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Dyslipidaemia in Hypertensives in South-South Nigeria

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Author's contribution

This whole work was carried out by author JOI.

Original Research Article

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ABSTRACT

Background: There is a strong relationship between hypertension and dyslipidaemia, and both can increase the risk of developing coronary heart disease.
Methods: A total of One hundred and eighty (180) participants were recruited for this study; out of which, there was one hundred and fifty (150) hypertensive patients and thirty (30) control subjects that were age- and socio-economically matched with the hypertensive patients. Lipid profile test was carried out for them using standard laboratory techniques.
Results: Fifty-four percent (n=69) of the hypertensive patients were females; majority of the female hypertensive patients were within the age bracket of 50-59years (45.7%) while majority of the male hypertensive patients were within the age bracket of 40-49 years (53.6%). With the exception of HDL-cholesterol values which were comparable with the Normotensive controls, the hypertensive patients had significantly higher lipid profiles (triglyceride, total cholesterol and LDL-cholesterol). There was positive correlation between total cholesterol, triglycerides (0.399, $p<0.05$), LDL-cholesterol ($r=0.609$, $p<0.05$) and HDL-cholesterol ($r=0.866$, $p<0.05$) among the hypertensive patients, also, HDL-cholesterol positively correlated with LDL-cholesterol ($r=0.218$, $p<0.05$) but in the normotensive patients, LDL-cholesterol negatively correlated with triglyceride ($r=-0.409$, $p<0.05$) and positively correlated with total cholesterol ($r=0.876$, $p<0.05$).
Conclusion: Hypertensive Nigerians have significantly higher lipid profile except the HDL-cholesterol which is comparable in both hypertensive and Normotensive Nigerians.

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This shows that the dyslipidaemia in hypertensive Nigerians majorly involve plasma total cholesterol, triglyceride and LDL-cholesterol.

Keywords: Dyslipidaemia; hypertension; normotensives; coronary heart disease; Nigerians.

1. INTRODUCTION

Dyslipidaemia is a common disorder but most patients are not diagnosed and therefore not treated [1]. The burden of the condition is very high in terms of morbidity, mortality, and medical costs. Dyslipidaemia is the second most prevalent cardiovascular risk factor [2]. Hypertriglyceridaemia when associated with high LDL cholesterol significantly increases the risk of coronary heart disease (CHD) [3]. Hypertension has for long been recognized globally as the most common cardiovascular disease and is an acknowledged potent risk factor in the development of coronary heart disease, stroke, congestive heart failure and renal insufficiency [4].

Hypertension is defined as blood pressure of equal to or greater than 140/90mmHg [5,6] from previous surveys therefore, the prevalence of hypertension in Nigeria was found to be 17–20percent [7,8] or more [9]. The prevalence of hypertension in Nigeria is said to be low compared to that of United States of America but the mortality associated with it in Nigeria remains high [10]. Some of the reasons advanced for this include high cost of newer antihypertensive drugs and even attitude of key players such as drug prescription pattern [11,12] in the management of hypertension. Hypertension is a powerful risk factor for cardiovascular disease and it remains one of the biggest health and economic issues facing the world [13,14]. The mortality associated with hypertension is higher in blacks, especially among Nigerians [7,8] than Caucasians despite the fact that the prevalence of hypertension is higher in the whites than the black populations [5] and increases with age in both races [8]. 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 [8]. Hypertension is known to be associated with alterations in lipid metabolism which gives rise to abnormalities in serum lipid and lipoprotein levels. It has been documented that the presence of hyperlipidaemia substantially worsens the prognosis of hypertension [15]. 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 [11]. Dyslipidaemia which is associated with hypertension, has been recognised as independent risk factor for cardiovascular disease, a leading diagnosis for visits to physicians10 and cause of death [12]. There is a strong association between hypertension and dyslipidaemia, and these may synergistically increase the risk of developing coronary heart disease. Dyslipidaemias vary significantly in various population groups due to difference in geographical, cultural [11], economical, social conditions14 dietary habits and genetic makeup. Age and gender differences also affect serum lipids considerably [13,14,15].

The main goal of treatment of hypertension is to reduce the cardiovascular morbidity and mortality, and influence the known modifiable risk factors that interact with the hypertension to increase cardiovascular risk [11,16,17]. This study was conducted to assess dyslipidaemia in hypertensive patients living in south-south Nigeria.

2. PATIENTS AND METHODS

2.1 Study Population

This study was conducted in South-South Nigeria in the Department of Chemical Pathology, University of Benin Teaching Hospital, Benin City. The Research and Ethics Committee of the University of Benin Teaching Hospital approved the protocol for the study. One hundred and fifty known hypertensive patients were recruited for this study, most of the hypertensive patients were between the ages of 30 and 59years. The inclusion criteria used in recruiting the hypertensive patients 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 while the exclusion criteria were patients with diabetes mellitus, on oral contraceptives, on thiazide and/or beta-blockers, and any patients on lipid lowering drugs. Thirty age and socioeconomically matched normotensive control subjects were also recruited for the study; Socio-demographic data were obtained by semi-structural questionnaire.

2.2 Sample Collection

A total of one hundred and eighty (180) participants were recruited for this study; one hundred and fifty (150) were hypertensive patients aged 30-59 years and thirty (30) age- and socio-economically matched normotensive controls. Height and weight were measured and BMI was calculated by dividing the weight in kilogram by the square of the height in meters. Five milliliters (5ml) of venous blood were obtained between 8.00 and 9.00am after 10-12hour overnight fast and dispensed into EDTA bottles. The plasma was then separated from the whole blood after centrifuging for 5minutes at 3000rpm and kept in plain bottle after which it was refrigerated at -20℃ prior to analyse s.

2.3 Biochemical Assay

Plasma total cholesterol and triglyceride concentrations were determined by enzymatic colorimetric assay as described previously [18] and modified by Richmond [19] and HDL-cholesterol and LDL-cholesterol were determined enzymatically after precipitation of other lipoprotein as described by Burstein et al. [20] and Assmann et al. [21] respectively, using kits from Biosystem Laboratories (Spain). All samples were analysed in duplicates after which the mean was determined.

2.4 Data Analysis

Data analysis was conducted using the general linear model of SAS (statistical for agric and sciences) 2004 model. All results were expressed as mean±standard error of mean. Multiple group comparison was performed by one way ANOVA followed by Duncan test.

Pearson correlation coefficient was employed to determine the association between various parameters.

Chi–Square test with one degree of freedom (for dichotomous variables and unpaired t-test (for continuous variable) were used for the evaluation of differences between groups.

3. RESULTS

The sociodemographic data of hypertensive and normotensive patients are shown in (Table 1). Most of the hypertensive patients were business men and they were significantly older than the Normotensive controls (46.8±8.2 vs. 38.8±13.2). fifty-four percent54% (n=81) of the hypertensive patient were females with majority (45.7%) in the age range 50-59 years, while majority (53.6%) of the male hypertensive patients were in the age group 40-49 years (Table 2).

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(4.2)	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		
Nill	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. In (Table 3), the hypertensive patients had significantly ($p<0.05$) higher BMI than the normotensive patients (28.34±4.40kg/m2 vs. 25.79±2.91kg/m2), with the exception of HDL-cholesterol, the hypertensive patients also had significantly higher lipid profile (triglyceride, total cholesterol and LDL-cholesterol).

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)

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/1)	4.67±1.26	3.69±0.67	<0.0001*
Triglyceride (mmol/1)	1.65±0.67	1.40±0.43	0.010*
HDL-Cholesterol (mmol/1)	1.31±0.51	1.22±0.27	0.174
LDL-Cholesterol (mmol/1)	2.61±0.96	1.79±0.81	<0.0001*

In (Table 4), the female hypertensive patients had significantly higher total cholesterol (4.86±1.29mmol/l vs. 4.45±1.19mmol/l) and BMI (29.29±4.79kg/m2 vs. 27.24±3.62kg/m2) than their male counterparts.

Table 4. Comparison of BMI and lipid profile in male and female hypertensive patients

	Male (n=69)	Female (n=81)	p-value
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	>0.05
HDL-Cholesterol (mmol/L)	1.23±0.48	1.38±0.53	>0.05
LDL-Cholesterol (mmol/L)	2.49±0.93	2.71±0.98	>0.05

Pearson correlation analyses showed that there was positive correlation between total cholesterol, triglyceride ($r=0.399$, $p<0.05$), LDL-cholesterol ($r=0.609$, $p<0.05$) and HDL-cholesterol ($r=0.866$, $p<0.05$) among the hypertensive patients. Also, HDL-cholesterol positively correlated with LDL-cholesterol ($r=0.218$, $p<0.05$). This trend differs in the Normotensive subjects, where there is a significant negative correlation between LDL-cholesterol and triglyceride ($r=-0.409$, $p<0.05$) but positive significant correlation between total cholesterol and LDL-cholesterol ($r=0.876$, $p<0.05$).

4. DISCUSSION

In this present study, the prevalence of hypertension was highest in age group 40-49years in males and 50-59years in females respectively. This is similar to observations from other sub-sahara African countries [16,22,23]. Several studies in both developed and developing countries have consistently shown a positive relationship between age and blood pressure [24,25,26,27,28]. In this study, majority of the hypertensive patients were businessmen and civil servants this 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 hypertension15, in addition to environmental factors such as stress and physical inactivity. More also, these groups are highly enlightened and the high prevalence of hypertension recorded could be as a result of their awareness to seek and be able to afford the cost of Medicare. This present study showed a significantly higher plasma total cholesterol, triglycerides and LDL-cholesterol in the hypertensive than in the normotensive patients, this is in agreement with the findings of Osuji et al and other earlier studies in sub-sahara Africa [25,29,30,31,32,33,34]. Again, studies in non-blacks have equally demonstrated similar trends of hypercholesterolaemia in hypertensives compared to normotensive controls [35,36].

The American Heart Association estimates in 2006 showed that a third of all Americans (100 million people) have total cholesterol levels greater than 5.18mmol/L (moderately high), while 34million adult Americans have total cholesterol greater than 6.22mmol/L (high levels necessitating treatment) [37]. Goff et al. [38] in their multi ethnic study of atherosclerosis (MESA) which focused on dyslipidaemia prevalence, treatment and control and which involved a multi-center cohort of 6814 persons, aged 45-84years, free of clinical cardiovascular disease, reported an overall dyslipidaemia prevalence of 29.3%; Non-Hispanic whites (males 36.9%, females 24.4%) recorded higher prevalence compared to blacks (males 31.2%, females 29.1%). In this study, the hypertensive patients had a mean plasma total cholesterol level of 4.67mmol/L which is low compared to the values above but this value was significantly higher than that of the normotensive controls, this finding is further supported by a study carried out in South Africa [34], in which adult white males had higher mean serum cholesterol than blacks (5.27mmol/L vs. 4.29mmol/L). 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 [39]. There was statistically significant higher triglycerides in the hypertensive patients than in non- hypertensive control in the present work, this is of particular importance since some workers are of the opinion that serum triglycerides is an independent risk factor for coronary heart disease [40]. Also high plasma triglyceride level has been found to be more predictive of heart disease in women than men but in this study there was no significant difference in plasma triglycerides level in the male and female hypertensive patients. On the other hand, Olusi et al showed that hypertriglyceridaemia and not hypercholesterolaemia was associated with myocardial infarction [41].

The female hypertensive patients in this study had significantly higher mean plasma 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. There was no statistically significant difference in the plasma concentration of HDL-Cholesterol in the hypertensive patients and Normotensive controls in this study, this is in agreement with the findings of Kesteloot et al. [42] and other studies else where [17,25,26,29,43,44]. It suggests that the hypertensives in our population are relatively protected from CHD; this finding is further supported by Timothy [43], who in an earlier prospective study of coronary heart disease showed that adult blacks have higher mean levels of HDL-Cholesterol than whites. However, in this present study, there was no significant difference in the plasma HDL-Cholesterol concentration between hypertensive male and females, this is at variance with some other studies [45,46] which 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.

5. CONCLUSION

Hypertensive Nigerians have significantly higher lipid profile except the HDL-cholesterol which is comparable in both hypertensive and Normotensive Nigerians. This shows that the dyslipidaemia in hypertensive Nigerians majorly involve plasma total cholesterol, triglyceride and LDL-cholesterol. Hypercholesterolaemia rather than hypertriglyceridaemia may be a better predictor of CHD in Nigerian female hypertensives.

CONSENT

All the participants were properly briefed about the study and an informed consent was obtained from them before venous blood was collected.

ETHICAL APPROVAL

The study was approved by the Research and Ethics Committee of the University of Benin Teaching Hospital.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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