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A STUDY OF SERUM TRIACYLGLYCEROL LEVEL, HDL LEVEL, LIPASE ACTIVITY IN NEWLY DIAGNOSED HYPERTENSIVE PATIENTS.

Biochemistry

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ABSTRACT

Objective - To study serum triacylglycerol level, serum high density lipoprotein level and serum lipase activity by estimating these parameters in fasting and post-prandial state that is 4 hours after meal in newly diagnosed hypertensive patients and comparing these values with the control group comprising of healthy subjects not suffering from hypertension.

Methods- Patients attending outpatient department of Lokmanya Tilak Municipal General Hospital who were clinically newly diagnosed hypertensive patients before administration of hypolipidemic drugs were enrolled for the study.

Duly signed consent forms were taken. Patients suffering from pancreatitis or any other acute diseases were excluded from our study. Control group comprised of age matched subjects not suffering from hypertension or any other diseases. The study protocol was approved by the Ethical Committee.

Serum triacylglycerol level, serum high density lipoprotein level and serum lipase estimations in hypertensive patients and control group in fasting and post-prandial (4 hours after meal) states were carried out.

Results –The hypertensive group had significantly high mean serum triacylglycerol level and low lipase activity in fasting and post prandial (4 hours after meal) state as compared to healthy control group. The serum HDL level was non-significant in fasting and post-prandial (4 hours after meal) state in hypertensive group as compared to healthy control group.

Conclusion –In Hypertensive patients, triacylglycerol level remains high because of low clearance by lipase. Circulating high TG is a risk factor for atherosclerosis and cardiovascular diseases.

KEYWORDS

Hypertension (HT), Serum Triacylglycerol (TG), Serum Lipase, High density lipoprotein (HDL) and Low density lipoprotein (LDL)

INTRODUCTION

Blood is pumped by the heart to the body at a pressure which is 120/80 mm of mercury. When blood vessels show resistance to blood flow, blood pressure is increased which can be harmful to the body. High blood pressure is associated with various functional changes of the hypertensive endothetical organ, which may contribute to the elevation of peripheral vascular resistance and to the development of complications of the disease process in the cerebral coronary or renal circulation. The systolic blood pressure increases when compliance of the arterial wall is disturbed by a lesion like atherosclerosis. Atherosclerosis changes occur, due to disturbed lipid and lipoprotein metabolism[1].

Hypertension and dyslipidemia are well known to frequently coexist. Elevated levels of lipid in the blood also known as hyperlipidemia have been implicated in the development of atherosclerosis and most cardiovascular diseases including hypertension.

Triacylglycerol are the esters of glycerol with fatty acids and act as primary fuel reserves of the human body. Liver and the adipose tissue are the major sites of triacylglycerol synthesis. Triacylglycerol are the storage form of lipids in the adipose tissue. Triacylglycerol in the body are hydrolyzed by enzyme lipases which are hydrolases. Lipase is a small molecule which can be filtered through the glomerulus [2].

Triacylglycerol is sequentially hydrolyzed by hormone sensitive lipase to free fatty acids and glycerol. Some of the fatty acids released by lipolysis pass into the blood stream and the remainder are used for resynthesis of triacylglycerol. Thus there is a continuous cycle of lipolysis and re-esterification.[3] Fatty liver is the excessive accumulation of fat primarily triacylglycerol in the liver parenchymal cells. Liver is not a storage organ for fat, it contains about 5% fat. In pathological conditions this may go up to 25-30% and the condition is known as fatty liver. Increased serum triacylglycerol is associated with increased risk of atherosclerosis.

High Density lipoprotein (HDL) is synthesized in the liver and small intestines. HDL is involved in the transport of cholesterol from the extra hepatic tissues to the liver for excretion.

Post prandial levels of parameters like TG and enzyme lipase are indicative of body's ability to metabolize nutrients [4]. So we chose to study serum TG, serum HDL and serum lipase parameters in fasting and post prandial (4 hours after meal) states in our study groups.

MATERIALS AND METHODS:

Group A consisted of 60 clinically diagnosed hypertensive patients before administration of hypolipidemic drugs attending outpatient department of Lokmanya Tilak Municipal General Hospital. These were selected for this study after duly signing consent form taking care that they were not suffering from pancreatitis or any other acute disease. Group B consisted of 60 age matched control not suffering from pancreatitis, diabetes mellitus, hypertension, nephrosis and any other chronic infections and not taking any hypolipidemic drugs. Blood samples were collected after 12 hours fasting and post-prandial (4 hours after meal) states in red top vacutainers. Serum samples were obtained after centrifuging these blood samples. Triacylglycerol, HDL and lipase estimations were carried out in the fasting as well as in the post-prandial (4 hours after meal) states samples in both Group A and Group B subjects. Triacylglycerol was estimated by enzymatic method [5]. HDL was estimated by direct determination of HDL-cholesterol selective Inhibition method [6]. Lipase was estimated by colorimetric method [7]. Statistical significance was established using unpaired students't' test [8].

RESULTS:

In this study there was significant increase in the triacylglycerol level in fasting and post-prandial (4 hours after meal) states in Group A patients as compared to that of Group B controls. There was no significant difference in serum HDL in fasting and post-prandial (4 hours after meal) states in Group A patients as compared to that of Group B controls. Serum lipase activity was significantly decreased in fasting and post-prandial (4 hours after meal) states in Group A patients as compared to Group B controls. These results are highlighted in table 1 along with statistical significance.

Table 1. Comparison Of Serum Triacylglycerol Level, HDL Level And Lipase Activity In The Study Groups

PARAMETERS	Group A n = 60 mean ± SD	Group B n = 60 mean ± SD	'p' value
TG fasting mg %	169±33	87.4 ± 20.1	< 0.001
TG * mg %	196±37.1	98.5 ± 21.8	< 0.001
HDL fasting mg%	42±6	46.1±5.6	< 0.05
HDL* mg%	38 ± 5	43.1±5.3	< 0.05
Lipase fasting umol/ml/hr	4.8 ±1.83	8.16 ± 1.85	< 0.001
Lipase* umol/ml/hr	3.2±0.75	6.94 ± 1.63	< 0.001

*Sample taken post prandial 4 hours after meal

TG – serum triacylglycerol
HDL- high density lipoprotein
$p < 0.001$ indicates statistically significant
Normal range - serum triacylglycerol – 50 to 150 mg%
Normal range – serum high density lipoprotein - 33 to 88 mg%
Normal range – serum lipase activity – 2.0 to 7.5 umol/ml/hr = unit of lipase activity

The mean value of TG in Group A patients and Group B controls at fasting state was 169±33 mg% and 87.4±20.1 mg% respectively. The difference was statistically significant ($p < 0.001$).

The mean value of TG in Group A patients and Group B controls at post-prandial (4 hours after meal) state was 196±37.1 mg% and 98.5± 21.8 mg% respectively. The difference was statistically significant ($p < 0.001$).

The mean value of HDL in Group A patients and Group B controls at fasting state was 42±6 mg% and 41.6±5.6 mg% respectively. The difference was statistically non-significant ($p < 0.05$). The mean value of HDL in Group A patients and Group B controls at post-prandial (4 hours after meal) state was 38±5 mg% and 43.1±5.3 mg% respectively. The difference was statistically non-significant ($p < 0.05$).

The mean value of lipase activity in Group A patients and Group B controls at fasting state was 4.8±1.83 units and 8.16±1.85 units respectively. The difference was statistically significant ($p < 0.001$).

The mean value of lipase activity in Group A patients and Group B controls at post-prandial (4 hours after mea)l state was 3.2±0.75 units and 6.94±1.63 units respectively. The difference was statistically significant ($p < 0.001$).

DISCUSSION:

In our study Group A patients showed an inverse relationship between circulating TG and the clearing enzyme lipase. The lipase activity in Group A patients was almost half as compared Group B controls. In Group A patients we found significantly high levels of TG and lower levels of lipase activity in post prandial (4 hours after meal) state but there was no significant change in HDL level. The research findings of Hitesh A Jani et al reveals that an increase in TG, cholesterol, low density lipoprotein and very low density lipoprotein cholesterol levels was found in prehypertensive with no difference in high density lipoprotein levels in prehypertensive patient when compared with controls [9].

These researchers found significant increase in TG, cholesterol and LDL levels in newly diagnosed hypertensive patients when compared to normal control group and suggested that altered lipid profile may be a risk for arterial diseases in newly diagnosed hypertensive patients. They found that HDL level were comparable in both newly diagnosed hypertensive patients and normal control groups which may not be significant enough to protect from vascular diseases [10].

The research findings of D. Kolovou et al revealed that significant rise in serum TG levels were seen in post prandial state in children. They suggest that impaired post prandial lipoprotein metabolism may contribute to or be a marker of the development and progression of atherosclerosis [11]. Murugan et al in their research finding found high TG levels in post prandial (4 hours after meal) in ischemic heart disease patients as compared to control group [12]. The research finding of Katsuyuki Nakajima et al highlighted an inverse correlation of lipoprotein lipase activity with TG level in post-prandial plasma. VLDL remnants are the major atherogenic lipoprotein increased in the post prandial plasma associated with insufficient lipoprotein lipase activity as the possible causal factor for the intiation of atherosclerosis[13]. The exact mechanism by which a low HDL increases cardiovascular disease risk however is not been fully elucidated, though experiential study suggest a direct role for HDL in promoting cholesterol efflux (this is called reverse cholesterol transport) from foam cells in the atherosclerotic plaque depots in blood vessels to the liver for excretion. According to Pavithran et al alteration in lipid metabolism including a decrease in HDL can result in endothelial damage and trigger an increase in blood pressure which may partially account for its strong predictive power for coronary heart disease [14].

The post-prandial state is a dynamic, non-steady state condition with rapid remodeling of lipoproteins compared with the relatively stable fasting condition. Determination of the post-prandial response is complex and it is therefore more challenging to assess the cardiovascular risk associated with post-prandial lipaemia than that during fasting conditions.

CONCLUSION :

From our study it can be suggested that post-prandial (4 hours after meal) state TG levels and lipase activity can be diagnostically significant to determine derangement in metabolism in newly diagnosed hypertensive patients. In hypertensive patients triacylglycerol level and lipase activity should be monitored to prevent atherosclerosis and consequently cardiovascular diseases. HDL concentration should be increased in these patients to get protection from cardiovascular disease.

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