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Original Article

Frequency of Cardiometabolic Risk Factors Among Young People with Type 2 Diabetes Mellitus at Tertiary Care Unit Karachi, Pakistan

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ABSTRACT

Objective: To determine the frequency of Cardiometabolic Risk Factors (CMRF) among young people with T2DM presenting at the Tertiary Care Unit in Karachi, Pakistan.

Study Design: Retrospective longitudinal study.

Place and Duration of Study: Baqai Institute of Diabetology and Endocrinology (BIDE), a Tertiary Care Unit, Karachi Pakistan, from Jan 2000 to Dec 2019.

Methodology: The data of participants with diabetes (PWD) aged 18-45 years on the first visit was extracted from the computerized Health Management System (HMS). The demographics, anthropometric, biochemical, and medical information on obesity, smoking, hypertension, dyslipidemia, HbA1c, and family history of diabetes were gathered.

Results: The study comprised 5336 participants with diabetes with a mean age of 31.94±5.52 years. High frequency of obesity, hypertension, dyslipidemia, cigarette smoking, poor glycemic control, and a positive family history of diabetes were observed, and their associations were statistically significant. Out of these, 4114(77.1%) were obese, 1663(31.4%) were hypertensive, 585(11%) were smokers, 4162(78%) had a positive family history of diabetes, 2519(47.2%) had HbA1c >10%, 2113(39.6%) had HbA1c between 7-10%. For dyslipidemia, 3383(63.4%) had high triglycerides, 3202(60%) had high LDL-C, 4578(85.8%) had low HDL-C, and 1729(32.4%) had high total cholesterol.

Conclusion: The results validate the importance of early screening for CMRF in young diabetics for management and complications prevention in the early stages of the disease and advocate screening for CMRF in health care policy.

Keywords: Cardiometabolic risk factors (CMRF), Dyslipidemia, Hypertension, Obesity, Smoking, T2DM.

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INTRODUCTION

Diabetes is a rising public health issue and global challenge that affects approximately 573.0 million adults worldwide, with estimates of 643.0 and 784.0 million by 2030 and 2045, respectively. Diabetes affects 73.0 million people in the Middle East and North Africa (MENA), with 796,000 deaths expected in 2021.[1,2] In Pakistan, 33.0 million people have diabetes, with another 11 million having Impaired Glucose Tolerance (IGT) and a significant risk of developing T2DM in the future.[3] The most common cause of morbidity and mortality in people with diabetes is atherosclerotic cardiovascular disease (ASCVD). Obesity, hypertension, dyslipidemia, smoking, poor glycemic control, and prolonged diabetes duration are risk factors for ASCVD.[4,5] The prevalence of cardiometabolic risk factors (CMRF) and its related complications and mortalities in early onset T2DM is higher than diabetes in elders.[3] In young adults with diabetes, CMRF contributes to the incidence of diabetes and mortality.6 One cohort study found that T2DM when developed at a younger age, is associated with more obesity, adverse lipid profiles, and higher HbA1c levels.[7] A study from Pakistan to assess cardiovascular disease (CVD) risk among participants with diabetes (PWD) revealed a strong association among risk factors.[8,9] Obesity and hypertension are strongly associated with diabetes in developing countries. Dyslipidemia and smoking at an early age were observed globally in the Asian population and tended to early death.[9,10] The high burden of CVD and T2DM because of CMRF must be understood to identify the high-risk people; they will benefit from early screening and prevention. Few studies have been carried out to evaluate CMRF and its association with each young adult with T2DM.

METHODOLOGY

The retrospective longitudinal study was conducted at the Baqai Institute of Diabetology and Endocrinology from January 2000 to December 2019 in Karachi, Pakistan after approval from Institutional Review Board (BIDE/IRB/KABHATTI/08/20/20/0237).

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Inclusion Criteria: Participants with T2DM aged 18-45 of either gender were included.

Exclusion Criteria: Patients of T1DM, endocrinal disorders, e.g. Thyroid, Adrenal, Pituitary Glands, and Polycystic ovarian diseases and Pregnant females were excluded.

The study sample was drawn from the computerized record for out-patient entries by the Health Management System of the Baqai Institute of Diabetology and Endocrinology (BIDE), which included 5336 patients with T2DM who fulfilled the inclusion criteria for the study with the duration of 20 years from 1st January 2000 to 31st December 2019.

Fasting plasma glucose (FPG) ≥126mg/dl (Fasting defined as no caloric intake for at least 8h) and/or Postprandial plasma glucose (PPG) ≥200 mg/dl after 2hr of oral 75gm OGTT and/or HbA1C ≥6.5.[11] Glycemic status: HbA1c <7.0%, HbA1c between 7.0–10%, HbA1c >10%. Newly diagnosed diabetes (NDD) was defined as FPG ≥126mg/dl or 2-hour PPG ≥200mg/dl or both. Previously diagnosed diabetes (PDD) was considered if the participant had been diagnosed as diabetic by a physician.[12] Hypertension was characterized by self-reported use of antihypertensive drugs and/or systolic BP >140mmHg or diastolic BP >90mmHg on two visits.[2] Participants were classified as non-obese if their BMI was <25kg/m^2 and obese if their BMI was ≥25kg/m^2 based on the WHO obesity cutoff for the South Asian population.[12] Serum cholesterol >200mg/dl, LDL-C 100mg/dl, HDL-C 40 and HDL-C 50(mg/dl) for males and females, and TG >150 (mg/dl) were all considered dyslipidemia in the 12-hour fasting state by the Adult Treatment Panel III.[13] People who were using a lipid-lowering medication were also labelled as having dyslipidemia. PWD smoking cigarettes in one or more of the 30 days before the OPD visit were considered smokers, whereas people not currently smoking were considered ex-smokers. PWDs who had never smoked were designated as non-smokers.[11]

Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 20. Continuous variables were presented as Mean±standard deviation, while categorical variables were presented as numbers (percentages). The chi-squared test was applied to check the association between variables.

RESULTS

Data of 5336 participants with diabetes (PWD) was retrieved. The mean age of PWD at diagnosis of diabetes was 31.94±5.52 years, whereas the mean age at first OPD visit was 35.52±4.58 years. Out of these, 2907(54.5%) were male, 1643(30.8%) had NDD, 3877 (77.1%) were obese, 585(11%) were a smoker, and 1663 (31.2%) were hypertensive. Furthermore, 4161(78%) had positive family history of diabetes, 1274(23.9%) had HbA1c >10%, and 1069(20.0%) had HbA1c between 7.1-10%. (Table-I).

Table-I: Demographic data and Cardiometabolic Risk Factors of study participants (n = 5336)

Parameters		n(%)
Age at diagnosis of DM (years), Mean±SD		31.94±5.52
Age at first visit (years), Mean±SD		35.52±4.58
Gender	Male	2907(54.5%)
	Female	2429(45.5%)
Marital status	Single	507(9.5%)
	Married	4829(90.5%)
Body mass index	<25 kg/m^2	1459(27.3%)
	≥25 kg/m^2	3877(77.1%)
Smoking Habit	No	4586(85.9%)
	Yes	585(11%)
	Ex-smoker	165(3.1%)
Hypertension	No	3673(68.8%)
	Yes	1663(31.2%)
Duration of DM	Newly diagnosed diabetes (NDD)	1643(30.8%)
	Previously diagnosed diabetes(PDD)	3693(69.2%)
Family history of DM	No	1175(22.0%)
	Yes	4161(78.0%)
HbA1c	≤7%	2993(56.1%)
	7.1-10%	1069(20.0%)
	>10%	1274(23.9%)
Dyslipidemia	High cholesterol (≥200 mg/dl)	717(13.4%)
	High triglyceride (≥150 mg/dl)	1387(26.0%)
	High LDL-C (≥100 mg/dl)	1552(29.1%)
	Low HDL-C (male<40mg/dl, female<50 mg/dl)	1864(34.9%)

PWD with BMI ≥25kg/m^2, 1333(34.4%, n=3877) were hypertensive, 1249(32.2%, n=3877) had NDD, 3103(80.0%, n=3877) had a family history of diabetes, 865(43.5%, n=3877), 827(21.3%, n=3877) had HbA1c >10% and between 7.1%-10%. High triglyceride in 1074(27.7%, n=3877) and low HDL-C in 1173(30.8%, n=3877) of PWD, results were significantly different (*p*-value <0.001) from PWD with BMI <25kg/m^2 and showed obese PWD had a higher frequency of hypertension, family history for diabetes, and more deranged HbA1c, fasting triglycerides and HDL-C level as compare to non-obese PWD (Table-II).

Association of HbA1c and other CMRF, PWD with HbA1c >10%, 865(67.9%) were obese, and 671 (52.7%) had high triglycerides, results were significantly different (<0.05) from PWD with HbA1c ≤10%, revealed a strong correlation between obesity and high HbA1c. Similarly, their cholesterol and LDL-C levels were also high, revealing an increased risk for CVD.

PWD with HbA1c ≥7% had a high frequency of hyper-tension, and PDD, which was significantly

different (<0.05) from PWD with HbA1c<7%, showed an early onset of diabetes or long duration of diabetes, had increased frequency and early development of cardio-metabolic derangement (Table-III)

Table-II: Relationship of Body Mass Index with Cardiometabolic Risk Factors of Study Participants (n=5336)

Cardiometabolic Risk Factors	Body Mass Index		*p*-value
	<25kg/m² (n=1459)	≥25 kg/m² (n=3877)	
Smoking Habit			
No	1216(83.3%)	3370(86.9%)	0.003
Yes	188(12.9%)	397(10.2%)	
Ex-smoker	55(3.8%)	110(2.8%)	
Hypertension			
No	1129(77.4%)	2544(65.6%)	<0.001
Yes	330(22.6%)	1333(34.4%)	
Duration of DM			
Newly diagnosed diabetes(NDD)	394(27.0%)	1249(32.2%)	<0.001
Previously diagnosed diabetes(PDD)	1065(73.0%)	2628(67.8%)	
Family History of DM			
No	401(27.5%)	774(20.0%)	<0.001
Yes	1058(72.5%)	3103(80.0%)	
HbA1c			
≤7%	808(55.4%)	2185(56.4%)	<0.001
7.1-10 %	242(16.6%)	827(21.3%)	
>10%	409(28.0%)	865(22.3%)	
Dyslipidemia			
High cholesterol (≥200 mg/dl)	163(11.2%)	554(14.3%)	0.003
High triglyceride (≥150 mg/dl)	313(21.5%)	1074(27.7%)	<0.001
High LDL-C (≥100 mg/dl)	379(26.0%)	1173(30.3%)	0.002
Low HDL-C (male <40 mg/dl, female<50 mg/dl)	477(32.7%)	1387(35.8%)	0.036

Data presented as n(%)

DISCUSSION

In our study, we found that most participants with diabetes had a high frequency of multiple CMRF and their association with each other was statistically significant. Several developing countries are facing obesity and undernutrition epidemics. The alarming increase in overweight and obesity because of an alteration in dietary pattern, reduced level of physical activity with frequent use of motorized transport.[11] Increased frequency of obesity, hypertriglyceridemia, decreased HDL-C, Insulin resistance, and T2DM has been documented among the Asian population and are considered more significant in the pathology of CVD.[12-14] In our study, these CMRF were significantly high in young PWD, the statistically significant association of obesity with high HbA1c, hypertension, dyslipidemia, and more seen in PWD with a family history of diabetes. It shows an increasing trend of increasing obesity is alarming in young adults because of diabetes at an early age. Raza *et al*. observed the same result.[6] Smoking raises one's risk of cardiovascular disease (CVD), although the link between smoking and diabetes is still up for debate.[15] Khawaja *et al.* in their studies found nearly parallel results.[16] In our study, no significant relation of smoking with obesity and HbA1c was found, quite the same results

Table-III: Association of HbA1c with Cardiometabolic Risk Factors of Study participants (n=5336)

Cardiometabolic Risk Factors	HbA1c			*p*-value		
	≤7% (n=2993)	7.1-10% (n=1069)	>10% (n=1274)	≤7% vs 7.1-10%	≤7% vs >10%	7-10% vs >10%
Body Mass Index						
<25 kg/m²	808(27.0%)	242(22.6%)	409(32.1%)	0.549	<0.001	<0.001
≥25 kg/m²	2185(73.0%)	827(77.4%)	865(67.9%)			
Smoking Habit						
No	2582(86.3%)	917(85.8%)	1087(85.3%)	0.368	0.549	0.110
Yes	318(10.6%)	112(10.5%)	155(12.2%)			
Ex-smoker	93(3.1%)	40(3.7%)	32(2.5%)			
Hypertension						
No	2140(71.5%)	703(65.8%)	830(65.1%)	<0.001	0.016	0.001
Yes	853(28.5%)	366(34.2%)	444(34.9%)			
Duration of DM						
Newly diagnosed diabetes(NDD)	1044(34.9%)	278(26.0%)	321(25.2%)	<0.001	<0.001	<0.001
Previously diagnosed diabetes(PDD)	1949(65.1%)	791(74.0%)	953(74.8%)			
Family history of DM						
No	624(20.8%)	243(22.7%)	308(24.2%)	0.021	0.549	0.036
Yes	2369(79.2%)	826(77.3%)	966(75.8%)			
DYSLIPIDEMIA (High cholesterol)						
<200 mg/dl	2852(95.3%)	844(79.0%)	923(72.4%)	<0.001	<0.001	<0.001
> 200 mg/dl	141(4.7%)	225(21.0%)	351(27.6%)			
High Triglyceride						
<150 mg/dl	2750(91.9%)	596(55.8%)	603(47.3%)	<0.001	<0.001	<0.001
>150 mg/dl	243(8.1%)	473(44.2%)	671(52.7%)			
High LDL						
<100 mg/dl	2651(88.6%)	569(53.2%)	564(44.3%)	<0.001	<0.001	<0.001
>100 mg/dl	342(11.4%)	500(46.8%)	710(55.7%)			
Low HDL (male <40, female<50)						
<40/50 mg/dl	375(12.5%)	648(60.6%)	841(66.0%)	<0.001	<0.001	<0.001
>40/50 mg/dl	2618(87.5%)	421(39.4%)	433(34.0%)			

reported by Aamir *et al* showed no assoc-iation between smoking and different glycemic HbA1c categories.[17] One study showed diabetes in smokers was less frequent because smokers had low BMI which was protective and improved insulin sensitivity.[15] There has been an increase in high blood pressure (hypertension) in emerging nations, such as Pakistan.[7] Hypertension is a risk factor for the development of CVD, especially when associated with diabetes.[6] In our study, one-third were hypertensive like one study which showed the same results.[7] One research demonstrated obese diabetics were hypertensive and had high HbA1c, as the same result found in our study.[18] Akalu *et al*. found that most patients with a BMI >25 kg/m^2 and poor glycemic control had a greater risk of developing hypertension as compared with those with a BMI <25kg/m^2 and those with adequate control.[19]

In our study, one-third were NDD while two-thirds were PDD, and most of them had HbA1c ≥7%. In our study majority had a positive family history of T2DM. Raza *et al*. reported two-thirds of the participants had a family history of diabetes.[6] Cardiovascular disease (CVD) and type 2 diabetes (T2DM) are both linked to abnormalities in lipids, which can be changed.[10] In our study, majority of obese PWD had dyslipidemia and high HbA1c. Similar findings were got by Raza *et al*. the half number of participants in their study had dyslipidemia.[6] Dyslipidemia can thus be used as a preventative strategy for cardiovascular disease (CVD) in people with type 2 diabetes.

CONCLUSION

We found an increasing trend of obesity, smoking, hypertension, dyslipidemia, poor glycemic control, and positive family history of diabetes in young adults and statistically significant when compared with each other and have strong contribution in the T2DM screening, diagnosis, and management.

Conflict of Interest: None

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under:

KAB: Conception, study design, drafting the manuscript, approval of the final version to be published.

MR: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

SA & AB: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES:

1. International Diabetes Federation, IDF Diabetes Atlas 10th Edition, 2021, [Internet] avaialble at: https://diabetesatlas.org/resources/?gclid=Cj0KCQjwqP2pBhDMARIsAJQ0CzrDjswlrXgm_gIJ6Q9n7sUoCIrJQpEs2QIaYQa_AGBvWc97zXFqNUkaApQWEALw_wcB
2. Khan HA, Sobki SH, Khan SA. Association between glycaemic control and serum lipids profile in type 2 diabetic patients: HbA-1c predicts dyslipidaemia. Clin Experiment Med 2007; 7(1): 24-29. https://doi.org/10.1007/s10238-007-0121-3
3. Dabelea D, Hamman RF. Elevated Cardiometabolic Risk Profile Among Young Adults With Diabetes: Need for Action. Diabetes Care 2019; 42(10): 1845-1846. https://doi.org/10.2337/dci19-0032
4. Saydah SH, Siegel KR, Imperatore G, Mercado C, Gregg EW. The Cardiometabolic Risk Profile of Young Adults With Diabetes in the U.S. Diabetes care 2019; 42(10): 1895-1902. https://doi.org/10.2337/dc19-0707
5. Steinarsson AO, Rawshani A, Gudbjörnsdottir S, Franzén S, Svensson AM, Sattar N, et al. Short-term progression of cardiometabolic risk factors in relation to age at type 2 diabetes diagnosis: a longitudinal observational study of 100,606 individuals from the Swedish National Diabetes Register. Diabetologia 2018; 61(3): 599-606. https://doi.org/10.1007/s00125-017-4532-8
6. Raza SA, Hassan M, Badar F, Rasheed F, Meerza F, Azam S, et al. Cardiovascular disease risk factors in Pakistani population with newly diagnosed Type 2 diabetes mellitus: A cross-sectional study of selected family practitioner clinics in four provinces of Pakistan (CardiP Study). J Pak Med Assoc 2019; 69(3): 306-312.
7. Basit A, Tanveer S, Fawwad A, Naeem N. Prevalence and contributing risk factors for hypertension in urban and rural areas of Pakistan; a study from second National Diabetes Survey of Pakistan (NDSP) 2016-2017. Clin Experiment Hypertens 2020; 42(3): 218-224. https://doi.org/10.1080/10641963.2019.1619753
8. Basit A, Askari S, Zafar J, Riaz M, Fawwad A. NDSP 06: Prevalence and risk factors for obesity in urban and rural areas of Pakistan: A study from second National Diabetes Survey of Pakistan (NDSP), 2016-2017. Obesity Res Clin Pract 2021; 15(1): 19-25. https://doi.org/10.1016/j.orcp.2020.11.007
9. Basit A, Younus BB, Waris N, Fawwad A, Members* N. Prevalence of tobacco use in urban and rural areas of Pakistan; a sub-study from second National Diabetes Survey of Pakistan (NDSP) 2016 - 2017. Pak J Med ScI 2020; 36(4). https://doi.org/10.12669/pjms.36.4.1705
10. Basit A, Sabir S, Riaz M, Fawwad A. NDSP 05: Prevalence and pattern of dyslipidemia in urban and rural areas of Pakistan; a sub analysis from second National Diabetes Survey of Pakistan (NDSP) 2016-2017. J Diabetes Metabol Disord 2020; 19(2): 1215-1225. https://doi.org/10.1007/s40200-020-00631-z
11. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2021. Diabetes Care 2021; 44(Suppl-1): S15-S33. https://doi.org/10.2337/dc21-S002
12. WHO. The Asia Pacific perspective: Redefining obesity and its treatment. World Health Organization, Regional Office for the Western Pacific, 2006, [Internet] available at: https://iris.who.int/handle/10665/206936?locale-attribute=de&show=full
13. Expert panel on detection, evaluation, and treatment of high blood cholesterol in adults. Executive summary of the third report of the national cholesterol education program (NCEP) Expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA 2001; 285(19):2486-2497. https://doi.org/10.1001/jama.285.19.2486

14. Zafar J, Nadeem D, Khan SA, Jawad Abbasi MM, Aziz F, Saeed S, et al. Prevalence of diabetes and its correlates in urban population of Pakistan: A Cross-sectional survey. J Pak Med Assoc 2016; 66(8): 922-927.
15. Wang S, Chen J, Wang Y, Yang Y, Zhang D, Liu C, et al. Cigarette smoking is negatively associated with the prevalence of type 2 diabetes in middle-aged men with normal weight but positively associated with stroke in Men. J Diabetes Res 2019; 2019: 1853018. https://doi.org/10.1155/2019/1853018
16. Khuwaja AK, Rafique G, White F, Azam SI. Macrovascular complications and their associated factors among persons with type 2 diabetes in Karachi, Pakistan--a multi-center study. J Pak Med Assoc 2004; 54(2): 60-66.
17. Aamir AH, Ul-Haq Z, Fazid S. Type 2 diabetes prevalence in Pakistan: what is driving this? Clues from subgroup analysis of normal weight individuals in diabetes prevalence survey of Pakistan. Cardiovasc Endocrinol Metabol 2020; 9(4): 159-164. https://doi.org/10.1097%2FXCE .0000000000000212
18. Mansour AA. Prevalence and control of hypertension in iraqi diabetic patients: a prospective cohort study. Open Cardiovasc Med J 2012;6:68-71. https://doi.org/10.2174/18741924601 0068
19. Akalu Y, Belsti Y. Hypertension and its associated factors among type 2 diabetes mellitus patients at Debre Tabor General Hospital, Northwest Ethiopia. Diabetes Metab Syndr Obes 2020; 13: 1621-1631. https://doi.org/10.2147%2FDMSO.S254537