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Plasma Lipid Profiles in Hypertensive Nigerians

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Abstract

Background: The association between hypertension and dyslipidaemia is well established and both may add up to increase patients' susceptibility to the development of coronary heart disease. Methods: Lipid profiles were studied in one hundred and fifty (150) hypertensive patients aged 30-59 years and thirty (30) age- and socio-economically matched normotensive controls using standard laboratory techniques. Results: Of the 150 hypertensive patients, 54% (n = 69) were females with majority (45.7%) in the age range 50-59 years while majority (53.6%) of hypertensive males were in the age group 40-49 years. Hypertensive patients have significantly higher lipid profile except for HDL-Cholesterol, which did not show any significant difference in the two groups. Among the hypertensive patients, total cholesterol was positively correlated with triglyceride (0.399,p < 0.05), LDL-cholesterol (r = 0.609,p < 0.05) and HDL- cholesterol (r = 0.866,p < 0.05) and HDL-C positively correlated with LDL-C (r = 0.218,p < 0.05). In normotensive patients however, LDL-cholesterol was negatively correlated with triglyceride (r = -0.409,p < 0.05) while total cholesterol was positively correlated with LDL-cholesterol (r = 0.876,p < 0.05). Conclusion: Hypertensive Nigerians have significantly elevated plasma total cholesterol, Triglyceride and LDL-C but comparable HDL-C with normotensives. The clinical implications of elevated HDL-C in hypercholesterolemic hypertensive Nigerians are unclear.

INTRODUCTION

Hypertension which is defined as blood pressure of equal to or greater than 140/90mmHg [1] has been recognised as the most common cardiovascular disorder [2] and a leading cause of morbidity and mortality in both developed and developing countries [3]. Hypertension has been recognised as one of ten (10) leading reported causes of death with about 4% of such deaths due to hypertensive complications [4]. Although the prevalence of hypertension is higher in the whites than the black populations [5], and increases with age in both races [6], higher mortality is associated with hypertension in blacks, especially among Nigerians [56]. It has been found that men have a higher prevalence of hypertension than women although this changes later in life with substantial increase in the number of females with hypertension after the age of 50 years [6]. The risk factors that have been associated with hypertension include increased salt intake, obesity, diabetes mellitus, cigarette smoking, elevated serum lipids, sedentary lifestyle and diets rich in saturated fats, genetic factors and stress [7]. Dyslipidaemia (hyperlipidaemia), which is associated with hypertension, has been recognised as independent risk factor for cardiovascular disease, a leading diagnosis for visits to physicians [6] and cause of death [8]. The association between hypertension and dyslipidaemia is well established and both may add up to increase patients' susceptibility to the development of coronary heart disease. Different plasma lipids vary significantly in various population groups due to difference in geographical, cultural [9], economical, social conditions [10], dietary habits and genetic makeup. Age and gender differences also affect serum lipids considerably [111213]. This study was conducted to assess the plasma lipid profile of hypertensive Nigerians. The objective is to provide documented scientific information on the interactions between hypertension and lipid profile of hypertensive Nigerians.

MATERIALS AND METHODS

This study was conducted in the Department of Chemical Pathology in conjunction with the Department of Internal Medicine at the University of Benin Teaching Hospital, Benin City, Edo State, Nigeria. The Research and Ethics Committee of the University of Benin Teaching Hospital approved the protocol for the study. On obtaining their consents, hypertensive patients (diagnosed by a Consultant Physician in the Department of Internal Medicine of the University of Benin Teaching Hospital based on World Health Organisation-International Society of Hypertension

Guideline of blood pressure ≥ 140/90mmHg) aged 30-59 years were recruited. Inclusion criteria include being hypertensive for ≥ one year, use of neutral antihypertensive agents such as calcium channel blockers, angiotensin converting enzyme inhibitors, and angiotensin II receptor blockers. Excluded from the study were patients with diabetes mellitus, on oral contraceptives, on thiazide and/or beta-blockers, and any patients on lipid lowering drugs. Socio-demographic data were obtained by semi-structural questionnaire administered by one of the researcher (JOI).

On the whole, one hundred and fifty (150) hypertensive patients were recruited while thirty age- and socio-economically matched apparently healthy normotensive subjects served as the control. Height and weight were measured with the subject in light clothes without shoes, and BMI (Kg/m2) was calculated. Seven millilitres (5ml) venous blood were obtained between 08:00 and 10.00 a.m. after a 12 hour fasting period and dispensed into EDTA bottles. The samples were centrifuged at 2000g for 5 minutes after which plasma was isolated into a dry plain plastic screw capped containers and refrigerated (at -200C) prior to analyses.

Plasma total cholesterol and triglyceride concentrations were determined by enzymatic colorimetric assay as described previously [14] and modified by Richmond [15] and HDL-cholesterol and LDL-cholesterol were determined enzymatically after precipitation of other lipoprotein as described by Burstein et. al.[16] and Assmann et. al. [17] respectively, using kits from Biosystem Laboratories (Spain). All samples were analysed in duplicates after which the mean was determined.

RESULTS

Table 1 shows the sociodemographic data of the subjects. While majority of both the normotensive and hypertensive patients were married, the latter were significantly ($p < 0.05$) older (46.8 ± 8.2 vs. 38.8 ± 13.2) and mainly businessmen. Of the 150 hypertensive patients, 54% (n = 81) were females with majority (45.7%) in the age range 50-59 years while in the male hypertensive patients majority (53.6) were in the age group 40-49 years (table 2).

Figure 1

Table 1: Characteristics of hypertensive and normotensive patients (percentage in parenthesis)

Patients characteristics	Hypertensive n = 150	Normotensive n = 30
Age (years)	46.8 ± 8.2	38.8 ± 13.2
Occupation		
Artisan	13 (8.7)	5 (16.7)
Civil servants	43 (28.7)	7 (23.3)
Business/trading	53 (35.3)	6 (20)
High skilled professionals	22 (14.7)	10 (33.3)
Clergy	7 (4.7)	1 (3.3)
Farming	12 (8)	1 (3.3)
Marital Status		
Married	138 (92)	20 (66.7)
Single	9 (6)	10 (33.3)
Widowed	2 (1.3)	-
Divorced	1 (0.7)	-
Educational level		
Nil	13 (8.7)	-
Primary	36 (24)	4 (13.3)
Secondary	52 (34.7)	10 (33.3)
Tertiary	49 (32.7)	16 (53.3)

However, incidences of hypertension were generally low in the younger age group for both sexes. From table 3, the hypertensive patients were significantly ($p < 0.05$) heavier than the normotensive patients (28.34 ± 4.40kg/m2 vs. 25.79 ± 2.91kg/m2) with significantly higher lipid profile except for HDL-Cholesterol which did not show any significant difference in the two groups.

Figure 2

Table 2: Age distribution of hypertensive and normotensive patients (percentage in parenthesis)

Age groups (years)	Hypertensive			Normotensive		
	Male	Female	Total	Male	Female	Total
30-39	11 (15.9)	14 (17.3	25 (16.7)	9 (56.3)	10 (71.4)	19 (63.3)
40-49	37 (53.6)	30 (37)	67 (44.7)	6 (37.5)	1 (7.1)	7 (23.3)
50-59	21 (30.4)	37 (45.7)	58 (38.7)	1 (33.3)	3 (21.5)	4 (13.3)
Total	69 (46)	81 (54)	150 (100)	16 (53.3)	14 (46.7)	30 (100)

Figure 3

Table 3: BMI and Lipid profiles of hypertensive and normotensive patients

	Hypertensive n = 150	Non-hypertensive n = 30	*P*-value
BMI (kg/m²)	28.34 ± 4.40	25.79 ± 2.91	0.003*
Total cholesterol (mmol/l)	4.67 ± 1.26	3.69 ± 0. 67	< 0.0001*
Triglyceride (mmol/l)	1.65 ± 0.67	1.40 ± 0.43	0. 010*
HDL-Cholesterol (mmol/l)	1.31 ± 0.51	1.22 ± 0.27	0.174
LDL-Cholesterol (mmol/l)	2.61 ± 0.96	1.79 ± 0.81	< 0.0001*

Legend: **BMI:** Basal metabolic index; **HDL:** High density lipoprotein; **LDL:** Low density lipoprotein **P*-value < 0.05 (significant)

Table 4 shows that the female hypertensive patients were significantly heavier than their male counterparts (29.29 ± 4.79kg/m2 vs. 27.24 ± 3.62kg/m2). Although, the lipid profiles were higher in the female than male hypertensive patients, only total cholesterol was statistically significant (4.86 ± 1.29mmol/l vs. 4.45 ± 1.19mmol/l).

Figure 4

Table 4; Sex related comparison of BMI and lipid profile in hypertensive Nigerians

	Male (n = 69)	Female (n = 81)	p-values
BMI (kg/m²)	27.24 ± 3.62	29.29 ± 4.79	< 0.05*
Total cholesterol (mmol/l)	4.45 ± 1.19	4.86 ± 1.29	< 0.05*
Triglyceride (mmol/l)	1.61 ± 0.71	1.69 ± 0.63	P > 0.05
HDL-Cholesterol (mmol/l)	1.23 ± 0.48	1.38 ± 0.53	P > 0.05
LDL-Cholesterol (mmol/l)	2.49 ± 0.93	2.71 ± 0.98	P > 0.05

*P –value < 0.05 is considered significant

Pearson correlation analyses showed that among the hypertensive patients, total cholesterol was positively correlated with triglyceride ($r = 0.399$, $p < 0.05$), LDL-cholesterol ($r = 0.609$, $p < 0.05$) and HDL- cholesterol ($r = 0.866$, $p < 0.05$). Also, HDL-cholesterol was positively correlated with LDL-cholesterol ($r = 0.218$, $p < 0.05$). Additionally, while total cholesterol was positively correlated with LDL-cholesterol in the normotensive patients ($r = 0.876$, $p < 0.05$) LDL-cholesterol showed negative correlation with triglyceride ($r = -0.409$, $p < 0.05$).

DISCUSSION

This study has shown that the prevalence of hypertension is highest in age group 40-49 years and 50-59years for male and females respectively. This is consistent with earlier study in Ibadan, Nigeria [18]. Several studies in both developed and developing countries have consistently shown a positive relationship between age and blood pressure [1920]. Although nutrition assessment was not part of the present study, the high prevalence of hypertension in the businessmen and civil servants than any other occupations could be partly attributed to higher BMI in these groups due to increased calorie intake which lead to overweight and obesity which are known risk factors for hypertension. In addition to environmental factors such as stress and inactivity, these groups are highly enlightened and high prevalence of hypertension recorded could be as a result of their awareness to seek and be able to afford the cost of Medicare. The significantly higher plasma total cholesterol, triglycerides and LDL-cholesterol in the hypertensive than in the normotensive patients in the present study is in corroboration with earlier studies [21222324]. Again, studies in non-blacks have demonstrated similar trends of hypercholesterolaemia in hypertensives compared to normotensive controls [2526].

Increase in plasma total cholesterol level, especially in the presence of hypertension has been associated with coronary heart disease. Studies [2728] have shown that atherosclerosis risk factor such as high plasma cholesterol level is less in blacks compared to the European white population. In a study in South Africa [26], adult white males had higher mean serum cholesterol than blacks (5.27mmol/L vs. 4.29 mmol/L). Despite the lower concentration of plasma total cholesterol in our hypertensives (4.67mmol/L) compared to the commonly accepted upper limit of 5.18mmol/L this was significantly higher than the value in the normotensive controls. However, some researchers have argued that the desired range of plasma total cholesterol concentrations as advocated for developed countries may have to be reviewed for developing countries based on the suspicion that subjects in developing countries could be prone to developing CHD at a lower plasma cholesterol level [29]. Significantly, higher triglycerides in the hypertensives than in non- hypertensives in the present work is of particular importance since some workers are of the opinion that serum triglycerides is an independent risk factor for coronary heart disease [30]. Also high plasma triglyceride level has been found to be more predictive of heart disease in women than men. However, our hypertensive men and women did not show any significant difference in plasma triglycerides level. On the other hand report has shown that hypertriglyceridaemia and not hypercholesterolaemia was associated with myocardial infarction [31].

Interestingly, our hypertensive females have significantly higher total cholesterol than their male counterparts, suggesting that hypercholesterolaemia rather than hypertriglyceridaemia may be more associated with CHD in female than males in this population. The lack of statistically significant difference in the plasma concentration of HDL-Cholesterol in the hypertensives and normotensives is in agreement with studies elsewhere [2132]. It suggests that the hypertensives in our population are relatively protected from CHD. Timothy [32] in an earlier prospective study of coronary heart disease showed that adult blacks have higher mean levels of HDL-Cholesterol than whites. The racial difference in plasma HDL-C has been suggested to be either due to genetic or environmental factors. Genetic factor, more than environmental factor is adjudged to be more responsible for the higher level of HDL-C in blacks [33]. However, cord blood HDL-C in neonates revealed no difference between races [34]. Similarly, cord blood from infants of subjects from high and low income groups did not have any difference in the levels of total and HDL-C in a Nigerian study [35]. The above findings in cord blood across racial and socioeconomic groups support the fact that environment plays an important role in HDL-C metabolism. However our findings show no significant difference in HDL-Cholesterol between hypertensive male and females. Findings on the preponderance of hyper HDL-Cholesterol in women are varied. Some studies [3637] showed increase HDL-C levels in premenopausal women who enjoy relative immunity from CHD while others showed a significant increase in plasma HDL-C even in elderly women.

It is therefore concluded that hypertensive Nigerians have significantly elevated plasma total cholesterol, Triglyceride and LDL-C but comparable HDL-C with normotensives and hypercholesterolaemia rather than hypertriglyceridaemia may be a better predictor of CHD in Nigerian female hypertensives. It however remains unclear the clinical implications of elevated HDL-C in hypercholesterolemic hypertensive Nigerians.

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