

A Lipid Profile Study Amongst the Cases of Type 2 Diabetes Mellitus: A Cross Sectional Study

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Abstract:

Background: India is known as the diabetes capital and has the highest number of diabetic cases worldwide. One of the leading causes of Coronary Artery Disease (CAD) mortality worldwide is diabetic dyslipidemia in India. Disorders of lipoprotein metabolism, such as excess or insufficiency in lipoproteins, are known as dyslipidemia. This avoidable risk factor, which is more common in people with diabetes, has the potential to exacerbate cardiovascular diseases. The study's objective is to ascertain how type 2 diabetes mellitus (T2DM) affects the lipid profiles of diabetic patients who present to tertiary care facilities.

Methods: It was a cross sectional study conducted at Department of Biochemistry, Patna Medical College, Patna, Bihar from July 2022 to June 2023.. A total of 140 diabetic cases were chosen at random, and their dyslipidemia was assessed. Using commercially available reagent kits in a biochemistry analyzer, the fasting blood glucose concentration and Lipid Profile (Total Cholesterol (TC), High Density Lipoprotein (HDL), Very Low Density Lipoprotein (VLDL), and Triglycerides (TG)) were examined. Software that was appropriate was used to examine the collected data.

Results: The mean age of the 140 diabetes cases that were investigated was 48.93 ± 12.1 years. The average fasting blood sugar (FBS) in the current study was 188.76 ± 54.63 mg/dl. In our study, there was a 13.6% and 41.4% prevalence rate for elevated total cholesterol (TC) and triglycerides (TG), respectively. In the diabetic participants, the prevalence rates for high LDL-C, very high LDL-C, and low HDL-C were 8.6%, 5.0%, and 72.9%, respectively.

Conclusion: The serum total cholesterol, triglyceride (triacylglycerol), low density lipoprotein (LDL-C), and high density lipoprotein (HDL-C) values were low in the diabetic subjects, suggesting a higher risk of cardiovascular disease.

Keywords: Type 2 Diabetes Mellitus, Dyslipidemia, Triglyceride, HDL-C, LDL-C, Total Cholesterol.

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Introduction

With an estimated 109 million people expected to have diabetes by 2035, India is the country with the highest number of diabetes cases worldwide and is frequently referred to as the diabetes capital of the world [1]. Presently, about 62 million Indians more than 7.1% of the country's adult population are afflicted by the illness. [2,3] The age group that is most productive economically is also the one where the number of diabetics is increasing the fastest.

Diabetes mellitus is a diverse collection of metabolic diseases characterized by hyperglycemia and abnormalities in the metabolism of proteins, fats, and carbohydrates brought on by a reduction in tissue sensitivity to insulin or a lack of insulin secretion. [4,5] Type 2 diabetes is frequently linked to lipid problems, cardiovascular disease, hyperten-

sion, and obesity. Type 2 diabetes mellitus can arise due to multiple risk factors, including obesity, smoking, sedentary lifestyle, family history, obesity, and hypertension.6 In terms of its impact on health, diabetes is second only to cardiovascular disease (CVD) in India. [7]

Disorders of lipoprotein metabolism, such as excess or insufficiency in lipoproteins, are known as dyslipidemia. Elevations of serum total cholesterol, low-density lipoprotein (LDL) cholesterol and triglyceride concentrations, and a reduction in high-density lipoprotein (HDL) cholesterol concentrations are possible symptoms of these illnesses. [8] One of the leading causes of Coronary Artery Disease (CAD) mortality in India is diabetic dyslipidemia. [9]

Material and Methods

From July 2022 to June 2023, the current study was carried out at the Department of Biochemistry, Patna Medical College, Patna, Bihar. After being randomly chosen, 140 cases of diabetes 70 male and 70 female with a 10-year history of the disease were tested for dyslipidemia. Excluded from the study were cases with various illnesses and metabolic problems. Before enrolling in the study, consent was obtained, and the purpose and methodology of the investigation were described.

Aseptic venous blood draws of three milliliters were made in simple tubes for the lipid profile, and serum samples were obtained for FBS in tubes containing sodium fluoride and ammonium oxalate. The GOD-POD end point (coefficient variation of 4.84%) was used to measure serum glucose.

Lipid profile measurements included measuring Total Cholesterol (TC) using the CHOD-POD end point method, Triglycerides (TG) using the GPO-

PAP end point method, and High Density Lipoprotein (HDL) and Low Density Lipoprotein (LDL) using the Direct Enzymatic method, which had coefficient variations of 1.5% and 2.3%, respectively. Commercially available reagent kits were used to determine all the parameters that were being investigated in the individuals' serum.

The ATP III model was used to categorize the participants' lipid profiles. Microsoft Excel was used to enter the data, and relevant analysis was completed. All parameter values were represented as mean \pm SD and were provided in mg/dl.

Results

The mean age, fasting blood sugar, and mean values of the different lipid profile parameters are shown in Table 1. The study comprised 140 patients of diabetes with a mean age of 48.93 ± 12.1 years. The study participants' mean FBS was 188.76 ± 54.63 mg/dl. The average level of triglycerides was 202.56 ± 83.45 mg/dl.

Table 1: Mean values of biochemical parameters of Diabetic cases (n=140)

Parameters	Mean \pm SD
Age (years)	48.93 \pm 12.1
FBS (mg/dl)	188.76 \pm 54.63
Total cholesterol (mg/dl)	187.23 \pm 36.19
Triglycerides (mg/dl)	202.56 \pm 83.45
HDL -C (mg/dl)	35.17 \pm 4.59
LDL - C (mg/dl)	118.46 \pm 38.89

The distribution of research participants based on Adult Treatment Panel III (ATP III) classification is displayed in Table 2. Of the 140 cases, 25 (17.9%) had borderline high cholesterol (200–239 mg/dl) and 19 (13.6%) had high cholesterol (≥ 240 mg/dl). Of the 140 participants, 33 (23.6%) had triglyceride levels that were borderline high (150–199 mg/dl), while 58 (41.4%) had high triglyceride levels (200–249).

Table 2: Distribution of Biochemical parameters according to ATP III classification

Total cholesterol (mg/dl)	
Desirable (<200)	96(68.6%)
Borderline high (200-239)	25(17.9%)
High (≥ 240)	19(13.6%)
Triglyceride (mg/dl)	
Normal (<150)	49(35.0%)
Borderline high (150-199)	33(23.6%)
High (200-249)	58(41.4%)
HDL-C (mg/dl)	
Low (<40)	102 (72.9%)
Borderline high (40-59)	34(24.3%)
High (≥ 60)	4(2.9%)
LDL-C (mg/dl)	
Optimal (<100)	53(37.9%)
Near optimal (100-129)	43(30.7%)
Borderline high (130-159)	25(17.9%)
High (160-189)	12(8.6%)
Very high (≥ 190)	7(5.0%)

Discussion

The Adult Treatment Panel III (ATP III) standards of the National Cholesterol Education Program (NCEP) were adhered to when interpreting serum

lipid reference values. The NCEP-ATP III recommendations describe hypertriglyceridemia as TAG > 150 mg/dl, low HDL-C when value is < 40 mg/dl, high LDL-C as value > 100 mg/dl, and hypercholesterolemia as TC > 200 mg/dl. The exist-

ence of one or more abnormal blood lipid concentrations was the definition of dyslipidemia. [10]

Numerous studies have conclusively shown that the main cause of difficulties in diabetes cases is persistent hyperglycemia, which negatively impacts health through a number of processes, including dyslipidemia, platelet activation, and altered endothelium metabolism. [11,12] It has been demonstrated that diabetes and lipid profile are significant predictors of metabolic disorders, such as dyslipidemia, hypertension, and cardiovascular illnesses. [13]

An essential part of the pathophysiology of diabetes mellitus involves lipids. Diabetes mellitus and dyslipidemia are common metabolic abnormalities linked to one another. It has been documented that individuals with diabetes mellitus who also have a higher risk of cardiovascular arteriosclerosis exhibit abnormalities in their lipid metabolism. [14]

In this study, individuals with diabetes were found to have considerably higher mean serum levels of LDL cholesterol, triglycerides, and total cholesterol when compared to normal values. These conditions are known risk factors for cardiovascular illnesses.

Numerous issues are associated with diabetes, such as low levels of HDL-C, elevated levels of LDL-C and triacylglycerols, and a preponderance of anomalies in the composition of the smaller, dense particles. [15] Similar results were seen in studies by Albrki et al. [17] and Idogun et al. [16], which indicated that the lipoprotein profiles of diabetics were higher than normal reference levels.

In this study, the prevalence rates of elevated TG and TC were 41.4% and 13.6%, respectively. In the diabetic participants, the prevalence rates for high LDL-C, very high LDL-C, and low HDL-C were 8.6%, 5.0%, and 72.9%, respectively. Numerous types of dyslipidemia have been described among people with diabetes worldwide, suggesting that the combination of hereditary and environmental variables may have an impact on dyslipidemia.

About 50% of people with diabetes had hypertriglyceridemia, according to the prevalence of lipid abnormalities described by Carlos et al. [18] and other Asian communities, such as populations in Bangladesh and Pakistan. [19] The current study's findings about the prevalence of hypertriglyceridemia in people with type 2 diabetes are consistent with the data mentioned above.

Conclusion

The serum total cholesterol, triglyceride (triacylglycerol), low density lipoprotein (LDL-C), and high density lipoprotein (HDL-C) values were low in the diabetic subjects, suggesting a higher risk of cardiovascular disease.

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