

Diabetes Mellitus Type 2: Prevalence and Estimation of Associated Risk Factors in District Okara, Pakistan

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Author's Contribution

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A B S T R A C T

Background: Diabetes type 2 is a metabolic disorder and distributed worldwide. Despite of frequent prevalence and survey-based studies in the Punjab province, a little is known about the status and prevalence of disorder in Okara district.

Objective: To find the prevalence associated risk factors of Diabetes Mellitus type 2 in district Okara, Pakistan

Methodology: This was a cross-sectional study and study participants were enrolled in Feb 2023. HbA1c test was used to determine the prevalence and a questionnaire was filled to collect the data of associated risk factors of types 2 diabetes. The sample size of the study was 138. Bivariate analysis was performed by using Chi-square square test at p value < 0.05.

Results: An overall frequency of diabetic (65.9 %), non-diabetic (11.6%) and prediabetes (22.5 %) were found from total 138 study participants. An overall prevalence was higher in female (69.2 %, p 0.442) than male (63.02 %, p 1.00). The age group 41 to 50 (76.6%, p 0.016) was found highly susceptible and significantly associated with disorders followed by the age groups 31-40 (68.9%, p 0.014), < 30 (68.7%, p 0.008), 51-60 (59.3%, p 0.070), 61-70 (54.5%, p 0.212), >70 (25%, p 1.000). Family history (83.3%, OR 2.93), Weight ranges 65-70 (40%, OR 0.07), 71-75 (33.3%, OR 0.09), 76-80 (70%, OR 0.31), 81-85 (59.3%, OR 0.23) and HCV (78.9%, OR 2.21) were also significantly associated with type 2 DM.

Conclusion: This study concludes the high rate of Diabetes type-II among the population of Oakra with awareness programs to control the burden of disorder in the district.

Keywords: Prevalence, Diabetes type 2, HbA1c.

Introduction

Diabetes Mellitus is chronic and one of the four major non-communicable disease (NCD) comprising- cancers, cardiovascular diseases and respiratory diseases.¹⁻³ Diabetes is a metabolic disorder and associated with impaired production and action of insulin through pancreas.⁴ It has two types: type 1 is mediated by autoimmune β cell destruction in pancreas, while type 2 is due to increased resistance to insulin. Type 2 is now becoming one of most important public health concern worldwide as it contribute >85% of all prevalent diabetes and associated with complications comprising cardiovascular abnormalities, kidney failure, depression and even suicide.^{5,6} According to a report of International Diabetes Federation (IDF) approximately 463million people globally suffer from diabetes (90% of these have type 2) and this figure will reach to 642million by year 2040. Moreover, one in two adults is undiagnosed with DM. In 2015, 5million deaths were caused by

diabetes indicating that one death in every six second. The incidence of type 2 in low to middle income countries increases and has becoming a socioeconomic burden on them including Pakistan.^{6,7}

Pakistan is the sixth populous country and population of 207.7million people. Pakistan is ranked 3rd for diabetes in the world after China and India. Results of previous prevalence-based studies show continuous increase in disease burden in the country. Prevalence in 2016, 2018 and 2019 was 11.77%, 16.98% and 17.1% respectively.^{6, 8} According to a report of IDF in 2022, 26.7% adults of Pakistan are affected by diabetes.⁷ This significant increase in type 2 diabetes can be linked with sedentary lifestyle (poor diet, consumption of fast food, less physical activity and obesity), urbanization, environmental and hereditary variables that cause impaired glucose homeostasis.

Although National action plan for non-communicable disease prevention, control and health promotion in Pakistan, increase in diabetes burden is alarming and there is dire need to review the interventions along with epidemiological data.⁹ There are number of test for Screening and detection of diabetes type like random blood sugar test, fasting blood sugar test, glucose tolerance test and HbA1c test. HbA1c has been approved as a diagnostic tool by WHO experts, providing that quality control checks are in place and no situations exist that would prevent an accurate measurement.¹⁰ Assessing the importance of type 2 DM prevalence we conducted five months study in Okara district as to best of our knowledge till date there is no prevalence based study published from this district. We choose HbA1c test instead of OGTT because following is exceedingly challenging to administer in many Pakistani community settings due to the amount of time needed for the test and the requirement that the subject fast.¹¹ So, the aim of the study was to determine the prevalence of type 2 diabetes through the HbA1c test as and its associated risk factors in Okara district, Punjab, Pakistan.

Methodology

A cross sectional study was conducted at from January 2023 to May 2023 in private diagnostic lab of Okara district. The sample size of the study which was 138, estimated prevalence of diabetes which is to be 10.0%, 95% confidence interval and margin of error to be 5%. All sampling process were carried out with strict accordance of institutional guidelines. The used procedure was approved from ethical committee of University of Okara.

To determine the levels of HbA1c a whole blood (3mL) was drawn from patient arm and stored in EDTA containing vials. HbA1c level was estimated through the Bio-10 system (Bio-Rad) based on HPLC- based ion exchange chromatography. After collection of blood a questionnaire was filled on verbal consent of patient. A questioner was designed containing information about age, gender, body weight, family history of diabetes, any other disease, education, and smoking, use of insulin, exercise and daily meal intake.

Sociodemographic data and associated risk factors were statically analyzed through statistical package for social sciences SPSS, version 20.0.¹⁰ Bivariate analysis was performed by using Chi-square square test at p value < 0.05. Multivariate regression analysis for risk factors by using backward stepwise selection method at p value < 0.2.

Results

138 patients were included in the study; 73 (52.9%) were male and 65 (47.1%) were female. The prevalence of diabetic, pre-diabetic and non-diabetic was 65.9%, 22.5% and 11.6% respectively. The prevalence of diabetes was higher among females 69.2% than males 63.02%. Among the different age groups the prevalence of diabetes was highest in age group 41 to 50 years (76.6%) followed by the age group 31 to 40 years (68.9%). The age group less than 30 years also had significant prevalence of diabetes (68.7%).

Prevalence of diabetes varied significantly among weight groups. Patients with the weight between 76 to 80 kg/m² had 70% prevalence for diabetes, while the weight group of 86 to 90 kg/m² had highest prevalence of 79.4%. This study also concludes that family history also contributes significantly to the prevalence of diabetes (83.3%) (Table I).

Table I: Bivariate analysis of risk factors associated with type 2 diabetes (n= 138).

	Non-Diabetic n (%)	Pre-Diabetic n (%)	Diabetic n (%)	P Value
	16 (11.6)	31 (22.5)	91 (65.9)	
Weight (Kg/m ²)				
66-70 (Kg/m ²)	2 (40)	1 (20)	2 (40)	0.010
71-75 (Kg/m ²)	1 (6.6)	9 (60)	5 (33.3)	
76-80 (Kg/m ²)	3 (10)	6 (20)	21 (70)	
81-85 (Kg/m ²)	5 (18.5)	6 (22.2)	16 (59.3)	
86-90 (Kg/m ²)	1 (2.9)	6 (17.6)	27 (79.4)	
>90 (Kg/m ²)	4 (14.8)	3 (11.11)	20 (74.1)	
Gender				
Female	9 (13.9)	11 (16.9)	45 (69.2)	0.298
Male	7 (9.6)	20 (27.4)	46 (63.02)	
Smoking				
No	16 (12.5)	27 (21.1)	85 (60)	0.249
Yes	0	4 (40)	6 (66.4)	
Age groups				
<30 Years	5 (12.5)	6 (18.8)	22 (68.7)	0.267
31-40 Years	5 (17.2)	4 (13.8)	20 (68.9)	
41-50 Years	3 (10)	4 (13.3)	23 (76.6)	
51-60 Years	3 (9.4)	10 (31.2)	19 (59.3)	
61-70 Years	0 (0)	5 (45.5)	6 (54.5)	
>70 Years	1 (25)	2 (50)	1 (25)	
Family History				
No	14 (12.3)	29 (25.4)	71 (62.3)	0.124
Yes	2 (8.3)	2 (8.3)	20 (83.3)	
Exercise				
No	11 (9.8)	27 (24.1)	74 (66.1)	0.312
Yes	5 (19.2)	4 (15.4)	17 (65.3)	
Use Insulin				
No	16 (28.6)	31 (54.4)	10 (17.5)	0.000
Yes	0	0	81 (100)	
Test Sugar daily at home				
No	16 (12.8)	30 (24)	79 (63.2)	0.102

Yes	0	1 (8.3)	12 (9.2)	
Daily meal intake				
2	1 (25)	1 (25)	2 (50)	0.653
3	14 (10.7)	30 (23.1)	86 (66.1)	
4	1 (25)	0 (0)	3 (75)	
Other diseases				
HBV	0	0	3 (100)	0.061
HCV	4 (21.1)	0	15 (78.9)	
No	12	31	73	

Bivariate analysis indicated that factors such as consuming meals more than two times a day and diseases like HBV and HCV were associated with the higher prevalence of disease (Table I).

In multivariate analysis, using backward stepwise selection with P value less than 0.2, age, weight, family history and HCV were found to be significantly associated with the diabetes. However, gender, smoking and exercise did not show significant association with diabetes (Table II).

Table II: Multivariate regression analysis of risk factors associated with type 2 diabetes (HbA1c>6.5(n=138).

Age groups	OR (95% CI)	P Value
<30 Years	33.2 (2.5-441.4)	0.008
31-40 Years	24.5 (1.9-316.9)	0.014
41-50 Years	22.2 (1.8-278.7)	0.016
51-60 Years	9.5 (0.83-109.5)	0.070
61-70 Years	5.2 (0.39-71.9)	0.212
>70 Years	-	1.000
Gender		
Female	1.32 (0.65-2.69)	0.442
Male	-	1.000
Smoking		
Yes	1.32 (0.35-4.92)	0.681
No	-	1.000
Exercise		
No	1.03 (0.42-2.53)	0.947
Yes	-	1.000
Other diseases (HCV)	2.21 (0.69-7.08)	0.183
Family History		
Yes	2.93 (0.96-9.43)	0.066
No	-	1.000
Weight (Kg/m ²)		
66-70 (Kg/m ²)	0.07 (0.01-0.68)	0.021
71-75 (Kg/m ²)	0.09 (0.02-0.43)	0.003
76-80 (Kg/m ²)	0.31 (0.08-1.26)	0.103
81-85 (Kg/m ²)	0.23 (0.06-0.89)	0.034
85-90 (Kg/m ²)	1.212 (0.32-4.46)	0.773
>90 (Kg/m ²)	-	1.000

Discussion

The study was the first HbA1c-based cross-sectional study conducted in this region, including 138 eligible participants from District Okara. Age, BMI, and family history all

are significantly associated with increased the risk of type 2 diabetes. The inverse relationships between type 2 diabetes, smoking and exercise were not found significant. According to current study, women are more prone to type 2 diabetes. This study can be compared with a research by Cho et al that found that women had a 1.7% higher death rate than men because females are more likely to develop type 2 diabetes than males because they have higher amounts of the hormones estrogen and progesterone, which lower their body's overall insulin sensitivity, and less muscular mass, which does not sustain a high uptake of a fixed glucose load.¹² This, however, contradicts a research by Bahendeka et al that found diabetes mellitus prevalence among males and females to be 1.6% and 1.1%, respectively.¹³ According to this study, the prevalence of pre-diabetics is 22.5%, which is comparable to another study that found young adults had a 24.0% prevalence rate of pre-diabetics as a result of eating unhealthy food, being inactive, and being overweight.¹⁴ The risk variables were nearly identical to those found in our research. Another study conducted by H Zhang et al reported that females had high prevalence of diabetes than males because females are less physically active, burning excess body fat in the tissues while eating an unhealthy diet high in fat and carbs, predisposing them to NCDs such type 2 diabetes.¹⁵ Among different age groups we found that age group 41 to 50 was most effected by type 2 diabetes mellitus due to aging-related declines in insulin production and increasing insulin resistance brought on by sarcopenia and changes in body composition.¹⁶ Other studies that were comparable to this study indicated that people between the ages of 40 and 50 and those between the ages of 50 and 60 were the age groups most frequently afflicted by diabetes mellitus.^{17,18}

Similarly, lifestyle, family history (83.3%) and obesity and other diseases like HCV are the main risk factors for developing diabetes. This study shows the increase in chances of diabetes is directly proportional to increase in weight. NEFA, glycerol, hormones, cytokines, pro-inflammatory chemicals, and other compounds that are involved in the development of insulin resistance are present in higher amounts in obese people. Diabetes is brought on by insulin resistance and -cell function impairment.¹⁹ Many other studies also indicate that increase in weight can also increase the chances of diabetes.²⁰ After considering for changes in food and activity, the risk was reduced by 16% for every kilogram of weight lost.²¹

Ignorance brought on by the lack of diversity in knowledge on this chronic disease may contribute to the widespread occurrence of type 2 diabetes in the Okara District. Furthermore, Okara District health centers still lack the resources and expertise necessary for diabetes screening, and

the lack of access to drugs for diabetic patients contributes to the high incidence.

Conclusion

The study concludes that diabetes type 2 is highly prevalent in Okara District, Punjab province and is associated with multiple risk factors (gender etc). The metabolic disorder is more prevalent in women and age group 41 to 50 years. The study recommended that there is dire need of awareness program to combat the risks associated with disorder and along with further studies are necessary to ascertain the disease burden in the district to better elucidate the control strategies.

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