Research Paper

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Lipid Profile Study in Diabetic Patients

Medical Science

KEYWORDS : Type II Diabetes Mellitus, Dyslipidemia, Lipid Profile, HbA1c.

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ABSTRACT

The present study was conducted to evaluate serum lipid profile in type II Diabetes Mellitus patient at who attended Out Patient Department of Gujarat Medial Research institute, Rajasthan Hospital, Ahmedabad. A total of 132 diabetic patients and 132 healthy controls were randomly selected and were examined for dyslipidemia. There was significant association of abnormal lipid parameters in type II diabetic patient in comparison with control group which was positively and significantly correlated. Type II Diabetes Mellitus abnormally influences lipid profile of patient and hence making them vulnerable to associated cardiovascular disease HbA1c was evaluated in 45 Diabetic patient and it was found that it can be used as a potential biomarker for glycaemia control in predicting dyslipidemia in type II Diabetic patients.

INTRODUCTION

The first systematic description was written by theArelaeus of cappadosis in Asia minor, probably in the1st century AD, the disease as "A melting down offlesh into the urine". It was discovered by Van Mering andMinikowaski in 1889 that pancreactomy causes ametabolic disorder called Diabetes mellitus due to insulin deficiency.[1]

Diabetes mellitus arises when insufficient insulin is produced, or when the available insulin does not function correctly. Without insulin, the amount of glucose in the bloodstream is abnormally high, causing unquenchable thirst and frequent urination. The body's inability to store or use glucose causes hunger and weight loss.2There are two main types of diabetes. Insulin-dependent diabetes – type 1 diabetes – occurs when there is a severe lack of insulin due to the destruction of most or all of the beta cells in the islets of Langerhans. This type of diabetes develops rapidly, usually appearing before the age of 35, and most often between the ages of 10 and 16. Regular insulin injections are required to survive. Non-insulin-dependent diabetes – type 2 diabetes – occurs when the body does not produce enough insulin, and the insulin that is produced becomes less effective. This type of diabetes usually appears in people over the age of 40, and tends to have a more gradual onset. In most cases, glucose levels in the blood can be controlled by diet, or diet and tablets, although sometimes insulin injections may be needed. About 90 per cent of diabetics are non-insulin dependent.[3]There are probably 100 million people in the world with diabetes mellitus and incidences of diabetes are on the rise. Patients with diabetes mellitus are at increased risk of developing coronary disease.4 Insulin deficiency causes excessive metabolisation of free fatty acids, this may lead to a disorder in lipid metabolism. Insulin is a hypoglycemic hormone secreted from β-cell of the islet of pancreas. Insulin also has an effect on lipid metabolism.[5]

Certain ethnic and racial groups of Africa and Asia have a greater risk of developing diabetes.[6] [1]ndia, a developing Asian country with fast industrialization and a modern lifestyle is facing a grave problem in having the largest number of people with diabetes7,8 which is estimated to reach 80 million by the year 2030.9,10 It is close to becoming the diabetic capital of the world. The literature on Indian studies showed a threefold rise in the diabetic prevalence in rural as well as urban areas.11,12The most common symptom of diabetes is no symptom and by the time the disorder is diagnosed, an abnormal lipid profile, hypertension and retinal changes may be already present.

Normally Insulin plays important role in inhibiting intracellular hormone sensitive lipases of adipose tissue and activating lipoprotein lipase because of lack of insulin action in Type-2 Diabetes Mellitus, the activity of lipoprotein lipase gets depressed whereas the activity of hormone sensitive lipase increases. Also because of insulin deficiency in DM, glucose cannot be utilizedfor energy purposes by the cells. Thus there is increased lipolysis leading to increased FFA (Free FattyAcids) which are then catabolized to acetylCoA in Liver and other tissues. Due to deficiency of acetyl CoA carboxylase in DM;(the Enzyme that converts acetyl CoA to malonyl CoA) there is no conversion of acetyl CoA to Malonyl CoA. Hence excess acetyl CoAgets converted to more & more cholesterol & its concentration in blood rises in Type-2 DM. VLDL & LDL increases either because of increased hepatic production of VLDL or decreased removal of VLDL and LDL from circulation. Serum concentration of triglycerides also increases because of decreased removal from circulation.13 Serum HDL concentration decreases due to excess catabolism and also there was negative relationship between HDL concentration and LDL concentration.Hence Hyperglycaemia is related with deranged Lipid Profile and this may lead to dyslipidaemia.

Diabetes is associated with a greater risk of mortality from cardiovascular disease (CVD) which is well known as dyslipidemia, which is characterized by raised triglycerides, low high density lipoprotein and high small dense low density lipoprotein particles. It may be present at the diagnosis of type 2 Diabetes mellitus and is a component of the metabolic syndrome. Abnormal serum lipids are likely to contribute to the risk of coronary artery disease in diabetic patients 14 and the determination of the serum lipid levels in people with diabetes is now considered as a standard of the diabetes care 15.Abnormal lipid profiles and lipoprotein oxidation (especially LDL-C) are more common in diabetes and are aggravated with a poor glycemic control. The measurement of the lipid profile of diabetic patients is needed to investigate how their lipid metabolism is affected Section by diabetes, as they have different genetic compositions and lifestyles.Although the exact reasons why Asian Indians are more prone to type 2 diabetes at a younger age and premature cardiovascular disease (CVD) remain speculative, there is a growing body of evidence to support the concept of the "Asian Indian Phenotype".16 This term refers to the peculiar metabolic features of Asian Indians characterized by a propensity to excess visceral adiposity, dyslipidemia with low HDL cholesterol, elevated serum triglycerides and increased

small, dense LDL cholesterol, and an increased ethnic (possibly genetic) susceptibility to diabetes and premature coronary artery disease.16,17 In countries like the United States, Germany, the United Kingdom and Japan, the prevalence of communicable diseases is much lower compared to chronic non-communicable diseases (NCD). In India, as in other low and middle income countries, diabetes and other NCDs are relatively overshadowed by the continued burden of communicable and nutrition-related diseases. While these health threats are still present (albeit, slowly decreasing), the rise of NCDs has been rather rapid. According to the World Health Report 200518 , NCDs already contribute to 52 per cent of the total mortality in India and these figures are expected to increase to 69 per cent by the year 2030.19 Therefore, countries like India are currently facing an epidemiologic transition with a 'double burden' of disease.

MATEIRAL AND METHODS

The subjects enrolled in this study were diabetic patient who attended Out Patient Department of Gujarat Medial Research institute, Rajasthan Hospital, Ahmedabad. A total of 132 diabetic patients and 132 healthy controls were randomly selected and were examined for dyslipidaemia. Patients with the other ailments and metabolic disorders were excluded from study. Laboratory tests were used to confirm the absence of diabetes in the control group and also by asking questions regarding signs of diabetes such as polyuria, polydipsia and recent weight loss. Ethical clearance was sought and obtained for the study from the hospital. The aim of study was explained to the subjects and those who gave their consents were included in the study.

In both patients and controls, about 5 ml of fasting blood was obtained by venipuncture obtained using sterile disposable syringes and needles. The blood was collected in EDTA, Fluoride and Plain vacutte and allowed to clot serum which was obtained analyzed on the day of collection for serum sugar, and lipid profile test. HbA1c was performed in 45 diabetic patients.

Serum total cholesterol was determined by an enzymatic (CHOD-PAP) colorimetric method[20] and triglycerides were determined by an enzymatic (GPO-PAP) methoD.21 HDL-Cholesterol was estimated by a precipitant method 22 and LDL-Cholesterol by was estimated by using Friedewald's formula 24 as has been shown below

LDL-C = TC - HDL-C – (TG/5)

Serum glucose was determined by using the glucose oxidase enzymatic method. Test were carried out by Cobas Integra – 400. 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.24

RESULTS

The mean age of the subjects were 54.71± 10.69 and 47.06 ± 13.59 years for the diabetic and the control groups respectively. The sex distributions showed 56 females in diabetic group and 54 females in control group and 76 males in diabetic group and 78 males in control group. Table [2] shows the mean of total cholesterol, triglyceride, LDL-C, HDL-C and the fasting blood sugar and post prandial blood sugar levels which were highly significant in the diabetics as compared to those in control. In diabetic group 52 % person were doing exercise and 35% had family history of diabetes.

Table [1]shows level presence of glycosuria in the diabetic subject, and glycosuria was absent in the non-diabetic- control group.

TABLE – 1, GLYCOSURIA IN DIABETIC PATIENT

GLYCOSURIA	FUS	PPUS
ABSENT	98	60
TRACE	5	8
+	4	17
++	10	14
+++	13	23
++++	2	10

Table [2] shows biochemical variable in the diabetic and control groups according to the ATP III classification and the findings are quite significant in diabetic than the control group.

TABLE -2,FREQUENCY OF THE BIOCHEMICAL VARIABLES IN THE DIABETIC AND CONTROL GROUPS ACCORDING TO THE ATP III CLASSIFICAITON

PARAMETER	DIABETICS		CONTROL	
TOTAL CHOLESTEROL				
DESIRABLE (<200)	86	65.16	111	84.09
BODERLINE HIGH (200-239)	32	24.24	17	12.88
HIGH (>/= 240)	14	10.6	4	3.03
TRIGLYCERIDES				
NORMAL (<150)	79	59.85	111	84.09
BODERLINE HIGH (150-199)	29	21.99	13	9.85
HIGH (200-249)	17	12.86	7	5.3
VERY HIGH (>/=500	7	5.3	1	0.76
HDL				
LOW (<40)	83	62.88	59	44.7
BODERLINE HIGH (40-59)	48	36.36	67	50.75
HIGH (>60)	1	0.76	6	4.55
LDL				
OPTIMAL (<100)	41	31.06	67	50.75
NEAR OPTIMAL (100-129)	41	31.06	41	31.06
BODERLINE HIGH (130-159)	34	25.76	21	15.91
HIGH (160-189)	13	9.85	2	1.52
VERY HIGH (>/= 190)	3	2.27	1	0.76

Table [3] shows comparison between mean values of FBS, Total Cholesterol, Triglyceride, HDL, LDL-C between diabetic group and control group. All the diabetic subjects have significantly higher cholesterol (t=7.83,df132;p<0.001), triglycerides (t5.09,df132;p<0.001) and significantly lower HDL cholesterol (t=2.16,df132;0.05) as compared to non diabetic control group. The LDL-C levels show significantly higher level in diabetics (t=3.34,,df132;p<0.001) compared with control non diabetic group and the levels of Total Lipid were significantly higher in diabetic group than control group (t=3.05, df 132; p<0.001)

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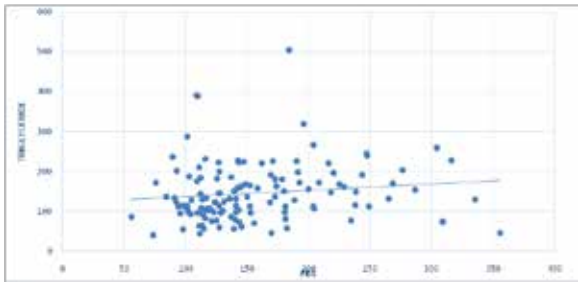
TABLE -3, BIOCHEMICAL PARAMETERS OF DIABETIC AND CONTROL GROUPS.

PARAMETER	DIABETIC	CONTROL	T table value
	MEAN±SD	MEAN±SD	
TOTAL CHOLESTEROL	182.60±45.50	151.65±35.78	7.83
TRIGLYCERIDE	145.85±71.63	107.26±49.59	5.09
HDL	40.81±7.60	43.68±13.00	2.16
LDL-C	119.20±40.05	102.75±37.97	3.34
TOTAL LIPID	518.18±144.73	472.19±94.89	3.05
FBS	156.7±56.76	85.55±11.99	14.11
PPUS	248.99±101.11	105.00±16.13	16.15

Table [4]shows comparisons between the mean biochemical variable with respect to gender in the diabetics and the controls respectively.The study observed no significant difference in the lipid profile values in diabetic group in relation with gender.

CORRELATIONS BETWEEN FBS AND TRIGLYCERIDES



CORRELATIONS BETWEEN FBS AND HDL

TABLE -4, COMPARISON OF THE BIOCHEMICAL PARAMETERS IN THE MALES AND FEMALES OF BOTH GROUPS

PARAMETERS	DIABETICS		T table Value	CONTROL		T table Value
	MALE	FEMALE		MALE	FEMALE	
TOTAL CHOLESTEROL	186.15±47.40	179.14±41.78	0.89*	152.7±40.79	151.65±27.29	0.17*
TRIGLYCERIDES	144.11±72.01	148.22±72.34	0.32*	110.26±51.53	102.93±46.78	0.84*
HDL-C	39.79±7.43	42.20±7.76	1.79*	41.67±10.73	44.74±8.35	1.84*
LDL-C	121.1±44.5	117.75±32.38	0.50*	102.14±32.20	102.16±45.35	0.002*
FBS	151.58±58.83	163.66±60.66	1.14*	85.70±9.9	85.33±14.60	0.16*
* Non significant at p <0.05						

Table – 5 shows comparisons of Lipid profile with HbA1c levels, and the cutoff of 7.0 % and hence divided accordingly which exhibited stastically significant increase in TC, LDL-C, TRIGLYCERIDES and TOTAL LIPID without significant alteration in HDL in comparison with patient having HbA1c value ≤ 7.0%.

TABLE-5 BIOCHEMICAL PARATMETERS CATEGORIZED BY PATIENT'S GLYCEMIC CONTROL

PARAMTER	GLYCATED HEMOGLOBIN (HbA1c)		T TABLE VALUE
	≤ 7.0 MEAN ± SD	≥ 7.0 MEAN ± SD	
TOTAL CHOLESTEROL	201.43±64.24	163.68±36.29	2.46
TRIGLYCERIDES	74.43±38.64	104.60±28.19	2.94
HDL-C	42.91±7.45	41.42±9.49	0.47*
LDL-C	131.541±38.64	104.60±28.19	2.55
TOTAL LIPID	576.06±78.43	455.0±90.50	4.107
* Non significant at p <0.05			

CORRELATIONS BETWEEN FBS AND LDL-C

DISCUSSION

The Patients with diabetes have a higher degree of atherosclerosis burden due to dyslipidaemia than people without diabetes.[25] New National Cholesterol guidelines raise the risk factors of patients with diabetes without known CHD to CHD equivalent, a guideline substantiated by the results of numerous studies.26Talat N, et al found that duration of diabetes was associated with higher incidence ofdyslipidaemia. Talat N, et al found that duration of diabetes was associated with higher incidence of dyslipidaemia27In diabetes many factors may affect

blood lipid levels, this is because carbohydrates and lipid metabolism are interrelated to each other if there is any disorder incarbohydrate metabolism it also leads disorder in lipid metabolism so there is high concentration of cholesterol and triglycerides and due to this there is reduction in HDL cholesterol levels. In diabetic subjects sex plays a significant effect on risk of coronary artery disease. The males have marginally high serum lipid levels as compared to diabetic females. The findings of study are comparable with Samantha p et al. [28]

CONCLUSION

The diabetic patients had a higher prevalence of high serum cholesterol, high triacylglycerol and high LDL-C than the controls, indicating that diabetic patients were more prone to cardiovascular diseases hyperlipidemia is the commonest complication of diabetes mellitus and it predisposes to premature atherosclerosis and macro vascularcomplications. Common lipid abnormalities in diabetes are raised triglycerides, LDL-C serum cholesterol and low HDL. Therefore good glycemic control can prevent development and progression of lipid abnormalities.

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