

**Lipid Profile Levels in type 2 Diabetes Mellitus**Reena Rani<sup>1</sup>, Anupam Kumar Singh<sup>2\*</sup><sup>1</sup>Assistant Professor, Department of Biochemistry, Teerthanker Mahaveer Medical College and Research Centre, New Moradabad, U.P<sup>2</sup>Assistant Professor, Department of Ophthalmology, Rohilkhand Medical College and Hospital, Bareilly, UP

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Conflict of interest: Nil

**Abstract:**

Diabetes mellitus (DM) is the most common metabolic disorder affecting the people worldwide. Even though diabetes has been known since antiquity, only in the last few decades new discoveries have provided great hopes to minimize morbidity and mortality. The present work was taken up to assess the lipid profile of a randomly selected group of adult diabetic patients and to compare them with that of the controls. A total number of 30 control who were healthy non-smokers non alcoholics and at the time of study all of them were keeping good health and 30 diabetics who were on treatment were studied. Results shows that TG, TC, LDL-C, and VLDL-C, the lipid profile are higher significantly in diabetes than and HDL-C was significantly lower in diabetics than control groups. The difference between the control and the study (Diabetic) groups was Statistically highly significant. This study revealed that dyslipidaemia was observed in the diabetic population. The diabetic patients had a higher prevalence of high serum cholesterol, high triacylglycerol and high LDL-C than the controls, indicating that diabetic patients were more prone to cardiovascular diseases.

**Keywords:** Diabetes, Lipid Profile.

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**Introduction**

Diabetes mellitus (DM) is the most common metabolic disorder affecting the people worldwide. Even though diabetes has been known since antiquity, only in the last few decades new discoveries have provided great hopes to minimize morbidity and mortality. It is estimated that for one diagnosed diabetes there is undetected diabetes. The diabetic ketoacidosis was major fatal complication of diabetes has virtually come down with advent of insulin. Dyslipidemia is commonly seen diabetes. Type 2 DM is one of the most common secondary causes of hyperlipidemia. The relationship between hyperlipidemia and vascular complication of diabetes has long been of interest because both tend to occur with greater frequency in Type 2 DM. Insulin resistance and obesity combine to cause dyslipidemia and hyperglycemia and hyperlipidemia have additive cardiovascular risk. It is recommended that patients with DM should be treated as if they already have coronary artery disease. Diabetes mellitus (DM) is a group of metabolic disease characterized by increase blood glucose level resulting from defects in insulin secretion, insulin action, or both [1]. The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction and disturbance in failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels

[2]. Patients with type-2 diabetes have increased risk of cardiovascular disease associated with atherogenic abnormalities and dyslipidaemia. Coronary artery disease, especially myocardial infarction is the leading cause of morbidity and mortality worldwide [3]. Hyperglycaemia and atherosclerosis are related in type-2 diabetes [4]. Persistent hyperglycaemia causes glycosylation of all proteins, especially collagen cross linking and matrix proteins of arterial wall. This eventually causes endothelial cell dysfunction, contributing to atherosclerosis. The prevalence of dyslipidemia in diabetes mellitus is 95% [5]. Lipid abnormalities in patients with diabetes, often termed "diabetic dyslipidemia", are typically characterized by high total cholesterol (T-Chol), high triglycerides (Tg), low high density lipoprotein cholesterol (HDL-C) and increased levels of small dense LDL particles. Low density lipoprotein cholesterol (LDL-C) levels may be moderately increased or normal. Lipid abnormalities are common in people with T2DM and prediabetes [6] but the pattern of the different lipids may vary between ethnic groups, economic levels, and access to health care [7,8]. A recently published meta-analysis reported that abnormal levels of the above-mentioned lipid parameters reflect, to some extent, the risk of T2DM [9]. Furthermore, studies in peo-

ple with T2DM have found an increased association between CAD and high Tg and low HDL-C combined, compared to the two lipid parameters assessed separately [10,11]. The measurement of the lipid profile of diabetic patients is needed to investigate how their lipid metabolism is affected by diabetes, as they have different genetic compositions and lifestyles. Hence, the present work was taken up to assess the lipid profile of a randomly selected group of adult diabetic patients and to compare them with that of the controls.

### Material and Method

A total number of 30 control who were healthy non-smokers non alcoholics and at the time of study all of them were keeping good health and 30 Type 2 diabetics who were on treatment were studied. The study was conducted in Biochemistry department. In our study, we excluded diabetic subjects who were smokers, alcoholics and who were hypertensives, familial hyperlipidemia patients and patients with complications.

The diagnosis of diabetes is based on revised criteria according to consensus panel of experts from the National Diabetes Data Group and WHO.

**Table 1: Lipid profiles of Diabetic group control group**

Lipid Profile (mg/dl)	Diabetic group n=30 Mean $\pm$ SD	Control Group n=30 Mean $\pm$ SD	P value
TC	184.03 $\pm$ 13.62	135.3 $\pm$ 6.24	<0.002
TGs	170.34 $\pm$ 12.14	138.2 $\pm$ 19.4	<0.0034
HDL-C	39.38 $\pm$ 2.4	50.2 $\pm$ 4.8	<0.0024
LDL-C	140.06 $\pm$ 8.4	115.3 $\pm$ 6.4	<0.001
VLDL-C	34.8 $\pm$ 4.2	25.02 $\pm$ 4.2	<0.001

TC-Total cholesterol, TGs-Triglycerides, HDL-High density lipoprotein, LDL- Low density lipoprotein, VLDL-Very low density lipoprotein. P<0.001 – Highly Significant.

Table 1 shows that TG, TC, LDL-C, and VLDL-C, the lipid profile are higher significantly in diabetes than and HDL-C was significantly lower in diabetics than control groups.

The difference between the control and the study (Diabetic) groups was Statistically highly significant.

### Discussion

Type 2 DM has emerged one of the most common causes of dyslipidemia vascular complications are believed to be critical for prognosis of DM and there development, in turn, is believed to depend on several factors such as duration, degree of control, and dyslipidemia in diabetes. It is been found that Type 2 DM suffer from dyslipidemia in tune leading to various vascular complication (All Bright et al. 1989) This study has shown that TG, TC, LDL-C, and VLDL-C, the lipid profile are higher significantly in diabetes than and HDL-C

### Inclusion Criteria

1. Patients with Type 2 DM of age 35-85 years
2. Duration of diabetes more than 2 years.

### Exclusion Criteria

1. Type 2 diabetes patients with concomitant diseases or condition affecting the lipid levels such as hypothyroidism, on lipostatic drugs.
2. Biochemical analysis for fasting blood sugar (FBS) and post prandial blood sugar (PPBS), Fasting serum triglycerides (TGs), Total cholesterol (TC), High-density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) was done.
3. The values of all the parameters were given in mg/dl and they were expressed as mean  $\pm$  SD. The statistical significance of the difference between the control and the study groups were evaluated by the Student's t-test. Pearson's correlation test was performed to examine various correlations.

### Results

was significantly lower in diabetics than control groups. According Fredrick et al. 1994, Michel et al. 1989, in Type 2 DM there is significant elevation of TG, VLDL-C, and decreasing in HDL-C. Our study has shown similar results except for TC, LDL-C which are significantly elevated. The reasons for increasing TC LDL-C are increasing in the incidence of the obesity, sedentary life lack of physical activity, the diet, and risk factors like hypertension. Type 2 DM has emerged one of the most common causes of dislipidemia vascular complications are believed to be critical for prognosis of DM and there development, in turn, is believed to depend on several factors such as duration, degree of control, and dyslipidemia in diabetes. It is been found that Type 2 DM suffer from dyslipidemia intune leading to various vascular complication (All Bright et al. 1989). Several workers in India (Ajagnakar and Sathi et al. 1989; Vaishnava et al. 1989; Shankar et al.) have reported that in the incidence of diabetes is greater in male then females. In our study, it is observed that 60% were males 40% were females. Diabetic patients have many complications which include elevated levels of LDL-C and triacylglycerols, low

levels of HDL-C and a preponderance of abnormalities in the composition of the smaller, dense particles [12]. Patients with type-2 diabetes have increased risk of cardiovascular disease associated with atherogenic abnormalities and dyslipidaemia. Coronary artery disease, especially myocardial infarction is the leading cause of morbidity and mortality worldwide [13]. Hyperglycaemia and atherosclerosis are related in type-2 diabetes [14.] Persistent hyperglycaemia causes glycosylation of all proteins, especially collagen cross linking and matrix proteins of arterial wall. This eventually causes endothelial cell dysfunction, contributing to atherosclerosis. The prevalence of dyslipidemia in diabetes mellitus is 95% [15]. Early detection and treatment of hyperlipidemia in diabetic patients reduces the risk for cardiovascular and cerebrovascular diseases. Lifestyle changes such as diet and exercise are very important in improving diabetic dyslipidemia, but often pharmacological therapy is needed [16]. Lipoprotein metabolism [17].

### Conclusion

This study revealed that dyslipidaemia was observed in the diabetic population. The diabetic patients had a higher prevalence of high serum cholesterol, high triacylglycerol and high LDL-C than the controls, indicating that diabetic patients were more prone to cardiovascular diseases.

### References

1. American Diabetes Association. Diagnosis and classification of diabetes Mellitus. *Diabetes Care*.2005;28(1):537-42.
2. Shera, A.S., F. Jawad and A. Maqsood, A. Prevalence of diabetes in Pakistan. *Diabetes Res. Clini. Pract.* 2007;76(2):219-22.
3. Roberto, T., A.R. Dodesini, Lepore G. Lipid and Renal disease. *J. Am. Soc. Nephrol.* 2006; 17: S145-7.
4. Devrajani, B.R., S.Z. Shah, A.A. Soomro and T. Devrajani. Type 2 diabetes mellitus: A risk factor for Helicobacter pylori infection: A hospital-based case control study. *Int. J. Diabetes Dev. Ctries.* 2010;30(1):22-6.
5. Chattanda SP, Y.M. Mgonda. Diabetic dyslipidemia among diabetic patients attending specialized clinics in Dar es Salaam. *Tanzania Med. J.*2008;23(1):08-11.
6. Santos-Gallego, C.G.; Rosenson, R.S. Role of HDL in those with diabetes. *Curr. Cardiol. Rep.* 2014; 16: 512.
7. Gerber, P.A.; Spirk, D.; Brandle, M.; Thoenes, M.; Lehmann, R.; Keller, U. Regional differences of glycaemic control in patients with type2 diabetes mellitus in Switzerland: A national cross-sectional survey. *Swiss Med. Wkly.* 2011;141:13218.
8. Joshi, S.R.; Anjana, R.M.; Deepa, M.; Pradeepa, R.; Bhansali, A.; Dhandania, V.K. Prevalence of dyslipidemia in urban and rural India: The ICMR-INDIAB study. *PLoS ONE* 2014; 9: e96808.
9. Zhu, Z.W.; Denga, F.Y.; Lei, S.F. Meta-analysis of Atherogenic Index of Plasma and other lipid parameters in relation to risk of type 2 diabetes mellitus. *Prim. Care Diabetes* 2015; 9: 60–67.
10. Lee, J.S.; Chang, P.Y.; Zhang, Y.; Kizer, J.R.; Best, L.G.; Howard, B.V. Triglyceride and HDL-C Dyslipidemia and Risks of Coronary Heart Disease and Ischemic Stroke by Glycemic Dysregulation Status: The Strong Heart Study. *Diabetes Care.* 2017; 40: 529–537.
11. Rana, J.S.; Liu, J.Y.; Moffet, H.H.; Solomon, M.D.; Go, A.S.; Jaffe, M.G.; Karter, A.J. Metabolic dyslipidemia and risk of coronary heart disease in 28,318 adults with diabetes mellitus and low-density lipoprotein cholesterol, 100 mg/dL. *Am. J. Cardiol.* 2015; 116: 1700–1704.
12. Haffner SM. Management of dyslipidemia in adults with diabetes. *Diabetes Care* 1998; 21:9 (1):1600-78.
13. Roberto, T., A.R. Dodesini, Lepore G. Lipid and Renal disease. *J. Am. Soc. Nephrol.* 2006; 17:S145-7.
14. Devrajani, B.R., S.Z. Shah, A.A. Soomro and T. Devrajani. Type 2 diabetes mellitus: A risk factor for Helicobacter pylori infection: A hospital-based case control study. *Int. J. Diabetes Dev. Ctries.* 2010;30(1):22-6.
15. Chattanda SP, Y.M. Mgonda. Diabetic dyslipidemia among diabetic patients attending specialized clinics in Dar es Salaam. *Tanzania Med. J.*2008;23(1):08-11.
16. Arjola Z, Klodiana S, Gentian V et al. Lipid profile in diabetes mellitus type 2 patients in Albania and the correlation with BMI, HTN and hepatosteatosis. *J Family Med community health.* 2014;1(4):1018.
17. Satyanarayana U, Chakrapani U. *Biochemistry.* 2013;(4):319-20.