

PATTERN OF LIPID PROFILE LEVELS IN DIABETIC PATIENTS PRESENTING IN TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Diabetes mellitus (DM) is a significant global population health concern that is associated with metabolic imbalance (carbohydrates, lipids, and proteins) caused by insulin resistance and/or deficiency. Dyslipidemia is another frequent comorbid condition of type 2 diabetes mellitus (T2DM) that leads to cardiovascular morbidity and mortality.

Objective: The purpose of this study is to determine the mean lipid profile values in patients with diabetes mellitus, presenting to Punjab Rangers Teaching Hospital, Lahore.

Methodology: The study was a cross-sectional one carried out at the Department of Medicine, Punjab Rangers Teaching Hospital, Lahore from July 2025 to October 2025. Non-probability consecutive sampling was used to enroll 300 patients diagnosed with T2DM who were aged between 18 and 50 years. Comorbidities (hypertension, chronic liver disease, long-term drug use) were excluded. Triglycerides (TG), total cholesterol (TC), high-density lipoprotein (HDL-C) and low-density lipoprotein (LDL-C) levels in blood were assessed. The analysis of the data was performed with SPSS v 28.

Results: The mean triglyceride level was 168.45±82.13 mg/dL, total cholesterol 182.76±44.92 mg/dL, HDL-C 42.67±10.85 mg/dL, and LDL-C 118.32±34.56 mg/dL. A large percentage of patients had dyslipidemia, with the most frequent abnormalities being increased TG and decreased HDL-C.

Conclusion: Diabetic patients had a high-frequency of dyslipidemia, especially high triglycerides and low levels of HDL. The findings reveal the importance of screening and treating lipid abnormalities at an early stage and managing it aggressively to minimize the risks of cardiovascular conditions among diabetic populations.

KEYWORDS: Diabetes Mellitus, Dyslipidemia, Lipid Profile, Triglycerides, HDL, LDL, Pakistan

INTRODUCTION

Diabetes mellitus (DM) is a significant health issue in the community that is marked by the impairment of carbohydrates, proteins, and fats metabolism since the insulin secretion, insulin action, or both are defective. The burden of diabetes has grown significantly with an estimated increase in the number of people with diabetes of 422 million to 642 million across the world in 2014 with an 8.5% prevalence being reported globally in 2014 (1).

Pakistan is a country with the fifth largest population in the world, which is experiencing various health challenges, one of them being the rapid increase in non-communicable diseases (NCDs). Diabetes mellitus is one of them, and it is becoming a significant health issue in terms of both its growing prevalence and economic and health costs. In 2000, it is estimated that there were about 5.2 million adults living with diabetes in Pakistan and this has risen drastically to about 33 million in 2021. The World Health Organization (WHO) reports that in 2016, NCDs were the leading cause

of death in Pakistan (58 percent), with cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes being the most common (2).

In the last ten years, the rate of diabetes has been fast growing as a result of factors like the rising life expectancy, genetic inclination, poor dietary habits, sedentary living, and the escalating obesity rates with urbanization (3).

Metabolic syndrome is characterized by the occurrence of a combination of metabolic disorders such as central obesity, dyslipidemia, insulin resistance and hyperinsulinemia. Dyslipidemia, which is a major factor of metabolic syndrome, is the reduced levels of high-density lipoprotein cholesterol (HDL-C) and the increased levels of total cholesterol, free fatty acids (FFAs), triglycerides (TG), very low density lipoprotein (VLDL), small dense low-density lipoprotein (sdLDL) (4).

One of the most frequent lipid abnormalities is hyperlipidemia, especially a high level of cholesterol. Others are hypertriglyceridemia and mixed hyperlipidemia in which cholesterol and triglycerides are high. Hyperlipidemia is on the rise all over the world. It has been indicated that those with untreated hyperlipidemia are under much more risk of contracting coronary artery disease (CAD), which can pose severe results like myocardial infarction and stroke (5).

Diabetic dyslipidemia, which are lipid abnormalities in diabetic patients, is usually characterized by an increased level of total cholesterol, high level of triglycerides, low level of HDL-C, and an increased size of small dense LDL particles. The LDL-C levels can be normal or slightly increased. Such abnormalities are common among people with type 2 diabetes mellitus (T2DM) and prediabetes but are different among people based on ethnicity, social economic factors and access to health facilities. A meta-analysis has indicated that these lipid abnormalities are closely associated with an increased risk of T2DM (6).

Clinical evidence indicates that aggressive LDL cholesterol reduction is recommended in the management of dyslipidemia in patients with T2DM according to international guidelines. Nevertheless, the therapeutic inertia in treating glycemia, blood pressure and lipid levels is a major challenge across the globe (7).

Past research has indicated different lipid profile values of diabetic patients. One study reported mean triglyceride levels of 159.01 ± 93.74 mg/dl, total cholesterol 195.17 ± 39.45 mg/dl, HDL-C 45.35 ± 11.58 mg/dl, and LDL-C 123.78 ± 29.20 mg/dl (8). Another study documented triglycerides at 206.07 ± 205.19 mg/dl, total cholesterol 176.86 ± 49.96 mg/dl, HDL-C 41.38 ± 13.28 mg/dl, and LDL-C 115.9 ± 40.91 mg/dl (9). Similarly, a different study reported mean triglyceride levels of 152 ± 71.2 mg/dl, total cholesterol 167 ± 55.1 mg/dl, HDL-C 43.9 ± 10 mg/dl, and LDL-C 105.7 ± 32.1 mg/dl (10).

The justification of the study is that it will find the average lipid profile values among patients who have diabetes mellitus since the previously published data has been varied. Also, alterations in the diets of the Asian groups, the tendency to replace the traditional with Western diets, as well as the increasing obesity and cardiovascular exposure, could be among the contributors to the variation in lipid profiles. Thus, the aim of this study is to have recent and geographically specific data to learn more about these differences.

OBJECTIVE

The purpose of this study is to determine the mean lipid profile values in patients with diabetes mellitus, presenting to Punjab Rangers Teaching Hospital, Lahore.

METHODOLOGY

This was a cross-sectional research study in the Department of Medicine, Punjab Rangers Teaching Hospital, Lahore that was carried out from July 2025 to October 2025, following ethical clearance. Non-probability consecutive sampling was used to enroll 300 patients who had been diagnosed with type 2 diabetes mellitus. Both male and female patients aged 18-50 years were included. Blood samples (20 cc) were taken and the lipid parameters analyzed such as triglycerides, total cholesterol, HDL-C, and LDL-C. Demographic and clinical characteristics data was collected on a structured proforma. The patients were excluded to reduce bias; those with confounding factors, including chronic diseases or long-term medication usage, were excluded. The statistical analysis was done in the SPSS version 28, and the significance level was determined as $p < 0.05$.

INCLUSION CRITERIA

Patients aged 18-50 years of either gender with diabetes mellitus diagnosed based on the operational criteria of HbA1c 6.5 2-hour plasma glucose 11.1 mmol/L during an oral glucose tolerance test, and fasting plasma glucose 7 mmol/L were included.

EXCLUSION CRITERIA

Patients that had been taken antidiabetic medication over a year, patients with a history of abdominal surgery, hypertensive patients (blood pressure over 140/100 mmHg) and those with chronic liver disease on the basis of history and physical assessment, and pregnant women who were checked by ultrasound abdomen were excluded.

DATA COLLECTION PROCEDURE

Upon receiving informed consent, qualified patients who came to the Department of Medicine were enrolled. A clinical history was taken in detail to determine the eligibility in terms of inclusion and exclusion criteria. Anthropometric data, such as height and weight, were taken. Aseptic blood samples (20 cc) were collected and submitted to the laboratory of the hospital to be analyzed on lipid profile. The parameters recorded were triglycerides, total cholesterol, HDL-C and LDL-C and all the results were recorded in a pre-designed proforma to maintain consistency and accuracy. The data of the patients was kept confidentially during the study. Laboratory analysis was done using quality control measures to guarantee reliability of results.

DATA ANALYSIS

The SPSS version 28 was used to insert data and analyze it. The quantitative variables like age and lipid profile parameters were presented as mean and standard deviation. Qualitative variables, like gender, obesity status, and dietary habits were reported in frequencies and percentages. Effect modifiers were assessed by stratifying according to age, gender, duration of diabetes, obesity, and food habits. Paired sample t-tests were used to perform post-stratification analysis where there were enough samples. A p-value of 0.05 was deemed as statistically significant. The results were displayed in tables and graphs to make them easier to understand and interpret.

RESULTS

A total of 300 patients with type 2 diabetes mellitus were included in the study. The mean age was 41.2 ± 6.8 years. Among the participants, 162 (54%) were males and 138 (46%) were females. In general, the study population was slightly male dominated with a similar age distribution.

Baseline Characteristics of Study Population (n = 300)

Variable	Value
Age (years), Mean \pm SD	41.2 ± 6.8
Gender	Male: 162 (54%) Female: 138 (46%)

The research sample was slightly male dominated and an age distribution was fairly balanced.

Mean Lipid Profile Values.

Lipid Parameter	Mean \pm SD (mg/dL)	Reference Interpretation
Triglycerides (TG)	168.45 ± 82.13	Elevated
Total Cholesterol (TC)	182.76 ± 44.92	Borderline high
HDL-C	42.67 ± 10.85	Low-normal
LDL-C	118.32 ± 34.56	Near optimal

The lipid profile showed a trend of diabetic dyslipidemia, especially a high level of triglycerides and low level of HDL-C.

Prevalence of Dyslipidemia among Study Population.

Lipid Abnormality	Cut-off	Frequency (n)	Percentage (%)
Hypertriglyceridemia	>150 mg/dL	183	61.0
Low HDL-C	<40 M / <50 F	174	58.0
Elevated Total Cholesterol	>200 mg/dL	96	32.0
Elevated LDL-C	>130 mg/dL	88	29.3

The lipid abnormalities that were most common among diabetic patients were hypertriglyceridemia and low HDL-C.

Risk Factor Stratified Analysis of Lipid Profile.

Variable	Category	TG (Mean \pm SD)	HDL-C (Mean \pm SD)	p-value
Obesity	Yes	185.72 ± 88.41	40.15 ± 9.62	<0.01
	No	152.36 ± 73.18	45.82 ± 10.91	
Dietary Habit	Fast Food	176.54 ± 85.23	39.88 ± 10.12	<0.05
	Home Food	158.21 ± 78.64	45.96 ± 10.43	

The unhealthy diets and obesity were found to have a significant negative correlation with lipid profiles.

INTERPRETATION

The findings of this study show that dyslipidemia is highly predominant in type 2 diabetes mellitus patients. The hypertriglyceridemia (61%), and low HDL-C (58%), were the most prevalent lipid abnormalities. The average lipid profile values demonstrated the general atherogenic trend with the increased triglycerides and the somewhat decreased levels of HDL-C.

Stratified analysis showed that, obesity had a significant effect of elevating the level of triglycerides and decreasing the level of HDL-C ($p < 0.01$). Equally, regular intake of fast food was related to a less desirable lipid profile than home-cooked foods ($p < 0.05$). Such results indicate that metabolic (obesity) and lifestyle (dietary habits) factors are important in the aggravation of lipid abnormalities in diabetic patients.

In general, the article emphasizes that early lipid screening and aggressive lifestyle change interventions should be considered in diabetic populations to decrease cardiovascular risk.

DISCUSSION

The results of the proposed research indicate that the prevalence of dyslipidemia is high in patients with type 2 diabetes mellitus (T2DM) and agrees with the already identified data on the regional and international levels (6,8,9). An established metabolic disorder is dyslipidemia in T2DM, which is characterized by high triglycerides, high levels of low-density lipoprotein cholesterol (LDL-C), and high levels of atherogenic lipoproteins, mainly due to insulin resistance and altered hepatic lipid metabolism (4,11,12).

The pattern of lipid profile in this case especially high triglycerides and low levels of HDL-C is the typical picture of diabetic dyslipidemia. These results are consistent with the population-based studies conducted in comparable environments, as inappropriate glycemic regulation, inactive lifestyles, and unhealthy eating habits play a major role in the lipid abnormalities among diabetic patients (6,9,10). Recent evidence also supports the idea that dyslipidemia is a core constituent of cardiometabolic risk and a key factor in atherosclerotic cardiovascular disease (ASCVD) in T2DM (14,16).

Lipid derangements were a bit more intense in the current study when compared to Sadeghi et al. (8). This disparity can be explained by the differences in nutrition, the prevalence of obesity, lack of physical activity, and the irregular use of lipid-lowering medication. Likewise, regional studies in Jordan and Ethiopia bring to the fore that dyslipidemia in diabetic patients is a worldwide health issue which is affected by genetic, environmental, and lifestyle factors (9,10). Strong correlation between obesity and dyslipidemia was found, which underlines the definition of the role of insulin resistance in lipid metabolism. The excess adiposity leads to an increase in the free fatty acid flux to the liver leading to increased very-low-density lipoprotein (VLDL) production and hypertriglyceridemia. Moreover, a decrease in HDL-C level is caused by the impairment of the reverse cholesterol transport and the heightened exchange of lipids in insulin-resistant conditions (11,12). The existing literature highlights that obesity and metabolic dysfunction represent critical points of focus to enhance lipid abnormalities and decrease the risk of cardiovascular diseases in T2DM (14,16).

There was also a significant relationship between adverse lipid profiles and dietary habit. Often fast food and high-energy diets contribute to deteriorating lipid parameters and cardiovascular risk. The poor quality of diet is supported as a significant risk factor that is modifiable in the development of diabetic dyslipidemia (13). Based on this, the international guidelines suggest lifestyle change as the initial line of treatment in dyslipidemia management (14,16). The clinical significance of the management of dyslipidemia in T2DM is well-established. The global recommendations suggest screening early and intensive lipid-lowering treatment to minimize cardiovascular risk (7,14). Good evidence on the use of large clinical trials has proved that reduction of LDL-C leads to the decrease in cardiovascular morbidity and mortality (15).

All in all, these results demonstrate that dyslipidemia is very common in T2DM and closely linked with the modifiable metabolic and lifestyle risk factors. Early diagnosis and holistic treatment that involves lifestyle change, glycemic management and pharmacological treatment is needed to minimize long term cardiovascular complications.

CONCLUSION

This paper has come up with a conclusion that dyslipidemia is very common in patients with type 2 diabetes mellitus with the most common abnormality being increased triglycerides and decreased HDL cholesterol. These lipid imbalances greatly expose the diabetic patients to cardiovascular complications, which are one of the causes of morbidity and mortality.

The results have shown that lipid screening of diabetic patients should be conducted on a regular basis, especially in developing nations such as Pakistan where the impact of diabetes is quickly rising. Pharmacological interventions in addition to lifestyle changes such as dietary changes and physical activity should be given priority to manage the condition.

When dyslipidemia is detected early and treated properly, it will considerably decrease the risk of cardiovascular disease and overall patient outcomes. More comprehensive, multicenter, large-scale research is suggested to examine the regional differences and work out specific intervention plans.

REFERENCES

1. PK T, Dhanapal CK, Muvvala S, Bhanja S, Pratap DS. A review study on worldwide estimation apropos pharmacotherapeutic management in diabetes mellitus population. *Int J Pharma Res Health Sci.* 2020;8(3):3161–3166.
2. Hasan SU, Siddiqui MR. Epidemiology of diabetes mellitus in Pakistan: systematic review protocol. *BMJ Open.* 2024;14(3):079513.
3. Rasmussen L, Poulsen CW, Kampmann U, Smedegaard SB, Ovesen PG, Fuglsang J. Diet and healthy lifestyle in management of gestational diabetes mellitus. *Nutrients.* 2020;12(10):3050.
4. Daryabor G, Atashzar MR, Kabelitz D, Meri S, Kalantar K. The immune system and the impact of type 2 diabetes mellitus on the metabolism of organs. *Front Immunol.* 2020;11:1582.
5. Khera AV, Hegele RA. What is familial hypercholesterolemia, and why is it important? *Circulation.* 2020;141(22):1760–1763.
6. Bhowmik B, Siddiquee T, Mujumder A, et al. Serum lipid profile and its relation with diabetes and prediabetes among a rural population of Bangladesh. *Int J Environ Res Public Health.* 2018;15(9):1944.
7. Tomlinson B, Patil NG, Fok M, Lam CW. The treatment of dyslipidemia in type 2 diabetes patients. *Expert Opin Pharmacother.* 2021;22(16):2221–2234.
8. Sadeghi E, Hosseini SM, Vossoughi M, et al. Lipid profile and type 2 diabetes in first-degree relatives: a 14-year follow-up study in Iran. *Diabetes Obes Metab Syndr.* 2020;13:2743–2750.
9. Al Quran TM, Bataineh ZA, Al-Mistarehi AH, et al. Prevalence and pattern of dyslipidemia in patients with type 2 diabetes mellitus in Jordan. *Int J Gen Med.* 2022;15:7669–7678.
10. Kelemework B, Woubshet K, Tadesse SA, et al. Burden of dyslipidemia in patients with type 2 diabetes mellitus in Ethiopia. *Obes Diabetes Metab.* 2024;17:825–832.
11. Gupta M, Tummala R, Ghosh RK, et al. A review of the pharmacotherapies used in diabetic dyslipidemia. *Prog Cardiovasc Dis.* 2019;62(4):334–341.
12. Jialal I, Singh G. The management of diabetic dyslipidemia: an update. *World J Diabetes.* 2019;10(5):280–290.
13. Kalra S, Raizada N. Dyslipidemia in diabetes. *Indian Heart J.* 2024;76(Suppl 1):S80–S82.
14. Mach F, Baigent C, Catapano AL, et al. 2019 ESC/EAS guidelines for the management of dyslipidaemias. *Eur Heart J.* 2020;41(1):111–188.
15. Silverman MG, Ference BA, Im K, et al. Association between lowering LDL-C and cardiovascular risk reduction. *JAMA.* 2016;316(12):1289–1297.
16. Cosentino F, Grant PJ, Aboyans V, et al. 2019 ESC guidelines on diabetes, pre-diabetes, and cardiovascular diseases. *Eur Heart J.* 2020;41(2):255–323.
17. Goldberg IJ. Diabetic dyslipidemia: causes and consequences. *J Clin Endocrinol Metab.* 2021;106(12):e4931–e4943.
18. Vergès B. Pathophysiology of diabetic dyslipidaemia: where are we? *Diabetologia.* 2022;65(6):891–904.
19. Grundy SM, Stone NJ, Bailey AL, et al. 2018 AHA/ACC guideline on the management of blood cholesterol. *Circulation.* 2019;139(25):e1082–e1143.