# OCCURRENCE OF DYSLIPIDEMIA IN NEWLY DIAGNOSED TYPE 2 DIABETES MELLITUS PATIENTS

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**ABSTRACT:**
**INTRODUCTION:** According to past research, the incidence of diabetes has increased by three times in both urban and rural regions, and in the near future, Pakistan will have a high number of diabetes patients. Due to alterations in lipid profiles, type 2 DM patients are more likely to develop vascular problems. Increased blood levels of triglycerides (TGs), total cholesterol (TC), or both, or decreased levels of elevated lipoprotein cholesterol are signs of diabetic dyslipidemia, which is more atherogenic (HDL-C). The risk of cardiovascular illnesses may be reduced by managing dyslipidemia.

OBJECTIVE: The aim of this research was to ascertain the occurrence of dyslipidemia in type-II diabetes mellitus patients who had just received their diagnosis.

METHODS: the research was carried out at the Fatima Memorial Hospital Lahore. In the research, 100 people with type 2 diabetes who had just received a diagnosis were enrolled as cases, while 100 healthy people were included as controls. Both the control and cases groups' participants provided blood samples, which were then tested for fasting and post-meal plasma glucose, HDL-C, LDL-C, TG, TC, and HbA1c.

**RESULTS:** Only 52% of controls were found to have dyslipidemia, compared to 84% of cases, and it was statistically significant that both the groups are different with p-value = 0.05. In comparison to the controls, the cases had higher mean values for fasting and postprandial plasma glucose, HbA1c, LDL-C, TG, TC, and HbA1c (p0.05).

**CONCLUSIONS:** This study demonstrated a favorable relationship between serum total cholesterol and glycemic parameters, LDL cholesterol, and triglycerides, and exhibited that dyslipidemia is frequent in recently diagnosed T2DM patients (p0.05). Since dyslipidemia is an established risk factor for cardiovascular illnesses, our research emphasizes the need and significance of taking action to reduce it in diabetes individuals.

**KEYWORDS:** Diabetes, Glucose, Cholesterol, Cardiovascular

**INTRODUCTION:** Hyperglycemia caused by insulin resistance or insulin insufficiency characterizes diabetes mellitus, a metabolic disorder. (1) A lack of insulin and problems with the metabolism of carbohydrates, proteins, and fats lead to chronic hyperglycemia. T1DM accounts for more than 90% of all diabetes patients, although T2DM frequency is greater. (2) In both low-income and high- and low-income countries, T2DM occurrence and cases are swiftly growing. (3) As stated by the International Diabetes Federation (IDF) Atlas guideline research, 629 million people (from 20 to 79 years of age) were expected to have DM by the year 2045, up from an estimated 425 million in 2017. One of the chronic non-communicable diseases (CNCDs) that has become a major worldwide health issue is this one. Of the 56.4 million fatalities worldwide in 2015, 39.5 million were caused by non-communicable illnesses. One of the biggest problems with diabetes mellitus is that between 30 and 80 percent of diabetics go misdiagnosed. In order to increase the likelihood of avoiding dangerous and expensive consequences, it is urgently necessary to screen, diagnose, and treat diabetics early on. The nations with the greatest rates of diabetes and those without a diagnosis are Pakistan, the United States, India, and China (4) One of the key factors contributing to death from coronary artery disease (CAD) is dyslipidemia in diabetic people. (5) In diabetic individuals with dyslipidemia, blood levels of low-density lipoprotein (LDL) cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), and triglycerides (TG) are increased while blood levels of high-density lipoprotein cholesterol (HDL-C) are diminished. Diabetes-related dyslipidemia has a greater atherogenic impact. (6) Insulin resistance causes impaired lipid metabolism to be often seen in T2DM patients. (7) According to recent research, in Pakistan, 25–30% of urban and 15–25% of rural respondents had elevated cholesterol. (8) In order to discover the occurrence of dyslipidemia in Type-II diabetes mellitus subjects with a recent diagnosis, this research was conducted.

**METHODS:** This cross-sectional research comprised 200 people in total, who were split into two groups: 100 T2DM patients in the study group and 100 non-diabetics in the control group. From February 2021 to January 2022, the research was carried out at the **Fatima Memorial Hospital Lahore**. It obtained ethical approval from the institutional ethics committee.

Patients over 20 who originally came to the medical OPD or IPD with diabetes-related signs and symptoms and satisfied the ADA diagnostic criteria for type 2 DM (PPBS > 200 mg/dl15, FBS > 126 mg/dl, or HbA1c > 6.5%) were included as cases. Over 20-year-old non-diabetic subjects were selected at random to serve as controls.

Every single one of the 200 participants—cases and controls—went through testing for their fasting and postprandial blood glucose, HbA1c levels, fasting plasma lipids, and hyperglycemia, as well as the liver and kidney function tests for the patients. According to advice from NCEP-ATP III, the lipid profiles of every person were computed (cases and controls). (9) Patients with known inherited lipid disorders, those with secondary hyperlipidemia carried on by drugs or pregnancy (beta-blockers, thiazides, etc.), those with acute comorbid conditions (insulin-dependent hypokalemia, glucose, and insulin hyperglycemic syndrome), those with acute disease, those with h/o myocardial infarction, those with cardiovascular events, hypothyroidism, liver cirrhosis, and kidney problems, as well as those

With the assistance of SPSS version 26, data was examined. The mean and standard deviation of the parametric variables were discovered. Chi-square was used for the comparison of qualitative data, and the independent samples t-test was applied to examine the connection between the groups. Using Pearson's correlation test, numerical variables were correlated. A 0.05 p-value is considered significant.

**RESULTS:** In contrast to the controls, 84% of patients had dyslipidemia, according to Table 1, the result depicts a statistically notable difference between the groups (Prob value < 0.05).

Table 1: Occurrence of dyslipidemia among study groups

|  | **Controls** | **Cases** | **P** |
|---|---|---|---|
| **Normal lipid profile** | 48 | 16 | < 0.001 |
| **Dyslipidemia** | 52 | 84 | |
| Total | 100 | 100 | |

Table 2: Comparing Different Characteristics between the Control and Cases Groups

| Parameters | Serum HDL-C | Serum LDL-C | Serum Triglyceride | Serum Total Cholesterol | PPBS | FBS | HbA1c | Age |
|---|---|---|---|---|---|---|---|---|
| **Controls** | 42.06±7.3 | 134.74±35.3 | 161.12±30.6 | 205.84±30.7 | 167.8±10.4 | 107.44±7.1 | 5.81±0.4 | 49.6±9.0 |
| **Cases** | 37.04±7.9 | 156.86±39.3 | 198.32±59.8 | 232.13±45.9 | 261.37±60.4 | 153.03±33.4 | 8.82±1.8 | 49.8±9.1 |
| **P-value** | 0.001 | 0.0001 | 0.0001 | 0.0004 | 0 | 0 | 0.0001 | 0.78 |

Table 3: Increased Blood Sugar and Dyslipidemia parameters in both Control and Cases Groups

| Parameters | Serum HDL-C | Serum LDL-C | Serum Triglycerides | Serum Total Cholesterol | PPBS | FBS | HbA1c |
|---|---|---|---|---|---|---|---|
| **Quant** | <40mg/dl | >130mg/dl | >150mg/dl | >200mg/dl | >200mg/dl | >126mg/dl | >6.5% |
| **Cases** | 71 | 66 | 77 | 66 | 99 | 84 | 100 |
| **Controls** | 59 | 43 | 39 | 44 | 1 | 0 | 0 |
| **P-value** | <0.01 | <0.01 | <0.01 | <0.01 | 0 | 0 | 0 |

Table 4: Relationship between the lipid profile and diabetes parameters

| Lipid profile Parameters | | Serum HDL-C | Serum LDL-C | Serum Triglycerides | Serum Total Cholesterol |
|---|---|---|---|---|---|
| **PPBS** | ρ | 0.037 | 0.501 | 0.664 | 0.643 |
| | p-value | >0.05 | <0.01 | <0.01 | <0.01 |
| **FBS** | ρ | 0.066 | 0.489 | 0.605 | 0.616 |
| | p-value | >0.05 | <0.01 | <0.01 | <0.01 |
| **HbA1c** | ρ | 0.025 | 0.486 | 0.678 | 0.64 |
| | p-value | >0.05 | <0.01 | <0.01 | <0.01 |

In the study group, 71% of the patients were in the 41–60 age range. The individuals in the control and study groups had median ages of 49.8 + 9.1 and 49.6 + 9.0, respectively. No statistically significant age difference existed between the two groups (p> 0.05). (Table 2). Comparing the average values of the case and control groups' FBS, HbA1c, PPBS, S. total cholesterol, S. triglycerides, LDL-C, and HDL-C revealed

a significant statistical difference (p 0.05). The incidence of dyslipidemia and high blood sugar parameters (HbA1c>6.5, FBS>126mg/dl, and PPBS>200mg/dl) in the case and control groups are shown in Table 3. When the two groups were compared, a statistically significant (p0.05) difference was discovered. The most frequent dyslipidemia was elevated serum TG (77% of cases), which was followed by reduced HDL-C levels (71% of cases).

Between lipid profile measures (serum LDL cholesterol, serum total cholesterol, and serum triglyceride) and glycemic parameters (HbA1c, FBS, and PPBS), there was a very significant positive connection (p 0.05). However, as indicated in Table 4, there was no significant connection with serum HDL-Cholesterol (p>0.05).

**DISCUSSIONS:** It is well known that persistent hyperglycemia causes health problems in diabetes patients via a variety of processes, including dyslipidemia, platelet activation, and altered endothelium metabolism. (10,11) According to multiple studies, dyslipidemia often develops in T2DM patients, and the most common lipid abnormalities are high TG, small dense LDL-C, and lowered HDL-C cholesterol, all of which are important CVD risk factors. (12,13) In the present study, the cases (T2DM patients) had higher mean plasma glucose, HbA1c, TC, and TG levels than the controls, whereas the cases' HDL-C was lower (T2DM patients). Similar findings were made by Venkatesh et al.21, who discovered that T2DM patients had higher mean levels of TC, VLDL-C, and LDL-C compared to healthy individuals and lower HDL-C. Additionally, a prior study showed that diabetics had significantly higher average plasma glucose, TG, HbA1c, and TC, levels than did controls. (14-16)

In the current research, patients had a prevalence of dyslipidemia of 84%, whereas controls had a prevalence of 52%. Additionally, the most prevalent form of dyslipidemia, hypertriglyceridemia, was present in 77% of cases compared to 39% of controls, a statistically significant difference (P 0.05). Following this, both controls (59%) and cases (71) had lower HDL-C levels, and this difference was also shown to be statistically relevant (P 0.05). Excessive amounts of total cholesterol and LDL-C were discovered in 66% of the individuals (P 0.05). Furthermore, case-control studies showed that diabetics had elevated TG levels most often (56%) than non-diabetics. (17) High triglyceride (TG) and total cholesterol (TC) and prevalence rates were observed to be 41.4% and 13.6%, respectively. (18) In the diabetic subjects, the occurrence rates for low HDL-C, very high LDL-C, and high LDL-C were 72.9%, 5.0%, and 8.6%, respectively. LDL-C was the lipid that was most often elevated in those with type 2 diabetes (59.3%), followed by total cholesterol (36.5%) and triglycerides (57.2%). HDL-C decreased by 34.4% in T2DM patients. (19)

According to the results of previous research, there was a substantial positive association between lipid variables (total cholesterol, LDL-C, and triglycerides) and glycemic parameters, and in our analysis and a modest negative correlation between HDL-C and glycemic parameters. (20)

**CONCLUSIONS:** The current study showed that diabetic patients have dyslipidemia, which is characterized by elevated serum total cholesterol, triglycerides, low-density lipoprotein (LDL-C), and decreased levels of high-density lipoprotein (HDL-C) levels. This finding suggests that diabetic patients are more susceptible to cardiovascular diseases. To reduce the risk of cardiac illnesses, people with T2DM must have frequent blood glucose and serum lipid profile monitoring together with the appropriate medication and preventative measures such as lifestyle changes and a nutritious diet.

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