RESEARCH ARTICLE

Prevalence of diabetes and prediabetes in district Swat Pakistan

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Abstract

Objective: To determine the prevalence of pre-diabetes and diabetes and its associated risk factors in adult population.

Methods: The cross-sectional population-based study was conducted from January to March 2018 in urban and rural areas of Swat, Pakistan, and comprised subjects aged 20-89 years. After a minimum 10-hour overnight fast, blood glucose was tested for pre-diabetes and diabetes according to the World Health Organization recommendations. Data was analysed using SPSS 21.

Results: Of the 1447 subjects, 837 (58%) were females and 610 (42%) males. The largest age group was 20-29 years with 322 (22.3) subjects. Pre-diabetes was found in 309 (21.4%) subjects and diabetes in 138 (9.52%). Higher age, urbanisation, family history of diabetes, weight, exercise, hypertension, monthly income and education were found to be significant risk factors for pre-diabetes and diabetes ($p<0.05$).

Conclusion: Every 10th resident of Swat was found to have diabetes, and every one in five had pre-diabetes.

Keywords: Prevalence, Diabetes, Pre-diabetes, District Swat, Pakistan. (JPMA 71: 243; 2021)

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Introduction

Diabetes mellitus (DM) is one of the major health issues and its prevalence is drastically increasing across the world.[1] DM is one of the common reasons of disability and death worldwide.[2,3] Globally, the number of individuals with diabetes is estimated to rise to 628.6 million in 2045 from 424.9 million in 2017.[4] Similarly, the prevalence of pre-DM is also rising globally and it is estimated that more than 470 million individuals will have it by the end of 2030.[5] Another report shows that approximately 70% of subjects with pre-DM will finally develop DM, which is one of the top-5 reasons of death in a number of developed nations.[5] Type 2 DM (T2DM0 decreases life expectancy by approximately 10 years.[6] The International Diabetes Federation (IDF) revealed that around 75% DM population live in developing countries, while 81.2% people are undiagnosed globally.[5] In the developing countries, most individuals with diabetes are aged 35-64 years, whereas in the developed countries those most commonly affected are of older age.[1] According to the World Health Organisation (WHO), in the underdeveloped countries, the number of diabetics will rise by 150% in the next 25 years.[1]

DM prevalence has been rising in Pakistan in line with worldwide trends, with total DM prevalence ranging 10-26% and varying from region to region.[7-15] The prevalence of pre-DM was 14.4% in Pakistan comprising 38 million people.[1] Around 82,000 women and 36,000 men die of DM-related complications in Pakistan each year. Considering the magnitude of the growing regional problem, many countries have taken preventive measures by launching national-scale diabetes control programmes.[16-20] There are no studies regarding the prevalence rate of pre-DM and DM in district Swat. The current study was planned to fill the gap by investigating pre-DM and DM prevalence, their association with known risk factors.

Subjects and Method

The cross-sectional population-based study was conducted from January to March 2018 in urban and rural areas of Swat, Pakistan. After approval from the institutional ethics review board of University of Malakand, the sample size was calculated using probability sampling techniques[21] based on an expected DM prevalence of 18%, which was on the basis of the prior pilot survey of this study (n=100),[13] and at a confidence level of 95% and margin of error 2%. Multistage cluster random sampling was used to raise the sample from among the permanent residents of the region age 20-89 years who were apparently healthy and did not have any other major disease. Each union council (UC) was marked as a single cluster. In the first level of sampling, 8 UCs were selected randomly from among the 64. Next, the target

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participants were approached, and those who consented to participate were included. Subjects who refused to give blood test samples, whether due to the fact that they were not fasting or due to culture norms, were excluded, and so were all pregnant women. The required sample size was met by further sampling from the respective clusters.

After informed consent from the subjects, a questionnaire was used to collect demographic and clinical characteristics along with lifestyle risk factors. This was done through one-on-one interviews. A current cigarette smoker was defined as a person who had smoked at least 100 cigarettes in the entire lifespan. Physical activity (labour) was considered as input in mild, moderate or heavy terms for 0-120 minutes/day.

Blood samples were tested for fasting plasma glucose in all subjects without a self-reported history of diabetes after a minimum of 10 hours of overnight fasting. Subjects were requested to keep their usual physical activities and food for at least 72 hours. DM and pre-DM were defined on the basis of WHO recommendations.[22] Diabetes was considered as a fasting blood glucose (FBG) level 126mg/dl or more. Pre-DM was considered as FBG level 110--125mg/dl, without medication. To confirm the results, the blood sample was retested by the same team with the same process on the very next day for all those whose FBG level was >126mg/dl. A person was considered hypertensive who was not taking any hypertensive medication, and had a blood pressure (BP) of 140/90mmHg or higher.

Data was analysed using SPSS 21. Prevalence of pre-DM and DM were expressed as frequencies and percentages at 95% confidence intervals (CIs). Chi-square test of independence was considered to measure the association among different categorical variables. The response variable had three categories; DM, pre-DM and normal. A multinomial logistic regression model was used to investigate the impact of different risk factors on DM and pre-DM. Backward elimination method was used for retaining the covariate in the best-fit model. $P<0.05$ was considered statistically significant.

Results

Of the 1447 subjects, 837(58%) were females and 610(42%) males. The largest age group was 20-29 years with 322(22.3) subjects (Table-1). Pre-DM was found in 309(21.4%) subjects and DM in 138(9.52%) (Table-2). DM and pre-DM were more prevalent in urban residents than rural residents, and the prevalence increased with age in both genders ($p<0.001$) though it was higher in men aged <50 years, and women aged 50 years or more. Pre-DM prevalence increased with age ($p<0.001$), and was higher in men aged <60 years (Figure).

Age, hypertension (HTN), positive family history of DM, higher BMI, exercise, income level, urban residence, and educational level were significantly related with DM prevalence ($p<0.05$). Advancing age, family history

Table-1: Demographic and socioeconomic characteristics (n=1447).

Variable	Sub-groups	Number (%)	Variable	Sub-groups	Number (%)
Age (Years)	Age-group		Monthly income	Pak Rupee (PKR)	
	20-29	322 (22.3)		≤10,000	80 (5.5)
	30-39	290 (20.0)		10,000-20,000	713 (49.3)
	40-49	288 (19.9)		20,000-30,000	267 (18.5)
	50-59	205 (14.2)		≥30,000	387 (26.8)
	60-69	187 (12.9)	Setting		
	70+	155 (10.7)		Rural	705 (48.7)
Gender				Urban	742 (51.3)
	Males	610 (42.2)	Body mass index (BMI) (weight)		
	Females	837 (57.8)		Underweight	228 (15.8)
Level of education				Healthy Weight	776 (53.6)
	Illiterate	505 (34.9)		Overweight	315 (21.8)
	Primary education	264 (18.2)		Obesity	128 (8.9)
	Secondary school	267 (18.5)	Exercise		
	High school and more	411 (28.4)		No exercise	273 (18.9)
Hypertension				Mild	584 (40.4)
	Yes	254 (17.6)		Moderate	289 (20)
	No	1193 (82.4)		Heavy	381 (26.3)

Table-2: Prevalence of diabetes and pre-diabetes by age and gender.

Age(yrs)	n	Known Diabetes	New cases of diabetes	Total cases of diabetes with (%)	Prediabetes with (%)	Normal
Men						
20-29	130	4	1	5 (3.85)	14 (10.80)	111
30-39	131	6	1	7(5.34)	22(16.79)	102
40-49	125	10	2	12(9.60)	25(20.00)	88
50-59	91	7	2	9(9.89)	25(27.48)	57
60-69	77	8	3	11(14.29)	25(32.47)	41
70+	56	7	4	11(19.64)	16(28.57)	29
Women						
20-29	192	2	2	4(2.08)	24(12.50)	164
30-39	159	1	3	4(2.52)	26(16.35)	129
40-49	163	10	3	13(7.98)	41(25.15)	109
50-59	114	9	8	17(14.91)	29(25.43)	68
60-69	110	11	9	20(18.18)	31(28.18)	59
70+	99	15	10	25(25.25)	31(31.31)	43
All ages	1147	90	48	138(9.53)	309 (21.35)	1000

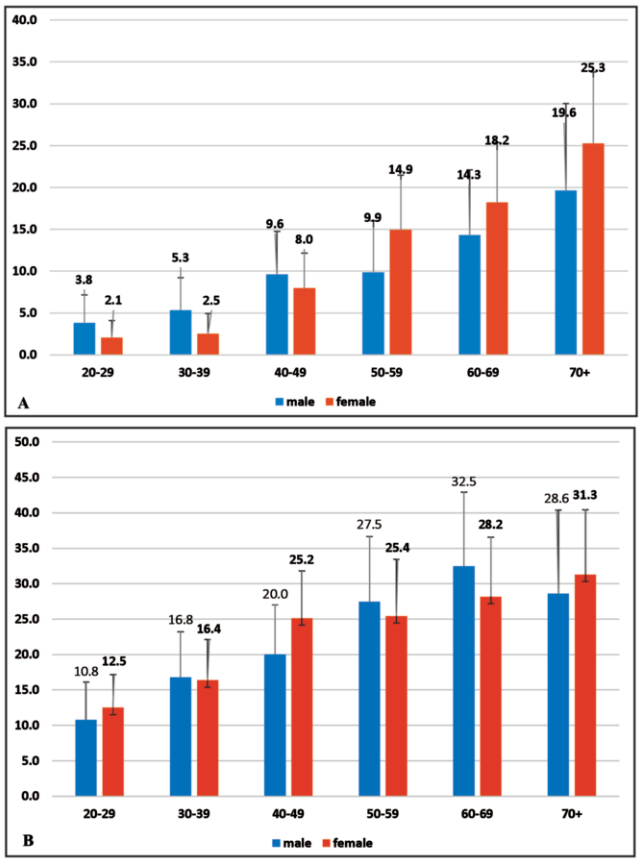

Figure: A) Age-specific prevalence rate of diabetes, and B) age-specific prevalence rate of pre-diabetes with I-bar representing the 95% confidence interval (CI).

of DM, urban residence and HTN were significantly related to the risk of pre-DM. Gender and smoking were non-significant factors with both DM and pre-DM (p>0.05) (Table-3).

Table-3: Fitted parameter estimates using stepwise logistic regression.

Predictor	Diabetes	P-value	Pre-diabetes	P-value
	Odds Ratio (95% CI)		Odds Ratio (95% CI)	
Age	1.05 (1.03-1.06)	<0.001	1.03 (1.02-1.04)	<0.001
History	2.95 (1.7-5.12)	<0.001	2.38 (1.51-3.77)	<0.001
Hypertension	5.73 (3.66-8.96)	<0.001	1.62 (1.12-2.34)	0.010
Income	1 (1-1)	0.034	1 (1-1)	0.961
Exercise	0.93 (0.86-1.01)	0.076	0.95 (0.9 -1)	0.067
Overweight (BMI)	1.08 (1.02-1.14)	0.008	1.02 (0.98 -1.05)	0.419
Education Level	1.31 (1.1-1.55)	0.002	1.09 (0.97-1.22)	0.170
Urban	2.09 (1.38-3.16)	<0.001	1.48 (1.14-1.93)	0.004

CI: Confidence interval; BMI: Body mass index.

Discussion

The overall prevalence of DM in the study region was 9.52% of the adult population; 3.32% being newly-diagnosed cases. Also, pre-DM prevalence was found to be 21.36%, which is an important risk factor of DM, indicating the likelihood for further increase in the number of diabetics. The prevalence of diabetes in Swat was found to be considerably lower than in an Indian study[23] (19.78%) done in a similarly hilly area, but was higher than Nepal (4.7%).[24] Furthermore, the analysis also showed that the prevalence rate of DM is significantly higher in urban residents (12.21%) than rural residents (7.0%). Urbanization is correlated with modifications in daily life that lead to an unhealthy food or diet, physical inactivity, and overweight, all of these have been associated as important reasons in the growth of diabetes. Similar to previous studies,[9-13] The analysis suggests that increasing age, hypertension, family history of diabetes, monthly income are the important risk factors for the prevalence of DM and pre-DM, while physical exercise was negatively correlated with the risk of

diabetes. However, gender, smoking, occupation were found insignificant in the analysis.

The current study has several limitations. We were not able to distinguish between T1DM and T2DM because that the diagnostic method for T1DM involves different methodological processes which were beyond the scope of the study. Besides, the study did not assess dietary intake, and, therefore, was not able to find the association between dietary factors and DM prevalence. Also, as most women refused to give the measurement of the waist-hip ratio (WHR), we used just the BMI to check the association between bodyweight and DM or pre-DM prevalence. Finally, the study only used multinomial logistic regression for data analysis when more advanced methods, like cluster analysis or discriminant analysis, may have been used to organise the data into meaningful hidden structures or relationship in order to gain further insight from them.

In the light of the findings, however, more focus should be given to earlier detection and preventive measures. A national-level survey is highly recommended to cover more hilly areas, like Swat, to check the prevalence of DM and pre-DM throughout the country.

Conclusion

DM and pre-DM prevalence was found to be higher in the urban population compared to the rural population. Urgent preventive measures should be adopted to bring DM and pre-DM levels down.

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Conflict of Interest: None.

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