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Prevalence of dyslipidemia in patients with type 2 diabetes mellitus: a cross sectional study

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Abstract
Background: *One of the major risk factors for cardiovascular disease in diabetes mellitus is dyslipidemia. It is characterised by high plasma triglyceride level, low HDL cholesterol level and increased level of small dense LDL-cholesterol particles. The prevalence of hypercholesterolemia is not increased in patients with diabetes mellitus, but mortality from coronary heart disease (CHD) increases with serum cholesterol levels, and lowering of cholesterol with drug therapy reduces diabetic patient's cardiovascular risk.*
Methods: *The cross sectional study was conducted on patients consisting of 100 (50 male and 50 female) known type 2 diabetes mellitus. Age, gender, duration of disease, body mass index (BMI) was recorded in all patients. Fasting blood glucose levels, total cholesterol, triglycerides, HDL, LDL, VLDL levels were measured using standard methods and recorded.*
Results: *The serum parameters TC, TG, HDL, LDL, and VLDL were significantly correlated to FBG levels in both diabetic and non-diabetic subjects. The variables were also significantly associated among each other in T2DM patients.*
Conclusion: *The present study provides evidence to suggest that lipid variables are associated with each other in T2DM patients among the population.*
Keywords: *Coronary heart disease, Type 2 diabetes mellitus, body mass index.*

Introduction

The combination of abnormalities caused by insulin deficiency secondary to dysregulation of insulin release from the β cells of pancreas, along with insulin resistance in peripheral tissues is called Type 2 diabetes mellitus (T2DM).[1] The prevalence of T2DM worldwide has increased dramatically in recent decades and is expected to increase to 300 million by the year 2025.[2] India standing in second highest diabetes prevalence in the world which could be due to rapid urbanization that brought along with it a sedentary lifestyle is an important factor inducing diabetes mellitus.[3-5] Diabetes mellitus is an important risk factor for cardiovascular disease and atherosclerosis as it is a common secondary cause of hyperlipidemia when the glycemic control is poor.[6] The prevalence of

dyslipidemia in type 2 diabetes is double with respect to the general population.[7] The lipid changes accompanying diabetes mellitus are attributed to increased free fatty acid flux supplementary to insulin resistance and aggravated by increased inflammatory adipokines.[8] This affects the key enzymes and the pathways of lipid metabolism including apoprotein synthesis, lipoprotein lipase regulation, action of cholesteryl ester, transfer proteins and hepatic and peripheral actions of insulin.[9] The distinctive pattern of diabetic dyslipidemia is characterized by the atherogenic triad of high plasma triglyceride (TG) concentration, low HDL cholesterol concentration and increased concentration of small dense LDL cholesterol particles.[1] The present study was aimed to find out the incidence of dyslipidemia in type 2 diabetic patients as it is a major risk factor for coronary heart disease.

Method

The present study was a cross sectional study conducted by the department of General Medicine for one year on 100 diabetic patients in which 50 were males and 50 were females. All the patients were selected randomly in both outpatient and inpatient wards. All the patients were explained about the study and the informed consent was obtained. Age, duration of diabetes, height, weight, and body mass index were recorded in all the patients.

Inclusion Criteria

Patients with type 2 diabetes mellitus with the duration of more than 5 years were included in the study.

Exclusion Criteria

The patients with T2DM with associated diseases altering the lipid profile and the patients suffering from coronary artery disease (CAD), cerebrovascular accident (CVA), having past history of CAD or CVA and the patients already taking drugs for lipid lowering were excluded from the study.

All the patients were instructed for at least 12 hours overnight fasting and the 5m1 of venous blood was collected before breakfast for the fasting blood glucose and the serum lipid profile. After collecting the blood from the patients, 3m1 of blood was transferred into serum tubes for lipid profile and 2m1 of blood was transferred into sodium fluoride tubes for blood glucose estimation.

The blood glucose estimation was done by GOD-POD method. To evaluate the dyslipidemia the serum total cholesterol, triglycerides and HDL levels were measured using CHOD-POD method, GOD-POD method, CHOD-POD methods respectively.

The mean and standard deviations were calculated for FBS, TC, triglycerides, HDL, and LDL in both males and females separately. The guidelines of national cholesterol education programmed (NCEP) adult treatment panel III (ATP III) were followed for the interpretation of serum lipid reference values. NCEP-ATPIII guidelines defines hypercholesterolemia as TC>200mg/dl, high LDL-C when value >100mg/d1, hypertriglyceridemia as TAG >150mg/d1 and low HDL-C when value is <40mg/d1.[10] Percentage wise variation in the incidence of dyslipidemia in the male and female diabetic patients was noted.

Result

The average age of the participants was 49.3±8.16 years. The average fasting blood glucose was noted as 152±40.26 mg/dl. The average total cholesterol was 207±40 mg/dl. The value of average triglycerides, LDL, HDL and VLDL were 164.26±80.26mg/dl, 129.45±30.28mg/d1, 39.1±14.6mg/d1 and 35.85±18.02 mg/dl respectively.

In the present study among 100 patients of T2DM 59% patients were having hypercholesterolemia, 41% patients were having hypertriglyceridemia, 66%patients were having increased LDL levels, and 71% patients were having reduced HDL levels.

Out of 50 females 35 (70%) patients were having hypercholesterolemia, 26(52%) patients were having hypertriglyceridemia, 42 (84%) patients were having increased LDL and 43 (86%) patients were having reduced HDL.

Out of 50 males, 24(48%) patients were having hypercholesterolemia, 15 (30%) were having hypertriglyceridemia, 24 (48%) patients were having high LDL levels and 29 (58%) were having reduced HDL. Incidence of dyslipidemia was observed to be very high in female diabetic patients when compared to male diabetic patients.

Discussion

Patients with T2DM have a higher mortality rate than the general population attributed mainly to cardiovascular disease (CVD) caused by dyslipidemia. Dyslipidemia is elevation of TC, TG, or both, or a low HDL and diagnosed by measuring plasma levels of TC, TG, and lipoproteins In the present study, most of the patients had mixed dyslipidemia with more than one lipid abnormality which was 88%. The prevalence of dyslipidemia in the present study was found as 88% which was coinciding with other studies done by Kolhar U et al, Pandya H et al, and Dayakar E et al which showed prevalence of 90%, 85% and 86.9% respectively.[6, 11, 12]

In the present study the hypercholesterolemia was reported as 59%, hypertriglyceridemia was 41%, increased LDL was 66% and lower HDL was 71%. In a study by Singh G et al, found the incidence of dyslipidemia as 59% of type 2 diabetics had hypercholesterolemia, 53% had hypertriglyceridemia, 98% had abnormal LDL levels and 89% had the HDL less than 40 mg/dl.[13] Incidence of hypercholesterolemia and lower HDL were similar with the present study results, but the incidence of increased LDL was too high when compared with the present study. In another study by Dayakar E

similar results were observed hypercholesterolemia was reported as 58.6%, hypertriglyceridemia was 36.9%, increased LDL was 65.2% and lower HDL was 93.4%.[12] The lipid parameters HDL, LDL, and VLDL except triglycerides are significantly negatively correlated to FBG in diabetic patients. In non-diabetic patients FBG is significantly correlated to TC, TG, HDL, LDL, VLDL with TG and VLDL showing negative association with FBG. This study revealed that dyslipidemia was observed in the diabetic population, but that HDL was significantly and negatively correlated to FBG.

The incidence of coronary artery disease in women is lower compared to men, but it rises steadily after fifth decade. The relative risk of hypercholesterolemia is lower in women compared to men at the young age, but after menopause the total cholesterol, LDL raises by 10 to 14% respectively and the HDL remains stable.[14-16] in the present study the incidence of dyslipidemia was higher in female diabetic patients when compared to male diabetic patients. Along with the blood sugar levels the lipid profile also should be monitored regularly to evaluate and treat the dyslipidemia. That could significantly reduce cardiovascular morbidity and mortality among the type 2 diabetes mellitus patients. An early identification of dyslipidemia as a well-known amendable risk factor of CVD is important for the implementation of therapy for its effective prevention and management. Thus achievement of proper treatment and strict control of diabetes is imperative in dyslipidemia towards prevention and treatment of complications of CVD.28 Enumeration of the prevalence of dyslipidemia in population and its association with diabetes can avert future atherogenic cardiovascular and cerebrovascular disease through proper management of diabetic dyslipidemia at the earliest possible.

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