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A correlative study of status of serum cholesterol, triglyceride and HDL-cholesterol in Type 2 diabetes mellitus patients with and without hypertension.

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ABSTRACT

Individuals with Diabetes mellitus may have several forms of dyslipidemia. In obese patients with type II diabetes, a distinct "diabetic dyslipidemia" is characteristic of the insulin resistance syndrome. The present study was undertaken to correlate the serum cholesterol, triglyceride and HDL-Cholesterol levels in healthy participants and type 2 Diabetes mellitus patients. The present work was carried out at KMC hospital, Attavar, Mangalore, after a written consent from all the participants. The study includes 160 subjects and was divided into Group 1 with 57 non Diabetic subjects, Group 2 with 58 Diabetic patients without hypertension and Group 3 containing 45 Diabetes with hypertension patients respectively. About 5 ml of blood sample was collected and used for the estimation of serum cholesterol, triglyceride and HDL- Cholesterol levels using standard methods. Statistical analysis was done using one-way ANOVA and $p<0.05$ was considered as significant. From our study, we found that there was a significant increase ($P<0.001$) in serum cholesterol and triglyceride in Diabetic patients with or without hypertension, but HDL – cholesterol was declined significantly ($P< 0.001$) when compared to normal individuals. In type 2 Diabetes mellitus patients, an increase in serum cholesterol, triglycerides and decline in HDL- Cholesterols is due to an increased lipolysis which causes the liver to increase glucose, serum cholesterol and triglycerides. The decline in HDL- Cholesterols might be due to its reciprocal relation with triglycerides. In Diabetic patients, the serum-cholesterol and triglyceride level increases, where as HDL – cholesterol level declines.

Keywords: Type 2 Diabetes mellitus, Serum Cholesterol, Triglyceride, and HDL-Cholesterol.

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INTRODUCTION

Diabetes mellitus is an "iceberg" disease. Currently, the number of cases of diabetes worldwide is estimated to be around 150 million. This number is predicted to double by 2025 (a prevalence rate of about 5.4%). It is estimated that 20% of the current global diabetic population resides in the South-East Asian region. The result of prevalence studies of diabetes mellitus in India in adults was found to be 2.4 percent in rural and 4.0-11.6 percent in urban dwellers [1]. Diabetes mellitus may have several forms of dyslipidemia. Because of the additive cardiovascular risk of hyperglycemia and hyperlipidemia, lipid abnormalities should be aggressively detected and treated as part of comprehensive diabetes care [2, 3]. The most common pattern of dyslipidemia is hypertriglyceridemia and reduced HDL-cholesterol levels. Diabetes mellitus itself does not increase levels of LDL, but the small dense LDL particles found in type 2 diabetes mellitus are more atherogenic because they are more easily glycated and susceptible to oxidation [3]. Patients with Type 2 diabetes are frequently affected by atherosclerotic vascular disease. These patients often have abnormalities of both quantity and quality of lipoproteins that, among other factors, might be responsible for the increased incidence of vascular complications [4]. Several studies were conducted to find out the lipid abnormalities in diabetes mellitus and to ascertain the effect of anti-diabetic treatment on these abnormalities [5-9]. The present study was undertaken to correlate the serum cholesterol, triglyceride & HDL levels in healthy participants & type 2 diabetes mellitus patients.

Dietschy, 1997 reported an increase in VLDL occurred in diabetes mellitus due to increase availability of glucose for VLDL synthesis and decrease in lipoprotein lipase activity leading to decrease of VLDL from peripheral circulation [10]. An increased percent body fat was identified with higher levels of TC: HDL-C and decreased HDL-C due to decrease in hepatic lipase activity resulting in decrease VLDL clearances which are metabolic abnormalities characterizing metabolic syndrome. This results in increase opportunity for lipid exchange leading to depletion of cholesterol esters in HDL to cholesterol ester enrichment in triacylglycerol rich lipoprotein whereas negatively significant association was found between percent lean body mass and weight, as well as with anthropometric variables i.e. BMI and WHR, triglycerides, positively with HDL-C and negatively to TC: HDL-C .It coincided with the study conducted that showed increased HDL-C and decreased LDL-C decreases risk factor for metabolic syndrome [11].

MATERIALS AND METHODS

The present work was carried out at Kasturba Medical College hospital, Attavar, Mangalore, after a written consent from all the participants and the institutional ethical clearance. The study includes 180 subjects and was divided into Group 1 with 60 non Diabetic subjects, Group 2 with 60 Diabetic patients without hypertension and Group 3 containing 60 Diabetes with hypertension patients respectively. A detailed history was taken. About 5 ml of blood sample was collected and used for the estimation of serum cholesterol, triglyceride and HDL- Cholesterol levels using standard methods. Major selection criteria for diabetes included: a random plasma glucose level of 200mg/dL or greater when the symptoms of diabetes were

present and fasting plasma glucose level of 126 mg/dL or greater. Major selection criteria for hypertension included: all the untreated hypertensive's with systolic blood pressure above 140 mmHg and diastolic blood pressure above 90 mmHg or treated hypertensive's on anti hypertensive drug. Patients suffering from Type 1 diabetes mellitus were excluded from the study.

Statistical analysis

Statistical analysis was done by using "ANOVA" (Analysis of variance; Fishers F test); student unpaired' test, and student paired't' test. Tukey's test was used in intercomparison of the three groups. P value was taken as significant at 5 percent confidence level ($P<0.05$).

RESULTS

The present data indicate that significant increase ($P<0.001$) in serum cholesterol and triglyceride levels in diabetics without hypertension and diabetes with hypertension patients when compared to the normal individuals (Table-1, Fig-1). The HDL- Cholesterol level was declined significantly ($P<0.001$) in diabetic patients without hypertension and diabetes with hypertension when compared to normal individuals (Table-1, Fig-1).

TABLE-1. Cholesterol, triglyceride and high density lipoprotein (HDL) levels in non-diabetic subjects, diabetic patients without hypertension and diabetic with hypertension patients. Data were expressed as Mean ± SD, n=60 each.

Parameters	Group 1	Group 2	Group 3	P value
Cholesterol (mg/dL)	168.01 ± 2.78	202.31 ± 4.31	209.90 ± 4.89	0.001
Triglycerides(mg/dL)	180.54 ± 4.39	242.53 ± 10.50	255 ± 9.53	0.001
HDL (mg/dL)	48.32 ± 0.63	37.94 ± 1.18	35.63 ± 1.14	0.001

Note: Group 1= Non-diabetic subjects, Group 2= Diabetic patients without hypertension, Group 3= Diabetic with hypertension patients. $P<0.05$ was considered as the level of significance.

DISCUSSION

In type 2 diabetes mellitus patients who are centrally obese, increased lipolysis causes the liver to increase glucose & very LDL output, while muscle uses less. This leads to a rise in blood glucose and triglycerides, a drop in HDL cholesterol & an increase in small, dense LDL particles [5]. The frequency of dyslipidemia is greater in individuals with type 2 diabetes mellitus [2]. From our study we found that there was a significant increase ($P<0.001$) in serum cholesterol and triglyceride in Diabetic patients with or without hypertension, but HDL – cholesterol was declined significantly ($P< 0.001$) when compared to normal individuals.

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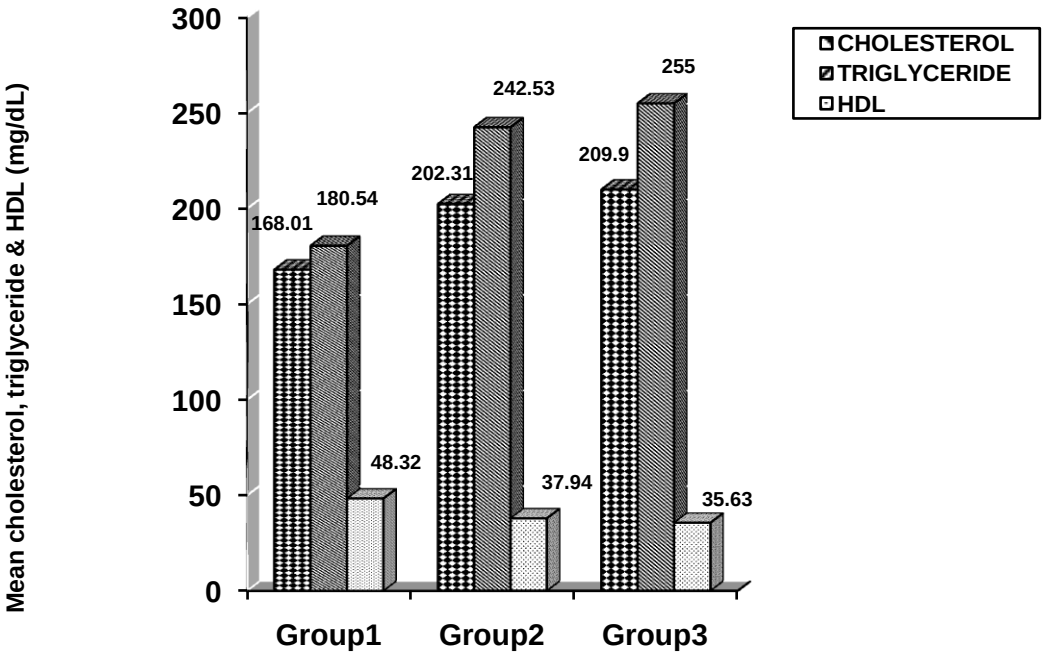

FIG - 1. Mean cholesterol, triglyceride and HDL (mg/dl) levels in non-diabetic subjects, diabetic patients without hypertension and diabetic with hypertension patients.

Velazquez et.al. 1991, have reported that the higher level of lipid peroxides were 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 [12]. In our study we 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. 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 are mobilized for energy purpose and excess fatty acid are accumulated in the liver, Which are converted to triglyceride [13]. Das et.al, 1992 and Yogi, K. *et al*. 1999 have reported that the 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 [14, 15]. The estimation of lipid peroxide along with other lipid profile in the diabetes mellitus is very useful as it may serve as a useful monitor to judge the

prognosis of the patient. The detection of risk factor in the early stage of the disease will help the patient to improve and reduce the morbidity rate. Since most of the type 2 diabetes mellitus patients are obese, weight loss and exercise of moderate degree, are associated with insulin sensitivity, and often improve glucose control (significant improvement in glycosylated hemoglobin levels) in diabetics [3]. Improvement of glycemic control can lower serum triglyceride levels and have a modest beneficial effect on rising HDL-cholesterol [2].

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