Original Article

Burden of Obesity and Diabetes Mellitus in Low Income Area of Lahore

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Abstract

Objective: To find prevalence of obesity, diabetes and pre-diabetes and its association with non-communicable diseases in a local community of Mughalpura, Lahore.

Methodology: A cross-sectional study was conducted at Mughalpura Division, Lahore, Pakistan from January to June, 2021. The demographic details and data on blood sugar levels were collected from 380 participants using cluster sampling. Blood sugar ratio level was obtained as a key factor for observing diabetes and pre-diabetes. A test of association was used to observe the significant relation between diabetes with Basal Metabolic Index.

Results: The average age of the participants was 46.0 + 12.6 SD (in years). Almost two-third of the participants were female and majority of participants were Punjabi. Among the total participants, 293 (77.1%) had normal blood sugar level, whereas 25 (6.6%) were pre-diabetic and 62 (16.3%) were diabetic. The under-weight participants were 10 (2.6%), 86 (22.6%) were normal, 143 (37.6%) were over-weight and 141 (37.1%) were obese.

Conclusion: High prevalence of diabetes among obese individuals was found in a poor community of Mughalpura. Most of them were obese females. Significant association was found between systolic hypertension, diabetes and obesity.

Keywords: Diabetes, Obesity, Non-Communicable Diseases, Basal Metabolic Index, hypertension.

Introduction

Non-communicable diseases, including Diabetes Mellitus, are on the rise globally.[1] A drift of lifestyle from rural to urban, with decreased physical activity and increase in consumption of fatty diets has contributed to an increase in Type 2 diabetes.[2] Simultaneously, the rapid surge of obesity worldwide has made it a pandemic, with several people being overweight or obese. Obese people are predisposed to developing Non-Insulin-Dependent Diabetes Mellitus (NIDDM), commonly called type 2 diabetes. Being overweight or obese with predominant abdominal fat distribution accounts for 80- 90% of all type 2 diabetes, which hinders successful long-term management and could increase the risk of cardiovascular mortality from ischemic heart disease, hypertension and stroke.[3]

A rise in type 2 diabetes in developing countries makes it a harbinger of multiple risks like cardiovascular diseases, renal failure, retinopathy, and neurological conditions.[4] Another concerning factor is that not every person with diabetes is diagnosed. Global estimates reveal that nearly half of the adults with diabetes are undiagnosed; 81% of these people live in low and middle income countries. Economic development in these countries will eventually lead to a substantial increase in per capita expenditure of treatment of newly diagnosed diabetic patients.[2]

The rapid rate at which adult diabetes mellitus is developing is alarming. Predictions reveal a total of 300 million cases of adult diabetics by the year 2025, compared to 135 million diabetics in 1995 in developing countries. This means a prevalence of 5.4% in 2025, compared to 4% in1995. By the year 2025, more than 75% of people will be residing in developing countries compared to 62% in 1995.6 World Health Organization's demographic survey for Pakistan estimates an increase in prevalence of type 2 diabetes from 4.3 million in 1995 to 14.5 million in 2025, making Pakistan the fourth of the top ten diabetes reporting countries.[5] A well- known risk factor for type 2 diabetes in the Asian population is dominance of diabetes among first degree relatives. Consanguineous marriages being common may contribute to the load of diabetes. Other risk factors being malnutrition of mother and thus of the fetus, unhealthy lifestyles as a result of urbanization with lack of exercise, coupled with genetic factors contribute as risk factors for the disease.[6] The purpose of this population-based survey in Mughalpura, a low-income community of Lahore, was to find prevalence of diabetes and prediabetes and its association with obesity.

Material and Methods

A cross-sectional study was conducted at a local community in Mughalpura Division, Lahore, Pakistan in the year 2021, from January to June. The data was collected from 380 participants, after obtaining a written consent. The sample size was calculated as 339 by using WHO sample size calculator with 4% as the margin of error, 95% confidence coefficient and 16.98% as the prevalence of typeII diabetes and adding 10% as the non-response rate, the minimum sample size became 380. The data was collected using cluster sampling. Union Council Mughalpura division was divided into blocks and a single block covers 2000 houses. Blocks in the division were used as primary units within clusters and data was collected from the randomly selected household in randomly selected blocks. The inclusion criterion was participant's age more than 30 years. The exclusion criteria were comorbid conditions such as cancer, HIV or TB.

The approval of the study was taken from Institutional Review Board (IRB) of Shalamar Institute of Allied Health Sciences which is located in the

vicinity of Mughalpura. Demographic details and data were collected using a valid structured questionnaire. The objectives of the study were explained and consent was obtained from each participant before data collection. Random Blood Sugar (RBS) ratio level was obtained as a key factor for observing diabetes and pre-diabetes. Normal RBS was standardized as less than 140 mg, pre-diabetic was 140-199 mg and diabetes was more than 200 mg. Basal metabolic index was calculated by taking height in meter square and weight in kilograms. Height was initially measured in feet and inches. A BMI less than 18.5 was considered as under-weight, 18.5 to 24.9 was taken as normal, 25 to 29.9 was over-weight and 30 or above was obese. Mean and standard deviation of quantitative variables was given. The prevalence of diabetes and pre-diabetes was calculated. The chi-square test of association was applied to observe the association of categorical variables. Level of significance was taken as 5%. IBM SPSS version 26 was used for data analysis. Association of diabetes was tested with other non-communicable diseases. Normal systolic blood pressure was 90-119 mm Hg, 120-139 mm Hg was used as pre-hypertensive, and above 140 mm Hg was hypertensive. Normal diastolic blood pressure was 60-79 mm Hg, pre-hypertensive was 80-89 and hypertensive was more than 90 mm Hg.

Results

The data was collected from 380 participants living in Mughalpura Division Lahore. The average age of the participants was 46.0 + 12.6 SD (in years). Almost two-third of the participants were female. The most popular ethnicity was Punjabi, 48.25 % of the sample, followed by Urdu speaking. Most of the participants were females/ housewives who looked after household chores. More than half of the participants belonged to middle class.

Table-1: Demographic features of all participants included in the survey

Factor	Categories	n(%)
Gender	Male	127(33.4 %)
	Female	253(66.6%)
Marital Status	Never Married	12(3.2%)
	Currently Married	340(89.5%)
	Separated/ Divorced	1(0.3%)
	Window	27(7.1%)
Ethnicity	Punjabi	183(48.2%)
	Urdu	142(37.4%)
	Pushtoon	29(7.6%)
	Others	26(6.8%)
Occupation	Government Employee	59(15.5%)
	Non-government Employee	49(12.9%)
	Self-employed	20(5.3%)
	Retired	11(2.9%)
	Unemployed (Can work)	4(1.1%)
	Unemployed (Disable)	9(2.4%)
	Household chores	228(60.0%

Socio-economic class	Low Class	119(31.3%)
	Middle Class	206(54.2%)
	High Class	55(14.5%)
Education	No formal schooling	115(30.3%)
	Primary or less	101(26.6%)
	Secondary or High school	137(36.1%)
	Graduation	19(5.0%)
	Post-graduation	8(2.1%)
Total		380(100.0%)

Among the total of 380 participants, 293 (77.1%) had normal blood sugar level, whereas 25 (6.6%) were pre-diabetic and 62 (16.3%) were diabetic. The average waist hip ratio was 0.9 + 0.1 SD. The under-weight participants were 10 (2.6%), 86 (22.6%) were normal, 143 (37.6%) were over-weight and 141 (37.1%) were obese. Among the total participants, 167 (43.9%) of the participants had past history of diabetes. About 156 (41.1%) of the participants had past family history of hypertension. Nearly 71 (18.7%) and 35 (9.2%) of the participants had family history of ischemic heart disease (IHD) and stroke.

Table 2: Blood Sugar, Heart rate and BMI of normal, pre hypertensive and hypertensive patients.

Factors	Categories	Diabetes			Total	Sig.
		Normal	Pre diabetic	Diabetic		
Systolic BP	Normal	63	07	08	78	.005
	Pre-hypetension	128	08	17	153	
	Hypertension	102	10	37	149	
Diastolic BP	Normal	80	05	14	99	.156
	Pre-hypertension	94	10	13	117	
	Hypertension	119	10	35	164	
Heart rate	Bradycardia	08	01	-	09	.176
	Normal	175	12	30	217	
	Tachycardia	110	12	32	154	
BMI	Under-weight	09	-	01	10	.406
	Normal	71	02	13	86	
	Overweight	110	12	21	143	
	Obese	103	11	27	141	
Total		293	25	62	380	

Chi-square test of association was applied at 5% level of significance to observe the relationship of diabetes with various other diseases. Table 2 shows that systolic blood pressure was statistically significantly associated with diabetes. A large proportion of the participants were pre-hypertensive or hypertensive. Out of the total diabetic participants, 21 (33.9%) were over-weight and 27 (43.5%) were obese. Nearly half of the diabetic participants had tachycardia.

Discussion

Diabetes has become one of the leading causes of mortality as it is highly prevalent globally, especially in the third world countries.[7] The main cause of its becoming a cause of mortality is its associated risk with cardiovascular diseases and obesity.[7] Therefore, this study aimed to observe the prevalence of diabetes

and its association with hypertension and obesity. In the current study we observed the prevalence of diabetes as 16.3% and pre-diabetes was 6.6%. The prevalence of diabetes and pre-diabetes in another study conducted in Pakistan was 16.98% and 10.91% which was quite similar to our results.[8] A meta-analysis pooled the prevalence of diabetes and pre-diabetes., the prevalence was found as 14.62% and 11.43% for diabetes and pre-diabetes.[9] In other studies conducted in Pakistan, results showed relatively higher proportion of diabetes as 26.3%.[10] The prevalence of diabetes and pre-diabetes was comparatively higher found in our study , whereas in a study conducted in Nanchong region of China, the prevalence of diabetes mellitus was 13.9% and pre-diabetes was 3.7%.[11]

In this study, 2.6% of individuals were underweight, 22.6% were normal, 37.6% were overweight, and 37.1% were obese, indicating that majority of the population was overweight and obese. In another research conducted in Pakistan, the prevalence of overweight and obesity according to WHO cut offs was 76.2% and 62.1%, respectively.[11] A survey conducted in China revealed that the prevalence of overweight people increased from 32.5% to 34.5% and the prevalence of obese people increased from 14.1% to 16.5% between 2013 and 2018, indicating an increasing trend of being overweight and obese, which could be attributed to dietary and lifestyle changes.[12]

Diabetes was significantly associated with obesity. Another similar study concluded that diabetes was more prevalent among obese people.[7] Advanced age, family history of diabetes, obesity and hypertension are the common risk factors of diabetes and pre-diabetes.[13] Diabetes was associated with obesity.[14] A substantial association was discovered between systolic hypertension and diabetes, and a considerable number of patients were pre-hypertensive or hypertensive. The majority of diabetes patients were overweight or obese (43.5% and 33.9%, respectively), and nearly half had tachycardia. The literature has revealed comparable outcomes to those reported in the current investigation.[8,15,16] The findings revealed that there is overlap between the etiology and the mechanisms of hypertension and diabetes.

We observed that the proportion of participants with past family history of diabetes were 41.1%. In a study conducted Tanzania, 70% of Tunisians showed a positive family history of diabetes in at-least one of their relatives from both sides.[17] In the underlying study, we observed that women were more obese. One reason might be due to the inequality of the gender distribution within sample. The prevalence of obesity among females was 28.2% whereas it was 14.2% for men.8 Similar findings can be seen in various studies conducted in Nigeria,18 Turkey[19] and Saudi Arabia.[20] We also observed that diabetic women were more obese Women with diabetes were relatively more obese as compared to men in a study conducted in Turkey.[19]

A strong association was found between diabetes and hypertension. This study can be used as a reference for pre-diabetes check of hypertensive patients. The study was single-centered conducted in one area of Lahore, this can be multi-centered by comparing other low income areas. The association of diabetes was observed with other non-communicable diseases, this association can be checked for socio-economic and demographic factors.

Conclusion

In our study there was high prevalence of diabetes found in a low-income area of Lahore. Most of them were females and were overweight and obese. Significant association was found between systolic hypertension and diabetes. This may be due to some etiological similarities between both diseases. Similarly, life style also plays a part in their mechanisms equally. So, there is need to generate awareness about the life style management and disease etiology at community level, also cost effective

screening programs should be established for prevention and early diagnosis at national level.

Limitations of this study
Due to low budget and time constraint, we could not expand our study to other areas of Lahore.

Authors' contribution
SK: Write-up and drafting. TK: Supervision, data collection and final proof reading of manuscript. MM: Proof reading, data collection. SF: Manuscript writing, revisions made. NS: Data analysis & interpretation of results.

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