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PREVALENCE & PATTERN OF DYSLIPIDEMIA IN TYPE 2 DIABETES MELLITUS IN QUETTA, PAKISTAN.

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Abstract

Background: *Dyslipidemia is a risk factor for cardiovascular disease (CVD) in individuals with Type 2 Diabetes Mellitus (T2DM). It is linked to insulin resistance in individuals with T2DM. Its prevalence in Pakistani T2DM patients remains unknown, despite being a common consequence of Type 2 Diabetes Mellitus.*

Objective: *To find out if dyslipidemia is conjoint in masses with T2DM in Quetta, Pakistan.*

Materials and Methods: *From July 2021 to June 2022, researchers conducted a cross-sectional study. The study enrolled 272 people with T2DM using a convenience sample technique. A standardized questionnaire was used to gather information on socio-demographics, behavior and clinical variables. We took measurements of things like blood pressure, weight and height. SPSS sort 23 was used to examine the data. A P-level 0.05 was judged scientifically noteworthy for the pearson correlation test.*

Results: *Dyslipidemia was found in 64.3 % of the research participants. A total of 30.9 % of patients had isolated dyslipidemia, 47.4 % had combined dyslipidemia and 21.7 % had mixed dyslipidemia. 71 % of individuals had hypertriglyceridemia as an isolated lipid profile abnormality, 47.4 % of them had hypercholesterolemia, 62.5% had an extreme value of low-density lipoprotein (LDL-C), and 72 % had a less than normal value of HDL-C. Physical dormancy, fatness, hypertension and extreme blood glucose level remained linked to dyslipidemia in people under the age of 35.*

Conclusion: *People with T2DM are more likely to suffer from dyslipidemia, according to a new study. Involvement of methods for the recognised risk issue and screening, treatment and prevention programs for dyslipidemia should be taken into account because of this study's findings.*

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INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is becoming increasingly common around the world. Prolonged hyperglycemia and changes in glucose metabolism and insulin production and action (or both) are characteristics of T2DM. [13], 463 million people (49 % of the global population) have T2DM, and 5 million adults will die this year from the disease or its complications because of T2DM and related disorders. [5], cardiovascular problems have a significant impact on T2DM-related morbidity and mortality. Medical dictionaries define dyslipidemia as a lipoprotein disease that promotes atherosclerosis, [26]. Elevated triglycerides decreased HDL-C, and elevated LDL-C constitute this diagnosis. Non-diabetics were shown to have greater LDL-C particle concentrations, lower HDL-C ranks and more hypertriglyceridemia in T2DM patients than did diabetics. T2DM has been associated with dyslipidemia since 2018 [8] because of insulin resistance and the resulting rise in free fatty acid flow. These lipoproteins are produced in excess by the liver, leading to a decreased clearance of triglyceride-rich lipoproteins and abnormal postprandial metabolism of lipoproteins under specific conditions. Hyperglycemia and insulin resistance are to blame for this. Sugden and Holness on the other hand (2011) showed that Adipose tissue hormone-sensitive lipase in T2DM is less insulin-resistant, leading to increased lipolysis and consequently increased fatty acid influx into the liver. Lipoprotein lipase can become detached from the endothelium membrane due to high quantities of free fatty acids, which can interfere with the enzyme's function. Six to fifteen Filippatos, Tsimihodimos (co-author), Pappa (co-author) and Elisaf are all featured in the bibliography (co-author). Consequently, apoB breakdown slows, resulting in an excess of VLDL-C production in insulin-resistant individuals, according to research by Schofield et al. (2016). This is the case. HDL levels fall and minor dense LDL increase when triglyceride-rich lipoproteins increase [3]. Chaudhury and Aggarwal did this research (2018).

Diabetics with T2DM who suffer from insulin resistance and hyperglycemia may see changes in their plasma lipoproteins. As a result of T2DM's obesity/insulin-resistant metabolic syndrome, it is possible to develop lipid abnormalities without hyperglycemia. When it comes to non-insulin-dependent diabetic mellitus (T2DM), previously known as type 2 diabetes, high triglyceride levels and low HDL-C levels are the most common symptoms. Furthermore, a lipoprotein known as tiny dense LDL may be much more harmful to health than LDL-C. [10] In a recent policy statement, the American Diabetes Association (ADA) recommends a diagnosis at the age of 40 and ongoing monitoring.

Because they are more easily achieved than blood pressure or glucose targets, patients with established coronary artery disease (CAD) are increasingly recommended to aim for LDL cholesterol levels as low as 100 mg/dL. With his coworkers, he was always on top of things (2015) [7] The most significant treatment for people with T2DM dyslipidemia is to change one's lifestyle. All aspects of this process, including dietary changes and cardiovascular exercise are included [24] Overweight and obese people have a higher chance of developing diabetes type 2 due to their elevated lipid and blood pressure profiles and other health indicators (T2DM). [18] A group led by Sjöström and colleagues (2003) T2DM and cardiovascular disease (CVD) have been linked to a low HDL-C level, according to recent studies [1] In individuals with T2DM, insulin insufficiency or resistance, adipocytokines and hyperglycemia all have the potential to alter lipid metabolism (T2DM). There are many unknowns about T2DM dyslipidemia, however hypertriglyceridemia in the syndrome is well understood, according to Taskinen (2003) [21]. According to the author, total cholesterol 200 mg/dL, LDL-C 100 mg/dL, triglycerides 150 mg/dL, or HDL-C 40 mg/dL in males and 50 mg/dL in females were dyslipidemic. The NCEP-ATP III Expert Panel on Detection (ATP III) identified lipid abnormalities in Stone et al. [19].

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MATERIAL AND METHODS

Patients with T2DM enrolled in this study had their lipid levels tested in the Endocrinology Department. Hepatic dysfunction, renal disease and chronic infections were not found in the patient. A question survey was used to conduct interviews with each participant. Weight, height and waist circumference of the person were measured. People's BMI was determined by taking their bodyweight in kilos and dividing it by their height squared (in millimeters, of course). Being overweight was defined as having a body mass index (BMI) less than 25 kg/ m^2, a waist circumference (WID) greater than 90 cm for men and 80 cm for females, and T2DM or hypertension (HTN). It was defined as having TG levels below 150 mg/dl and HDL cholesterol levels below 40 mg/dl in patients with atherogenic dyslipidemia regardless of gender.

Physical examination

The body mass index (BMI) was measured by multiplying a person's weight in kilogram by their height in millimeters. Normal body weight was defined as a BMI of 24 kg/m^2 or less, overweight was classified as a BMI of 24 kg/m^2 or more and obese was defined as a BMI of 28 kg/m^2 (obesity). How to calculate a person's body mass index (BMI) is monitored by comparing their waist measurement (WC) males and females over 90 cm in waist circumference were considered to be centrally overweight, whereas those under 85 cm were considered normal. After a 20-minute rest, the participants' blood pressure was checked. In this experiment, the meaning of three measurements was employed.

Definition

Unless anyone has a fasting plasma glucose (FPG) level between 100 and 125 milligrams per deciliter (mg/dL) and a hemoglobin A1C level greater than or equal to 6.5%, he or she has T2DM.

There are two ways to determine whether someone has high blood pressure, by measuring their systolic (SBP) and diastolic (DBP) values. If any of these values were above or below the normal range, they were considered to have high blood pressure (HBP).

Biochemical measurements

All research facilities currently collect blood in the same way. FPG, TC, TG, HDL-C, LDL-C, and then VLDL-C stood dignified in blood samples taken from patients after a minimum of eight hours of fasting following recognised techniques.

Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (NCEP-ATP III) detected deviations in lipids profile [4]

Total Cholesterol	
Desirable	≤ 200mg/ Dl
Border line High	200-239 mg/Dl
High	>240mg/ dL
Triglycerides	
Normal	≤ 150mg/ Dl
Borderline High	150-199mg/Dl
High	200-499mg/dL
Very High	>500mg/ Dl
High Density Lipoprotein Cholesterol	
Normal HDL-C	More than≥40mg/dL
Low HDL-C	Less than<40mg/dL
Low Density Lipid Cholesterol	
Optimal	<100 mg/ dL
Above optimal Level	100-129 mg/ dL

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Borderline High	130-159 mg/dL
High Level	160-189 mg/ dL
Very High Level	>190 mg/ dL
Very Low-Density Lipoprotein Cholesterol	
≤30 mg/ Dl	
More than 30 mg/Dl	

Statistical analysis

The SPSS Software version 23 statistical software got applied for research (SPSS Inc. Chicago land, Us) (SPSS Inc. Chicago, USA). Unless otherwise specified, data were given as the mean (SD), midpoint (percent) or number (percent). The Chi-square test was used to examine all non-parametric data, including high blood pressure, dyslipidemia and smoking. The link between dependent variables such as lipid parameters and independent variables such as CVD risk factors was evaluated using Pearson correlation. A significance value P 0.05 was utilized.

RESULTS

Women comprised 43.8 % (n=119) of the participants, while men comprised 56.3 % (n=153). With a standard deviation of 12.54 years on average, the mean lifespan was 47.24 years. According to BMI estimates, 34.6 % of the study participants (n=94) were overweight, while 49.6 % (n=135) were obese. According to the American Diabetes Association, 64.3 % (n=175) had high cholesterol levels and 68 % (n=186) had abnormal fasting plasma glucose levels (ADA). 31.6 % were physically active, 39.7 % adhered to a food plan and 52.6 % (n=143) were nonsmokers.

Social and Involved people's backgrounds and other traits in the analysis

Glucose parameters of the analysis respondents

Pattern of multiple kinds of abnormalities in a person's cholesterol profile.

Serum lipid abnormalities were shown to have a distinct pattern. As an illustration, only 30.9% (n=84) of the participants in the study had isolated abnormalities in their lipid profiles, whereas 47.4% (n=129) had combined abnormalities in their serum lipid profiles and 21.7% (n=59) had mixed dyslipidemia. More than a third of the subjects (129) had hypercholesterolemia and more than a third (198) had hypertriglyceridemia when the dyslipidemia components were assessed. Additional information can be found in the following table:

Table 1: Subjects' anthropometric measurements in the analysis

Gender Female Male		
	Frequency	Percent
Female	119	43.8
Male	153	56.3
Physical activities		
	Frequency	Percent
Yes	86	31.6
No	186	68.4
Meal Plan		
	Frequency	Percent
Yes	108	39.7
No	164	60.3
Tobacco use		
	Frequency	Percent

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Yes	129	47.4
No	143	52.6

Table 2: Blood Pressure, Glucose and Lipid parameters of study respondents

Descriptive Statistics			
	Range	**Mean**	**Std. Deviation**
Age in years	23-78	47.2426	12.54688
Body Mass Index kg/m^2	19.50-56.70	33.4096	5.59159
Waist Circumference	28-55	40.4963	4.49107
Systolic Blood Pressure mmHg	70-220	130.1654	19.52438
Diastolic_ Blood Pressure mmHg	50-120	85.6875	11.65786
Fasting Plasma Glucose(mg/dl)	67-418	163.9926	62.54038
Random Plasma Glucose (mg/dl)	103-594	270.1360	104.69270
Hb_A1c %	4.90-14.20	8.9386	2.12924
Total Cholesterol (TC) (mg/dl)	90-668	208.1691	67.74731
Triglyceride (TG) (mg/dl)	53-1140	295.6103	225.80105
High Density Cholesterol (HDL-C) (mg/dl)	17-63	35.6544	8.33202
Low Density Cholesterol (LDL-C) (mg/dl)	37-415	118.2647	46.49822
Very Low Density Cholesterol (VLDL-C) (mg/dl)	11-228	58.9449	46.39244

Table 3: Gender base classification of Anthropometric, Blood Pressure and Lipid parameters

	Female Respondents (n=119)			**Male respondents (n=153)**		
	Range	**Mean**	**Std. Deviation**	**Range**	**Mean**	**Std. Deviation**
Age in years	23-76	46.0769	12.48596	25-78	48.1118	12.63263
BMI	19.50-56.70	35.3903	6.47073	24.40-50.00	31.9851	4.26965
WC	28-54	39.5385	4.76072	32-55	41.1382	4.12720
SBP mmHg	80-220	127.4615	18.79909	70-220	132.2500	20.03218
DBP mmHg	60-120	83.0769	10.62378	50-120	87.6776	12.14406
FPG (mg/dl)	73-410	161.7009	66.08919	67-418	166.8158	59.92793
RPG (mg/dl)	122-551	263.4615	105.00382	103-594	277.0921	104.58783
Hb_A1c	4.90-14.20	8.8641	2.28309	6.60-14.20	9.0257	2.00488
TC (mg/dl)	93-668	193.3162	63.39254	90-422	220.5987	68.84085
TG (mg/dl)	56-1140	244.8376	165.74960	53-991	337.3355	257.43261
HDL (mg/dl)	17-60	36.8205	9.55620	18-63	34.7237	7.19289
LDL (mg/dl)	37-415	117.8547	52.22552	39-229	118.4934	41.78310
VLDL (mg/dl)	11-228	47.8205	31.89736	11-223	68.0329	53.73117

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Table 4: Glucose parameters of the study respondents

Fasting Plasma Glucose (mg/dL)		
	Frequency	Percent
<100 to 125 (mg/dL)	86	31.6%
>126 (mg/dL)	186	68.4%
Random Plasma Glucose (mg/dL)		
	Frequency	Percent
>200 (mg/dL)	83	30.5%
<200 (mg/dL)	189	69.5%
HbA1c_class		
	Frequency	Percent
Good (HbA1C<7%)	100	36.8%
Poor (HbA1C>7%)	172	63.2%

Table 5: Prevalence of lipid profile among T2DM patients

Lipid Profile of the study respondents		
Total Cholesterol (mg/dL)		
	Frequency	Percent
<200 Desirable(mg/dL)	143	52.6%
200-239 Border line high (mg/dL)	65	23.9%
>240 High (mg/dL)	64	23.5%
Triglycerides (mg/dL)		
	Frequency	Percent
<150 (mg/dL)	74	27.2%
150-199 (mg/dL)	67	24.6%
200-499 (mg/dL)	97	35.7%
>500 (mg/dL)	34	12.5%
High Density Lipoprotein cholesterol(HDL-C) (mg/dL)		
	Frequency	Percent
Normal HDL-C (mg/dL)	76	27.9%
Low HDL-C (mg/dL)	196	72.1%
Low Density Lipoprotein cholesterol (LDL-C) (mg/dL)		
	Frequency	Percent
Optimal (mg/dL)	102	37.5%
above optimal level (mg/dL)	83	30.5%
Borderline High (mg/dL)	52	19.1%
High Level (mg/dL)	15	5.5%
Very High Level (mg/dL)	20	7.4%
Very Low Density Lipoprotein cholesterol (VLDL-C) (mg/dL)		
	Frequency	Percent
Less than 30 (mg/dL)	75	27.6%
More than 30 (mg/dL)	197	72.4%

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Table 6: Pattern of body mass index of respondent of study

BMI		
	Frequency	Percent
Normal weight >24.99 kg/m^2	43	15.8%
Overweight >29.99 kg/m^2	94	34.6%
Obese >34.99 kg/m^2	135	49.6%
Female BMI		
	Frequency	Percent
Normal weight >24.99 kg/m^2	20	16.8%
Overweight >29.99 kg/m^2	37	31.1%
Obese >34.99 kg/m^2	62	52.1%
Male BMI		
Normal weight >24.99 kg/m^2	23	15.0%
Overweight >29.99 kg/m^2	57	37.3%
Obese >34.99 kg/m^2	73	47.7%

Table 7: Pattern of dyslipidemia in respondent of study

Pattern of Dyslipidemia		
	Frequency	Percent
Isolated Dyslipidemia	84	30.9%
Combined Dyslipidemia	129	47.4%
Mixed Dyslipidemia	59	21.7%

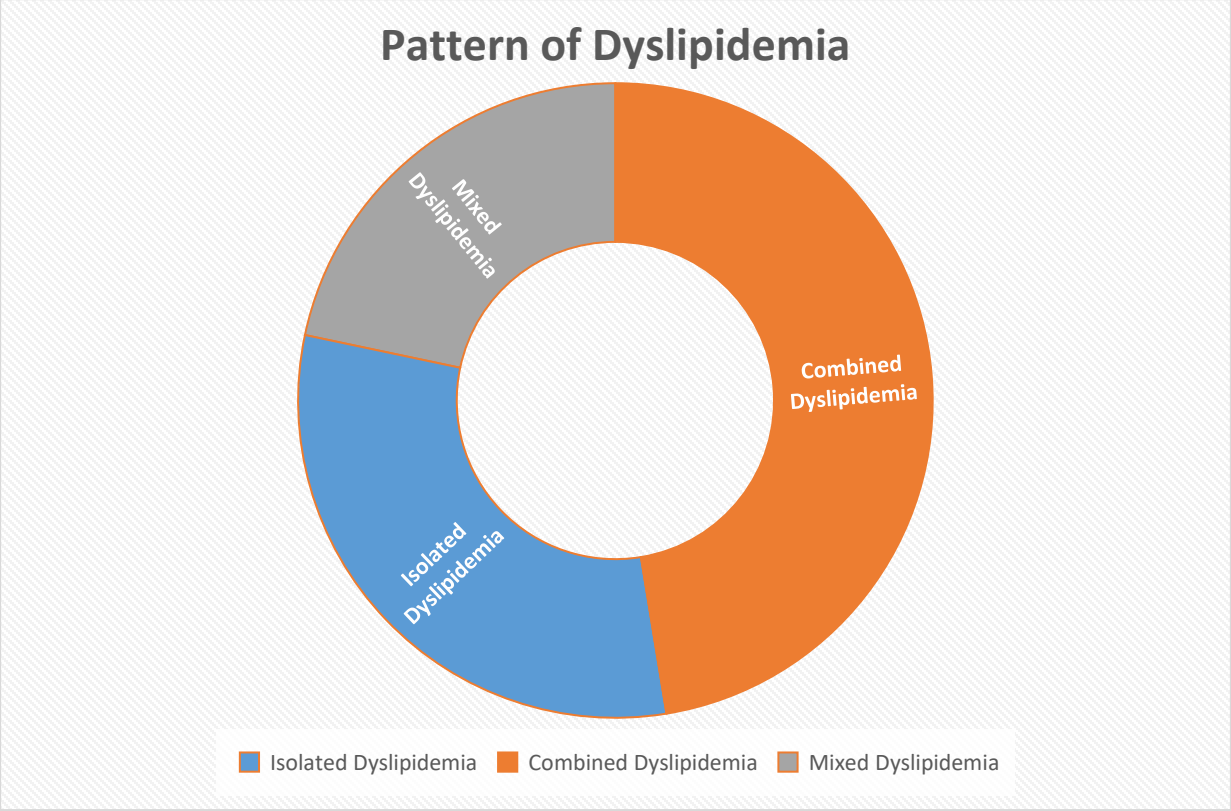

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Table 8 Pearson Correlations of glucose and lipid parameters of the study respondents

Pearson Correlations								
	FPG	RPG	Hb_A1c	TC	TG	HDL	LDL	VLDL
Fasting Plasma Glucose(mg/dl)	1							
Random Plasma Glucose (mg/dl)	.724**	1						
Hb_A1c %	.627**	.580**	1					
Total Cholesterol (TC) (mg/dl)	-.012	-.028	.092	1				
Triglyceride (TG) (mg/dl)	.006	-.004	.087	.703**	1			
High Density Cholesterol (HDL-C) (mg/dl)	-.048	-.040	-.036	-.026	-.371**	1		
Low Density Cholesterol (LDL-C) (mg/dl)	.005	.035	.022	.654**	.179**	.078	1	
Very Low-Density Cholesterol (mg/dl)	.012	.001	.106	.715**	.978**	-.354**	.169**	1
**. Correlation is significant at the 0.05 level (2-tailed).								

DISCUSSION

Aberrant blood lipid profiles are becoming more common, particularly in developing countries, in those with chronic illnesses who are also sedentary due to economic expansion and changing lifestyles. In people with T2DM, Dyslipidemia is the most significant independent risk factor for cardiovascular disease (CVD), which increases the mortality and morbidity rates.

Using the revised National Cholesterol Education Program-Adult Treatment Panel III criteria, researchers attempted to know the prevalence of dyslipidemia among individuals with T2DM in Quetta, Pakistan.

In the study, the individual TC lipid profile was 47.4% (n=129), TG was 72.8% (n=198), LDL-C was 72.1% (n=170), HDL-C was 72.1% (n=196), and VLDL-C was 72.4% (n=197%) and dyslipidemia was found in (n=175) 64.3% of the participants. Among those with dyslipidemia, 30.9% had only isolated dyslipidemia, 47.4% had combined dyslipidemia and 21.7% had mixed dyslipidemia. Other Asian researchers have found that hypertriglyceridemia then low HDL-C levels are the most common forms as regard dyslipidemia in China and other Asian nations similar to these results While in the US population, elevated LDL levels (Tóth, Potter, & Ming, 2012) are the most common kind of aberrant lipid profile (27%).

The most recent comparable study took place at the Endocrinology department of tertiary care hospitals between April and December of 2019. Our expectation from this study was to provide new information on dyslipidemia and its consequences for T2DM in Quetta, Pakistan. For example, [15] and [17] found that Patients with T2DM in Pakistan showed a much higher frequency of dyslipidemia (88%), which has been stable since 2003. A similar study from China found that dyslipidemia affected 67.1% of Chinese people with T2DM [25]. Similarly, according to the United States National Health and Nutrition Examination Survey for 1999–2000, 71% of men and 78.9% of women with T2DM had LDL-C > 100 mg/dL, indicating that dyslipidemia control was unsatisfactory in collaboration with the American Diabetes Sets the guidelines [9]

The incidence of dyslipidemia in these pearsons could be due to a variety of factors, including genetics and lifestyle. The fight against disease necessitates a well-functioning healthcare system

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and comprehensive patient education. A growing number of countries in the developing world are adopting Western-style diets that are high in calories and poor in fiber, which has a significant impact. Changing eating habits are contributing to an increase in diseases like obesity, metabolic syndrome, and T2DM [12], according to a recent study [13]. Dyslipidemia in people with T2DM was found to be strongly associated with obesity. Obesity, hypertriglyceridemia and high levels of LDL-C and other lipids were associated with greater HbA1c levels than those with normal lipid profiles in another study from India [17]. HbA1c levels and cardiovascular difficulties are directly linked to lipid levels, according to several studies. This is likely due to increased insulin resistance [14]

Additionally, current smoking was observed to have a significant impact on the prevalence of dyslipidemia in patients with T2DM. Having high TG levels and low HDL-C levels was connected to a 2.13-fold increased risk of stroke in a community-based prospective cohort of American Indians.

Preventing all of the vascular issues listed above, as well as dyslipidemia as a risk factor, can be accomplished by lifestyle modification

CONCLUSION

To synopsize, according to a recent study from Quetta, Pakistan, the prevalence of dyslipidemia among Pakistani T2DM was notably high. There was a strong correlation between dyslipidemia and wide range of demographic and medical variables. Health care practitioners in Pakistan who manage people with T2DM should be aware of the significance of better control of dyslipidemia because of this study. It is possible to reduce the risk of cardiovascular disease through regular follow-ups, competent advice and a focus on vascular health issues' primary prevention. Patients with T2DM should be educated and made aware of the importance of making lifestyle changes and taking medication on a regular basis.

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