Correlation Of Dyslipidemia And Type 2 Diabetes Mellitus Amongst The People Of Vidarbha Region Of India

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Abstract: **Objectives:** Cardiovascular diseases are most universal in patients in Type 2 DM and Type 1 diabetes mellitus. High density lipoprotein(HDLc) and serum low-density lipoprotein cholesterol(LDLc) and relatively constructive lipid profiles, as it may help to diagnosis of the T2DM. To examine T2DM with dyslipidemia and their correlation is the aim of the present study in residents of Vidarbha Region. **Methods:** This case-control study was carried out in Jawaharlal Nehru medical college, Sawangi (Meghe), Wardha , on total of 100 subjects, with 50 T2DM patients and 50 controls (non-diabetic cases) and, to study their HDL and LDL profiles.
Results: The present study showed increased levels of and LDL cholesterol 121.79±44.33 than in control 120.04 (30.57).Fasting blood sugar 97.70± 12.05 than in control 94.3±19.5 in T2DM subjects; conversely, serum HDL cholesterol 35.5± 9.27 level was reduced significantly in T2DM patients than in controls 45.0 ±4.10.
Conclusion: Findings of the present study rivet a significant correlation between serum LDL and HDL cholesterols in T2DMpatients.

Keywords: High density lipoprotein, Low density lipoprotein, blood glucose, Cholesterol, , Non-insulin dependent diabetes mellitus

I.   INTRODUCTION

Type 2 diabetes mellitus (T2DM) is one of the most widespread forms of DM characterized by hyperglycemia, insulin resistance, and relative insulin deficiency. Diabetes Mellitus is a complex syndrome concerning severe insulin dysfunction in conjugation with gross abnormalities in lipid metabolism and glucose homeostasis. [1] It is estimated that 366 million people had DM in 2011; by 2030 this would have risen to 552 million.[2] Minimal changes liable for development of macrovascular and microvascular complications which are present at the time diagnosis,. This Untreated diabetes may leads to complication likes, kidney failure, blindness, , and neuropathy limb amputation. T2DM is also associated with fourfold increased risk of cardiovascular events and is a risk factor for duplication the risk of cardiovascular death [3,4,5].

Patient with type-2 DM are usually dyslipidmic even if under relative good glycemic control. They have several lipid abnormalities including elevated plasma triglycerides, high Low Density Lipoprotein-Cholesterol (LDL-C) and decreased High Density Lipoprotein-Cholesterol (HDL-C).[6] Among the established risk factors for coronary heart disease (CHD), the lipid triad (elevated triglycerides, decreased high-density lipoprotein cholesterol, and elevated small dense low-density lipoprotein cholesterol) is a powerful risk factor for atherosclerosis in type 2 diabetes.[7] Triglyceride removal may be diminished due to decreased lipoprotein lipase action when diabetes mellitus uncontrolled. As triglycerides increase-still within the so-called normal limit -abnormalities, low-density lipoprotein (LDL) and HDL become more obvious. The mean concentration of LDL cholesterol in those with type 2 diabetes is not significantly different from those individuals who do not have diabetes. In particular, patients with diabetes tend to have a higher proportion of smaller and denser LDL particles, more susceptible to oxidation and may thereby increase the risk of cardiovascular diseases[8,9.] Low-density lipoproteins (LDL) cholesterol is the main lipid marker in cardiovascular risk estimation and the principle therapeutic target in diabetic subjects . High-density lipoprotein (HDL) cholesterol is inversely correlated with cardiovascular events in all major epidemiological studies. Earlier reports have demonstrated that increased HDL cholesterol is associated with decreased cardiovascular risk in high-risk individuals such as patients with T2DM . An abnormal lipid profile is more common in diabetics and gets aggravated with poor glycemic control. Thus, the analysis of lipid profile is needed to investigate how the lipid metabolism, especially HDL and LDL cholesterol, is affected by diabetes[10]. High levels of LDL cholesterol and low HDL cholesterol may be a consequence of obesity, increased calorie intake and a lack of muscular exercise in the patients with T2DM . Insulin resistance is a multifaceted syndrome responsible for the future development of T2DM, obesity, hypertension, dyslipidemia and atherosclerotic CVD[11]. The cause of T2DM is defective production of insulin or

defective action of insulin, a hormone that controls the metabolism of carbohydrates, proteins and lipids. T2DM is regarded as a long-term disease without variable clinical manifestation and progression of diseases. T2DM is associated with a cluster of interrelated plasma lipid and lipoprotein (Lp) abnormalities that are all recognized as predictors for CHD. Elevated levels of Lp (a), a well-known independent predictor of CVD, has also been reported in diabetics [12,13]. DM induces a state of dyslipidemia with abnormalities in all Lp, namely, chylomicrons, very low density Lp, LDL, and HDL. The pattern of dyslipidemia, however, may vary among patients with T1DM and T2DM. Other studies have indicated that an increased triglyceride level is an independent risk factor and a predictor for the development of coronary artery disease (CAD), especially in T2DM. Frequent co-existence of hypertriglyceridemia and low HDL possesses a greater risk for CAD development[12]. Thus, there is a need to evaluate lipid profiles in T2DM population and determine the trends of the major lipid risk factors for CAD. Subsequently, this is an additional criterion for our physicians in making decisions about therapeutic and dietary measures in T2DM patients. Indian population is at a high risk for DM and its complications. Keeping in mind the increased incidence and the risk factors of diabetes mellitus together with scarcity of recent literature, we thought of conducting this study.[14]

 Hence, the present study aims to give a better insight on the levels of HDL and LDL status and their correlation between these two parameters in T2DM subjects of Vidarbha Region.

II.   METHODS

Study design

   This case-control study was carried out in Jawaharlal Nehru medical college, Sawangi (Meghe), Wardha , on a total of 100 subjects, with 50 controls as healthy non-diabetic cases and 50 T2DM patients as study group. The aim was to study the plasma HDL and LDL-cholesterol and to evaluate the correlation between them of study   and the control group. A total of 50 T2DM subjects were taken for the study, among which 26 i.e. 52% were males, and 24 i.e. 48%were females, in the age group of 45-65 years (table no.1)All the experiments were approved out as per national guidelines and protocols, approved by Institutional Human Ethical Committee.

   Patients with conditions which may affect the serum Lp concentrations, like renal failure, hypertension, pregnancy, chronic alcoholism, drug addiction and familial disorders of Lp metabolism. were excluded from the study. Others total of 50 healthy subjects without any history of DM, major illness or factors, which may alter the concentration of serum lipids, formed the control group. Out of which 30 i.e.60% were males, and 20 i.e.40 %were females, in the age group of 45-65 years (Table no.1).

Biochemical analyses

From the patients, venous blood sample were collected after overnight (12 hrs) fasting, in fluoride vacutainer and samples was centrifuged to obtain plasma for the determination of fasting blood sugar (FBS), serum HDL, serum LDL .by using RANDOX Daytona autoanalyser and the values were documented for statistical analysis.

Analysis of plasma glucose

 Plasma glucose levels were determined by the glucose oxidase/ GOD-POD method using a commercially available reagent kit (RANDOX Laboratories, Crumlin, UK) with the help of Robonic Prietest exp semi auto-analyzer

Analysis of serum HDL and LDL cholesterol

Serum HDL and LDL were analyzed by Fasting lipid profile was obtained by RANDOX Daytona autoanalyser with the help of commercially available reagent kits (RANDOX Laboratories, Crumlin, UK).
 With biological reference of HDL cholesterol >40 mg/dl, LDL cholesterol <130 mg/dl.

Statistical analyses

   In this present study statistical analysis has been carried out with mean (standard deviation) (min-max) and results on categorical measurements are presented in a number (%). Significance is assessed at $p<0.05$. Analysis of variance has been used to find the significance of study parameters between three or more groups of patients, Student's *t*-test has been used to find the significance of study parameters on continuous scale between two groups inter-group analysis. Chi-square/Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Pearson correlation of HDL and LDL cholesterol was computed both in control subjects and T2DM patients [15,16].

III.   RESULTS

The mean age of T2DM patients study group and the corresponding control group was 53.8 ± 7.11 (years) and 52.8 ± 7.83 (years) respectively; whereas, the percentage of gender in studied population showed that control

group consisted of 60% male and 40% female while, among T2DM patients 52% are male and 48% are female. Hence, the results suggest that the study comprised of equal distribution of age group and gender.

The FBS and serum LDL cholesterol levels were significantly elevated in the study group 97.99 ± 12.05 and 121.79 ± 44.33 respectively with respect to the control group 94.3 ± 19.5 and 120.4 ± 30.57 respectively, which implies a strong significance at p<0.002 and p<0.001 respectively (Table 2). Whereas, HDL cholesterol levels are found to be lower in patients 35.5 ± 9.27 than the control group 45.0 ± 4.10, which also shows a highly significance at p<0.001 (Table 2).

Serum LDL levels of T2DM patients also showed an significantly increased(Table 2). Whereas a significant difference was observed in LDL:HDL ratio was observed between control and T2DM (Table 2).

Fig. 1 shows a significant negative correlation between HDL and LDL cholesterol between the control group groups.
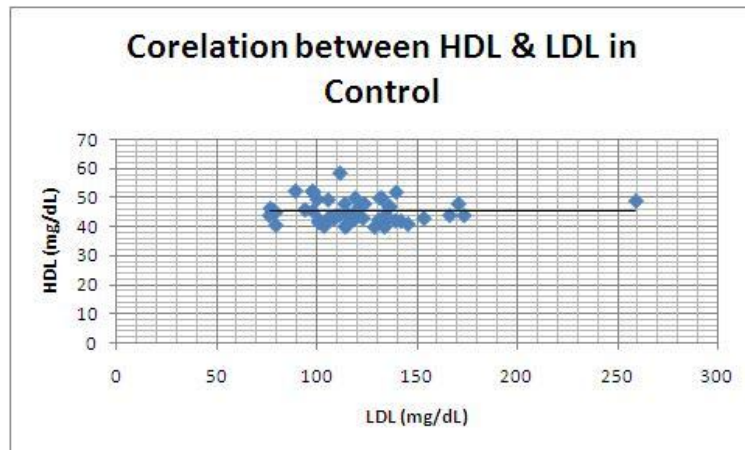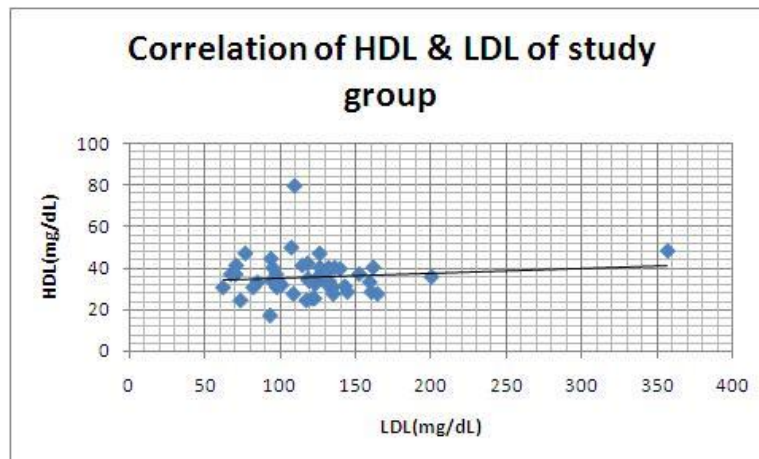

Fig. 2 shows a significant negative correlation between HDL and LDL cholesterol between the study group groups.

Table no.1:   Sex-wise Comparison both group

Sex	Control Group (%)	Study Group (%)
Female	40	48
Male	60	52
Total	100	100

Table no.2: Test the significance between Control and Study Group for following variables

	Control group	Study group	P value	Significance
Age	52.8 ± 7.83	53.8 ± 7.11	>0.01	NS
FBS	97.99 ± 12.05	97.99 ± 12.05	< 0.02	SS
LDL	120.4 ± 30.57	121.79 ± 44.33	< 0.01	HS
HDL	45.0 ± 4.10	35.5 ± 9.27	< 0.01	HS
LDL/HDL (Ratio)	**2.67** ± 0.69	**3.60** ± 1.28	< 0.01	HS

IV.   DISCUSSION

In present study the subjects enrolled were irrespective of age and sex. The age and sex wise distribution among the study population was as shown in(table no.1)Out of total (52%) were male and (48%) were females. On the findings of this study, there appears to be no sex predilection for T2DM that is in compliance with other publications that report no significant differences in the prevalence of T2DM between males and females [17,18]

DM comprises of a cluster of disorders that share a phenotype of hyperglycemia which leads to morbidity and mortality in the diabetic patients.

In this study, the fasting blood glucose levels are found to be significantly (p<0.02) high in T2DM patients, than control Our findings are supported by[19,20] .HDL cholesterol was low in Type 2 patients when compared to control. The decrease was found to be moderately significant (p<0.001)in T2DM patients. Similar studies have been reported by Keshab Joshi et al.*,* Harno et al in which they reported a reduction in HDL cholesterol in Type 2 diabetic patients due to the increased activity of hepatic lipase, which plays an important role in HDL metabolism. However, controversial studies also have been reported where no significant change in HDL cholesterol levels in diabetic patients were reported[21]. HDL cholesterol concentration is strongly and independently related to CAD, but the relationship is inverse a low HDL cholesterol being an important predictor of CHD and whereas high levels of HDL cholesterol is protecting against CHD. Hence, a possible explanation for these findings is the role played by HDL cholesterol in reverse cholesterol transport as an acceptor of cellular free cholesterol [22].

Most common dyslipidemic profile in T2DM is a hyper triglyceridemia and low HDL cholesterol levels. In this present study, LDL cholesterol is found to be elevated and highly significant (p<0.001) in Type 2 diabetic patients. However, there was a negative correlation between LDL cholesterol and HDL cholesterol in Type 2 diabetic patients. The above findings are consistent with some observations by other workers [22,23,24]. In our study, LDL: HDL ratio did significantly differ between controlled and uncontrolled diabetics .Similar results have also been forwarded by. However, Schmitt et al.1982   found that LDL: HDL ratio correlated with HbA1c better than any of the lipids or lipoprotein fractions. LDL: HDL ratio changed significantly than did its component fractions and. suggested that LDL uptake by fibroblasts may be impaired in Type 2 diabetics. This may lead to an increase in LDL cholesterol levels and decrease in HDL cholesterol levels and an increase in the LDL:HDL ratio in Type 2 diabetics. [24].

Some reports also suggested that differences in LDL receptor genes in T2DM patients also results in abnormal lipid metabolism In our study, LDL:HDL ratio differs significantly between control and diabetics. Similar results have also been forwarded by Singla et al.[25]

V.   CONCLUSION

In T2DM of evaluation of serum HDL cholesterol and LDL cholesterol is fairly dependable and applicable which acts as a useful monitor for the prediction of dyslipidemia and risk to CVD in patients. The

findings present study propose that FBS and serum LDL cholesterol levels were elevated in T2DM subjects, whereas, serum HDL cholesterol level was reduced statistically, resulting in increased LDL: HDL ratio in patients. Thus, a significant negative correlation was observed between serum HDL and LDL cholesterol levels in diabetic subjects

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