Study of Lipid Profile in Type 2 Diabetes Patients

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Abstract:

Diabetes mellitus is characterized by chronic hyperglycaemia with disturbances in carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. Many studies have proposed HbA1c to be used as a biomarker of both glycaemic control and dyslipidemia in type 2 diabetes mellitus. Thus, the aim of this study was to observe the lipid profile in type 2 diabetes mellitus patients. The study was a cross sectional, case control study done in department of medicine, RIMS Medical College and Hospital Adilabad, in which the patients were selected as per the inclusion and exclusion criteria. 30 patients of Type 2 diabetes mellitus and 30 non diabetic patients were included in this study. Lipid profile, HbA1c, Fasting blood sugar was measured in all subjects. Total cholesterol, LDL, VLDL, Triglycerides values were higher in diabetic patients as compared to normal subjects and this difference was highly significant. HDL values were less in diabetic patients as compared to normal subjects and this difference was highly significant. Fasting blood sugar and Hba1c values were higher in diabetic patients as compared to normal subjects and this difference was highly significant. Diabetic dyslipidemia is characterized by low HDL, high TG and high small dense LDL. Early screening of diabetic patients for dyslipidemia and early intervention is required to minimize the risk of future cardiovascular mortality.

Keywords : Lipid profile , Fasting blood sugar , HbA1c, Type 2 Diabetes Patients

Introduction

The rate of patients with type 2 diabetes mellitus (T2DM) is increasing rapidly due to physical inactivity and obesity as a result of lifestyle modification.[1] Diabetes mellitus is due to abnormality in carbohydrate, lipid, and protein metabolism due to increase in insulin resistance in type 2 diabetics and due to insulin deficiency in type 1 diabetes mellitus (T1DM).[2] The major risk factor in development of coronary vascular disease in patients with T2DM is evidenced by abnormal lipid profile parameters, apart from metabolic syndrome, which is a combination of T2DM and systemic hypertension.[3,4] The number of receptors of low-density lipoprotein increase with elevation of the insulin level; hence, LDL receptor levels diminish with decrease in level of insulin, which causes higher level of LDL cholesterol in patients with T2DM.[5,6] It acts as a modifiable risk factor for cardiovascular disease in type 2 diabetes mellitus, as dyslipidemia accelerates progression of atherosclerosis. The level of HbA1c acts as a better indicator for analyzing the average blood glucose level for over a period of 3 months.[7,8] In order to take a suitable action at an appropriate time, it is essential to estimate the lipid

profile of patients with T2DM.[9,10] 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 [11,12] but the pattern of the different lipids may vary between ethnic groups, economic levels, and access to health care [13,14]. A recently published meta-analysis reported that abnormal levels of the above-mentioned lipid parameters reflect, to some extent, the risk of T2DM [15]. Furthermore, studies in people 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 [16,17]. Many studies have proposed HbA1c to be used as a biomarker of both glycaemic control and dyslipidemia in type 2 diabetes mellitus. Thus, the aim of this study was to observe the lipid profile in type 2 diabetes mellitus patients

Material and Methods

The study was a cross sectional, case control study done in Department of Medicine, RIMS Medical College and Hospital Adilabad , in which the patients were selected as per the inclusion and exclusion criteria. 30 patients of Type 2 diabetes mellitus admitted in Department of Medicine during the period of February to April 2022 were taken for the study. Written and informed consent was also taken. 30 non diabetic age and sex matched healthy controls were also included in the study.

Inclusion criteria

Type 2 diabetes mellitus patients in the age range of 30-85 years.

Exclusion criteria

1. T2DM patients with concomitant diseases or conditions affecting lipid levels like chronic liver disease and hypothyroidism.
2. Patients on drugs like oral contraceptive pills, steroids and diuretics.

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. Every patient was advise for at least 12-14 hours overnight fasting and the 5ml venous blood sample were collected in a disposable syringe on next morning (before breakfast) for the serum lipid profile and fasting blood sugar (for the assessment of blood glucose level). The lipid profiles were evaluated. The known cases of type 2 diabetes mellitus will also be evaluated for their blood sugar by advising the HbA1C level.

Statistical Analysis

The data was analyzed with SPSS version 22.0. The mean, SD, p value were used to interpret the results. The p-value of <0.001 was considered statistically highly significant.

Results

Table 1 : Lipid profile parameters in Diabetic patients

Lipid Profile (mg%)	Control n = 30 mean± SD	Cases n = 30 mean± SD	p value*
Total cholestrol	164.32±7.82	192.04±13.24	<0.001
LDL	110.24±6.2	144.02±9.82	<0.001
HDL	54.24±8.2	34.26±5.82	<0.001
VLDL	28.02±3.16	33.8±4.23	<0.001
Triglycerides	110.32±15.23	180.2±40.24	<0.001

p value * highly significant

Table 2 : Fasting blood sugar and HbA1c in Diabetic patients

Parameters	Control n = 30 mean± SD	Cases n = 30 mean± SD	p value*
Fasting blood sugar	80.9±5.6	148.2±40.26	<0.001
HbA1c %	5.1±0.32	8.82±1.64	<0.001

p value * highly significant

Total cholesterol, LDL, VLDL, Triglycerides values were higher in diabetic patients as compared to normal subjects and this difference was highly significant (Table 1). HDL values were less in diabetic patients as compared to normal subjects and this difference was highly significant. Fasting blood sugar and HbA1c values were higher in diabetic patients as compared to normal subjects and this difference was highly significant (Table 2).

Discussion

This study demonstrated that dyslipidemia exists in the type 2 diabetic population. There were significant increase in the level of TCH, in all subjects with DM when compared with that of control, also increase in the level of TG, LDL. HDL cholesterol shows lower concentration in DM subjects . This was in agreement with Gordon et. al [18]. In diabetes many factors may affect blood lipid levels, this is because carbohydrates and lipid metabolism are interrelated to each other if there is any disorder in carbohydrate metabolism it also leads disorder in lipid metabolism so there is high concentration of cholesterol and triglycerides and due to this there is reduction in HDL cholesterol levels [19]. 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. 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. 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. 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).[20] 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. These small dense lipoprotein particles are taken up by arterial wall macrophages, resulting in atherogenesis.[21] 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 HDL-C. In our study, all patients of type 2 low serum HDL level. Low HDL-C concentrations are often accompanied by elevated triglyceride levels as seen in this study and others, and this combination has been strongly associated with an increase in risk of Coronary Heart Disease (CHD).[22] In our study Total cholesterol, LDL, VLDL, Triglycerides values were higher in diabetic

patients as compared to normal subjects and this difference was highly significant. HDL values were less in diabetic patients as compared to normal subjects and this difference was highly significant. Fasting blood sugar and HbA1c values were higher in diabetic patients as compared to normal subjects and this difference was highly significant . [23]

Conclusion

Diabetic dyslipidemia is characterized by low HDL, high TG and high small dense LDL. Early screening of diabetic patients for dyslipidemia and early intervention is required to minimize the risk of future cardiovascular mortality. Present study highlights the magnitude of dyslipidaemia in type-2 DM patients. Hence patients should be managed with life style modifications with or without lipid lowering agents to achieve target lipid values along with adequate glycemic control.

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