

FREQUENCY AND PATTERN OF DYSLIPIDEMIA AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS AT A TERTIARY CARE HOSPITAL IN ISLAMABAD

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Abstract

Background: Dyslipidemia is one of the most common metabolic complications of Type 2 Diabetes Mellitus (T2DM) and a major contributor to cardiovascular disease. Although several studies have reported a high burden of dyslipidemia among diabetic patients, local evidence from a tertiary healthcare setting in Pakistan remains limited.

Objective: To determine the frequency and pattern of dyslipidemia among patients with Type 2 Diabetes Mellitus (T2DM) attending PIMS Hospital, Islamabad, and to evaluate its association with demographic and clinical characteristics.

Methods: A cross-sectional study was conducted among 127 adult patients with T2DM attending the OPD and Central Diagnostic Laboratory of PIMS, Islamabad. Serum total cholesterol, triglycerides, high-density lipoprotein cholesterol, and low-density lipoprotein cholesterol were analyzed using standard laboratory methods. Dyslipidemia was defined according to established lipid profile criteria. Data were analyzed using IBM SPSS Statistics version 26, and statistical significance was set at $p < 0.05$.

Results: Among the 127 participants, 88 (69.3%) had dyslipidemia. Low HDL cholesterol was the most common lipid abnormality (49.6%), followed by hypertriglyceridemia (33.1%), elevated LDL cholesterol (24.4%), and hypercholesterolemia (18.1%). Mixed dyslipidemia was identified in 51.2% of affected patients. Female gender ($p=0.04$) and longer duration of diabetes ($p=0.02$) were significantly associated with dyslipidemia, whereas age showed no significant association ($p=0.31$).

Conclusion: Dyslipidemia is highly prevalent among patients with Type 2 Diabetes Mellitus attending PIMS Hospital, with low HDL cholesterol being the predominant abnormality. Routine lipid screening and timely management should be incorporated into diabetes care to reduce the risk of cardiovascular complications.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and progressive pancreatic β -cell dysfunction, resulting in persistent hyperglycemia. It is one of the fastest-growing

non-communicable diseases worldwide and is associated with substantial morbidity, mortality, and healthcare costs. According to the International Diabetes Federation (IDF), approximately 589 million adults were living with diabetes in 2025, and this number is

projected to increase considerably in the coming decades.¹ Pakistan is among the countries with the highest diabetes burden, making diabetes-related complications a major public health challenge.²

Dyslipidemia is a common metabolic complication of T2DM. It is characterized by elevated triglycerides (TG), reduced high-density lipoprotein cholesterol (HDL-C), and increased concentration of atherogenic low-density lipoprotein cholesterol (LDL-C).^{3,4} These lipid abnormalities accelerate atherosclerosis and significantly increase the risk of cardiovascular disease, which remains the leading cause of death among individuals with T2DM.⁵ Current international guidelines recommend routine lipid profile assessment and timely intervention as essential components of diabetes management to reduce long-term cardiovascular risk.⁶

Although the burden of diabetic dyslipidemia has been widely reported, its prevalence and pattern vary across different populations due to genetic, environmental, and lifestyle factors.⁷ Recent studies from Pakistan have demonstrated a high frequency of dyslipidemia among patients with T2DM, highlighting the need for region-specific data to guide preventive strategies and clinical management.^{8,9} However, evidence from a tertiary care hospital in Islamabad remains limited. Therefore, the present study was conducted to determine the frequency and pattern of dyslipidemia among patients with Type 2 Diabetes Mellitus attending Pakistan Institute of Medical Sciences (PIMS), Islamabad, and to evaluate its association with selected demographic and clinical characteristics.¹⁰

METHODOLOGY

A cross-sectional study was conducted over six months at the Outpatient Department (OPD) and Central Diagnostic Laboratory of Pakistan Institute of Medical Sciences (PIMS), Islamabad.

Ethical approval was obtained from the Institutional Review Board of Khyber Medical University, Institute of Health Sciences, Islamabad, and administrative permission was granted by PIMS before data collection.¹¹

A total of 127 adults (≥ 30 years) with confirmed Type 2 Diabetes Mellitus (T2DM) were enrolled using non-probability consecutive sampling. Sample size was calculated using the WHO formula. Patients with Type 1 diabetes, gestational diabetes, congenital heart disease, or those receiving lipid-lowering drugs were excluded.¹²

Demographic and clinical data were collected via interview and medical records. Serum total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and Low-density lipoprotein cholesterol (LDL-C) were analyzed using standard laboratory procedures. Dyslipidemia was defined according to the American Diabetes Association (ADA) criteria as the presence of one or more abnormal lipid parameters.¹³

Data were analyzed using IBM SPSS Statistics version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Associations were assessed using the chi-square test, with $p < 0.05$ considered statistically significant.

RESULTS

Demographic Characteristics

A total of 127 patients with Type 2 Diabetes Mellitus were included in the study. The mean age of the study population was 58.9 ± 13.2 years (range: 32 to 85 years). Females constituted the majority with 74 patients (58.3%), while males accounted for 53 patients (41.7%). The majority of participants belonged to the 51-70 years age group (49.6%), and 37.8% had a diabetic duration of 10-15 years.

Table 1: Demographic Characteristics of T2DM Patients (N=127)

Characteristics	Category	Frequency (n)	Percentage (%)
Age Group (years)	30-50	38	29.9
	51-70	63	49.6
	71-85	26	20.5
Gender	Male	53	41.7
	Female	74	58.3

T2DM Duration(years)	1-5	36	28.3
	5-10	43	33.9
	10-15	48	37.8

Pattern of Lipid Abnormalities

Among the 88 patients with dyslipidemia, low HDL cholesterol was the most frequent individual abnormality, observed in 49.6% (n=63) of all patients. This was followed by hypertriglyceridemia (TG>150 mg/dl) in 33.1%

(n=42) and elevated LDL (>100 mg/dl) in 24.4% (n=31). Isolated hypercholesterolemia (TC>200 mg/dl) was present in 18.1% (n=23) of patients. A mixed dyslipidemia pattern (≥2 abnormalities) was observed in 51.2% (n=45) of the affected individuals.

Table 2: Pattern of Individual Lipid Abnormalities (N=127)

Lipid Abnormality	Frequency (n)	Percentage (%)
Low HDL Cholesterol	63	49.6
Hypertriglyceridemia	42	33.1
Elevated LDL cholesterol	31	24.4
Hypercholesterolemia	23	18.1

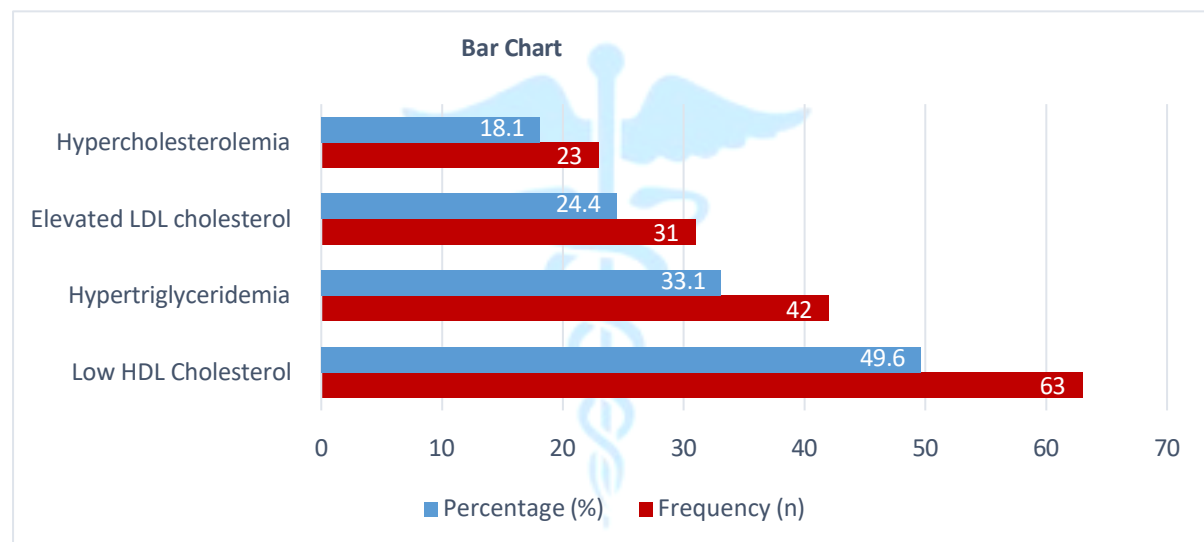


Figure 1: Distribution of specific lipid abnormalities among Dyslipidemia Patients

Stratification of Lipid Parameters

The mean total cholesterol (TC) was 162.1 ± 58.9 mg/dl, which was within the normal reference range of <200 mg/dl. The mean triglycerides (TG) was 148.5 ± 59.1 mg/dl, which was close to the upper limit of the normal reference range <150 mg/dl. The mean HDL cholesterol level was 39.5 ± 11.6 mg/dl, which

was below the recommended reference values (>40 mg/dl for males and >50 mg/dl for females), indicating reduced HDL cholesterol among the study population. The mean LDL cholesterol level was 83.4 ± 38.1 mg/dl, which remained within the normal reference range (<100 mg/dl).

Table 3: Stratification of Lipid Parameters (N=127)

Lipid Parameter	Mean $\pm$ SD (mg/dl)	Reference Range
Total Cholesterol	162.1 ± 58.9	< 200 mg/dl
Triglycerides	148.5 ± 59.1	< 150 mg/dl

HDL Cholesterol	39.5 ± 11.6	M >40, F >50
LDL Cholesterol	83.4 ± 38.1	< 100 mg/dl

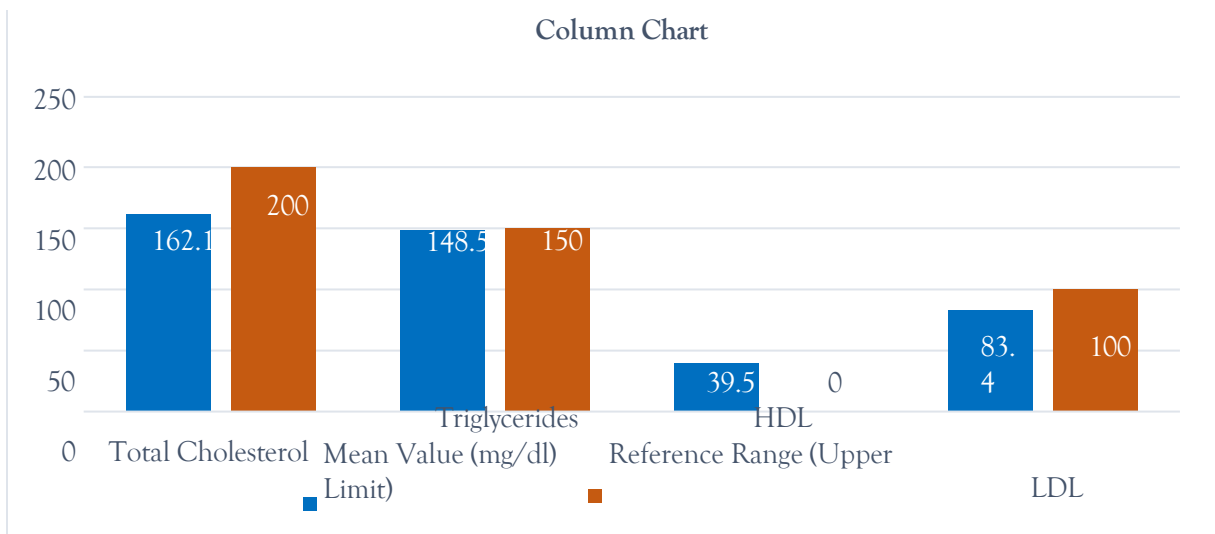


Figure 2: Mean Lipid Parameters With Reference Ranges

Factors Associated With Dyslipidemia

Female participants had a significantly higher prevalence of dyslipidemia than male participants (74.3% vs 62.3%; $P=0.04$). Dyslipidemia also increased significantly with longer duration of diabetes, from 55.6% among

patients with 1-5 years of disease to 79.2% among those with 10-15 years ($p=0.02$). Although a higher prevalence was observed in older age groups, the association between age and dyslipidemia was not statistically significant ($p=0.31$)

Table 4: Association of Dyslipidemia with gender, Age group, and Duration of Diabetes (N=127)				
Characteristic	Category	Total (N)	Dyslipidemia Present n (%)	P-value
Gender	Male	53	33 (62.3%)	0.04
	Female	74	55 (74.3%)	
Age Group	30-50	38	24 (63.2%)	0.31
	51-70	63	45 (71.4%)	
	71-85	26	19 (73.1%)	
Diabetes Duration	1-5 years	36	20 (55.6%)	0.02
	5-10 years	43	29 (67.4%)	
	10-15 years	48	38 (79.2%)	

Chi-square test was used to assess associations. A p-value <0.05 was considered statistically significant

Comparison of Mean Lipid Parameters by Dyslipidemia

The mean serum lipid parameters of participants with and without dyslipidemia were compared to assess differences in lipid profile between the

two groups. An independent-samples t-test was used to compare the mean value of total cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol.

Table 5: Comparison of Mean Lipid Parameters by Dyslipidemia Status			
Lipid Parameter (mg/dl)	Dyslipidemia Present (n=88) Mean ± SD	Dyslipidemia Absent (n=39) Mean ± SD	p-value
Total Cholesterol	178.4 ± 54.2	142.6 ± 48.3	0.001

Triglycerides	162.3 ± 58.7	124.1 ± 42.5	<0.001
HDL Cholesterol	35.2 ± 9.4	46.8 ± 10.2	<0.001
LDL Cholesterol	92.1 ± 36.4	71.3 ± 31.7	0.003

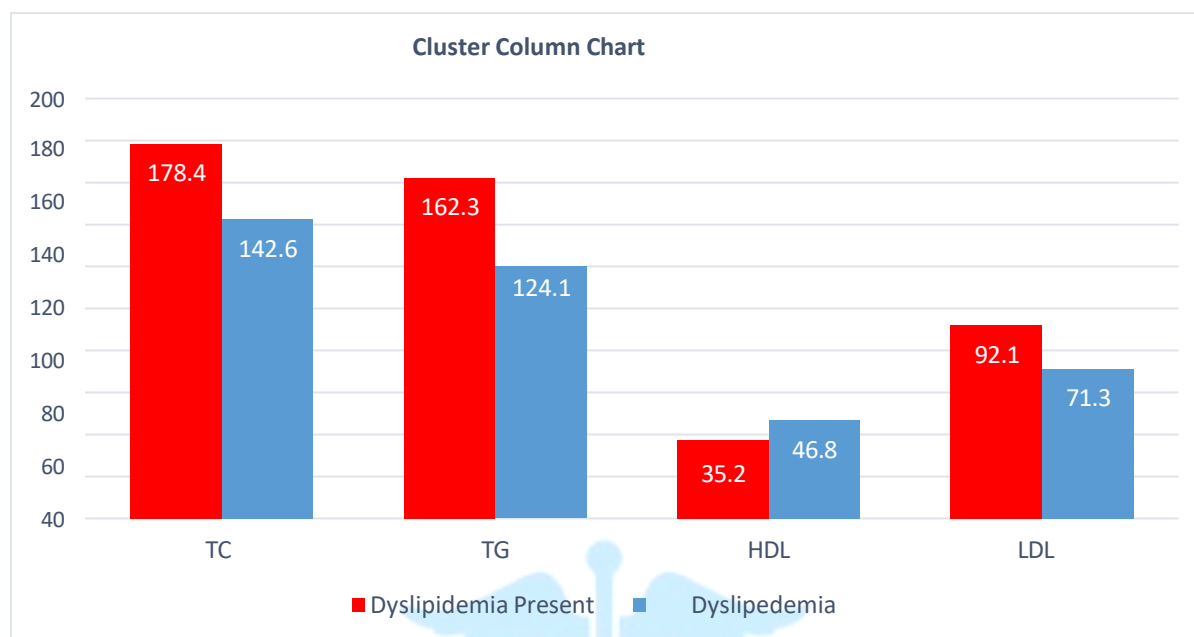


Figure 3: Comparison of Mean Lipid Parameters by Dyslipidemia Status

DISCUSSION

The present study found that 69.3% of patients with Type 2 Diabetes Mellitus (T2DM) had dyslipidemia, confirming that lipid abnormalities remain highly prevalent among diabetic patients attending a tertiary care hospital. This finding underscores the importance of routine lipid profile assessment as part of comprehensive diabetes management to reduce the risk of cardiovascular complications.^{6,7}

The prevalence observed in this study is comparable with previous reports from Pakistan and neighboring countries, where dyslipidemia has been reported in approximately 65-75% of patients with T2DM.^{8,9} The slight variation in prevalence across studies may be attributed to differences in study population, diagnostic criteria, glycemic control, and lifestyle factors. Low HDL-C (49.6%) was the most common lipid abnormality, followed by hypertriglyceridemia (33.1%), elevated LDL-C (24.4%), and hypercholesterolemia (18.1%). This pattern is consistent with the characteristics of diabetic dyslipidemia associated with insulin resistance, which promotes increased triglyceride production and reduced HDL-C

levels, thereby increasing the risk of atherosclerotic cardiovascular disease.^{4,5,10}

Female patients had a significantly higher prevalence of dyslipidemia than males ($p=0.04$), and the frequency increased with longer duration of diabetes ($p=0.02$), whereas no significant association was observed with age ($p=0.31$). These findings suggest that prolonged diabetes may progressively impair lipid metabolism, emphasizing the need for regular lipid monitoring, particularly among high-risk patients.^{9,11}

Although this study provides valuable evidence from a major tertiary care hospital in Islamabad, its findings should be interpreted in light of certain limitations. The single-center design and relatively small sample size may limit the generalizability of the results, and important variables such as HbA1c, body mass index, smoking status, dietary habits, and physical activity were not evaluated. Future multicenter studies with a larger sample size are recommended to validate these findings further.

CONCLUSION

Dyslipidemia was highly prevalent among patients with Type 2 Diabetes Mellitus attending

PIMS Hospital, Islamabad, affecting nearly seven out of ten participants. Low HDL-C was the predominant lipid abnormality, while female gender and longer duration of diabetes were significantly associated with dyslipidemia. These findings emphasize the importance of routine lipid profile screening and early management of lipid abnormalities as integral components of diabetes to reduce cardiovascular risk and improve long-term patient outcomes.

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