

Cardiovascular Risk Factors In Nigerians With Systemic Hypertension

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Abstract:

Background: Hypertension is the commonest risk factor for cardiovascular disease, and it frequently coexists together with other risk factors, thereby increasing the absolute cardiovascular risk. This study is primarily aimed at assessing cardiovascular risk factors in patients with hypertension in comparison with controls. It is also aimed at assessing target organ damage and absolute cardiovascular risk among the hypertensives.

Study design: The study was case-control in design, conducted at the General outpatient and Cardiology Clinics of Aminu Kano Teaching Hospital, Kano, Nigeria. Three groups of patients (treated hypertensives, untreated hypertensives and controls), each 70 in number, were matched for age and sex. Patients were selected by balloting, using simple random sampling method.

Results: The most prevalent cardiovascular risk factor was Increased Body Mass Index, which was significantly more prevalent among treated (70%) than untreated (45.7%) hypertensives and controls (44.3%). Left Ventricular Hypertrophy was the most prevalent Target Organ Damage, found in 54.3% of treated and 42.9% of untreated hypertensives, and 0% of controls. Very high cardiovascular risk was detected in 75.6% of treated and 68.5% of untreated hypertensives.

Conclusion: Even before the commencement of treatment, hypertensives had high prevalence of cardiovascular risk factors and evidence of target organ damage. These were more pronounced in treated hypertensives. The basis and prognosis are discussed.

Key words: Cardiovascular Risk Factors, Hypertension, Nigerians.

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INTRODUCTION

Hypertension, as currently defined, is the most common of the risk factors for cardiovascular and renal diseases¹. It frequently clusters with other cardiovascular risk factors in affected individuals across populations, thereby significantly increasing the risk for cardiovascular morbidity and mortality². The World Health Organization/International Society of Hypertension (WHO/ISH) and other health policy-making bodies, have

been insisting that for Cardiovascular Disease (CVD) prevention to achieve the desired impact, a paradigm shift is required, a shift away from treating risk factors in isolation to a comprehensive and holistic cardiovascular risk-management approach.^{3,4} This study was designed with the primary aim of assessing the hospital prevalence of various cardiovascular risk factors among Nigerians with systemic hypertension in Kano, Nigeria. It also aimed at assessing target organ damage and absolute cardiovascular risk in the hypertensive patients.

PATIENTS AND METHODS

The study was case-control in design, carried out at the Cardiology and General Out-Patient (GOP) Clinics of Aminu Kano Teaching Hospital (AKTH), Kano, Nigeria.

In this study, the 1999 WHO/ISH definition of systemic hypertension was adopted, for the diagnosis of hypertension.³ Therefore, the cut-off values of systolic and diastolic blood pressures were =140 and 90 mmHg respectively. There were three patient groups: the first was hypertensive patients attending the cardiology clinic and who were on antihypertensive drugs (treated hypertensives); the second comprised of newly diagnosed hypertensives who were not yet on anti-hypertensive drugs (untreated hypertensives); and the third comprised of patients that did not have hypertension, and who presented to the GOP clinic with minor ailments (controls). Each group was 70 in number. All patients were selected using simple random sampling method and matched for age and sex.

At the cardiology clinic, patients who were being managed for hypertension were selected from a booking register (Sample frame). On each clinic day, numbers were then allocated to these patients and only 10 were selected randomly by balloting. On subsequent clinic days, those already assessed were excluded. Also excluded were non-Nigerians and those whose residence is not in Kano metropolis, so as to match patients as much as possible. Matching was also done for age and sex.

At the GOP clinic, general practitioners evaluated all patients at the time of first presentation and selected out the untreated hypertensives and controls. These were then booked for subsequent selection (using the same method mentioned above) by one of the authors (KMK).

Data was collected in the same weeks, in April and May 2004. Seventy patients were selected and evaluated in each group, based on the prevalence of hypertension of 20% among adults in Nigeria (calculated from data in the Non-Communicable Diseases {NCD} Committee report, 1997).⁵

All the CVD risk factors assessed were recognized in the 1999 and 2003 World Health Organization/International Society of Hypertension (WHO/ISH) guidelines for the management of hypertension^{3,4}. The definitions of the following risk factors were adopted from the above-mentioned guidelines: increased age, family history of premature CVD, sedentary lifestyle, hypercholesterolaemia, and grading of hypertension. Standard techniques for Blood Pressure (BP) measurement were adopted⁶. History of tobacco smoking was considered a risk factor if smoking was daily, regardless of the dose. Excessive alcohol intake was defined as weekly intake of more than 21 units for men and 14 units for women⁷. Low Socioeconomic status (SES) was defined as having monthly income of <10 000 Naira (\$77) for a single person, or <15 000 Naira (\$115) for a couple, and less than additional 5 000 Naira (\$38.50) for each child. This was based on the local purchasing power of the Naira and the salary scale of the Kano State civil service. The diagnosis of Diabetes Mellitus (DM) was based on WHO criteria⁸. The determinants of Target Organ Damage (TOD) from hypertension that were assessed include Left Ventricular Hypertrophy (LVH), proteinuria, 'slight elevation of plasma creatinine' and early hypertensive retinopathy. LVH was determined using Araoye's Code System⁹ for LVH in 12-lead Electrocardiogram (ECG) in hypertensive patients. This has been shown to have higher sensitivity and specificity than other methods in the ECG determination of LVH, in black Africans with systemic hypertension¹⁰. Echocardiography could not be done because of lack of funds. Urine analysis for protein was done using commercial reagent strips (Combi 2 Medi-Test, by Macherey-Nagel, Germany). Slight elevation of plasma creatinine was defined as concentration of 105.6-176 mol/l (1.2-2 mg/dl).³ Early hypertensive retinopathy was defined as the presence of generalized or focal narrowing of the retinal arteries, with or without arterio-venous nicking.³ Associated Clinical Conditions (ACC) assessed in this study were: Cerebrovascular disease, heart diseases, renal diseases and/or renal failure (defined as the presence of plasma creatinine of > 2 mg/dl (176 mol/l), vascular diseases (aortic aneurysm and peripheral artery disease), and advanced hypertensive retinopathy (retinal haemorrhages, exudates or papilloedema).³

CVD risk (typical 10 year risk of stroke or myocardial infarction) was stratified using the recommendation in the 1999 WHO/ISH guidelines. The risk strata were: low risk (<15% risk), medium risk (15-20% risk), high risk (20-30% risk) and very high risk (>30% risk).³

ETHICS

The Ethical Committee of AKTH approved the study protocol. Informed consent was obtained from each patient, and all patients signed a 'Consent Form'.

DATA ANALYSIS

Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 10.0. Means and standard deviations were computed for quantitative variables. The Chi-squared or Fisher's exact tests were used to test for significance of observed associations and the student's t-test was used to compare means. A p-value of <0.05 was considered significant.

RESULTS

A total of 210 patients were studied, 70 belonging to each of the 3 groups of treated and untreated hypertensives, and controls. The 3 groups of patients were matched for age (p=0.5) and sex (p=0.98). The mean age of hypertensive patients was 50.54 ± 11.93 years (range = 19-80 years) while that of controls was 49.33 ± 12.92 years (range = 18-76 years). Thirty-two patients (45.7%) among both treated and untreated hypertensives were males while 31 (55.7%) of them were females. Similarly, 31(44.3%) of controls were males and 39(55.7%) of them were females.

The distribution of CVD risk factors in hypertensives and controls, and comparisons between them, are presented in Table I. The two most prevalent risk factors were increased BMI and sedentary lifestyle. The least prevalent risk factor was cigarette smoking.

The mean BMI for all hypertensive patients was 26.74.90 kg/m² and 24.52.94 kg/m² for controls. The mean BMI for treated hypertensives, (28.115.48 kg/m²), was significantly higher than for untreated hypertensives (25.283.79 kg/m²) (p=0.001). Other comparisons between the three groups revealed significant statistical differences, except between untreated hypertensives and controls (p=0.175; not significant).

The mean SBP for all hypertensive patients (161.329.75 mmHg) was significantly higher than for controls (119.310.66 mmHg) (p= 0.0001). Similarly the mean

DBP for all hypertensive patients (100.919.34 mmHg) was significantly higher than for controls (72.48.28 mmHg) ($p=0.0001$). The mean SBP and DBP for treated hypertensives (150.127.15mmHg and 93.415.96 mmHg respectively) were significantly lower than for untreated hypertensives (172.428.16 mmHg and 108.519.6 mmHg respectively) ($p=0.0001$). Only 14.3 % of the treated hypertensives had controlled BP ($< 140/90$ mmHg) despite treatment. Grades I, II and III of hypertension were found among 32.9%, 21.4% and 31.4% of treated hypertensives respectively; and among 21.4%, 30% and 48.6% of untreated hypertensives respectively ($p=0.105$). Hypertension was diagnosed in the previous 4 years in 48.6% of the treated hypertensives, previous 5-9 years in 15.7% of them, previous 10-14 years in 21.4% of

them and previous 15 years or more in 14.3% of them.

The mean Fasting Plasma Glucose (FPG) for treated hypertensives (5.010.52 mmol/l) was significantly higher than that for untreated hypertensives (4.80.34 mmol/l) ($p=0.006$). The mean FPG for the controls (4.40.20 mmol/l) was significantly lower than that for treated hypertensives ($p<0.0001$) as well as that for untreated hypertensives ($p<0.0001$). The mean Total Cholesterol (TC) for treated hypertensives (5.671.19 mmol/l) was significantly higher than that for untreated hypertensives (5.230.75 mmol/l) ($p=0.009$) and that for controls (4.910.72 mmol/l) ($p<0.000$). The mean TC for untreated hypertensives was also significantly higher than that for controls ($p=0.01$).

Table I: Distribution of Cardiovascular risk factors among hypertensive patients and controls.

CVD risk factors	Groups (total number of each = 70)								
	TH N(%)	UH N(%)	p- value	TH N(%)	C N(%)	p- value	UH N(%)	C N(%)	p- value
Increased age	16 (22.9)	16 (22.9)	1.00	16 (22.9)	15 (21.4)	0.84	16 (22.9)	15 (21.4)	0.84
Male sex	32 (45.7)	32 (45.7)	1.00	32 (45.7)	31 (44.3)	0.87	32 (45.7)	31 (44.3)	0.87
Smoking	3 (4.3)	2 (2.9)	0.50	3 (4.3)	4 (5.7)	0.50	2 (2.9)	4 (5.7)	0.34
Sedentary lifestyle	44 (62.9)	40 (57.1)	0.49	44 (62.9)	35 (50)	0.13	40 (57.1)	35 (50)	0.13
Low SES	22 (31.4)	23 (32.9)	0.86	22 (31.4)	21 (30)	0.86	23 (32.9)	21 (30)	0.72
FH of premature CVD	10 (14.3)	7 (10)	0.44	10 (14.3)	7 (10)	0.44	7 (10)	7 (10)	1.00
Increased BMI	49 (70)	32 (45.7)	0.004*	49 (70)	31 (44.3)	0.002*	32 (45.7)	31 (44.3)	0.87
DM	5 (7.1)	2 (2.9)	0.22	5 (7.1)	0 (0)	0.03*	2 (2.9)	0 (0)	0.25
High cholesterol	14 (20)	3 (4.3)	0.004*	14 (20)	1 (1.4)	0.000*	3 (4.3)	1 (1.4)	0.31

Key: TH, Treated Hypertensives; UH, Untreated Hypertensives; C, Controls; FH, Family History; SES, Socio-economic status; *, p-value significant.

Pattern of TOD among hypertensives and controls is presented in Table II. The most prevalent TOD is LVH, found in 38 treated (54.3%) and 30 untreated (42.9%) hypertensives ($p=0.18$; difference not statistically significant), and in none among controls. The mean

plasma creatinine concentrations for treated and untreated hypertensives and controls were 104.3 μ mol/l, 107.4 μ mol/l and 77.2 μ mol/l respectively. The untreated hypertensives had significantly higher mean plasma creatinine than the controls ($p=0.004$), but the other comparisons did not reach statistical significance.

Table II: Pattern of Target Organ Damage (TOD) among hypertensive patients and controls.

TOD	Groups (total number of each = 70)								
	TH N(%)	UH N(%)	p- value	TH N(%)	C N(%)	p- value	UH N(%)	C N(%)	p- value
LVH	38 (54.3)	30 (42.9)	0.18	38 (54.3)	0 (0)	0.000*	30 (42.9)	0 (0)	0.000*
Slightly increased creatinine	8 (11.4)	16 (22.9)	0.07	8 (11.4)	4 (5.7)	0.23	16 (22.9)	4 (5.7)	0.004*
Proteinuria	15 (21.4)	19 (27.1)	0.43	15 (21.4)	5 (7.1)	0.02*	19 (27.1)	5 (7.1)	0.002*
Early hypertensive retinopathy	28 (40)	24 (34.3)	0.48	28 (40)	0 (0)	0.000*	24 (34.3)	0 (0)	0.000*

Key: TH, Treated Hypertensives; UH, Untreated Hypertensives; C, Controls; LVH, Left Ventricular Hypertrophy; *, p-value significant.

Pattern of ACC among treated and untreated hypertensives is presented in Table III. The commonest ACC was hypertensive heart disease, found to be significantly more prevalent among treated hypertensives (51.4%) than untreated hypertensives (22.9%) (p=0.001). It was notable that renal failure did not occur in isolation as the only ACC, but with hypertensive heart disease and also with cerebrovascular disease.

Table III: Pattern of Associated Clinical Conditions (ACC) in hypertensive patients

ACC	Treated hypertensives N(%)	Untreated hypertensives N(%)	p-value
Heart disease	36(51.4%)	16(22.9%)	0.001*
Advanced Hypertensive Retinopathy	2(2.9%)	1(1.4%)	0.56
Cerebrovascular disease	2(2.9%)	0(0%)	0.25
Heart disease+ Renal failure	5(7.1%)	3(4.3%)	0.36
All patients with ACC	52(74.3%)	29(41.4%)	0.000*
Total	70(100%)	70(100%)	

Key: N, number; %, percentage; *, p-value significant,

Analysis of the CVD risk strata for treated hypertensives revealed that 2.9% of them were in 'low risk', 8.6% of them were in 'medium risk', 12.9% of them were in 'high risk' while up to 75.6% of them were in 'very high risk' strata. However, none of the untreated hypertensives was in 'low risk', but 2.9% of them were in 'medium risk', 28.6% of them were in 'high risk' while 68.5% of them were in 'very high risk' strata.

DISCUSSION

Despite the benefits of antihypertensive drugs in randomized clinical trials, several population studies have demonstrated that treated hypertensive patients

continue to experience substantially higher risk of CAD, stroke and overall mortality than do non-hypertensive individuals, despite years of antihypertensive drug therapy.¹¹ The reasons for this persisting risk of cardiovascular complications were thought to be uncertain but likely to involve both modifiable and non-modifiable cardiovascular risk factors. It is indeed now well established that whenever hypertension coexists with other CVD risk factors, the overall absolute cardiovascular risk increases significantly and the prognosis worsens.²

In this study, we demonstrated that treated hypertensives still had higher prevalence of risk factors,

TOD and very high CVD risk than untreated hypertensives as well as non-hypertensive individuals (controls). Treated hypertensives had higher prevalence of increased BMI and high TC than the other 2 groups. In addition, the mean BMI, TC and FPG were also higher in treated than untreated hypertensives and controls. Though there was tendency for treated hypertensives to also have higher prevalence rates than untreated hypertensives and controls, for smoking, sedentary lifestyle, DM, family history of premature CVD and low SES, the differences did not reach statistical significance. However, the differences between untreated hypertensives and controls in these risk factors did not reach statistical significance.

Higher BMI and cholesterol levels among hypertensives than controls were similarly reported in studies done in Sokoto and Jos, in Northern Nigeria.^{12,13,14} It is well known that individuals with hypertension tend to have a constellation of other CVD risk factors in a relationship described as the Metabolic Syndrome.¹⁵

The high prevalence of ECG LVH detected among hypertensives in this study (48.6% of all hypertensives) was also observed in other regions of Nigeria, with values ranging from 35% to 44%.^{10,16,17} However, the result of our study shows that prevalence of LVH was high among the hypertensives right from the time of first presentation (42.9% of untreated hypertensives) perhaps because of delayed diagnosis of hypertension and therefore of intervention. None of the controls had LVH on ECG, but it is possible for echocardiography to detect it in some of the controls as it has higher sensitivity and specificity than the ECG in the detection of LVH. Unfortunately lack of funds precluded our use of echocardiography.

Proteinuria and 'slightly increased creatinine' were significantly more common in the untreated hypertensives than treated hypertensives and controls. These results might be explained by the fact that mean SBP and DBP for the untreated hypertensives were found to be significantly higher than for treated hypertensives. Maki *et al*¹⁸ in a meta-analysis of long-term clinical trials demonstrated that increasing preservation of renal function is associated with decreasing BP over a continuum of values.

Overall, hypertensive retinopathy (early and advanced) was present in 46% of treated hypertensives and in 35.7% of untreated hypertensives ($p=0.46$). Wong *et al*¹⁹ similarly observed that hypertensive retinopathy was common in African-Americans, and twice as frequent as

in whites, but the excess prevalence of retinopathy in African-Americans was associated with the severity of hypertension.

The high prevalence of ACC among the treated hypertensives (74.3%) had significant effect on their absolute CVD risk. These findings are in contrast to that of Familoni *et al*¹⁶ who reported 18.3% as hospital prevalence of ACC among hypertensive patients, perhaps because BP control was achieved in up to 42.5% of their patients. This is a factor that can improve eventual out-come and overall prevalence of ACC.²⁰

CVD risk was generally high among both treated and untreated hypertensives. The high blood pressure of the untreated hypertensives played an important role in exaggerating their CVD risk, despite relatively lower prevalence of other CVD risk factors as well as ACC, when compared to the treated hypertensives. However, the impact of hypertension on all-cause mortality when other cardiovascular risk factors are absent is significantly minimized.²¹ The observed rather low mean BP for age among controls was perhaps because many of them presented with a febrile illness, and fever is well known to have a vasodilatory effect.

Almost half (48.6%) of the treated hypertensive patients were known to have the disease for less than 5 years, while only 35.7% had the disease for more than 10 years. In most cases, the duration of hypertension was estimated based on patients' information, which might not have been accurate. This was probably why there were so many cases of target organ damage and other complications, though majority of the treated patients had the disease for a rather short period of time. Moreover, hypertension may remain asymptomatic for a long time until when complications arise and force patients to seek for medical attention, hence its tag of 'silent killer'.

CONCLUSION

We have reported that hypertensive patients had higher prevalence of CVD risk factors than controls. We also reported that hypertensive patients on treatment had higher prevalence of CVD risk factors, TOD, ACC and absolute CVD risk than untreated hypertensives. We believe that this difference is likely related to the duration of hypertension. We recommend a paradigm shift towards a comprehensive risk evaluation in all hypertensive patients, and to avoid assessment of risk factors in isolation.

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