

## Association of Lipid Abnormality with Newly Diagnosed Type II DM Patients

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### Abstract

**Aim:** To study the lipid profile abnormalities in newly diagnosed type 2 diabetics.

**Methodology:** A cross-sectional study was carried out to determine the triglyceride levels in newly diagnosed type 2 diabetic patients. A total of 150 newly diagnosed type 2 diabetics were enrolled in our study. Relevant patient data was collected from the inpatient and outpatient Department of General Medicine, Darbhanga medical College & Hospital, Laheriasarai Darbhanga, Bihar, India, Fasting lipid profile levels were measured in these patients. All patients of age > 25 years who have been diagnosed as having type 2 diabetes mellitus within the last 3 months using the ADA (American Diabetes Association) criteria. Blood samples were taken of all the patients to analyze lipid profile and Blood glucose levels.

**Results:** Out of 150 enrolled patients, the maximum number of patients belonged to the age group of 41-50 years (58%) and the least number belonged to the age group 20-30 years (9.33%). The gender distribution of the participants showed that 97 (64.6%) were females, and 53 (35.4%) were males. According to ATP III classification, 68 (45.3%) participants had normal serum triglycerides levels which are level of serum triglycerides. Among the 82 participants with abnormal triglycerides, 30% had borderline high levels (150-199mg/dl), 18.6% had high levels (200-499 mg/dl) and 6.1% participants had very high triglycerides ( $\geq 500$  mg/dl). According to the NCEP ATP III criteria, HDL levels  $\leq 40$  is considered low for males and  $\leq 50$  is considered low for females. Based on this criterion, in our study, 31.3% participants had low HDL and 68.7% participants had normal HDL. According to the NCEP ATP III criteria, 50 (33.3%) participants had an optimal level of LDL, 69 (46%) had near optimal levels of LDL, 20 (13.3%) had borderline high levels of LDL, 6 (4%) had high levels of LDL, and 5 (3.4%) participants had very high levels of LDL. Among the 200 participants, 117 (78%) participants had desirable total Cholesterol levels of < 200mg/dl, 30 (20%) had borderline high levels of 200- 239mg/dl and 3 (2%) had high total cholesterol levels of  $\geq 240$ mg/dl.

**Conclusion:** This study found that lipid profile is associated with T2DM

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## Introduction

Type 2 diabetes mellitus (T2DM) is the most common metabolic disorder and is seen as a major health threat all over the world [1]. Lipid abnormalities in people with diabetes, which are often called "diabetic dyslipidemia," are usually marked by high total cholesterol (T-Chol), high triglycerides (Tg), low high density lipoprotein cholesterol (HDL-C), and higher levels of small dense LDL particles. Levels of low density lipoprotein cholesterol (LDL-C) may be slightly high or normal. People with T2DM and prediabetes often have abnormal lipids [2, 3]. However, the pattern of the different lipids can vary by ethnicity, income, and access to health care [4, 5].

According to a research that was published in 2015 by the International Diabetes Federation, the prevalence of diabetes mellitus was around one out of eleven persons in the year 2017, and it is predicted that this number would climb to 642 million by the year 2040. In 2010, it was projected that type 2 diabetes was responsible for around 6.8 percent of worldwide mortality among persons aged 20–79 years. Both dyslipidemia and hypertension are key risk factors that may be modified for type 2 diabetes and coronary artery disease (CAD), which together account for more than 87 percent of disability in low- and middle-income countries [6, 7].

The mechanism of T2DM is largely understood. It is generally accepted that in normal circumstances, there is a feedback loop between insulin action and insulin secretion

When this feedback loop is broken, insulin sensitivity is reduced, insulin production is hampered, and abnormally high amounts of glucose are produced in the blood [4]. Insulin resistance (IR) and beta-cell dysfunction are the primary characteristics of type 2 diabetes [8]. [Citation needed]

An aberrant lipid profile has been demonstrated to have a tight link with IR, according to a growing body of research that has been conducted. In addition to type 2 diabetes, insulin resistance is the primary factor in a number of other metabolic illnesses. For example, it has been shown that insulin resistance is linked to having a high level of very low-density lipoprotein (VLDL), high quantities of blood triglycerides (TG), and a low level of serum high-density lipoprotein (HDL). Since of this, the lipid profile is given a significant amount of attention in almost all follow-up programs for type 2 diabetes because it is a significant risk factor [9, 10].

Increased hepatic secretion of large amount of triglyceride-rich VLDL and impaired clearance of VLDL is central to the pathophysiology of this dyslipidemia. The contribution of triglycerides to CVD risk has been much debated in the past, with many important prospective studies observing an association between elevated triglycerides levels and CVD risk. This independent association with long term all-cause mortality supports the idea that serum triglycerides could play a role in type 2 diabetic patients mortality risk.

A meta-analysis that was just published indicated that aberrant levels of the lipid markers that were stated before reflect, to some degree, the likelihood of developing type 2 diabetes [11]. In addition, research conducted on persons who had type 2 diabetes indicated an enhanced connection between coronary artery disease (CAD) and high Tg and low HDL-C when the two lipid parameters were evaluated together rather than separately [12, 13]. It is of considerable clinical and public health importance to gain an understanding of the association between serum lipid patterns and the various stages of glucose intolerance. Such data have the potential to serve as the foundation for future

prevention programs for diabetes and other complications related to the condition.

### Materials and Methods

A cross-sectional study was carried out to determine the triglyceride levels in newly diagnosed type 2 diabetic patients. A total of 150 newly diagnosed type 2 diabetics were enrolled in our study. Relevant patient data was collected from the inpatient and outpatient Department of General Medicine, Darbhanga medical College & Hospital, Laheriasarai Darbhanga, Bihar, India. Fasting lipid profile levels were measured in these patients. The Study was carried out during a period of 1 year.

### Inclusion criteria

- All patients who have been diagnosed as having type 2 diabetes mellitus within the last 3 months using the

ADA (American Diabetes Association) criteria

- Age of the patient >25 years
- Sex: Both males and females.

### Exclusion criteria

- Patients on steroids
- Type II diabetics
- Patients on antipsychotic medications
- Known cases of active hypothyroidism
- Known cases of Cushing's syndrome were excluded from the study.

### Methodology

All individuals signed informed written consent for their participation. Blood samples were taken of all the patients to analyze lipid profile and Blood glucose levels.

### Results

**Table 1: Demographic details**

Age	N	%
20-30	14	9.33
31-40	20	13.33
41-50	87	58
51-60	29	19.34
Gender		
Male	53	35.4
Female	97	64.6

Out of 150 enrolled patients, the maximum number of patients belonged to the age group of 41-50 years (58%) and the least number belonged to the age group 20-30 years (9.33%). The gender distribution of the participants showed that 97 (64.6%) were females, and 53 (35.4%) were males.

**Table 2: Lipid profile of all the patients**

	Range	N	%
Serum triglycerides levels (mg/dl)	Normal (<150mg/dl)	68	45.3
	Borderline high (150-199 mg/dl)	45	30
	High (200- 499mg/dl)	28	18.6
	Very High (>500mg/dl)	9	6.1
Serum HDL levels	Low (<40 for males and <50 for females)	47	31.3
	Normal	103	68.7
Serum LDL levels	Optimal (<100 mg/dl)	50	33.3
	Near optimal (100-129 mg/dl)	69	46
	Borderline high (130-159 mg/dl)	20	13.3

	High (160-189 mg/dl)	6	4
	Very high (>189 mg/dl)	5	3.4
Total cholesterol	Normal (<200 mg/dl)	117	78
	Borderline high (200-239 mg/dl)	30	20
	High (>239 mg/dl)	3	2

According to ATP III classification, 68 (45.3%) participants had normal serum triglycerides levels which are level of serum triglycerides. Among the 82 participants with abnormal triglycerides, 30% had borderline high levels (150-199mg/dl), 18.6% had high levels (200-499 mg/dl) and 6.1% participants had very high triglycerides ( $\geq 500$  mg/dl).

According to the NCEP ATP III criteria, HDL levels  $\leq 40$  is considered low for males and  $\leq 50$  is considered low for females. Based on this criterion, in our study, 31.3% participants had low HDL and 68.7% participants had normal HDL.

According to the NCEP ATP III criteria, 50 (33.3%) participants had an optimal level of LDL, 69 (46%) had near optimal levels of LDL, 20 (13.3%) had borderline high levels of LDL, 6 (4%) had high levels of LDL, and 5 (3.4%) participants had very high levels of LDL.

Among the 200 participants, 117 (78%) participants had desirable total Cholesterol levels of  $< 200$ mg/dl, 30 (20%) had borderline high levels of 200- 239mg/dl and 3 (2%) had high total cholesterol levels of  $\geq 240$ mg/dl.

## Discussion

Today, it is commonly known that dyslipidemia is related with T2DM. Patients with combination high TG and low HDL-C values showed 12.75 and 4.89 times greater risks of developing diabetes and prediabetes, respectively [14]. Diabetic dyslipidemia is generally characterized by high TC, high TG, low HDL cholesterol, and increasing amount of LDL [15, 16]. A lipid profile screening in T2DM FDRs may be beneficial to lower the risk of disease development and also for early management. The specific

mechanism of this risk is not entirely known, however at first, this may be attributable to hereditary factors. For instance, a study of Japanese-American boys revealed an elevated risk of diabetes incidence among those with a family history of diabetes (odds ratio 1.73) [17]. Bjørnholt et al. studied healthy Caucasian male FDRs with normal fasting blood glucose. They discovered that maternal diabetes is connected with a higher risk of diabetes [18].

The goal of the Strong Heart study was to find out if people with T2DM were more likely to have both high Tg and low HDL-C, which is called "atherogenic dyslipidemia" [19]. Based on a prospective cohort, this study found that having a high fasting Tg level and a low HDL-C level increased the risk of CAD and ischemic stroke, especially for people with diabetes. It was also found that 60% of the people who had both high TG and low HDL levels also had T2DM, while only 30% of the people who didn't have diabetes did.

According to the ATP III classification, 44 percent (88) of the patients in our research had normal blood triglyceride levels, which is the level of serum triglycerides. 32.5 percent of the 112 people with abnormal triglyceride levels had borderline high levels (150-199 mg/dl), 19 percent had high levels (200-499 mg/dl), and 4.5 percent had very high levels (500 mg/dl). In a research conducted in North India, Bharadwaj et al. found that hypertriglyceridemia was prevalent in 42.7% of diabetic participants [20]. The greatest incidence of hypertriglyceridemia, 29.5%, was found in Chandigarh, with obesity, diabetes, and dysglycemia being the most frequent risk factors [21].

Decades of study have been conducted to establish the precise mechanism of the effects of TG, VLDL, and non-HDL cholesterol in T2DM. Diabetic dyslipidemia is not yet completely understood, however IR and relative insulin insufficiency are often reported in T2DM patients. In addition, several adipocytokines, including adiponectin, may contribute to the development of diabetic dyslipidemia [22].

Previous research also indicated that excessive levels of lipid variables increase the chance of developing diabetes. For example, Azmatulla et al. analyzed the distribution of body fat, cardiorespiratory fitness, and lipid profile in T2DM FDRs. They demonstrated that an aberrant lipid profile in FDRs was connected with the development of various conditions, including serious cardiovascular impairments [23]. Iraj et al. examined 793 people with prediabetes in T2DM FDRs. They observed that the isolated impaired fasting glucose group had substantially higher mean LDL levels than the isolated impaired glucose tolerance group [24]. In addition, our subgroup analysis revealed that dyslipidemia elevated the risk of diabetes in female FDRs disproportionately. Similarly, Jafari-Koshki et al. [25] revealed that while there was a substantial connection between the risk of diabetes in FDRs and waist circumference and waist/hip ratio, these results were only seen in females.

Several variables are associated in diabetes dyslipidemia, such as insulin's effects on liver apoprotein synthesis, control of lipoprotein lipase, activities of cholesteryl ester transfer protein (CETP), and insulin's peripheral actions on adipose and muscle tissue [26]. The loop of dyslipidemia-insulin resistance (IR)-hyperinsulinemia, often known as the "vicious cycle theory" [27], underlies the pathophysiology of the development of cardiac complications. In a condition of insulin resistance, hypertriglyceridemia is caused largely by

an increase in the hepatic synthesis of very low density lipoprotein (VLDL) particles, postprandial hyperlipidemia, and low lipoprotein lipase (LPL) levels. This hypertriglyceridemia increases the CETP-mediated exchange of Tg from Tg-rich lipoproteins to HDL-L/HDL-VL and the consequent enrichment of Tg in HDL-C. Hepatic lipase has increased activity against Tg and will thus convert big HDL particles to tiny HDL particles, which are also removed from circulation more quickly by the kidney, hence decreasing the concentration of HDL particles (HDL-P) [28-30].

### Conclusion

This study found that lipid profile is associated with T2DM. Hence in view of the associated cardiovascular mortality and morbidity, optimum care of these patients include not only adequate glycemic control but effective measure to control the dyslipidemia as well.

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