Pattern of some risk factors for cardiovascular disease in untreated Nigerian hypertensive patients

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Summary

Objective: **Coronary heart disease risk factors tend to cluster in patients with hypertension. In works done in Nigeria, the hypertensive subjects studied were those receiving treatment. Our aim was to evaluate the pattern of these risk factors in untreated hypertensive patients.**

Study design: **Fifty untreated hypertensives and fifty normotensives were recruited among salary earners in Ilorin, Nigeria, after excluding conditions that can cause dyslipidaemia. Plasma total cholesterol (TC), Triglycerides (TG), HDL Cholesterol (HDL-C), LDL Cholesterol (LDL-C), Fasting Plasma Glucose (FBG) and Body moras Index (BMI) were determined in the subjects.**

Result: **Prevalence of hypertension increased with age. Plasma TC, HDL-C, LDL-C and BMI were higher in hypertensives (TC; 4.54mmol/L ±1.56, HDL-C; 1.28mmol/L ± 0.45, LDL-C; 3.21mmol/L ± 1.34, BMI; 26.42kg/m^2 ± 4.75) than in normotensive controls (TC; 3.20mmol/L ± 1.28, HDL-C; 0.93mmol/L ± 0.41, LDL-C; 2.28mmol/L ± 1.01, BMI; 23.37kg/m^2 ± 4.75). Overweight was more common in hypertensives (70%) than in normotensives, and females constituted 53% of the overweight hypertensives.**

Conclusion: **The dyslipidaemia associated with hypertension, is here noted to be present before commencement of antihypertensive therapy. This observation should influence drug prescription for treatment of hypertension. Overweight hypertensives are likely to benefit from a concurrent control of blood pressure and body weight**

Key-words: ***Coronary heart disease, Risk factors, Hypertension, Nigeria.***

Résumé

Objectif: Des facteurs de risques de la maladie de coeur coronaire a tendance à se rassembler autour des patients atteints d'hypertension. D'après des recherches effectuées au Nigéria, des sujets hypertensifs étudiés étaient ceux qui recevoient du traitement. Notre objectifs est d'évaluer la tendance de ces facteurs de risques chez des hypertensifs qui n'ont pas le moyen de recevoir du traitement..

Plan d'étude: Cinquante cas d'hypertensifs sans traitement et cinquante cas des normotensifs ont été embaucher parmi des salariers à Ilorin, au Nigéria après avoir exclu des conditions qui pourront provoquer le plasma dyslipidémie TC, TG, HDL-C, LDL-C, FBS et BMI ont été décidés chez des sujets.

Résultats: La fréquence d'hypertension augement avec l'âge. Plasma TC,HDL-C, LDL-C et BMI étaient très élevé chez des hypertensifs (TC; 4,54 mmol/L±-1.56, HDL-C; 1,28mmol/1± 0.45, LDL-C; 3,21mmo1/L±-1,34, BMI; 26,42 Kg/m^2+ 4.75) plus que chez le groupe temoin normo-tensifs, (TC ;3,20mmol/L+ 1,28, HDL-C; 0,93mmol/L± 0,41, LDL-C; 2,28mmol/L ± 1,01, BMI; 23.37Kg/m^2± 4.75. Surpoids était plus ordinaire chez des hypertensifs (70%) plus que chez des normotensifs; et des sujets du sexe féminin constituent 53% des hypertensifs surpoids.

Conclusion: La dyslipidémie liée avec l'hypertension est ici notée d'être présente avant le commencement de la thérapie d'antihypertensif. Cette observation devrait influencer l'ordonnance des drogues pour le traitement de l'hypertension. Il y a des chances pour que des cas des hypertensifs surpoids bénéficient d'un contrôle de la tension artérielle et poids du corps.

Introduction

The incidence of coronary heart disease (CHD) is said to be increasing in some parts of Africa.[1] Experience from comparative studies in America suggest that blacks manifest more CHD risk factors than whites.[2] Apart from hypertension, other risk factors that contribute to this emerging enormous health burden include, male gender, hyperlipidaemia and obesity[3,4]. These risk factors tend to cluster in patients with hypertension, with the observation that obesity, lipid abnormalities and impaired glucose tolerance, commonly coexist in them.[5]

The prevalence of some traditional risk factors for CVD, such as hypertension, impaired glucose tolerance and obesity, is said to disproportionately affect blacks.[6] This might contribute to the observation that cases of ischaemic heart disease may be rising in Nigerians. [3] The belief in some quarters is that despite lower plasma Total Cholesterol (TC), Triglyceride (TG), and higher High Density Lipoprotein Cholesterol (HDL-C) in blacks, the clustering of certain CVD risk factors can result in a risk profile that abolishes the advantages of reduced TC, TG and higher HDL-C.[6,7]

This makes the assessment of CVD risk factors es-

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sential in our community, especially in hypertensives. Though various studies in Nigeria [8,9] have related hypertension with hyperlipidaemia, obesity and impaired glucose tolerance, none has evaluated these factors in untreated hypertensives.

Our thinking is that, analyses of the CVD risk factors in untreated hypertensives could contribute to making clear why treatment of hypertension by blood pressure (BP) reducing agents alone has decreased stroke incidence more than that of CHD.[10]

Materials and method

In order to recruit strictly untreated hypertensives, we undertook BP screening exercise for some government and private agency workers in Ilorin, Nigeria. Hypertension was defined as BP ³ 140/90mmHg. Subjects, who had hypertension at first visit, were re-evaluated the next day and taken as hypertensives if they had a BP ³ 140/90mmHg.

Apart from those who gave history suggestive of diabetes mellitus, chronic renal disease, chronic liver disease and use of oral contraceptives, the other hypertensives numbering 60, were temporarily recruited for the study. These hypertensives and 80 normotensive controls were fasted overnight for at least 12 hours after which 10mls of venous blood was collected from the ante-cubital fossae of each subject. Seven millitres (7mls) of collected blood was put into EDTA-bottle and the remaining 3mls put in a Fluoride Oxalate bottle. The blood samples were spun for 10minutes at 2,500 rpm, and their plasma put in well-labeled plastic bottles that were kept in a freezer at –20°C. Analytes determined in the EDTA samples were TC, TG, and HDL-C. The value of Low Density Lipoprotein Cholesterol (LDL-C) was calculated based on the Friedwald Formula;[11] LDL-C (mmol/L) = (TC mmol/L)-(HDL-C mmol/L)-(TG mmol/L).

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Fasting plasma glucose (FPG) was determined in the Fluoride Oxalate plasma. Based on the results of FPG, subjects who had values ³ 7.00mmol/L were excluded from the study. The height (metres) and weight (kilogram) of the subjects were measured in order to determine their Body Mass Index (BMI).

In all, we recruited fifty hypertensive subjects and fifty normotensives that served as controls. The plasma concentrations of TC, TG, HDL-C, LDL-C, FPG, BMI, systolic and diastolic BP, of all recruited subjects were evaluated using Epi-info Version 6.03 statistical package.

Results

The mean age in years of untreated hypertensives (45.26 years ± 7.63) and controls (44.06 years ± 11.93) did not show any significant difference. Eighty-two (82%) of the hypertensives were above 40 years of age. There was a graded increased prevalence of hypertension with age; it was 4% at 20-29 years bracket and this peaked at 46% in the 50-59 years bracket. After the age of 60 years, this prevalence dropped to 4%. (Table 1)

Mean plasma TC in the hypertensives (4.54 ± 1.56mmol/L) was higher than the value in the control group (3.20 ± 1.28mmol/L). Plasma TC in the male hypertensives (4.48 ± 1.43mmol/L) and the female hypertensives (4.65 ± 1.81mmol/L) were higher than the values in male and female hypertensives respectively (males; 3.53 ± 1.39mmol/L, females; 2.77 ± 0.84mmol/L). These differences were statistically significant (P < 0.05). Table 2 & 3.

The mean plasma TG levels in the whole population of hypertensives (1.00 ± 0.51mmol/L) and controls (0.87 ± 0.43mmol/L) did not show any significant difference. Plasma TG level was higher in male hypertensives (1.12 ± 0.57mmol/L) than in male controls (0.87 ± 0.28mmol/L). The mean plasma TG in female hypertensives (0.76 ± 0.24mmol/L) and female controls (0.88 ± 0.57mmol/L) did not show any significant difference. Male hypertensives had a significantly higher mean TG (1.12 ± 0.57mmol/L) than female hypertensives (0.76 ± 0.24mmol/L) at P < 0.05.

Mean plasma HDL-C in the hypertensives (1.28 ± 0.45mmol/L) was significantly higher than in the controls (0.93 ± 0.41mmol/L). The mean plasma HDL-C in male hypertensives (1.31± 0.47mmol/L)and female hypertensives (1.23 ± 0.41mmol/L) were significantly higher than the values in male and female controls respectively (males; 1.05 ± 0.45mmol/L, females; 0.77 ± 0.29mmol/L). P < 0.05.

The mean plasma LDL-C concentration was higher in the hypertensives (3.21 ± 1.34mmol/L) than in the controls (2.28 ± 1.01mmol/L). Both male and female hypertensives had higher mean plasma LDL-C (males; 3.07 ± 1.20mmol/L, females; 3.48 ± 1.57mmol/L) than their respective controls (males; 2.49 ± 1.23mmol/L, females; 2.01 ± 0.56mmol/L). The differences in values were significant a P < 0.05. Table 2 & 3.

The mean FPG levels among the hypertensives (3.57 ± 0.76mmol/L) and controls (3.72 ± 0.64mmol/L) did not show any significant difference. The mean FPG in male (3.65 ± 0.79mmol/L) and female (3.72 ± 0.66mmol/L) hypertensives were not significantly different from those of male (3.59 ± 0.68mmol/L) and female (3.18 ± 0.55mmol/L) controls.

Body Mass Index (BMI) was significantly higher in hypertensives (26.42 ± 4.75kg/m^2) than in controls (23.37 ± 4.75kg/m^2). P < 0.05. The mean BMI in male hypertensives (24.82 ± 3.77kg/m^2) and male controls (23.71 ± 5.35kg/m^2) did not show significant difference. The difference in mean BMI of female hypertensives (29.51 ± 5.01kg/m^2) and female controls (22.93 ± 3.95kg/m^2) was significant at P < 0.05. Table 3.

The female hypertensives mean BMI (29.51 ± 5.01kg/m^2) was significantly higher than that of the male hypertensives (24.82 ± 3.77kg/m^2) at P < 0.05. Table 4.

Seventy percent (70%) of the hypertensive subjects were overweight as against 44% in the normotensives. About 53% of the overweight hypertensives (32) were females while 47% (18) were males. Seventy percent (70%) of the overweight females were obese (BMI ³ 30kg/m^2), and 46.7% of overweight males were obese. Table 5.

Table 1 The age and sex distribution in the hypertensive and control groups

Age group	Hypertensives		Controls	
Years	Male	Female	Male	Female
20-29	1	1	2	3
30-39	1	6	7	4
40-49	10	6	10	9
50-59	14	9	4	3
60-69	1	16	5	3
Total	27	23	28	22

Table 2 Comparison of the values of parameters measured in TC hypertensive and control subjects

Variable	Hypertensives	Controls	P-value
TC (mmol/L)	4.54 (1.56)	3.20(1.23)	0.00
TG (mmol/L)	1.00 (0.51)	0.87(0.43)	0.196
HDL-C (mmol/L)	1.22 (0.45)	0.93(0.41)	0.00
LDL-C (mmol/L)	3.21 (1.34)	2.28(1.01)(mmol/L)	0.001
FPG (mmol/L)	3.57 (0.76)	3.72	0.30
Systolic BP (mmHg)	152.96(15.63)	119.50(7.97)	0.00
Diastolic BP (mmHg)	96.00 (7.07)	77.70(4.54)	0.00
BMI(kg/m ^{2})	26.42 (4.75)	23.37(4.75)	0.002

Statistical significance at P < 0.05

Table 3 Comparison of the parameters based on gender in the hypertensive and control gorups

Parameters	Male Hypertension (SD)	Male Controls (SD)	Female Hypertension (SD)	Female Controls (SD)
TC (mmol/L)	4.48 (1.43)*	3.53(1.39)	4.65 (1.81)*	2.77(0.84)
TG (mmol/L)	1.12 (0.57)*	0.87(0.29)	0.76 (0.24)	0.88(0.57)
HDL-C (mmol/L)	1.31 (0.47)*	1.05(0.45)	1.23 (0.41)*	0.77(0.29)
LDL-C (mmol/L)	3.07 (1.20)*	2.49(123)	3.48 (1.57)*	2.01(0.56)
FBG (mmol/L)	3.65 (0.80)	3.59(0.68)	3.72 (0.64)	3.81(0.55)
Systolic BP (mmHg)	154.64(17.70)*	121.43(7.60)	149.70(10.23)*	117.05(7.97)
Diastolic BP (mmHg)	95.15 (7.55)*	78.75(3.76))	97.65 (5.89)*	76.36(5.16)
BMI(kg/m^2)	24.82 (3.77)	23.71(5.35)	29.51 (5.01)*	22.93(3.95)

* = *Significance at P < 0.05*

Table 4 Table showing differences in the parameters among hypertensives

Parameters	Male Hypert (SD)	Female Hypert (SD)	P-value
TC (mmol/L)	4.48(1.43)	4.65(1.81)	0.615
TG (mmol/L)	1.12(0.57)	0.76(0.24)	0.000
HDL-C (mmol/L)	1.31(0.47)	1.23(0.41)	0.367
LDL-C (mmol/L)	3.07(1.20)	3.48(1.57)	0.144
FBG (mmol/L)	3.65(0.80)	3.72(0.66)	0.144
Systolic BP (mmHg)	154.64(17.70)	149.71(10.23)	0.091
Diastolic BP (mmHg)	95.15(7.55)	97.65(5.89)	0.067
BMI(kg/m^2)	24.82(3.77)	29.51(5.01)	0.000

Statistical significance at P < 0.05

Hypert. = Hypertension

Table 5 BMI frequency table in hypertensives and controls

BMI GRPS	Hypertensive (N)		Controls (N)	
Years	Male	Female	Male	Female
< 20	0	0	2	0
20.0-24.9	12	3	14	10
25.0-29.9	8	6	4	5
≥ 30	7	14	6	7
Total	27	23	28	22

Discussion

The mean age in the hypertensives was 45.26 years and 82% of them were above 40 years of age. In this study, there was an increase in the prevalence of hypertension as age increase, and this peaked at 46% in the 50-59 years bracket. The association of age and hypertension had earlier been described in several other studies [12,13,14].

The untreated hypertensives had a significantly higher plasma TC than the controls. Some workers in Nigeria [8,15] noted elevated plasma TC in hypertensives receiving treatment. This increase in TC can either be due to antihypertensive agents,[16] or an integral component of the metabolic disorder associated with the condition.[10] Our findings suggest that there is hitherto dyslipidaemia associated with hypertension in our subjects. This can be worsened by lipid-hostile antihypertensives in patients who use them. Hypercholesterolaemia in the presence of hypertension is associated with increased susceptibility to CHD.

A similar increase in plasma TG was demonstrated only in untreated male hypertensives. The danger of hypertriglyceidaemia lies in its predisposition of patients to thrombosis, by increasing Factor VII coagulant activity.[17] Some studies suggest that TG level is an independent CHD risk factor only when HDL-C is low[18], or when the LDL-C:HDL-C ratio is high, largely due to low HDL-C[19].

The level of HDL-C in our hypertensives was not particularly low, as is the pattern in Caucasians in which low plasma HDL-C and high TG commonly coexist. [10] Our hypertensives had a mean plasma HDL-C level that was significantly higher than that of controls. Such increase in HDL-C could affect the LDL-C: HDL-C ratio mentioned above and so mitigates the observed elevated plasma TG, especially in men. The association of elevated HDL-C in blacks could be contributory to observed lesser prevalence of CHD among them[20]. This favourable pattern could change with the adoption of such lifestyle practices as smoking, sedentary posture, dietary changes and increasing body weight. Unfortunately, we could not get accurate information on smoking habit in most of our subjects.

In like manner, the untreated hypertensives had a higher mean plasma LDL-C than controls. Elevated plasma LDL-C is an established modifiable risk factor for CVD.[21] The increase in LDL-C in hypertensives which we noted in our study, was not reflected in a study done in Norway.[22] But in another study done in united Kingdom (UK),[23] there was a higher but not significant plasma LDL-C in hypertensives compared to normotensive controls. This UK study however found that untreated hypertensives have a preponderance of smaller LDL subfractions. The outright increase in mean plasma LDL-C in our subjects could be due to such confounding variables as body weight, fat distribution, diet, physical activity and other lifestyle factors,[22] which we did not control for.

Body weight as determined by BMI was also higher in the hypertensives. This was not so among the males in which the hypertensives and controls did not show any significant difference in mean BMI. Increase in BMI was greater in females, this suggest that the well documented association of body weight and blood pressure[24], is more relevant among our female hypertensives. Overweight is seen by some workers as the central factor in the origin of hypertension in those patients who are overweight.[25] Furthermore, increased BMI has been positively related to serum cholesterol[26] and cardiovascular mortality[27]. Commonly, elevated BMI, dyslipidaemia and impaired glucose tolerance coexist in hypertensive subjects, thus making them more prone to CVD. Hence body weight control should be an integral part in the management of hypertensives who are overweight.

We did not find any significant difference in mean FPG value in hypertensives and controls. Though some persons have mentioned an association of glucose abnormality and hypertension[10] our study and those of two others[22,23] did not support such an association. One of the studies mentioned above[22] suggest that glucose abnormality in untreated hypertensives, is possibly due to increased endogenous production of glucose.

Epidemiological studies have demonstrated a strong relationship between hypertension and CVD in blacks,[28] inspite of reported favourable lipid profile in them. The role played by associated metabolic abnormalities in the overall morbidity/mortality of hypertensives, needs to be properly examined among our patients. In this study, it is shown that even before commencing treatment, there exists some degree of dyslipidaemia among our hypertensives. This can only get worse if proper drug selection is not observed I the drug prescriptions of our hypertensives. These precautions are important because it is the clustering of the various risk factors in patients that determines their total morbidity/mortality status. The emerging problem of obesity in developing countries, should receive more attention from clinicians, especially in subjects who have hypertension,

It is argued that the most natural target of primary prevention of cardiovascular disease is elevated BMI.[25] This therefore stresses the importance of weight control in patients with hypertension, obesity, lipid abnormalities and impaired glucose tolerance.[25] By supporting the current drug therapy in the treatment of hypertension, lipid abnormalities and Type II diabetes mellitus, with non-pharmacological treatment such as weight control, substantial savings in cost can be obtained. [25] This will be quite beneficial in economically disadvantaged persons prevalent in most black communities.

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