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ORIGINAL ARTICLE

Association of Diabetes with Various Risk Factors

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ABSTRACT

Objective: To investigate the association of possible risk factors with Diabetes Mellitus in Population of Rawalpindi.

Patients & Methods: This case control study was conducted in Rawalpindi. A total of 99 cases of diabetes from OPD and 101 healthy controls from blood banks were included in the study. Self-developed closed ended questionnaires were used for data collection. Statistical analysis was performed using SPSS version 16.

Results: A total of 200 respondents (cases and controls) were selected for this study. Results were interpreted in the form of odds ratio (OR) and p-value. A p-value < 0.05 was considered significant. OR for age group (41-50 yrs) was 8.3 indicating that there were 8.3 times more chances of having Diabetes mellitus in this age group as compared to age group of 21-30 years. Males had a 4.4 times higher chances of getting Diabetes Mellitus as compared to females. While OR revealed that there were 12.7 times more chance of getting Diabetes Mellitus with positive family history as compared to negative family history.

Conclusion: Main risk factors identified in this study were age group 41-50 years, male gender and positive family history of Diabetes Mellitus.

Keywords: Age, Diabetes Mellitus, Family history, Male gender, Risk factors.

Author`s Contribution	Address of Correspondence	Article info.
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Introduction

Over the recent decades, the alarming increase in the prevalence of Diabetes Mellitus (DM) has lead it to become a global public health epidemic. It is leading to significant personal, social and economic burden worldwide. The World Health Organization has predicted that the major burden will occur in the developing countries (170% increase) as compared to 42% in the developed countries.[1] Diabetes Mellitus is typically characterised by persistent hyperglycaemia and impaired carbohydrate, lipid and protein metabolism due to insufficient insulin secretion and or action. Diabetes has two main types, Type 1 DM (Insulin Dependent Diabetes) and Type 2 DM (Non-Insulin Dependent Diabetes). Type 2 DM is the more common form, accounting for 90-95% of all the diabetic patients.[2] According to WHO, "the global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014.[1] Meanwhile, Type 1 DM is also showing an increase of 2% to 5% annually worldwide. This rapid and constant increase in Type 1 DM suggests a somewhat genetic-environmental interaction; rather than genetic shift alone in such a short time period.[3]

Well known risk factors associated with diabetes are increased body mass index (BMI), hypertension, smoking, physical inactivity, low education, inappropriate eating habits, high serum lipids, family history, genetics and

even specific ethnicities. Stressful life events and psychological stress is also intimately linked to poor blood sugar control.

Also, differences in the availability or affordability of healthy food, which includes fresh food rather than processed/ fast foods is a cause for intake of excessive refined sugars. Availability of places to exercise due to urbanization especially for the females is another leading cause in conservative societies.[4] Social inequalities in the form of access to health care facilities exists both in developed and developing countries. Thus, those attending specialised care centers are offered better care and information as compared to those attending general clinics. Recently a cross sectional study in UK in 2016 has revealed the combination of little physical activity, prolonged hours spent on watching television and internet and poor sleep duration as important unaddressed high-risk characteristics of both cardiovascular diseases and Type 2 DM.[5]

Public health policies are emphasizing the need for the early identification of the risk factors for DM and combating the modifiable risk factors, alongside implementing appropriate preventive interventions. This strategy is aimed to slow down the manifestations of the disease and eventually reduce public health expenditure. The present study was aimed to find out the association between diabetes and various risk factors such as age group, gender, education, socioeconomic status, family history, duration of diabetes, dietary intake and physical activity etc.

Patients and Methods

This study was conducted in Holy family hospital and Social security hospital of Rawalpindi from February 2016 to July 2016. A total of 99 cases of Type 2 diabetes from OPD of the hospitals and 101 healthy controls from blood bank were included in the study. Age group, gender, socioeconomic status and educational status were matched between cases and controls. Cases and controls were selected by non-probability consecutive sampling. Both cases and controls either aware of or having record of their blood groups and Rh type. Admitted cases of DM and cases or controls not aware of their blood groups or Rh type were excluded from the study. Data was collected through a self-developed, close ended questionnaire. Pilot study was carried out and in the light of it, necessary amendments were made in the data collecting tool. The Questionnaire was administered to both cases and controls. It included information on demographic profile, whether they were diabetic or not. If diabetic, the type of DM and the duration since their diagnosis. Rest of the questions including dietary habits (intake of food rich in fats or carbohydrates), physical activity (minimal with most of the time spent sitting or no), and blood group were same for both cases and controls. The Statistical Package for Social Sciences (SPSS version 16) was used to enter and analyze the data. Mean and standard deviation were calculated for quantitative variables and frequency with percentages were presented for qualitative variables. Multivariate logistic regression was used to assess impact of different independent variables on outcome variable of diabetes status. Results were interpreted in the form of odds ratio and p-value. A p-value < 0.05 was considered significant.

Results

In this study, a total of 99 cases of DM and 101 healthy controls were included. Overall mean age was 50.8 $\pm$ 7.3 years. Mean age in cases was 52.3 $\pm$ 6.75 years and controls was 47.8 $\pm$ 7.32 years. Among cases, 56 were males and 43 were females. While, among the controls, 67 were males and 34 were females. About 20 cases and 15 controls belonged to rural areas, whereas 77 cases and 84 controls belonged to urban areas. Amongst cases, 41 cases were diagnosed within last five years, 37 within 5-10 years and 21 for more than 15 years.

According to the results of multivariate logistic regression; overall age of the patient had significant (p-value < 0.05) effect on having diabetes. Although results showed a very large odds ratio (OR) in the age group ranging from 31-40 years, but it is not statistically significant (p-value > 0.05). The age group 41-50 years is a significant contributor for acquiring DM. The OR for this age group is 8.3 which shows that there are 8.3 times more chances of having diabetes in this age group as compared to age group of 20-30 years.

Gender played a significant (P-value < 0.05) role in acquiring DM. Males have a 4.4 times higher chances of getting DM as compared to females. Educational status of a person did not show any relationship with DM. There

was no significant (p-value > 0.05) effect of education on diabetes status. Furthermore, the study revealed that residence was found to be an insignificant (p-value > 0.05) contributor in acquiring DM, indicating that DM is not necessarily a disease affluent in urban localities. A key contributor for DM established in this study was the family history. A positive family history had significant (p-value < 0.05) effect on having diabetes. The odds ratio shows that there are more chances of diabetes with positive family history as compared to negative family history. Physical activity and meal intake did not show any significant (p-value > 0.05) impact on getting diabetes on the basis of this study. (Table 1)

Table 1. Demographic data in study groups.

characteristics	Cases (n=99)		Control (n=101)	
	Frequency	Percent	Frequency	Percent
Age Categories n(%)				
20-30	0	0	2	2.0
31-40	3	3.0	10	9.9
41-50	38	38.4	56	55.4
51-60	53	53.5	31	30.7
> 60	5	5.1	2	2.0
Total	99	100.0	101	100.0
Educational status				
Matric	35	35.4	28	27.7
Inter	18	18.2	25	24.8
Graduate	30	30.3	21	20.8
Post graduate	16	16.2	25	24.8
Total	99	100.0	99	98.0
Residence				
Rural	20	20.2	15	14.9
Urban	77	77.8	84	83.2
Total	97	98.0	99	98.0
Family history of Diabetes				
Yes	73	73.7	33	32.7
No	25	25.3	67	66.3
Total	98	99.0	100	99.0

Blood group as a whole had no impact diabetes. According to the results overall, there was no significant (p-value > 0.05) effect of blood group on having diabetes, but individually blood group O negative showed significant (p-value < 0.05) relationship with diabetes when multivariate logistic regression model was applied, and having O negative blood group had 10.28 times more chances of acquiring diabetes as compared to A positive blood group. (Table 2)

Multivariate logistic regression analysis of different factors with diabetic is shown in table 3.

Table 2. Frequency of various risk factors in study groups.

characteristics	Cases		Control	
	Frequency	Percent	Frequency	Percent
Meals rich in fats and carbohydrates?				
yes	55	55.6	52	51.5
no	44	44.4	49	48.5
Minimal physical activity				
yes	55	55.6	56	55.4
no	44	44.4	45	44.6
Blood group				
A Positive	12	12.1	6	5.9
A Negative	5	5.1	3	3.0
B Negative	41	41.4	32	31.7
B Negative	6	6.1	6	5.9
AB Negative	9	9.1	18	17.8
AB Negative	6	6.1	2	2.0
O Positive	16	16.2	29	28.7
O Negative	3	3.0	4	4.0
Total	98	99.0	100	99.0

Discussion

The results of this study revealed that age, family history and gender have a positive relationship in the acquisition of type 2 DM and unfortunately, all three of these are non-modifiable risk factors. The increasing insulin resistance with age, decreased physical activity and emergence of elderly diabetic patients due to improved healthcare are the reasons given for the rising prevalence of Type 2 DM with age in developed countries.[6-9] This study has revealed that age group of 41-50 years are the significant contributors to the non-insulin dependent diabetes mellitus load. Previous research has supported this finding showing that incidence of Type 2 DM increases with age universally, however, it occurs at lower ages among Pakistanis compared to Western developed countries.[10,11.] Two probable justifications might be provided. Firstly, Pakistan is a low income developing country with limited resources and healthcare facilities, thus the average life expectancy is 66 years compared to 81 years (in a developed country such as United Kingdom).[12] Secondly, the growth rate of Pakistan (2.1%) exceeds those of many developed nations (UK 0.8%,

Table 3: Multivariate logistic regression for association of different characteristics with diabetes						
Characteristics	Regression Coefficient	S.E.	Wald	Df	Sig.	(OR) Exp (B)
Age of participant			13.573	4	.009	
31-40 yrs	22.119	28420.72	.000	1	.999	403
41-50 yrs	2.120	1.065	3.967	1	.046	8.333
51-60 yrs	1.304	.863	2.285	1	.131	3.684
> 60 yrs	.380	.867	.192	1	.661	1.462
Gender	1.487	.444	11.217	1	.001	4.425
Education			1.872	3	.599	
Matric	-.536	.577	.865	1	.352	.585
Inter	-.046	.566	.007	1	.935	.955
Graduate	-.590	.556	1.127	1	.288	.554
Family History	-1.780	.315	32.019	1	.000	.169
Meals intake rich in fat and carbohydrate	-.691	.398	3.024	1	.082	.501
Lifestyle with minimum physical activity	.056	.397	.020	1	.887	1.058
Blood Group			13.658	7	.058	
A Neg	-.363	1.125	.104	1	.747	.696
B Pos	.241	.691	.122	1	.727	1.272
B Neg	.669	.921	.527	1	.468	1.952
Ab Pos	1.269	.791	2.571	1	.109	3.558
Ab Neg	-1.450	1.179	1.511	1	.219	.235
O Pos	1.346	.772	3.044	1	.081	3.844
O Neg	2.330	1.150	4.104	1	.043	10.280
Constant	-3.475	1.432	5.890	1	.015	.031

Reference Categories for: Age (20-30 yrs), Gender (Female), Education (Post Graduation), Residence (Urban), Family History (Negative), Meals (No), Physical Activity (Yes), Blood Group (A+).

China 0.5%), leading to a surge of young population.[13] The present study also showed a significant association between family history and incidence of DM, thus complimenting with previous findings in other studies.[14,15] A study conducted in Rawalpindi revealed similar findings.[16] Research reveals that individuals with family history of DM have six fold chances of acquiring DM as compared to those with negative family history.[17] This association could be derived partly from a genetic transmission and partly from unhealthy eating habits being passed from generation to generation in a cultural group suffering from DM.[18]

This study also revealed that males have 4.4 times more chance of having DM. This result is supported by International Diabetes Federation (IDF), which indicated that the prevalence of diabetes in Pakistan is higher in males, while the prevalence of impaired glucose tolerance (IGT) is higher in females.[19] This result may be attributable to specific cultural and geographic factors also; as literature has shown impact of geographic location on variety of diseases. A cross sectional survey published in 2011 conducted within the same geographical location i.e. Rawalpindi; revealed that prevalence of DM was more in males than females i.e. 15.41% vs. 12.31% respectively.[20]

According to a case control study conducted in Malaysia, A and O blood groups were negatively associated with diabetes mellitus. [21] Blood group B was associated with high incidence of type 2 diabetes according to a study conducted in Riyadh, Saudi Arabia.[22] Whereas our study revealed blood groups O negative is positively associated with diabetes mellitus.

A sub Saharan meta-analysis published in 2013 revealed men to have significantly more impaired fasting glucose

levels as compared to women. One possible justification for these different levels was said to be the lower hepatic sensitivity to insulin leading to higher fasting glucose levels in men. While, another justification provided was that men are more likely to smoke than women, and smoking decreases insulin sensitivity leading to impaired fasting glucose levels and eventually DM.[21] This explanation matches the conservative setup in Pakistan also where men are regular smokers compared to women. Another possibility for the increased cases of DM amongst the males may be due to the fact that women in a low-income country such as Pakistan have poor access to health care services and therefore little chances of being diagnosed with DM .[22,23]

Conclusion

Diabetes mellitus is an important public health threat specially in a resource poor country such as Pakistan. The age shift of DM is towards younger population, especially. Family history is a significant contributor for diabetes mellitus.

A non-modifiable risk factor, but screening in relatives of known patients of DM can reveal many hidden cases, and its early management.

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