heavy financial burden to both the affluents and the poor of the world.

Diabetes mellitus causes silent but irreversible damage to different organ systems if not detected early and treated properly-e.g. eye, kidney. It also predisposes the affected individual to various other comorbidities and infections by weakening the immune system. It increases the chance of Cardiovascular diseases with very rapid progression [1].

Diabetes mellitus has been defined as Fasting blood glucose-126 mg/dl (7.0 mmol/L) and Post-prandial blood glucose-200 mg/dl (11.1 mmol/L) [2,3]. Impaired glucose tolerance and impaired fasting glycaemia are risk categories for future development of diabetes and cardiovascular disease. In some age groups, people with diabetes have a two-fold increase in the risk of stroke. Diabetes is the leading cause of renal failure in many populations in both developed and developing countries.

People with diabetes require at least two to three times the healthcare resources compared to people who do not have diabetes, and diabetes care may account for up to 15% of national health care budgets. The population in India has an increased susceptibility to diabetes mellitus. The prevalence of disease in adults was found to be 2.4 percent in rural and 4.0-11(6). Percent in urban dwellers(4). This study has been undertaken among the slum population of Chetla (Ward No.82) which is within the field service area of All India Institute of Hygiene and Public Health, Kolkata, with the following objectives

Toestimate the prevalence of diabetes mellitus among ≥35 years adult slum dwellers of Kolkata (urban slum population of Chetla).

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To assess the awareness about diabetes mellitus among the study population.

Results and Discussion

Among the total of 235 study subjects, the number of male was

Table 1: Distribution of Cases with Diabetes mellitus according to Education.

Education	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
Illiterate	12 (18.75%) (29.268%)	52 (81.25%) (26.804%)	64 (100%) (27.23%)	d.f.=5
Primary	9 (15.79%) (21.951%)	48 (84.21%) (24.742%)	57 (100%) (24.26%)	Chi-Square value=0.599
Middle	11 (17.46%) (26.829%)	52 (82.54%) (26.804%)	63 (100%) (26.81%)	*P-value*=>0.05.
Secondary	4 (17.39%) (9.756%)	19 (82.61%) (9.79%)	23 (100%) (9.79%)	
Higher Secondary	3 (17.65%) (7.317%)	14 (82.35%) (7.22%)	17 (100%) (7.23%)	
≥Graduate	2 (18.18%) (4.878%)	9 (82.61%) (4.64%)	11 (100%) (4.68%)	
Total	41 (17.45%) (100%)	194 (82.55%) (100%)	n=235 (100%) (100%)	

Table 2: Distribution of Cases with Diabetes mellitus according to Per capita income per month (According to Modified Prasad's Scale, 2008).

Per capita income (inRs.)	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
<480 (Class-V)	2 (11.11%) (4.88%)	16 (88.89%) (8.25%)	18 (100%) (7.66%)	df.=4 Chi-Square value=3.052 *p-value*=>0.05.
480-959 (Class-IV)	8 (17.02%) (19.51%)	39 (82.98%) (20.1%)	47 (100%) (20%)	
960-1599 (Class-III)	13 (22.41%) (31.71%)	45 (77.59%) (23.2%)	58 (100%) (24.68%)	
1600-3199 (Class-II)	12 (13.79%) (29.27%)	75 (86.21%) (38.66%)	87 (100%) (37.02%)	
≥3200 (Class-I)	6 (24%) (14.63%)	19 (76%) (9.79%)	25 (100%) (10.64%)	
Total	41 (17.45%) (100%)	194 (82.55%) (100%)	n=235 (100%) (100%)	

Table 3: Distribution of Cases with Diabetes mellitus according to Tobacco use.

Tobacco use	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
Tobacco user	25 (21.74%) (60.98%)	90 (78.26%) (46.39%)	115 (100%) (48.94%)	d.f.=2
Ex-tobacco user	7 (31.82%) (17.07%)	15 (68.18%) (7.73%)	22 (100%) (9.36%)	Chi-Square value=9.272
Non-tobacco user	9 (9.18%) (21.95%)	89 (90.82%) (45.88%)	98 (100%) (41.7%)	*P-value*=<0.05.
Total	41(17.45%) (100%)	194 (82.55%) (100%)	n=235 (100%) (100%)	

Table 4: Distribution of Cases with Diabetes mellitus according to Alcohol use.

Alcohol use	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
Alcohol user	7 (25.93%) (17.073%)	20 (74.07%) (10.31%)	27 (100%) (11.49%)	d.f.=2
Ex-alcohol user	6 (50%) (14.634%)	6 (50%) (3.09%)	12 (100%) (5.11%)	Chi-Square value=11.533
Non-alcohol user	28 (14.29%) (68.293%)	168 (85.71%) (86.6%)	196 (100%) (83.4%)	*P-value*=<0.05.
Total	41 (17.45%) (100%)	194 (82.55%) (100%)	n=235 (100%) (100%)	

106 (45.11%) and number of female was 129 (54.89%). Female were more in number. Highest number were in 35-44 years age group (38.72%) followed by gradually decreasing numbers in 45-54 years age group (32.34%) and 55-64 years age group (15.74%) to be least in 65 years & above age group (13.2%).

Highest number of study subjects were Hindu (85.11%) followed by Muslim (11.91%) and Christian (2.98%).

Highest number of study subjects were in General category (61.28%) followed by gradually decreasing number in SC (21.28%) and OBC (14.89%) and ST (2.55%) categories.

Highest number of study subjects were in Illiterate category (27.23%), followed by gradually decreasing Middle (26.81%), Primary (24.26%), Secondary (9.79%) and Higher Secondary (7.23%) and

≥Graduate (4.68%) categories. Male were more educated than female. No subject was found within the study subjects having "Just literate" status.

Highest number of study subjects were in Married category (84.68%) followed by gradually decreasing number in Unmarried (7.66%), Widower/Widow (5.11%) and Divorced/Separated (2.55%) categories. Male were more in Married, Unmarried and Divorced/Separated categories, and female were more in Widower/Widow category.

60.43% of study subjects were in Unemployed category and 39.57% were in Employed category. Male were more in Employed category (82.08%) and female were more in Unemployed category (95.35%).

Table 5: Distribution of Cases with Diabetes mellitus according to Physical exercise.

Physical exercise	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
Yes	19 (10.61%) (46.34%)	160 (89.39%) (82.47%)	179 (100%) (76.17%)	d.f.=1
No	22 (39.29%) (53.66%)	34 (60.71%) (17.53%)	56 (100%) (23.83%)	Chi-Square value=24.345
Total	41 (17.45%) (100%)	194 (82.55%) (100%)	n=235(100%) (100%)	*P-value*= <0.05.

Table 6: Distribution of Cases with Diabetes mellitus according to Obesity (Body Mass Index or BMI).

Body Mass Index (BMI)	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
≥30	9 (37.5%) (21.95%)	15 (62.5%) (7.73%)	24 (100%) (10.21%)	d.f.=1
<30	32(15.17%) (78.05%)	179 (84.83%) (92.27%)	211 (100%) (89.79%)	Chi-Square value=7.46
Total	41(17.45%) (100%)	194 (82.55%) (100%)	n=235 (100%) (100%)	*P-value*= <0.05.

Highest number of study subjects (37.02%) were in Rs. 1600-3199 (Class-II) per capita income per month category followed by gradually decreasing number in Rs. 960-1599 (Class-III) (24.68%), Rs. 480-959 (Class-IV) (20%) and ≥ Rs. 3200 (10.64%) (Class-I) and <Rs. 480 (Class-V) (7.66%) per capita income per month categories. Male individuals had more per capita income per month than female individual among the study subjects.

Male were more than female in tobacco user (66.04%) and alcohol user (23.59%) and in ex-tobacco user (10.38%) and ex-alcohol user (8.49%) categories. So addiction was more in male.

Greater number of study subjects used to undertake physical exercise (76.17%) and lesser number of individuals did not undertake physical exercise (23.83%). More male (77.36%) used to undertake physical exercise than female (75.19%).

Intake of vegetarian diet, fruits, mustard oil was more in the female. Intake of milk products, animal proteins, green vegetables, junk foods, sunflower and mixed oils was more in the male.

Family history of hypertension and ischaemic heart disease was more in the male. Family history of diabetes mellitus and cerebrovascular accidents was more in the female.

Prevalence of diabetes mellitus among the total study subjects was found to be 17.45% with prevalence of 20.93% among the female and 13.21% among the male. New cases and old cases were 39.02% and 60.98% respectively of the total cases of diabetes mellitus.

Prevalence of obesity was more in female than male according to BMI {female (13.18%); male (6.6%)} and according to WHR {female (41.86%); male (22.64%)}.

Prevalence of hypertension and hypercholesterolaemia was more in female than in male {hypertension: female (31.78%); male (26.42%)} and {hypercholesterolaemia: female (10.85%); male (9.43%)}.

Awareness about diabetes mellitus was more in the female (8.53%) than male (6.6%).

Significant statistical association of diabetes mellitus was observed with age, marital status, tobacco use, alcohol use, physical exercise, diet (green vegetables, fruits, junk foods), family history of diabetes mellitus, obesity (BMI, WHR), hypertension, hypercholesterolaemia.

No statistical association of diabetes mellitus was observed with sex, religion, caste, education, occupation, per capita income per month and diet (vegetarian diet, milk products, animal proteins, oils).

In this present study, the prevalence of diabetes mellitus was found to be 17.45% (male-13.21% and female-20.93%).

In the study Current Status of Diabetes in India and Need for Novel Therapeutic Agents [4,5], Ramachandran et al. reported that age-standardised prevalence of diabetes and Impaired Glucose Tolerance (IGT) in urban India in 2000 were 12.1% and 14.0%, respectively, with no gender difference.

In the study Survey of Diabetes, Hypertension and Chronic Disease Risk Factors [6], which was a cross-sectional and descriptive study, with a stratified multistage sampling, in 1397 subjects older than 19 years of age and conducted in the municipality of Villa Nueva, department of Guatemala. the findings were-overall, 8% of participants had been found to present diabetes mellitus (includes previously diagnosed individuals, with fasting blood glucose equal or greater of 126 mg·dL or with 2h-OGTT equal or greater of 200 mg·dL); the prevalence of diabetes found was similar to the rate reported in Mexico City (8.7%) and greater than the rates found in other cities of Latin America, such as La Paz, Bolivia (5.7%); Santiago, Chile (6.5%); Bogotá, Colombia (7.4%); and Asunción, Paraguay (6.5%).

In this present study, the prevalence of diabetes mellitus was highest in the ex-tobacco user category followed by gradual decline in the tobacco user category and lowest in the non-tobacco user category.

In the study Smoking cessation and diabetes control in Kerala, India: an urgent need for health education [7], the findings were-studies from various parts of India had reported a steady increase in the prevalence of diabetes from 2% in the 1970s to >15% in the early 2000s; the highest rates of diabetes prevalence are in India's southern states; the southern state of Kerala reported the highest diabetes prevalence of 16.2%; several prospective studies had reported that cigarette smoking is an independent and modifiable risk factor for diabetes; current smokers were reported to have 2.1 times higher risk of developing diabetes compared with non-smokers in a study among a healthy population; in one prospective study, 25% of the smokers developed diabetes at 5 years compared with 14% of never smokers;

Table 7: Distribution of Cases with Diabetes mellitus according to Hypertension.

Hypertension(Increased blood pressure = ≥140 mm of Hg)	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
Present	22 (31.88%) (53.66%)	47 (68.12%) (24.23%)	69 (100%) (29.36%)	d.f.=1
Not Present	19 (11.45%) (46.34%)	147 (88.55%) (75.77%)	166 (100%) (70.64%)	Chi-Square value=14.14
Total	41 (17.45%) (100%)	194 (82.55%) (100%)	n=235 (100%) (100%)	*P-value*= <0.05.

Table 8: Distribution of Cases with Diabetes mellitus according to Hypercholesterolaemia.

Hypercholesterolaemia (Increased blood cholesterol level = ≥240 mg/dl)	Diabetes mellitus		Total	Statistical association
	Present	Not Present		
Present	12 (50%) (29.27%)	12 (50%) (6.19%)	24 (100%) (10.21%)	d.f.=1
Not Present	29 (13.74%) (70.73%)	182 (86.26%) (93.81%)	211 (100%) (89.79%)	Chi-Square value=19.67
Total	41 (17.45%) (100%)	194 (82.55%) (100%)	n=235 (100%) (100%)	*P-value*= <0.05.

the prevalence of tobacco use in India and Kerala state is high. In India, 47% of men and 14% of women aged ≥15 years either smoke or use smokeless tobacco (chewing tobacco); in Kerala, the prevalence of current smoking among men in the age group of ≥15 years was estimated to be 36% compared with 33% in India as a whole; smoking among women was low in India (1.4%) as well as Kerala (0.1%).

In this present study, the prevalence of Diabetes mellitus was highest in the ex-alcohol user category followed by gradual decline in the alcohol user category and lowest in the non-alcohol user category and male were more in the alcohol user and the ex-alcohol user categories and female were more in the non-alcohol user category within the study subjects.

In the study Risk Factors of Diabetes Mellitus in Rural Puducherry [8], which was a Cross sectional study in two villages of Puducherry, India with 1403 subjects above 25 years from 2 villages during January 2007 to April 2008, the findings was-that there was no association between alcohol consumption and prevalence of diabetes; literature showed varied association of alcohol and diabetes like U-shaped association, linear protection effect, protective effect only at low level of alcohol consumption and increased risk of development of diabetes across increasing levels of alcohol.

In this present study, the prevalence of diabetes mellitus was more in those individuals who did not undertake physical exercise and less in those individuals who undertook physical exercise within the study subjects.

In the study, Physical activity, body mass index, and diabetes risk in men: a prospective study, which was prospective cohort design using Cox proportional hazards models to calculate Hazard Ratios (HRs) and 95% Confidence Intervals (CIs) of incident diabetes in 20,757 men without diabetes at baseline, the finding was-that active men with normal and overweight BMIs had lower diabetes hazards than their inactive counterparts, but no difference by weekly activity was seen in obese men; elevated BMI is a key driver of diabetes risk, with relatively modest attenuation by activity.

In this present study, the prevalence of Diabetes mellitus was more in those individuals who had obesity than in those individuals who had no obesity within the study subjects.

In a study Diabetes mellitus and obesity [9], the finding was-that although an inherited liability to develop diabetes was probably the most important single factor leading to the development of clinical diabetes; obesity, acting as a diabetogenic factor, was probably a critical factor in the appearance of diabetes in many instances.

In the study [9], it had been found that obesity, acting as a diabetogenic factor, was probably a critical factor in the appearance of diabetes in many instances.

In this present study, the prevalence of diabetes mellitus was more in those individuals who had hypertension than in those individuals who had no hypertension within the study subjects and hypertension had been found to have significant statistical relation with diabetes mellitus.

In the study Hypertension in Diabetes Study (HDS): I. Prevalence of hypertension in newly presenting type 2 diabetic patients and the association with risk factors for cardiovascular and diabetic complications [10], which was a Cross-sectional study with newly diagnosed type 2 diabetic patients (n=3648, mean age 52 years, 59% male), the findings were-hypertension was common in newly diagnosed type 2 diabetes and was associated with obesity; the association between hypertension and higher triglyceride and insulin levels might be secondary to obesity in this population; an association between hypertension and cardiovascular complications was already apparent at diagnosis of diabetes. In this present study, the prevalence of diabetes mellitus was more in those individuals who had hypercholesterolaemia than in those individuals who did not have hypercholesterolaemia within the study subjects and hypercholesterolaemia had been found to have significant statistical relation with diabetes mellitus (Tables 1-8).

In the study Hypercholesterolemia in undiagnosed non-insulin-dependent diabetes in southern Taiwan [11,12], which was done to investigate the prevalence of hypercholesterolemia among subjects having diabetes and glucose intolerance, according to the guidelines of the National Cholesterol Education Program (Adult Treatment Panel II, ATP II) and consisted of 2090 subjects (856 men, 1234 women) aged 30 years or more from the Sun-Ming district of Kaohsiung city, the findings were-frequency of elevated total cholesterol in female subjects with abnormal glucose tolerance is significantly greater than in those with Normal Glucose Tolerance (NGT) and only male subjects with undiagnosed NIDDM (UDDM) had a statistically

higher rate of hypercholesterolemia than those with NGT.

Recommendations

The study population were advised regarding life style modification:

• Advise was given to give up, if not at all possible, to curb drastically the addiction habit of tobacco use and alcohol use (predominantly male population).

• Advice was given to reduce body weight (obesity) by diet control and by regular physical exercise and walking (predominantly female population).

• Advice was given to use minimum oil (sunflower oil/ mixed) for cooking and to avoid junk food altogether.

• Advice was given to increase the intake of green vegetables and fruits for their protective effect.

• Advice was given to cultivate healthy living habits and behaviours.

Those who were suffering from diabetes mellitus/hypertension/ ischaemic heart disease/cerebrovascular accident and those who were not suffering from any of these diseases with/without family history of these diseases, singly or in combination, among the study subjects, had been advised to attend Life style clinic at Urban Health Centre, Chetla (A specialist clinic conducted on every Tuesday with dedication and care), for regular check-up and follow-up including dietary advice by the dietician and examination of blood for sugar and cholesterol or more as advised by the specialist.

The field staffs and the dietician of Urban Health Centre, Chetla, were advised to conduct regular home visits to create awareness about diabetes mellitus and its ill effects among the slum community of Chetla through IEC and FGD.

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