

ORIGINAL ARTICLE

Study of Lipid Profile in patients with Diabetes Mellitus

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Abstract

Background: This particular study was done to determine the pattern and frequency of hyperlipidemia in patients with diabetes mellitus. **Methods:** The study was carried out in patients with type 1 and type 2 diabetes mellitus of at least 1 year duration. Same number of patients was taken as controls having age and gender matched. During a period of 1 and half year, total of 200 patients were evaluated for lipid profile. **Results:** Out of 200, diabetic patients 147 (73.5%) were males and 53 (26.5%) were females. 170 patients had Type 2 Diabetes Mellitus and 30 patients had Type 1 Diabetes Mellitus. The mean \pm SD for age of patients with type 2 and type 1 diabetes mellitus was 48.98 ± 6.65 and 22.37 ± 3.86 . **Conclusion:** The diabetic patients are more prone to develop hyperlipidemia. Hyperlipidemia is the commonest complication of the diabetes mellitus and it can predispose patients to premature atherosclerosis and microvascular complications. Early preventive action must be taken to decrease further complications.

Key words: Diabetes mellitus Hyperlipidemia Lipid profile

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Introduction

Diabetes mellitus is a group of metabolic diseases characterized by increase blood glucose level resulting from defects in insulin secretion, insulin action or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels.¹

The first systematic description of diabetes was written by the Arelaeus of cappadosis in Asia minor, probably in the 1st century AD. In this, the disease is described as "A melting down of flesh into the urine". Van Mering and Minikowaski in 1889 discovered that pancreatotomy causes a metabolic disorder called Diabetes mellitus and is the result of insulin deficiency.² Certain ethnic and racial groups of Africa and Asia have a greater risk of developing diabetes.³ India, a developing Asian country with fast industrialization and a modern lifestyle is facing a great problem in having the largest number of people with diabetes.⁴ The

literature on Indian studies showed a threefold rise in the diabetic prevalence in rural as well as urban areas.^{5,6} Diabetes is considered a syndrome because the patients possesses many symptoms especially if management is not carried out.⁷

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.⁸ Insulin deficiency causes excessive metabolism 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.⁹ The rationale of the present study was to evaluate the lipid abnormality in diabetic patients. Early detection and treatment of hyperlipidemia in diabetes mellitus can prevent the progression of lipid abnormalities and can

also minimize the risk for atherogenic cardiovascular disorders and cerebrovascular accidents.

Materials and Methods

Total 200 patients of known or newly diagnosed cases of type 1 or 2 diabetes mellitus were taken for the study. The study was carried out for a period of 1 and half year. The patients were taken on random basis and detail case history was taken with all relevant clinical examination. Also routine investigations were carries out. Approval form the ethical committee was taken before start of the study and also informed consent was taken from all the participants. Every patient was advise for at least 12-14 hours overnight fasting and the 5ml venous blood sample were collected in a disposable syringe on next morning (before breakfast) for the serum lipid profile and fasting blood sugar (for the assessment of blood glucose level). The lipid profile was evaluated by National Cholesterol Education Programme (NCEP) Adult Treatment Panel III (ATP III) classification of lipid profile. The data was collected on predesign proforma and then entered, saved and analyzed in IBM SPSS version 20. The frequency of dyslipidemia was evaluated while the pattern was determined by serum level for cholesterol, high density lipoprotein HDL-C, low density lipoprotein LDL-C and triglyceride.

Results

During one and half year study period, total 200 patients with diabetes mellitus were evaluated for lipid profile. Out of 200, diabetic patients 147 (73.5%) were males and 53 (26.5%) were females. 170 patients had type 2 diabetes mellitus and 30 patients had type 1 diabetes mellitus.

Table 1: Frequency of hyperlipidemia in patients with diabetes mellitus.

Hyper-lipidemia	Type-1 DM	Type-2 DM	Total
Yes	18 (60%)	126 (74.11%)	144 (72%)
No	12 (40%)	44 (25.89%)	56 (28%)
Total	30	170	200

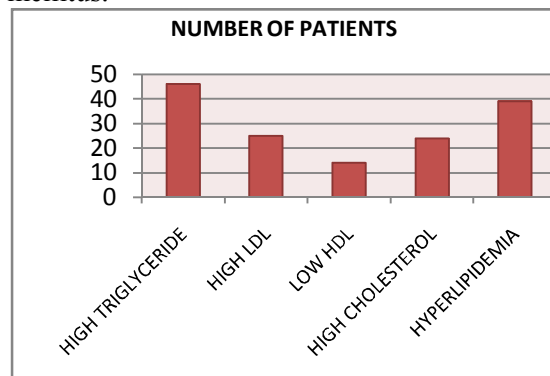
The mean \pm SD for age of patients with type 2 and type 1 diabetes mellitus was 48.98 ± 6.65 and 22.37 ± 3.86 . The lipid profile of patients with type 1 and 2 are shown in table 1 whereas the frequency of dyslipidemia in patients with diabetes mellitus (type 1 and 2). The pattern of disturbance in lipid profile of diabetic patients is shown in table 2.

Table 2: Pattern of hyperlipidemia in patients with diabetes mellitus.

Lipid profile	N=	Percentage
	148	
High triglyceride	46	31.08%
High LDL	25	16.89%
Low LDL	14	09.45%
High cholesterol	24	16.21%
Combined hyperlipidemia	39	26.35%

Majority of hyperlipidemic diabetic patients 122/148 (82.43%) had uncontrolled diabetes i.e. raised fasting blood sugar level and HbA_{1c}. The pattern of lipid abnormalities observed was high triglyceride in 46 (31.08%) patients, high LDL in 25 (16.89%), low HDL in 14 (09.45%), high cholesterol in 24 (16.21%) and combined hyperlipidemia in 39 (26.35%) diabetic patients.

Graph- 1: Graph showing pattern of hyperlipidemia in patients with diabetes mellitus.



Discussion

The toxic material produced by activated phagocytes during reaction can cause maximal damage to the membrane because they are active in the lipid phase. The damaging effect of elevated toxic radical is due to an increase in the formation of superoxide radicals within cells. This causes inactivation of superoxide

dismutase enzyme in hyperglycemic condition. This affects the tissue damage and secondary disorder in diabetes mellitus.¹⁰ Normally free radicals produce in metabolism are effectively scavenged. Oxidative stress occur when there is an imbalance between production and scavenging. Increased in lipid peroxidation in diabetes mellitus is due to excess formation of free radicals. Glycosylated protein, auto-oxidation, reduced superoxide dismutase enzyme and ascorbic acid and lack of reduced glutathione are other causes for oxidative stress.⁹ There are two main types of diabetes¹¹: Insulin-dependent diabetes (Type 1 Diabetes)¹¹ It 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)¹¹:— It 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.¹¹ Changes occurring in diabetic dyslipidaemia Include quantitative and qualitative changes. Quantitative changes Includes increase in VLDL as compared to normal due to increase availability of glucose for VLDL synthesis and decrease in lipoprotein lipase activity leading to decrease of VLDL from peripheral circulation, increase in LDL-C levels and decrease in HDL-C levels due to increase in hepatic lipase activity decrease in VLDL clearance.¹² Qualitative changes Includes increase amount of triglycerides, LDL-C and HDL-C, non enzymatic glycation of LDL and non enzymatic glycation of HDL, thus increasing risk of heart diseases.¹² The increased risk of vascular disease in diabetics is in part due to the lipid abnormalities, which are twice as common in type 2 diabetes compared to non-diabetics and are more complex than in type 1 diabetics.¹³ The 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 often. Diabetes is associated with a greater risk of mortality from cardiovascular disease (CVD) which is well known as dyslipidaemia, 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 and the determination of the serum lipid levels in people with diabetes is now considered as a standard of the diabetes care.^{4,14} Insulin affects many sites of mammalian lipid metabolism. It stimulates synthesis of fatty acid in liver adipose tissue and in the intestine.² It has been suggested that the increase in triglyceride may be due to insulin deficiency which results faulty glucose utilization, causes hyperglycemia and mobilization of fatty acids from adipose tissue. In diabetes blood glucose is not utilized by tissue resulting in hyperglycemia. The fatty acid from adipose tissue is mobilized for energy purpose and excess fatty acid is accumulated in the liver, which are converted to triglyceride.¹⁵ The present study indicates that insulin increases the number of LDL receptor, so chronic insulin deficiency might be associated with a diminished level of LDL receptor. This causes the increase in LDL particles and result in the increase in LDL-cholesterol value in diabetes mellitus.² High level of cholesterol, triglyceride, LDL-cholesterol and low HDL-cholesterol may be due to the obesity, increase calorie intake and lack of muscular exercise in the patients of diabetes mellitus.^{2,16,17} Higher level of lipid peroxides was observed in diabetic subject with vascular complication. This increase in lipid peroxide may be due to the increased activity of the free radical formation. Free radical interacts in arachidonic acid metabolism, forming a toxic endoperoxidase. The lipid peroxide formed stimulates the cyclooxygenase and prostaglandin and thromboxane synthesis. This will cause increased platelets aggregation, leading to vascular complications.^{2,18} We have found that serum cholesterol is increased in all group of diabetes when compared with the controls.

Some of the possible reason of higher concentration of serum cholesterol in diabetes may be attributed to decrease muscular exercise or inhibition of cholesterol catabolism.²

There are many theories proposed to account for the excess risk of diabetes in women. These include differences in coagulation, the pattern of obesity between men and women, and possible role for hyperinsulinemia.¹⁹ Low grade inflammation may have a greater role in perturbing insulin action in women, or inflammatory factors may interact with female sex hormones, resulting in a decrease of protective effects of estrogens on body fat distribution and insulin action.¹¹

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. Diabetics have higher lipid levels than non-diabetics and this abnormality is exaggerated in patients with poor diabetic control.²⁰

Conclusion

Hyperlipidemia is the commonest complication of the diabetes mellitus and it can predispose patients to premature atherosclerosis and microvascular complications. Good glycemic control can prevent the development and progression of common lipid abnormalities in diabetes like raised triglycerides, LDL, serum cholesterol and low HDL.

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Ethical Permission: Obtained

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