Original Research Article

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A comparative study on the fasting and postprandial lipid abnormalities in type 2 diabetes mellitus in tertiary care teaching hospital of southern Rajasthan, India

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ABSTRACT

Background: The worldwide prevalence of diabetes mellitus has risen dramatically. Based on current trends, the International Diabetes Federation projects that 438 million individuals will have diabetes by the year 2030. Type 2 diabetes is characterized by insulin resistance which is associated with hypertension, dyslipidemia, micro and macro vascular disease.

Methods: This study was institutional based Case Control comparative study carried out on 200 type 2 diabetes patients and on 200 healthy controls at tertiary care teaching hospital in Jhalawar, Rajasthan. Non-probability purposive sampling technique was used followed by interview of 400 participants.

Results: In final analysis, Diabetes subjects were middle aged (mean age 43.2±7.48 years) with a mean BMI of 26.9±5.46 kg/m2, matched with controls. Among diabetes patients 152 has positive family history for diabetes. The fasting and postprandial lipid profile were increased in the type 2 DM subjects as compared to controls and among the type 2 DM patients, the postprandial lipid parameters were increased as compared to the fasting level.

Conclusions: 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.

Keywords: Abnormalities, Diabetes mellitus, Fasting, Lipid, Postprandial, Type-2

INTRODUCTION

The worldwide prevalence of diabetes mellitus had risen dramatically. Basing on current trends, the International Diabetes Federation projects that 438 million individuals will have diabetes by the year 2030.¹

Although the prevalence of both type 1 and type 2 DM is increasing worldwide, the prevalence of type 2 DM is rising much more rapidly, presumably because of increasing obesity, reduced activity levels as countries become more industrialized and the aging of the population. India is considered the diabetes capital of the

world. It is estimated that 50 million in our country already have diabetes and it is expected to reach 70 to 80 million by 2030AD. In India the prevalence is 2-4% in rural and 4.0-11.6% in urban areas.²

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.^{3,4} 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,

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exaggerated, postprandial state.^{6,7} 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.⁸

METHODS

Assessment of fasting and postprandial lipid abnormalities in type 2 diabetes mellitus was done. A case control study was conducted the OPD of SRG Hospital, a tertiary care teaching hospital in southern Rajasthan. The study was initiated after obtaining ethical approval from institutional ethical committee in March 2021 to August 2021.

This study was carried out on 200 known cases of type-2 Diabetes Mellitus visiting at SRG OPD on regular basis were included as cases; based on non-probability purposive sampling technique and 200 healthy participant 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 400.

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 <35 and >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.

Informed consent: We explained our purpose of study to all individual participants in local language and then written and informed consent was obtained from each participant for being included in the study before starting interview

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 200 controls and 200 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 43.2±7.48years), with a mean body mass index (BMI) of 25.9±5.46kg/sq m. Diabetic subjects were matched for age, BMI with controls, Family history of diabetes.

Table 1: Baseline characteristics of patients with type 2 Diabetes Mellitus.

Parameters	Controls (200)	Diabetic patients (200)	T- value	P- value
Age (years)	45.6±6.14	45.2±7.48	0.5845	0.5592
BMI (kg/sqm)	25.84±4.52	25.70±504	0.2925	0.7701

BMI = Body mass index

Table 2: Comparison of fasting lipid profile among the subjects.

Lipid profile	Controls (200)	Diabetics (200)	T- value	P-value
TC (mg/dl)	162.43±21.85	212.42±49.64	13.0350	< 0.0001*
HDL (mg/dl)	49.84±6.15	43.54±8.14	8.7331	< 0.0001*
TG(mg/dl)	118.64±29.39	160.27±55.23	9.4103	< 0.0001*
LDL(mg/dl)	83.14±30.10	127.86±33.20	14.1126	< 0.0001*
VLDL (mg/dl)	24.84±6.74	36.72±7.24	16.9848	< 0.0001*

TC = Total Cholesterol, TG = Triglycerides, HDL = High density Lipoprotein, LDL = Low density Lipoprotein, VLDL = Very low-density Lipoprotein cholesterol) *statistically significant

The above table depicted 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 (212.42±49.64), TG (160.27±55.23), LDL (127.86±33.20) and VLDL (36.72±7.24) compare to control group TC (162.43±21.85), TG (118.64±29.39),

LDL (83.14 ± 30.10) and VLDL (24.84 ± 6.74) . Only HDL was higher in control group. A statistically significant difference was observed between control and diabetic groups. (p.value<0.0001*).

The Table 3 depicted Post prandial lipid profile of the subjects. According to results prandial lipid parameters

was higher among diabetics as compare to control. Parameters was higher in diabetic group TC (248.74±54.12), TG (200.8±64.63), LDL (154.66±41.78) and VLDL (39.98±8.76) compare to control group TC

(177.68±31.24), TG (138.85±37), LDL (112.85±29.66) and VLDL (26.84±5.7). Only HDL was higher in control group. A statistically significant difference was observed between control and diabetic groups. (p.value<0.0001*)

Table 3: Post prandial lipid profile of the subjects.

Lipid profile	Controls (200)	Diabetics (200)	T- value	P value
TC (mg/dl)	177.68±31.24	248.74±54.12	16.0818	< 0.0001*
HDL (mg/dl)	46.30±7.21	35.64±8.52	13.50	< 0.0001*
TG (mg/dl)	138.85±37	200.8±64.63	11.7643	< 0.0001*
LDL (mg/dl)	112.85±29.66	154.66±41.78	11.5400	< 0.0001*
VLDL (mg/dl)	26.84±5.7	39.98±8.76	17.78	< 0.0001*

^{*}Statistically significant

Table 4: Comparison of fasting and post prandial lipid profile of type 2 diabetes mellitus (200)

Lipid profile	Fasting	post prandial	T- value	P value
TC (mg/d)	218.42±49.64	250.74±54.12	6.224	< 0.0001*
HDL (mg/d)	44.54±8.14	36.64±8.52	9.4813	< 0.0001*
TG (mg/d)	160.27±55.23	199.8±64.63	6.5758	< 0.0001*
LDL (mg/d)	124.86±36.20	153.66±41.84	7.3616	< 0.0001*
VLDL (mg/dl)	37.72±8.24	39.98±9.86	2.4873	< 0.0133

^{*}Statistically significant

The Table 4 depicted fasting and post prandial lipid profile of type 2 diabetes mellitus. According to results post prandial lipids parameters was higher compare to fasting lipids among diabetic. in diabetics post prandial lipids Parameters was higher TC (250.74±54.12), TG and VLDL (199.8±64.63), LDL (153.66±41.84) (39.98±9.86) compare to fasting lipids TC $(160.27\pm55.23),$ $(218.42\pm49.64),$ TG LDL (124.86±36.20) and VLDL (37.72±8.24). 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

Dyslipidemia as a metabolic abnormality is frequently associated with diabetes mellitus. We know that lipid profile and diabetes together are related to be a important predictors for metabolic syndrome. 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). Abnormalities in lipid metabolism have been reported in patients with diabetes mellitus accompanied by the risk of cardiovascular arteriosclerosis.9 Heavy meals also precipitate atherosclerosis thus Myocardial Infarction. There are few studies that have reported that

post-prandialdyslipidaemia is more important in the pathogenesis of the vascular changes and atherosclerosis and it increases the risk of the cardiovascular events. 10 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 The postprandial dysmetabolism and the them. associated oxidative stress may have a link with insulin resistance and type 2 DM, thereby increasing the incidence of cardiovascular disease disproportionately.¹¹ Another study has proposed cardiovascular disease morbidity and mortality associated with type 2 DM showed prolonged and exaggerated postprandial state.¹²

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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Ethical approval: The study was approved by the

Institutional Ethics Committee

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