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Lipid profile of patients with diabetes mellitus: a cross sectional study

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Abstract: ***Background:*** *Dyslipidemia is one of the common disorders which is seen in most of the diabetic patients, which causes cardio vascular disorders. Objective: To detect the lipid abnormality in diabetic patients.*
Methods: *The study was carried out in Medicine Department, at a tertiary care hospital, Visakhapatnam from March 2017 to June 2017. The lipid profiles and the blood sugar values of 60 diabetic patients and 60 healthy subjects were studied after taking informed consent. Their serum samples were assessed for fasting blood glucose (FBG), post prandial blood glucose(PPBS), total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL) and high density lipoprotein cholesterol (HDL) by using standard biochemical methods. The data was collected by predesigned, pretested proforma and analyzed using SPSS 17.0 (Trial version).*
Results: *Maximum number of patients (36.6%) were from age group of 40-49 years. Mean age in DM group was 42.13 ± 9.29 years. Among males with diabetes 43.3% were in the 50-59yrs age group. Among females with diabetes 46% were in the 30-39yrs age group. Among Diabetic patients only 26.6% had fasting blood glucose less than 140mg/dl and 23.3% showed more than 200 mg/dl level of Post Prandial Blood Sugar (PPBS). All the subjects with diabetes mellitus showed high serum cholesterol level (>240mg/dl). Among Diabetic patients showed normal (<150 mg/dl) serum triglyceride level, whereas all the control group subjects showed normal level. Serum LDL level was high (>160 mg/dl) in 98.3% of Diabetic patients. In diabetic patients group 41.6% of them showed low (<40 mg/dl) serum HDL value whereas in the control group all the participants had normal serum HDL level(>40mg/dl). In DM patients, the mean values of S. Cholesterol and S. LDL were high whereas S. triglyceride and S. HDL level were in normal limit in both the sexes. Males have shown slightly higher mean level of S. cholesterol, S. triglyceride, S. LDL and S. HDL level as compared to females.*
Conclusions: *The frequencies of the high cholesterol, high TG and high LDL levels were higher in the diabetic group, thus indicating that diabetic patients were more prone for dyslipidemia, which could cause cardiovascular disorders.*

Keywords: *Lipid profile, Dyslipidemia, Diabetes, Serum cholesterol, Serum triglyceride,* Serum LDL

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I. Introduction

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by increased blood glucose level resulting from defects in insulin secretion, insulin action, or both[1]. The prevalence of diabetes is on the rise, more alarmingly in the developing nations. Globally, an estimated 422 million adults were living with diabetes in 2014[2]. Diabetes also caused 1.4million deaths in 2016, up 31 percent since 2006. Diabetes mellitus is ranked 7th among leading causes of death & has been rated 3rd when all its fatal complications are taken in to account. Patients with diabetes have increased risk of cardiovascular disease associated with atherogenic dyslipidemia. Coronary artery disease, especially myocardial infarction is the leading cause of morbidity and mortality worldwide[3].Hyperglycemia and atherosclerosis are related in type-2 diabetes[4] .Besides multiplying the risks of coronary artery diseases, diabetes enhances incidences of cerebrovascular stokes.Moreover, it is the leading cause of acquired blindness & accounts for more than 25% cases with end stage renal diseases as well as 50 % non-traumatic lower limb amputations. Being a pan metabolic disorder, diabetes is characterized by alteration in lipid profile, both quantitative & qualitative. Persistent hyperglycemia causes glycosylation of all proteins, especially collagen cross linking and matrix proteins of arterial wall. This eventually causes endothelial cell dysfunction, contributing further to atherosclerosis. The prevalence of dyslipidemia in diabetes mellitus is 95%.[5] The dyslipidemia is a major risk factor for Coronary Heart Disease (CHD).[6] The cardiovascular disease is a cause of morbidity and mortality in patients with diabetes mellitus because of disturbance in lipoproteins i.e. serum triglycerides 69%, serum cholesterol 56.6%, Low-Density Lipoprotein cholesterol (LDL) 77% and High Density Lipoprotein cholesterol (HDL) 71%.[7,8] In uncontrolled diabetes, serum triglycerides, Very Low Density

Lipoproteins (VLDL), cholesterol are raised both at fasting & following fixed meal. In post mixed meal Chylomicrons remnants & Low Density Lipoproteins (LDL) remain high for longer period than normal. Total cholesterol & LDL are mild to moderate high in 1/3rd patients. On other end HDL remain significantly low particularly in type-2 diabetes patients with central obesity. Among changes in composition of Lipoproteins high proportion of small, dense triglyceride rich LDL & glycoxidation products of LDL are considered to be most atherogenic. Age adjusted incidence of coronary artery diseases is 3 to 5 times higher in both male & female diabetics compare to general population. Individuals with diabetes may have several forms of dyslipidemia leading to additive cardiovascular risk of hyperglycemia. So lipid abnormalities should be aggressively detected & treated as a part of comprehensive diabetic care. The rationale of this study was to detect the lipid abnormality in diabetic patients.

II. Material And Methods

The study was carried out in Medicine Department of a tertiary care hospital during period from March 2017 to April 2017. 60 patients with diabetes Mellitus were selected from inpatients in medicine ward for this study. 60 normal healthy volunteers between age group of 20-60 years were selected for control study. The detail history was taken; relevant clinical examination and all routine investigations were performed. An informed consent was taken from every patient after full explanation of procedure. Those who were not willing to participate or not giving the consent were excluded. Every patient was adviced for at least 12-14 hours overnight fasting and the 5ml venous blood sample was collected in a disposable syringe on the next morning (before breakfast) for the serum lipid profile and fasting blood sugar (for the assessment of blood glucose level). Post-prandial blood sugar was also estimated. The lipid profiles were evaluated. Ethical clearance was obtained from the respective Institutional Ethical Committee. The data was collected by predesigned, pretested proforma and analyzed using SPSS 17.0 (Trial version). Reference ranges for lipid profile were taken from NCEP ATPIII Guidelines.

III. Result

Maximum number of patients (36.6%) were from the age group of 40-49 years. Mean age in DM group was 42.13 ± 9.29 years . Among males with diabetes 43.3% were in the 50-59yrs age group. Among females with diabetes 46% were in the 30-39yrs age group. Among Diabetic patients only 26.6% had fasting blood glucose less than 140mg/dl and 23.3% showed more than 200 mg/dl level of Post Prandial Blood Sugar (PPBS). All the subjects with diabetes mellitus showed high serum cholesterol level (>240mg/dl). In control group only 56.6% had high serum cholesterol level (Table 1). 80% of DM patients showed normal (<150 mg/dl) serum triglyceride level, whereas all the control group subjects showed normal level (Table 2). Serum LDL level was high (>160 mg/dl) in 98.3% of DM patients(Table 3). In DM patients 41.6% of them showed low (<40 mg/dl) serum HDL value and 5% showed higher value. In the control group all the participants had normal serum HDL level >40mg/dl (Table 4). In DM patients, the mean values of S. Cholesterol and S. LDL were high whereas S. triglyceride and S. HDL level were in normal limit in both sexes. Males have shown slight higher mean level of S. cholesterol, S. triglyceride, S. LDL and S. HDL level as compared to females (Table 5).

Table no 1 : Distribution of the controls and patients according to their serum cholesterol level.

Serum cholesterol level (mg/dl)	**Control group (n1)**	**Diabetic cases group(n2)**	**t test**
<200	11(18.3%)	00	
200-239	15 (25%)	00	P <0.01
>240	34(56.7%)	60(100%)	
Total	60	60	

Table no2: Distribution of the controls and patients according to their serum triglyceride level.

Serum triglyceride level (mg/dl)	**Control group (n1)**	**Diabetic cases group(n2)**	**t test**
<150	60 (100%)	48(80%)	
150-199	00	12(20%)	P < 0.001
200-499	00	00	
≥500	00	00	
Total	60	60	

Table no 3: Distribution of the controls and patients according to their serum LDL level.

Serum LDL(mg/dl)	**Control group (n1)**	**Diabetic cases group(n2)**	**t test**
<130	10(16.7%)	00	
130-159	15(25%)	01(1.7%)	P < 0.001

>160	35(58.3%)	59(98.3%)	
Total	60	60	

Table no4 : Distribution of the controls and patients according to their serum HDL level.

Serum HDL(mg/dl)	**Control group (n1)**	**Diabetic cases group(n2)**	**t test**
<40	00	25(41.6%)	
40-60	29(48.3%)	16(26.7%)	P < 0.001
>60	31(51.7%)	19(31.7%)	
Total	60	60	

Table no 5: Gender wise distribution of lipid profile of type-1 DM patients (Mean values).

Sex	**Serum cholesterol mg% mean**	**Serum triglyceride mg% mean**	**S. HDL mg% mean**	**S. LDL mg% mean**
Female	310.76	95.33	60.3	225.02
Male	350.53	157.26	34.6	284.06

IV. Discussion

Diabetes is associated with a greater risk of mortality from cardiovascular disease (CVD) which is well known as dyslipidemia, which is characterized by raised triglycerides, low high density lipoprotein and high small dense low density lipoprotein particles. It may be present at the diagnosis of type 2 Diabetes mellitus and is a component of the metabolic syndrome. Abnormal serum lipids are likely to contribute to the risk of coronary artery disease in diabetic patients[9]. Lipid abnormalities are common in diabetics and frequently seen in type-2 diabetics. Dyslipidemias make diabetics prone to develop coronary heart diseases (CHD and other complications of atherosclerosis. In our study majority all DM patients (100%) showed high serum cholesterol level. According to the CDC, 97% of adults with diabetes have one or more lipid abnormalities while the prevalence of diabetic dyslipidemia varies from 25% to 60% in other studies[10]. This variation in prevalence may be due to differences in BMI and possibly genetic variation. A study conducted in Nishtar Hospital, Multan by Ahmad et al. showed that 21% patients with type-2 diabetes had raised serum cholesterol (>200 mg/dl) and 34. 2% patients have raised triglycerides in serum (>150 mg/dl).[11] In our study serum TG was raised in 20% of the type 2 DM patients. The reason for difference in serum cholesterol values may be due to difference in the dietary habits of the people. Another study conducted at Hazara division Pakistan on "Frequency of dyslipidaemia in type 2 diabetes mellitus in patients of hazara division" showed that serum triglyceride was raised in 59%.[12] In Singapore, fasting serum TG levels, but not HDL and LDL concentrations, were found to be higher among persons with type 2 DM than those of nondiabetics.[13]High TG levels cause increased transfer of cholesteryl esters from HDLC and LDLC to very VLDLC via cholesteryl ester transfer protein, thus forming cholesteryl ester depleted, small dense LDLC particles.[14] These small dense lipoprotein particles are taken up by arterial wall macrophages, resulting in atherogenesis[15] HDL acts by enhancing the removal of cholesterol from peripheral tissues and so reduces the body's cholesterol pool. Type 2 DM was usually associated with low plasma levels of HDLC.[16] In our study, 41.6% of patients of type 2 DM had low serum HDL level. Low HDLC concentrations are often accompanied by elevated triglyceride levels[17] has been strongly associated with an increase in risk of Coronary Heart Disease (CHD).[18-20]

V. Conclusion

Hyperlipidemia is the commonest complication of diabetes mellitus and it is predisposing condition to premature atherosclerosis and macrovascular complications. Common lipid abnormalities in diabetes are raised serum cholesterol, raised triglycerides, raised serum LDL and low serum HDL. The important impact of dyslipidemia on cardio vascular complications in diabetics requires undivided attention throughout the course of disease.

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