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Study of Correlation of Lipid Profile and HbA_1C in Diabetic Complications

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Abstract
Aim: *The aim of the study was to assess the association of lipid profile with HBA1C in diabetic complications.*
Materials and Methods: *For our study 50 type 2 diabetes mellitus patients with complications were included as study group and 50 type 2DM patients without complications as controls. The study was conducted at SRM Medical college Hospital and Research centre, Kattankulathur, Chennai. Fasting sample was collected and processed for plasma sugar, lipid profile and HbA1C.*
Results: *Significant correlation was found between total cholesterol, triglycerides, LDL. Correlation was not significant was between HDL and HbA1C even though there was decrease in HDL levels compared to control group.*
Conclusion: *Dyslipidemia with poorly controlled blood sugar levels are contributors for diabetic complications, which can be prevented by regular monitoring of blood sugar levels and lipid profile.*
Keywords: *Dyslipidemia, HbA1C, Diabetes complications.*

Introduction

Diabetes mellitus is one of the leading cause of morbidity and mortality affecting the people worldwide. With the increasing trend of changes in life style, people are more prone for obesity, insulin resistance, hyperglycemia and dyslipidemia. In 2000 the diabetes was the third leading cause of mortality in some parts of the world, in people aged between 45 to 65 years. It is estimated that more than 387million people were affected by diabetes worldwide and reports say that it is the 7th leading cause of death.[1,2]

According to the 2014 estimate, the prevalence of diabetes in world was 9%, among adults aged 18 years or older[2]

Diabetes is associated with complications like neuropathy, nephropathy, retinopathy and cardiovascular complications that are attributed due to uncontrolled blood sugar and chronic exposure to glycosylation of proteins.

Several studies were done to correlate blood glucose level with serum lipid profile parameters[3,4]. In one of the studies it was observed that uncontrolled diabetes lead to higher

vascular complications and was related to longer duration of diabetes ,poor control, weight gain and high blood pressure. The increased blood sugar levels are associated with insulin resistance leading to rapid progression to atherosclerosis[5]

People with diabetes are at risk of developing cardiovascular complications and stroke due to dyslipidemia. Dyslipidemia comprises raised triglycerides, reduced high density lipoproteins (HDL) and increased low density lipoproteins (LDL). Several studies have reported the association between atherosclerosis and dyslipidemia[6,7]. Reports from the studies say that each of the dyslipidemic features is associated with increased risk of cardiovascular disease, the leading cause of death in patients with type 2 diabetes mellitus. Numerous studies have been demonstrated that an association between LDL size and density and coronary artery disease[8,9] It was found that low HDL levels are associated with high triglyceride levels.[10]

Glycated hemoglobin (HbA1c) can be used as a tool to monitor the long-term glycemic control. It also predicts the risk for development of complications in diabetes[11].

The present study was aimed to study the correlation of lipid profile and HbA1c in type 2 diabetes complications.

Methods

This was a cross sectional study which includes 50 type 2 diabetes mellitus patients with complications like neuropathy, retinopathy and cardiovascular complications were recruited as study group and type 2 diabetes mellitus patient's without complications as control group.

The study was carried out at SRM Medical College Hospital and Research Center, after obtaining approval from institutional ethics committee. Informed consent was obtained from all the participants. Physical examination and routine investigations were done.

Inclusion Criteria

Type 2 diabetes mellitus patients, aged between 40-70 years of both male and female with complications like neuropathy, retinopathy and cardiovascular complications were included in the study.

Exclusion Criteria

Patients with chronic hepatitis, thyroid diseases, acute and chronic illness were excluded from the study.

Sample Collection and Processing

After overnight fasting 5ml of venous blood sample was collected in appropriate vacutainers for the processing for fasting blood sugar, HbA1c and lipid profile.

Plasma glucose was estimated by Hexokinase method on Beckmann coulter, HbA1c was estimated onD10 BIO-RAD analyzer by using HPLC method and serum lipid profile was assayed on Beckmann coulter which includes total cholesterol by cholesterol oxidase- peroxidase method, triglycerides by enzymatic glycerol - peroxidase method, HDL by direct antibody inhibition, LDL by direct method, VLDL is calculated, TC/ HDL-C& LDL/HDL ratio was calculated.

Statistical Analysis

The data was analyzed using SPSS software. Student's 't' test was done to compare the variables among the study and control groups. Statistical significance at P value 0.01 was considered as significant .Pearson correlation was done to find out the association between lipid profile and HbA1C. P value 0.05 was found to be statistically significant.

Results

Patients with type 2 diabetic mellitus with complications were recruited for our study. Nearly 80% of patients were identified with dyslipidemia in study group and 30% in control group. It is more commonly observed in males when compared to females.

As per American diabetes association, the lipid profile of patients with higher range than the normal were considered as dyslipidemia ,the normal range being for total cholesterol 150- 200 mg/dl, triglycerides 40- 150 mg/dl, LDL 80- 100

mg/dl, HDL <40 mg/dl in males and ≤ 50 mg/dl in females.

HbA1c range being 4-6% is normal and above 8% is considered as poor control of diabetes. In our study there was a significant increase in Total cholesterol, triglycerides and LDL levels in study group was observed when compared to control group. There was no significant difference of HDL levels in both the study group as well as control group.

HbA1c was significantly elevated in study group (9.5±2.5) when compared o control (6.5±0.5).

Total cholesterol /HDL level ratio was calculated which was found to be higher in study group when compared to controls. Similarly, LDL/ total cholesterol ratio was calculated and found to be higher in diabetic complications when compared to control groups.

Table 1: comparison of serum total cholesterol (mg/dl) between study group and control group

Groups	N	Mean± SD (mg/dl)	P value
T2DM with complication	50	214.54± 54.13	<0.001
T2DMwithout complication	50	159.20± 35.97	

Table 2: comparison of serum triglycerides (mg/dl) between study group and control group

Groups	N	Mean± SD (mg/dl)	P value
T2DM with complication	50	215.94± 54.19	<0.001
T2DM without complication	50	144.26± 45.52	

Table 3: comparison of serum LDL (mg/dl) between study group and control group

Groups	N	Mean± SD (mg/dl)	P value
T2DM with complication	50	121.94± 17.40	<0.001
T2DM without complication	50	94.38± 19.39	

Table 4: comparison of serum HDL (mg/dl) between study group and control group

Groups	N	Mean± SD (mg/dl)	P value
T2DM with complication	50	37±4.5	0.1
T2DM without complication	50	30±3.5	

Pearson correlation was used to found out the association between cholesterol, triglycerides, LDL & HDL with HbA1c.

There was a positive correlation with cholesterol and HbA1c, with, r = 0.3 and P value was found to statistically significant at P < 0.005.Standard error of mean as 7.66&5.09

Similarly, triglycerides showed positive correlation with HbA1c, r = 0.4 and P < 0.001, SEM-7.66,6.44

LDL was strongly correlated with HbA1c with r value, r = 0.5 and P< 0.001, SEM-19.39, 17.40.

HDL was weakly correlated with HbA1c r = 0.1, P< 0.2 and was not statistically significant.

Discussion

Diabetes is associated with microvascular and macrovascular complications. The underlying cause being poorly controlled diabetes and dyslipidemia. In our study we found patients with diabetic complications had poor control of blood sugar levels with HbA1c more than 9.5% and alterations in lipid profile, majority of the patients have been found with high LDL levels, triglycerides levels, and HDL below the normal range.

Abnormalities in lipid metabolism have been reported in patients with diabetes mellitus accompanied by the risk of cardiovascular arteriole sclerosis.[12] Hypertriglyceridemia usually accompanies decreased HDL which is also a prominent feature of plasma lipid abnormality seen in individuals with diabetes[13]

Insulin deficiency causes increase in triglycerides levels due to mobilization of free fatty acids from adipose tissue which can be used for energy process and excess fatty acids are accumulated in the liver, which are converted to triglycerides Increased cholesterol levels in these subjects can be due to decreased cholesterol breakdown and increased cholesterol synthesis[14].

Insulin deficiency also decreases LDL receptors and thereby increases LDL cholesterol in diabetes mellitus. Increased glycation of proteins causes increase in lipid peroxidation and accumulation of free radicals which leads to atherosclerosis[15].

Conclusion

From the present study it can be concluded that lipid abnormalities are associated with high HbA1C that can contribute to for atherosclerosis leading to coronary artery disease and stroke. Routine monitoring of blood sugar levels and lipid profile can prevent or prolong the appearance of diabetic complications. Interventions like life style modifications, restriction of high calorie diet, physical activity along with medications for hyperlipidemia can h alter the lipid abnormalities.

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Conflict of Interest: None.

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