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Serum Lipids and Lipoproteins Profile in Hypertensive Patients Reporting for Treatment at Central Hospital, Benin City, Nigeria

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In the study being reported, the serum levels of Total Cholesterol (T-CHOL), Triacylglycerol (TAG), LDL Cholesterol (LDL-C) and HDL Cholesterol (HDL-C) were determined in a total of 150 subjects comprised of 100 hypertensives (visiting the Central Hospital, Benin in outpatient capacity) and 50 normotensive individuals. The results obtained show that there were significant increases in serum T-CHOL, ($p < 0.05$), TAG ($p < 0.01$) and LDL-C ($p < 0.05$) in hypertensives relative to normotensive controls. Serum HDL-C was however significantly lower in the hypertensive subjects when compared with controls. The study suggests amongst other things that a significant proportion of hypertensives in Benin City may carry in their blood unacceptable and potentially dangerous levels of atherogenic lipids. It is also suggested that a substantial interplay exists between plasma lipid abnormalities and hypertension amongst sufferers within the population studied.

Key words: Hypertension, cholesterol, atherogenesis, lipoproteins, triacylglycerol, Benin City

INTRODUCTION

The role of elevated serum cholesterol in the etiology of arteriosclerosis and associated cardiovascular complications is already well established^[1,2]. On the basis of this understanding, several clinical trials have been conducted to test the hypothesis that a reduction in serum cholesterol level will lead to a reduction in morbidity and mortality arising from cardiovascular diseases. Martin *et al.*^[3] has shown that there is an increased risk associated with total serum cholesterol as low as 181 mg dL⁻¹ and that this risk increases progressively as serum total cholesterol levels increases. This assertion has been repeatedly supported by several other investigators^[4-7]. It is worthy of note that this relationship between elevated serum cholesterol and cardiovascular risk cuts across sex, race or age divides. This association has been found to hold true for men^[8], women^[6-11] blacks^[12,13] and the elderly^[14-19]. Findings from several angiographic studies also suggest that elevations in total cholesterol, LDL cholesterol and apolipoprotein B are a major risk factor in the aetiology of arteriosclerosis and associated cardiovascular abnormalities^[20-24].

As stated earlier, in the more developed nations of Europe and America, the contributions of abnormal plasma lipid distribution to the aetiology of cardiovascular disorders is already well documented and dietary modification is fast becoming an acceptable part of the management protocol for the disorder. Fears that several members of the general population may carry in their blood unacceptably high levels of atherogenic lipids with attendant potential risk of cardiovascular diseases prompted the present study which was designed to evaluate the level of these lipids in hypertensives reporting to the clinic for the first time. This is of great import since early detection of and dietary modification strategies are vital to the management of plasma lipid aberrations.

MATERIALS AND METHODS

Sample collection: A total of one hundred and fifty subjects comprising of fifty normotensive controls mean age 56.4 years and one hundred hypertensives, mean age 52.5 years were studied for serum lipids and lipoproteins levels. The goal was to establish the profile of these biochemical parameters in hypertensives visiting the Central Hospital, Benin City, Nigeria. It is worthy of note that some of these patients had actually visited the outpatient unit of the Hospital without any prior knowledge of their hypertensive state. Informed consent was obtained from all subjects prior to the commencement of the experiment and blood samples were

collected after an overnight fast. The subsequent biochemical analysis was carried out within hours of sample collection.

Biochemical assays: All biochemical parameters namely, Total Cholesterol (T-CHOL), HDL Cholesterol (HDL-C), LDL Cholesterol (LDL-C) and Triacylglycerol (TAG) were determined using standard procedures. Commercially available test kits, product of Rando Laboratories UK were used for all the assays and with the manufacturer's instructions strictly adhered to.

Statistical analysis: The group Mean±SEM was calculated for each analyte and significant differences between means evaluated using the student t- test, with p<0.05 considered as statistically significant.

RESULTS AND DISCUSSION

There was a significant increase in total cholesterol (p<0.01), triacylglycerol (p<0.05), LDL cholesterol (p<0.05) in hypertensive subjects relative to the normotensive control (Table 1). The data obtained for HDL cholesterol revealed a significantly depressed level (p<0.05) in hypertensives when compared with normal subjects. There was no sex related differences observed in the concentrations of serum lipids studied (data not shown).

The implication of elevations in plasma triacylglycerol, total cholesterol and LDL cholesterol on the aetiology of atherosclerosis and associated cardiovascular disorder is well established^[25-27].

Atherosclerosis is the distortion and obstruction of the artery which may result from the calcification and ulceration of atheromatous plaques. The condition is characterized by the proliferation of intima smooth muscle cells, together with macrophage association and formation of large amount of connective tissues by the proliferated cells. This is often accompanied with the accumulation of lipids, notably free and esterified cholesterol within the cell, as well as in the surrounding connective tissues^[28-31]. There is a positive correlation between the risk of developing ischaemic heart disease and raised levels of total and esterified cholesterol in plasma.

Table 1: Plasma lipid and lipoprotein profiles in normotensive and hypertensive subjects

Parameters (mg dL ⁻¹)	Control	Test (Hypertensive)	Statistics	
			p-value	t-value
T-CHOL	156.73±3.11 ^a	169.26±3.88 ^b	0.0347	2.132
TAG	59.12±2.55 ^a	66.26±1.43 ^b	0.0090	2.647
LDL-C	81.48±4.24 ^a	95.62±3.42 ^b	0.0122	2.537
HDL-C	64.16±1.83 ^a	57.14±2.01 ^b	0.0262	2.246

All values are Mean±SEM and values on the same row bearing different superscript differ significantly

Chronically elevated levels of LDL cholesterol leads to an increase in the number of cholesterol molecules in the plasma membrane. The result is an increase in the Cholesterol: Phospholipid ratio of the membrane. The increased viscosity and thus decreased malleability of the endothelial membrane is believed to be the primary potentiating factor in the aetiology of atherosclerosis^[32]. It has been suggested that oxidized LDL is injurious to endothelium and smooth muscle *in vitro*^[33,41]. Thus a rational approach to preventing the incidence of atherosclerosis should include reduction in LDL levels, prevention of LDL oxidation or both.

Several epidemiological and clinical studies have linked elevated triacylglycerol to an increased cardiovascular risk^[34,35]. It has been suggested that the link between elevated triacyl glycerol and cardiovascular complications may be secondary to other diseases^[36]. Various diseases that are associated with elevated plasma triacylglycerol such as diabetes mellitus and renal failure are at least in part associated with atherogenic risk.

HDL particles are believed to participate in the reverse transport of free cholesterol from peripheral tissues by way of a putative HDL receptor^[27]. This receptor mediated reverse transport may explain why patients with elevated HDL concentration are less prone to coronary artery disease^[37].

Rational management of hypercholesterolaemia are geared towards reducing plasma total cholesterol, LDL cholesterol and triacylglycerol, while increasing the proportion of HDL cholesterol^[26,38,39].

The plasma lipid pattern obtained in this study with elevated total cholesterol, LDL cholesterol and triacylglycerol and depressed HDL: total cholesterol and HDL:LDL cholesterol ratios in hypertensives relative to control suggests a significant potential for cardiovascular complications especially if the gradual buildup is left unmanaged. These ratios are considered useful tools in assessing the risk of developing coronary artery disease^[40].

This study suggests amongst other things that a significant proportion of hypertensives in Benin City and environs may carry in their blood unacceptable and potentially dangerous levels of atherogenic lipids. It is also suggested that there is a substantial interplay between plasma lipid abnormalities and the aetiology of hypertension amongst sufferers within the population studied. That a sizeable proportion of the sufferers studied were first time callers at the clinic without any prior knowledge of their hypertensive state is of particular importance. It implies that several members of the general population may be moderately or severely hypertensive without knowing. This clearly calls for increased

enlightenment campaigns by the respective agencies concerned. The findings also underscore the necessity of regular check up regimen for apparently healthy individuals and some measure of dietary modifications for confirmed hypertensives.

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