Electrocardiographic Evaluation of Structural and Electrical Abnormalities in Nigerians Presenting with Undiagnosed Systemic Hypertension

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ABSTRACT

Background: Essential hypertension has emerged as the commonest cardiovascular disorder in developing countries especially in Sub Saharan Africa. Blacks are known to suffer more severe hypertension and develop complications early. Some of the complications of hypertension can be detected early through non-invasive electrocardiography. The aim of this study is to evaluate the hypertension related abnormalities on the electrocardiograph of patients with untreated hypertension.

Methodology: A detailed prospective analysis of the electrocardiographic tracing of all patients with untreated essential hypertension at first presentation over a six month period was undertaken. The patients were recruited from the medical outpatient clinic of the University of Port Harcourt Teaching Hospital.

Result: A total of eighty three adult Nigerians aged 18years to 90 years who presented with untreated essential hypertension over the six months study period had their ECGs analyzed.

There were thirty three males and fifty females (0.7:1), mean systolic blood pressure was 192.78+38.4mmHg and the mean diastolic blood pressure was 116.6+16.9mmHg. Sixty percent (60.22%) had normal rhythm, and forty percent had various rhythm abnormalities, 77.6% had normal axis while 22.4% had left axis deviation, 45.8% had repolarisation abnormalities, 25.3% had evidence of left ventricular hypertrophy and 26.5% had various ventricular arrhythmias.

Conclusion:
Adult Nigerians presenting with hypertension for the first time have significant rhythm and structural abnormalities that should influence their clinical management and drug treatment choice. ECG is an important investigation and should be a mandatory evaluation for all newly presenting hypertensives.

INTRODUCTION

Hypertension remains a health challenge globally with rising prevalence in both developed and developing countries. In Nigeria the current prevalence estimate ranges from 20 to 25% with variation between various parts of the country [1]. Studies in whites and Americans of African descent has shown that hypertension occurs much earlier in blacks, is more severe and tends to present with complications at diagnosis [2,3]. These findings does suggest the possibility of Nigerian hypertensive's presenting with evidence of cardiac and other target organ damage at diagnosis [4].

Electrical and conduction abnormalities which reflect structural abnormalities due to hypertension are common and demonstrable on the electrocardiograph. The observed abnormalities on ECG will guide the treatment modalities not only in achieving blood pressure control targets, but also in the prevention or reversal of complications and target organ damage at the onset of treatment.

Consequently the electrocardiography evaluation of newly presenting hypertensive

patients is essential before the initiation of treatment since drug choice depends on the presence or absence of target organ damage, other complications and the severity of the hypertension at presentation among other factors [5,6]. It is on this background that this study sought to evaluate the pattern of electrocardiographic abnormalities among newly presenting hypertensive's at the medical outpatient clinic of the university of Port Harcourt teaching hospital.

METHODOLOGY

A prospective analysis of the electrocardiogram of treatment naive adult patients with essential hypertension presenting for the first time to the Medical Outpatient Clinic of University of Port Harcourt Teaching Hospital over a six month period 1st July to 31st December 2010 was undertaken to determine the pattern of abnormalities. The electrocardiogram was done with a 3 channel Schiller[R] machine in the outpatient department. The analyses were undertaken by a panel of three, conversant with ECG analysis using standard protocol. Hypertension was diagnosed and classified based on JNC 7 criteria. Left ventricular hypertrophy was based on the Sokolow Lyon Index [7], ST segment was elevated or depressed if it was more than 2mm from the baseline, bundle branch block was present if the QRS duration was more than 0.11second with characteristic shape, left axis deviation of the QRS complex diagnosed if the axis was more than -110^0 and $+30^0$ while right axis deviation was diagnosed if the axis was between $+30^0$ and $+180^0$.5-6. The findings are presented as percentages and simple descriptive statistics.

RESULTS

Demographics of Patients: The ECGs of Eighty three patients, thirty three males and fifty females (0.77:1.0) were analyzed over the six month study period. The age range of the subjects was 18 to 90years with a mean age of 52.3+15.4years. Table 1 show the age and sex

Age Range	Males	Females	Total	Percentage
<19	0	1	1	1.2
20-29	1	1	2	2.4
30-39	8	7	15	18.1
40-49	7	14	21	25.3
50-59	7	13	20	24.1
60-69	7	8	15	18.1
70-79	3	4	7	8.4
>80	0	2	2	2.4
TOTAL	33	50	83	100

distribution of the subjects. Fourteen patients [16.9%] had grade I hypertension (BP 140-159/90-99mmHg) while sixty nine [83.1%] had grade II hypertension (BP ≥ 160/100 mmHg). The mean systolic blood pressure was 192.78+38.4 (range 150 to 250mmHg) and mean diastolic blood pressure was 116.6+16.9mmHg (range 90 to 150mmHg).

ABNORMALITY	NO	PERCENTAGE
Rhythm Abnormalities	33	39.8
Electrical Axis Abnormalities	17	20.4
Repolarisation Abnormalities	26	31.3
Chamber Enlargement	21	25.3
Heart Blocks	17	20.4

Table 3: Pattern and Distribution of ECG Abnormalities

ECG Findings		
Category of findings	Description of findings	Number (%)
Rhythm Characteristics	Normal Sinus Rhythm	50 (60.2%)
	Tachycardia(PR>100)	21(25.3%)
	Bradycardia(PR<50)	11(13.3%)
	Bigemini	4(4.8%)
Electrical Axis (QRS wave)	Normal Axis	66(77.6%)
	Left Axis Deviation	17(23.2%)
Repolarisation Changes (ST Segment)	ST Elevation (>2mm)	27(32.5%)
	ST Depression(<2mm)	6(7.2%)
	Raised J point	5(6.0%)
	Normal	45(54.2%)
Other Abnormalities	Left Ventricular Hypertrophy [Sokolow Lyon Index]	21(25.3%)
	Partial left bundle branch block	11(13.3%)
	Partial right bundle branch block	3(3.6%)
	Complete left bundle branch block	4(4.8%)

Table 1: Age and Sex Distribution of study subjects

The pattern and distribution of ECG abnormalities is shown in Table 2 and 3.
Rhythm Abnormalities (39.8%), Repolarisation Abnormalities (31.3%) and Chamber Enlargement (25.3%) were the most common abnormalities. The spectrum and pattern of the abnormalities in each of these categories is displayed in table 3.

Table 2. Summary of ECG Abnormalities

DISCUSSION

This study shows that 80% of untreated hypertensive patients presenting for the first time have grade II hypertension. This finding is in keeping with findings in the United States

which show that blacks, especially of African origin have more severe hypertension [5,6].

Majority of the patient who presented in this study were in the most productive age group (aged 30 to 59years) constituting 67.5 % of the study population. This has significant economic implication for the population as these groups of patients with severe hypertension and cardiac target organ damage are at risk for life threatening complications such as strokes, heart attacks and acute pulmonary edema with their attendant impact on productivity and increase healthcare cost.

In these treatment naive hypertensive patients, 33 patients (39.8%) had various rhythm abnormalities. This much higher than findings among Caucasians as reported by scheltens et al in the Utretch health project [8] and from previous report from the same centre that reported 28.8% prevalence of rhythm abnormalities predominantly from atrial fibrillation and sinus tachycardia.[4] There was no report of AF in this study. These differences could be due to the fact that the patients in this study were treatment naïve compared to the previous study in the same institution by Agomuoh et al and the Utretch health project study which had patients on treatment.

About twenty five percent of these newly presenting patients already had evidence of left ventricular hypertrophy using the Sokolow Lyon index. This observation while significant is however lower than result of similar studies from other parts of Nigeria by Araoye et al and Katibi et al respectively [9,10]. Left ventricular hypertrophy has been shown to constitute an increased risk factor for cardiovascular morbidity and mortality [11,12,13] and its presence in this group of untreated hypertensive patients would suggest increased cardiovascular disease risk and long standing hypertension preceding diagnosis.

The study also showed that 21.07% of all the patient seen had various degrees of heart block while over 30% of subjects had repolarisation abnormalities (ST segment changes) or

ischemic cardiac changes which are independent risk factors for ischemic heart disease [14] and therefore increase of total cardiovascular risk in these patients.

These identified electrocardiocargraphic abnormalities represent complications which constitute additional cardiovascular risks and should influence the choice of drug regimen for treatment if optimal benefit of hypertension treatment is to be obtained. This is particularly important because routine post mortem evaluation of sudden cardiac deaths are not done in our hospital and the causes of such deaths remains a 'mystery' while coronary artery disease or ischemic heart disease continues to be described as uncommon in Nigerians[15].

This study reveals the presence of significant cardiac abnormalities with potential for increased cardiovascular disease risk and risk of sudden death in Nigerians with untreated

hypertension. There is therefore a need to provide simple ECG facilities in all primary care centres for the evaluation of hypertensive patient so that those with evidence of abnormalities can be further evaluated for appropriate therapy in secondary health institutions.

CONCLUSION

The study shows that essential hypertension occurs in relatively young Nigerians who at presentation show electrocardiographic evidence of significant structural and electrical abnormalities. These abnormalities which have potential for sudden cardiac death and increased cardiovascular disease risk can be identified with simple non-invasive electrocardiography. The routine performance of electrocardiography for newly diagnosed or evaluated hypertensives is recommended.

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