Original Research Article

A lipid profile study amongst the patients of type 2 diabetes mellitus - A cross sectional study

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Abstract

Introduction: India leads the world with largest number of diabetic patients and is often referred to as the diabetes capital. Diabetic dyslipidemia in India is one of the main causes for Coronary Artery Disease (CAD) mortality of the world. Dyslipidemia are disorders of lipoprotein metabolism, including lipoprotein overproduction or deficiency. It is a preventable risk factor which is mostly observed in diabetes patients and that may precipitate the cardiovascular disorders. Our aim of the study is to determine the impact of type 2 diabetes mellitus (T2DM) on lipid profile of diabetic patients reporting at tertiary care hospital.

Materials and methods: It was a cross sectional study conducted at Civil Hospital and Gujarat Medical Education Research Society, Medical College, Valsad, Gujarat, India. Total 140 diabetic patients were randomly selected form OPD and IPD of our hospital and they were examined for dyslipidemia. Fasting blood glucose concentration and Lipid Profile [Total Cholesterol (TC), High Density Lipoprotein (HDL), Very Low Density Lipoprotein (VLDL) and Triglycerides (TG)] were investigated by using commercially available reagent kits in Biochemistry analyzer. Collected data was analyzed by using appropriate software.

Results: Out of total 140 diabetic patients examined, the mean age of patients was 48.93 ± 12.1 years. In present study we found the mean Fasting Blood Sugar (FBS) was 188.76 ± 54.63 mg/dl. The prevalence rates in our study for high Total Cholesterol (TC) and Triglycerides (TG) were 13.6% and 41.4% respectively. The prevalence rates for high LDL-C, very high LDL-C and low HDL-C in the diabetic subjects were 8.6%, 5.0% and 72.9% respectively.

Conclusion: The diabetic patients had elevated serum total cholesterol, elevated triglyceride (triacylglycerol) and slightly elevated low density lipoprotein (LDL-C) and reduced levels of high

density lipoprotein (HDL-C) indicating that diabetic patients were more prone to cardiovascular diseases.

Key words

Type 2 Diabetes Mellitus, Dyslipidemia, Triglyceride, HDL-C, LDL-C, Total Cholesterol.

Introduction

India leads the world with largest number of diabetic patients and is often referred to as the diabetes capital of the world [1] with a projected 109 million individuals with diabetes by 2035. The disease currently affects more than 62 million Indians, which is more than 7.1% of India's Adult Population [2, 3]. The largest increase of the diabetic population occurs in the most economically productive age group. Diabetes mellitus is a heterogeneous group of metabolic disorders characterized by hyperglycemia with disturbances of carbohydrate, fat and protein metabolism caused by either lack of insulin secretion or decreased sensitivity of tissues to insulin [4, 5].

Type 2 diabetes is commonly associated with obesity, hypertension, cardiovascular disease and lipid abnormalities. The various risk factors for the development of type 2 DM are obesity, ethnicity, sedentary life style, sex, family history, hypertension and smoking [6]. Diabetes is second only to cardio vascular disease (CVD) as a health burden in India [7].

Dyslipidemia are disorders of lipoprotein metabolism, including lipoprotein overproduction or deficiency. These disorders may be manifested by elevation of the serum total cholesterol, low-density lipoprotein (LDL) cholesterol and triglyceride concentrations, and a decrease in the high-density lipoprotein (HDL) cholesterol concentration [8]. Diabetic dyslipidemia in India is one of the main causes for Coronary Artery Disease (CAD) mortality [1].

Aim and objective

- To find out the prevalence of dyslipidemia in diabetic patients.

Materials and methods

The subjects who were enrolled in this study were diabetic patients who attended the Out Patients Department and indoor patient department of the Gujarat Medical Education and Research Society Medical College and Hospital, Valsad, Gujarat. A total of 140 diabetic patients (70 males and 70 females) with a history of diabetes for 10 years were randomly selected and they were examined for dyslipidemia. Patients with other ailments and metabolic disorders were excluded from the study. Consent have been taken prior to enroll the study and explained about aim and method about study.

Serum samples were collected for FBS in tubes containing sodium fluoride and ammonium oxalate and for lipid profile 3ml venous blood was drawn aseptically in plain tubes. Serum glucose was determined by GOD-POD end point (co-efficient variation of 4.84%). Lipid Profile like Total Cholesterol (TC) was measured by CHOD-POD end point method with a co-efficient variation of 2.91%, Triglycerides (TG) by the GPO-PAP end point method with co-efficient variation of 2.78% and High Density Lipoprotein (HDL) and Low Density Lipoprotein (LDL) by a Direct Enzymatic method with co-efficient variation of 1.5% and 2.3% respectively. All the parameters which were under investigation were determined in the serum of the subjects by using commercially available reagent kits.

The lipid profile of the subjects was classified, based on the ATP III model [9]. Data was entered in Microsoft Excel and appropriate analysis was done. The values of all the parameters were given in mg/dl and they were expressed as mean ± SD.

Results

Table - 1 shows mean age, fasting blood sugar and mean values of various lipid profile parameters. Total 140 diabetic patients with mean age of 48.93 ± 12.1 years were included in the study. Mean FBS of study participants was 188.76 ± 54.63 mg/dl. Mean triglycerides level was 202.56 ± 83.45 mg/dl.

Table - 1: Mean values of biochemical parameters of Diabetic patients (n=140).

Parameters	Mean ± SD
Age (years)	48.93 ± 12.1
FBS (mg/dl)	188.76 ± 54.63
Total cholesterol (mg/dl)	187.23 ± 36.19
Triglycerides (mg/dl)	202.56 ± 83.45
HDL-C (mg/dl)	35.17 ± 4.59
LDL-C (mg/dl)	118.46 ± 38.89

Table - 2: Distribution of Biochemical parameters according to ATPIII classification.

Total cholesterol (mg/dl)	
Desirable (<200)	96 (68.6%)
Borderline high (200-239)	25 (17.9%)
High (≥240)	19 (13.6%)
Triglycerides (mg/dl)	
Normal (<150)	49 (35.0%)
Borderline high (150-199)	33 (23.6%)
High (200-249)	58 (41.4%)
HDL-C (mg/dl)	
Low (<40)	102 (72.9%)
Borderline high (40-59)	34 (24.3%)
High (≥60)	4 (2.9%)
LDL-C (mg/dl)	
Optimal (<100)	53 (37.9%)
Near optimal (100-129)	43 (30.7%)
Borderline high (130-159)	25 (17.9%)
High (160-189)	12 (8.6%)
Very high (≥190)	7 (5.0%)

Table - 2 shows the distribution of study subjects according to Adult Treatment Panel III (ATP III) classification. Out of the total 140 patients, borderline high cholesterol (200-239 mg/dl) and high cholesterol (≥240 mg/dl) level were 25 (17.9%) and 19 (13.6%) respectively. Out of 140 subjects, 33 (23.6%) had borderline high triglyceride (150-199 mg/dl) while 58 (41.4%) had high triglyceride (200-249 mg/dl) level.

Discussion

For the interpretation of serum lipid reference values, the guidelines of National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) were followed. According to NCEP-ATPIII guidelines, hypercholesterolemia is defined as TC > 200 mg/dl, high LDL-C when value > 100 mg/dl, hypertriglyceridemia as TAG > 150 mg/dl and low HDL-C when value is < 40 mg/dl. Dyslipidemia was defined by presence of one or more than one abnormal serum lipid concentration [10]. In patients with diabetes, many studies have clearly established that complications are mainly due to chronic hyperglycemia that exerts its injurious to health effects through several mechanisms: dyslipidemia, platelet activation, and altered endothelial metabolism [11, 12]. Both lipid profile and diabetes have been shown to be the important predictors for metabolic disturbances including dyslipidemia, hypertension and cardiovascular diseases [13]. Lipids play a vital role in the pathogenesis of diabetes mellitus. Dyslipidemia as a metabolic abnormality is frequently associated with diabetes mellitus. Abnormalities in lipid metabolism have been reported in patients with diabetes mellitus accompanied by the risk of cardiovascular arteriosclerosis [14]. In the present study, significantly higher mean serum levels of total cholesterol, triglycerides and LDL cholesterol were noted in patients with diabetes, which are well known risk factors for cardiovascular diseases among patients, when compared to the normal values.

Diabetic patients have many complications which include elevated levels of LDL-C and triacylglycerols, low levels of HDL-C and a preponderance of abnormalities in the composition of the smaller, dense particles [15]. Similar findings found in study done by Idogun, et al. [16] and Albrki, et al. [17] and observed

that lipoprotein profiles of the diabetics were found higher than normal reference values.

The prevalence rates of high TC and TG in this study were 13.6% and 41.4% respectively. The prevalence rates for high LDL-C, very high LDL-C and low HDL-C in the diabetic subjects were 8.6%, 5.0% and 72.9% respectively. Type of dyslipidemia reported among diabetic population is numerous in different places in world indicating that dyslipidemia can be influenced by the interaction of genetic and environmental factors. The prevalence of the lipid abnormalities reported by Mexican nationwide survey done by Carlos, et al. [18] and other Asian populations, including Bangladeshi and Pakistani populations [19] showed that around 50% of the diabetic population had hypertriglyceridemia. The present study is in agreement with the above report in relation to prevalence rates of hypertriglyceridemia among type 2 diabetic population.

Conclusion

The diabetic patients had elevated serum total cholesterol, elevated triglyceride (triacylglycerol) and slightly elevated low density lipoprotein (LDL-C) and reduced levels of high density lipoprotein (HDL-C) indicating that diabetic patients were more prone to cardiovascular diseases.

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