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Study of Dyslipidemia in Newly Diagnosed Type II Diabetes Mellitus Patients

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ABSTRACT: Background : India is becoming the diabetic capital of the world. This study assesses the lipid profile abnormalities in newly diagnosed type 2 diabetes mellitus.

Material and methods: A total of 150 patients of newly diagnosed cases of type 2 diabetes mellitus(less than 1 year duration)were taken for the study. The study was carried out for a period of 8 months.

Results: Out of 150 diabetic patients, 97 patients were males (64.66%) and 53 patients were female (35.33%). The pattern of lipid abnormalities observed was high triglyceride in 42 patients (28%), high LDL in 32 patients (21.33%), high cholesterol in 35 patients (23.33%), low HDL in 16 patients (10.66%) and combined hyperlipidemia in 33 patients (22%).

Conclusion: Deranged lipid profiles are quite prevalent in type 2 diabetics. Early recognition of such elevated triglyceride levels in even newly diagnosed type 2 diabetics will help in better prevention of associated cardiovascular disease.

Keywords: diabetes mellitus, dyslipidemia, atherosclerosis, CHD.

I. INTRODUCTION:

Man has known diabetes for the past 3500 years having been documented by the Egyptians[(1)] .India leads with the largest number of diabetic subjects earning the dubious distinction of being termed as 'the diabetes capital of the world'. The literature on Indian studies showed a threefold rise in the diabetic prevalence in rural as well as urban areas[(2,3)]. Individuals with T2DM have two- to four-fold increased risk of coronary artery disease (CAD), the leading cause of death among people with T2DM[(4)]. Dyslipidemia and hypertension are major modifiable risk factors for T2DM and related CAD, which account for more than 87% of disability in low- and middle-income countries [(5,6)] . Lipid abnormalities in patients with diabetes, often termed "diabetic dyslipidemia", are typically characterized by high total cholesterol (T-Chol), high triglycerides (Tg), low high density lipoprotein cholesterol (HDL-C) and increased levels of small dense LDL particles. Low density lipoprotein cholesterol (LDL-C) levels may be moderately increased or normal. Lipid abnormalities are common in people with T2DM and pre-diabetes [(7,8)] but the pattern of the different lipids may vary between ethnic groups, economic levels, and access to health care [(9,10)] .

II. MATERIALS AND METHODS:

A total of 150 patients of newly diagnosed cases of type 2 diabetes mellitus(less than 1 year duration) were taken for the study. The study was carried out for a period of 8 months. The patients were taken on random basis and detail case history was taken with all relevant clinical examination. Patients with age >40 years, non insulin dependent diabetes mellitus (type 2 diabetes mellitus), duration of diabetes <1 year and patient willing to participate in the study were included in this study. Pregnant women, patients diagnosed with acute illness (like recent stroke, recent myocardial infarction) and patients with mental illness were excluded from the study. Also routine investigations were carries out. After an overnight fasting of 12-14 hours, 5ml venous sample was collected next morning (before breakfast) for serum lipid profile and fasting sugar level. The frequency of dyslipidemia was evaluated while the pattern was determined by serum level for cholesterol,

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high density lipoprotein HDL-C, low density lipoprotein LDL-C and triglyceride.

III. RESULTS:

Over a period of 8 months, 150 patients of type 2 diabetes mellitus were evaluated for lipid profile. Out of 150 diabetic patients, 97 patients were males (64.66%) and 53 patients were female (35.33%). The pattern of lipid abnormalities observed was high triglyceride in 42 patients (28%), high LDL in 32 patients (21.33%), high cholesterol in 35 patients (23.33%), low HDL in 16 patients (10.66%) and combined hyperlipidemia in 33 patients (22%).

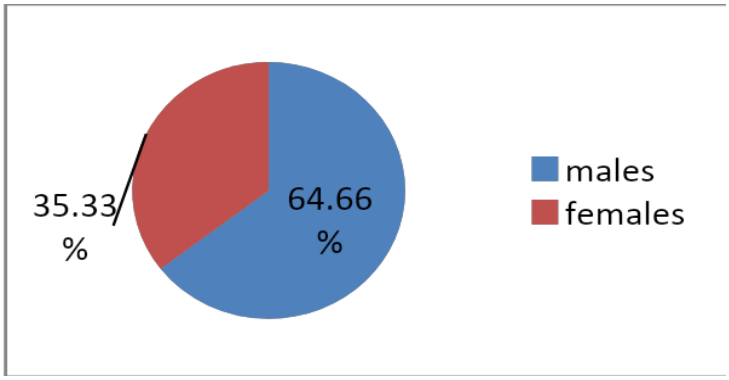

Figure 1: gender distribution of diabetes mellitus

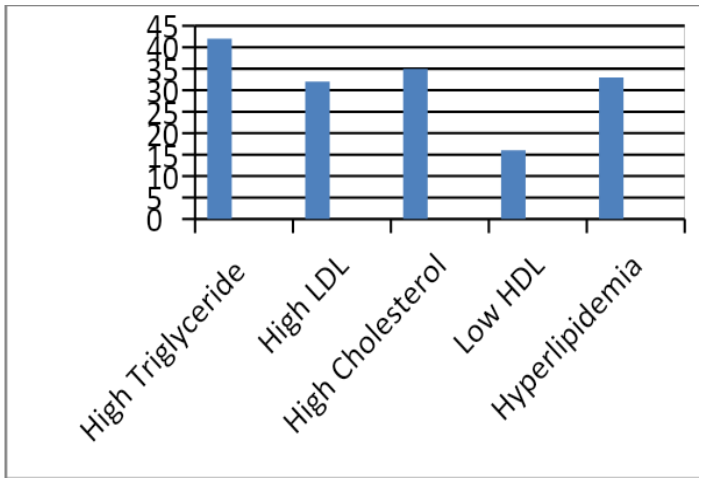

Figure 2: pattern of hyperlipidemia in patients with diabetes mellitus.

IV. DISCUSSION:

Out of the 150 participants of our study, all were type 2 diabetics diagnosed in the past 1 year. Overall gender distribution of the study population revealed that 64.66% were males and 35.33% were females. Among them, majority of patients were >40 years of age. In our study, 42 patients (28%) had high triglycerides i.e., ≥150mg/dl. Out of 150, 32 (21.33%) patients had high LDL levels (>100mg/dl). High LDL levels is one of the risk factors for developing cardiovascular complications and such elevated levels are seen even in newly detected type 2 diabetics as seen in our study. Our study showed that 35 patients (23.33%) had high cholesterol levels (>200mg/dl).

There are three major sources of fatty acids in the liver all of which may be altered in patients with T2DM. First, the flux of fatty acids from adipose tissue to the liver is increased. An increased mass of adipose tissue, particularly visceral stores, results in increased fatty acid delivery to the liver. Additionally, insulin suppresses the lipolysis of triglycerides to free fatty acids in adipose tissue; thus, in patients with either poorly controlled diabetes due to a decrease in insulin or a decrease in insulin activity due to insulin resistance, the inhibition of triglyceride

lipolysis is blunted and there is increased triglyceride breakdown leading to increased fatty acid deliver to the liver. A second source of fatty acids in the liver is de novo fatty acid synthesis. Numerous studies have shown that fatty acid synthesis is increased in the liver in patients with T2DM. This increase may be mediated by the hyperinsulinemia seen in patients with insulin resistance. While the liver is resistant to the effects of insulin on carbohydrate metabolism, the liver remains sensitive to the effects of insulin stimulating lipid synthesis. Specifically, insulin stimulates the activity of SREBP-1c, a transcription factor that increases the expression of the enzymes required for the synthesis of fatty acids. Thus, while the liver is resistant to the effects of insulin on carbohydrate metabolism the liver remains sensitive to the effects of insulin stimulating lipid synthesis. Additionally, in the presence of hyperglycemia, glucose can induce another transcription factor, carbohydrate responsive element binding protein (ChREBP), which also stimulates the transcription of the enzymes required for fatty acid synthesis. The third source of fatty acids is the uptake of triglyceride rich lipoproteins by the liver. Studies have shown an increase in intestinal fatty acid synthesis and the enhanced secretion of chylomicrons in animal models of T2DM. This increase in chylomicrons leads to the increased delivery of fatty acids to the liver. The increase in hepatic fatty acids produced by these three pathways results in an increase in the synthesis of triglycerides in the liver and the protection of Apo B-100 from degradation resulting in the increased formation and secretion of VLDL. Finally, insulin stimulates the post translational degradation of Apo B-100 in the liver and a decrease in insulin activity in patients with T2DM also allows for the enhanced survival of Apo B-100 promoting increased VLDL formation.

The elevation in triglyceride rich lipoproteins in turn has effects on other lipoproteins. Specifically, cholesterol ester transfer protein (CETP) mediates the exchange of triglycerides from triglyceride rich VLDL and chylomicrons to LDL and HDL. The increase in triglyceride rich lipoproteins per se leads to an increase in CETP mediated exchange, increasing the triglyceride content of both LDL and HDL.

Many if not most patients with T2DM are obese. Obesity is a pro-inflammatory state due to the macrophages that infiltrate adipose tissue. The cytokines produced by these macrophages and the adipokines that are produced by fat cells also alter lipid metabolism [11,12]. The pro-inflammatory cytokines, TNF and IL-1, decrease the expression of lipoprotein lipase and increase the expression of angiopoietin like protein 4, an inhibitor of lipoprotein lipase. Together these changes decrease lipoprotein lipase activity, thereby delaying the clearance of triglyceride rich lipoproteins. In addition, pro-inflammatory cytokines stimulate lipolysis in adipocytes increasing circulating free fatty acid levels, which will provide substrate for hepatic triglyceride synthesis. In the liver, pro-inflammatory cytokines stimulate de novo fatty acid and triglyceride synthesis. These alterations will lead to the increased production and secretion of VLDL. Thus, increases in the levels of pro-inflammatory cytokines will stimulate the production of triglyceride rich lipoproteins and delay the clearance of triglyceride rich lipoproteins, which together will contribute to the increase in serum triglycerides that occurs in obese patients.

V. CONCLUSION:

High levels of dyslipidemia are seen even during the early stages and newly detected diabetics as well. These are likely to play a major role in the development of cardiovascular diseases and cerebrovascular accidents among the diabetic patients. Good glycemic control can prevent the development and progression of common lipid abnormalities in diabetes like raised triglycerides, LDL, serum cholesterol and low HDL. Therefore, lipid profiling for all persons with type 2 DM should be a routine test. All persons with type 2 diabetes must be started on primary prevention by encouraging healthy lifestyle diets so as to reduce the risk of CHD and atherosclerosis.

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