A PROSPECTIVE STUDY OF FASTING AND POSTPRANDIAL LIPID ABNORMALITIES IN TYPE 2 DIABETES MELLITUS

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Abstract

Introduction: Type 2 diabetes mellitus (DM) is characterized by insulin resistance; a syndrome which includes glucose intolerance, dyslipidemia, and hypertension, and results in an increased predisposition to atherosclerotic vascular disease. The increased prevalence of cardiovascular disability in type 2 DM is believed to be because of a prolonged and exaggerated postprandial dysmetabolism, most notably hyperglycemia and hypertriglyceridemia, which induce endothelial dysfunction and oxidative stress.

Materials and Methods: Assessment of fasting and postprandial lipid abnormalities in type 2 diabetes mellitus was done. A case control study was conducted in the OPD of Department of General Medicine, Maheshwara Medical College, Chitkul(v), Isnapur x road, pattancheruvu, sangareddy (dist). This study was carried out on 100 known cases of type-2 Diabetes Mellitus visiting at General Medicine, Maheshwara Medical College, OPD on regular basis were included as cases; based on non-probability purposive sampling technique and 100 healthy participants who were not known cases of type-2 Diabetes Mellitus were included in the study as controls.

Results: A total of 100 controls and 100 cases were included in the final analysis. Table I shows the baseline characteristics of patients with type 2 diabetes mellitus. Diabetic subjects were middle aged (mean age 45.1±7.47 years), with a mean body mass index (BMI) of 25.67±5.02 kg/sq m. Diabetic subjects were matched for age, BMI with controls, Family history of diabetes.

Conclusion: Both fasting and post prandial lipid abnormalities seen in type 2 diabetes but the post-prandial lipid profile was altered when compare to fasting lipid levels. Lifestyle

modifications along with diet and proper lipid lowering drugs are helpful in diabetic individuals with lipid abnormalities.

Key words: Type 2 diabetes mellitus, hypertriglyceridemia, BMI, post-prandial lipid profile.

INTRODUCTION

Type 2 diabetes mellitus (DM) is characterized by insulin resistance; a syndrome which includes glucose intolerance, dyslipidemia, and hypertension, and results in an increased predisposition to atherosclerotic vascular disease.[1] The increased prevalence of cardiovascular disability in type 2 DM is believed to be because of a prolonged and exaggerated postprandial dysmetabolism, most notably hyperglycemia and hypertriglyceridemia, which induce endothelial dysfunction and oxidative stress. Thus, postprandial dyslipidemia is as significant as fasting dyslipidemia in causing atherosclerotic complications in type 2 DM.[2]

It is believed that atherosclerosis is a postprandial phenomenon with respect to lipids, as we are in the postprandial state for most of the day Diabetes Mellitus (DM) is a group of metabolic diseases, which is characterized by chronic hyperglycemia, which results from the defects in the insulin action, insulin secretion or both. The most prevalent form of the disease, type 2 Diabetes Mellitus is often asymptomatic in the early stages and it may remain undiagnosed for many years.[3]

The insulin resistance in the liver leads to failure of the hyperinsulinaemia to suppress the gluconeogenesis, which increases fasting glucose levels and decreases Glycogen storage by the liver in the postprandial phase. Increased glucose production in the liver occurs early in the course of diabetes, and it is likely in skeletal muscles after the onset of the insulin secretory abnormalities and the insulin resistance. Due to the insulin resistance in the adipose tissue and obesity, the free fatty acid (FFA) flux from the adipocytes is increased, which in turn leads to an increase in lipid [very low-density lipoprotein (VLDL) and triglycerides] synthesis in the hepatocytes. This is responsible for the dyslipidaemia which is found in type 2 diabetes mellitus [elevated triglycerides, reduced HDL, and increased low-density lipoprotein (LDL) particles.[4]

Type 2 Diabetes Mellitus (DM) is characterized by insulin resistance which is associated with glucose intolerance, hypertension, dyslipidemia, a pro-coagulant state, and an increase in the microvascular and the macrovascular disease. Diabetics are frequently hyperlipidemic and they are at a high risk for coronary heart disease.[5] The high cardiovascular mortality which is associated with Type 2 DM is due to a prolonged, exaggerated, postprandial state. The abnormal lipid profile in the postprandial state is more significant than the abnormal lipid profile in the fasting state in causing atherosclerotic complications in Type 2 diabetics.

MATERIALS AND METHODS

Study design: A prospective case control study.

Study location: Department of General Medicine, Maheshwara Medical College, Chitkul(v), Isnapur x road, pattancheruvu, sangareddy (dist).

Study duration: March 2021 to February 2022.

Assessment of fasting and postprandial lipid abnormalities in type 2 diabetes mellitus was done. A case control study was conducted in the OPD of Department of General Medicine, Maheshwara Medical College, Chitkul(v), Isnapur x road, pattancheruvu, sangareddy (dist). This study was carried out on 100 known cases of type-2 Diabetes Mellitus visiting at General Medicine, Maheshwara Medical College, OPD on regular basis were included as cases; based on non-probability purposive sampling technique and 100 healthy participants who were not known cases of type-2 Diabetes Mellitus were included in the study as controls. The sample size for the study was calculated 200. Study participants included who were on oral hypoglycemic drugs, duration of diabetes of more than five years and were in the age group of 35-65 years and who had given consent for inclusion in the study. Those who declined to participate did not give written consent to be included in the study and were 65 years age study participant was not included in the study.

Data collection: A pre-tested, semi-structured questionnaire was used for data collection that was build based on literature review and was reviewed and validated by 5 arbitrators and modified accordingly. The questionnaire has 2 parts: Part I - questions about the participants' socio-demographic characteristics such as age, gender and socioeconomic status. Part II – question body weight, BMI, WHR waist circumference, diet, daily exercise, biochemical parameters and diabetes medications.

Statistical analysis: The data was expressed as means± (SD) values. The data was recorded in Microsoft excel and analyzed using SPSS software (version 15). The significance of the difference between the groups was assessed by Student's t-test, between cases and controls.

RESULTS

A total of 100 controls and 100 cases were included in the final analysis. Table I shows the baseline characteristics of patients with type 2 diabetes mellitus. Diabetic subjects were middle aged (mean age 45.1 ± 7.47 years), with a mean body mass index (BMI) of 25.67 ± 5.02 kg/sq m. Diabetic subjects were matched for age, BMI with controls, Family history of diabetes.

Parameters	Controls (100)	Diabetes patients (100)	P-Value
Age (years)	44.6±5.13	45.1±7.47	0.56
BMI (Kg/sqm)	24.83±4.15	25.67±502	0.76

Table 1: Baseline characteristics

Lipid profile	Controls (100)	Diabetes patients (100)	P-Value
TC (mg/dl)	161.24±20.17	210.7±46.12	<0.0001
HDL (mg/dl)	48.12±6.10	42.12±8.12	<0.0001
TG (mg/dl)	117.16±25.12	160.17±24.12	<0.0001
LDL (mg/dl)	82.15±16.12	125.17±30.12	<0.0001
VLDL (mg/dl)	24.18±6.16	35.12±7.10	<0.0001

Table 2: Comparison of fasting lipid profile among the subjects

According to result fasting lipid parameters higher among diabetics as compare to control. Parameters was higher in diabetic group TC (210.7±46.12), TG (160.17±24.12), LDL (125.17±30.12) and VLDL (35.12±7.10) compare to control group TC (161.24±20.17), TG (117.16±25.12), LDL (82.15±16.12) and VLDL (24.18±6.16). Only HDL was higher in control group. A statistically significant difference was observed between control and diabetic groups. (p.value <0.0001)

Lipid profile	Controls (100)	Diabetes patients (100)	P-Value
TC (mg/dl)	176.14±45.12	242.15±50.12	<0.0001
HDL (mg/dl)	46.10±6.12	35.25±8.42	<0.0001
TG (mg/dl)	137.12±35	200.6±37.12	<0.0001
LDL (mg/dl)	111.43±27.12	150.13±35.12	<0.0001
VLDL (mg/dl)	26.14±5.6	39.18±8.35	<0.0001

Table 3: Post prandial lipid profile of the subjects

Lipid profile	Fasting	Post Prandial	P-Value
TC (mg/dl)	217.17±48.12	249.17±52.19	<0.0001
HDL (mg/dl)	44.50±8.10	36.52±7.12	<0.0001
TG (mg/dl)	160.19±37.13	199.6±32.13	<0.0001
LDL (mg/dl)	122.14±32.19	152.17±32.18	<0.0001
VLDL (mg/dl)	36.17±7.16	39.37±7.37	<0.0133

Table 4: Comparison of fasting and post prandial lipid profile of type 2 diabetes mellitus (100)

According to results post prandial lipids parameters was higher compare to fasting lipids among diabetic. In diabetics post prandial lipids Parameters was higher TC (249.17±52.19), TG (199.6±32.13), LDL (152.17±32.18) and VLDL (39.37±7.37) compare to fasting lipids TC (217.17±48.12), TG (160.19±37.13), LDL (122.14±32.19) and VLDL (36.17±7.16). Only HDL was higher in fasting lipids. A statistically significant difference was observed between fasting lipid profile and post prandial lipid profile among type 2 diabetes mellitus. (P value <0.0001*).

DISCUSSION

The lipid profile (both fasting and post prandial) was altered in individuals with type 2 diabetes when compared with controls. In the present study, the fasting and postprandial lipid parameters i.e., TC, TG, LDL and VLDL were increased and the fasting and postprandial HDL level was decreased in the type 2 DM subjects as compared to controls (Table 2 and 3] and the postprandial lipid parameters i.e., TC, TG, LDL and VLDL were increased in the type 2 DM subjects as compared to the fasting lipid parameters (Table 4).[6]

Abnormalities in lipid metabolism have been reported in patients with diabetes mellitus accompanied by the risk of cardiovascular arteriosclerosis.[7] Heavy meals also precipitate atherosclerosis thus Myocardial Infarction. There are few studies that have reported that post-prandial dyslipidaemia is more important in the pathogenesis of the vascular changes and atherosclerosis and it increases the risk of the cardiovascular events.[8]

Postprandial hyper-triglyceridaemia has been linked to macrovascular diseases in both normo and hyper-triglyceridaemic subjects in type 2 DM. The increased risk of atherosclerosis among them, may therefore, be related to the higher postprandial lipaemia in them.[9] The postprandial dysmetabolism and the associated oxidative stress may have a link with insulin resistance and type 2 DM, thereby increasing the incidence of cardiovascular disease disproportionately.[10] Another study has proposed cardiovascular disease morbidity and mortality associated with type 2 DM showed prolonged and exaggerated postprandial state.

CONCLUSION

Both fasting and post prandial lipid abnormalities seen in type 2 diabetes but the post-prandial lipid profile was significantly altered when compare to fasting lipid levels. Lifestyle modifications along with diet and proper lipid lowering drugs are helpful in diabetic individuals with lipid abnormalities. Health education should be provided at community level lipid abnormalities. India has low rate of awareness about lipid abnormalities so, it is important to include postprandial lipid profile, in addition to the fasting lipid profile, which helps in better cardiovascular risk assessment in type 2 diabetes mellitus.

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