

Electrocardiographic changes in newly diagnosed hypertensive patients at Federal Teaching Hospital Gombe

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ABSTRACT

Background: Hypertension is an important public health problem globally with an increasing prevalence, severity and attendant complications on the heart and other internal organs. It was described as a silent killer due to its insidious onset and no obvious symptoms. Electrocardiogram (ECG) is a basic tool that can help determine some of the changes induced on the heart by systemic hypertension especially when it's not diagnosed early. **Objectives:** To determine the pattern of ECG change in newly diagnosed hypertensives (HTN) at Federal Teaching Hospital, Gombe. **Methods:** The ECG results of 1015 newly diagnosed HTN patients referred for electrocardiographic study between Jan 2012 and Dec 2016 were retrieved and reviewed. All the patients had their basic anthropometric parameters, systolic and diastolic blood pressure (BP) recorded. Descriptive statistics was used in analyzing the different ECG findings. **Results:** The mean age of patients was 49.3 ± 14.8 years. The mean BMI was 28.9 ± 6.5 kg/m. The mean systolic and diastolic BP were 154.7 ± 22.0 mmHg and 93.7 ± 12.5 mmHg respectively. The mean ECG's Heart Rate (HR), PR interval and QTc interval were; 85.9 ± 16.8 ms, 154.1 ± 23.9 ms, and 433.5 ± 32.5 ms respectively. The commonest ECG abnormality was left ventricular hypertrophy (LVH) seen in 315(31.0%) of the patients. Some other abnormal ECG findings include; LAD (19.9%), LAE (18.7%), ST-T wave changes (14.1%), SB (1.8%), BBB (1.5%), AF (0.5%). Only 284(29%) of the patients had normal ECG. **Conclusion:** Most of the newly diagnosed hypertensives have already developed one or more cardiac related complications at the time of diagnosis. This further emphasizes the need for public enlightenment on regular BP check for early diagnosis and management of HTN.

Key words: Hypertension, Electrocardiogram, left ventricular hypertrophy.

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Introduction

Hypertension is a common problem with significant disease burden.¹ Globally, the prevalence of hypertension is estimated to be 40% affecting more than 1 billion in 2008, higher amongst men, African-American, urban and low income counties.^{2,3} Estimated

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prevalence of hypertension in Nigeria ranges from 8% to 46.4% depending on the cut-off BP used, thus making it the most common non-communicable disease in Nigeria.⁴ Despite the high prevalence in Nigeria, there is lack of adequate awareness and policies geared towards controlling the menace are under-implemented.⁵⁻⁶ Also there is late presentation of patients to the hospital with attendant complications.⁷

Electrocardiography (ECG) is one of the cheapest and readily available, non-invasive investigative tools to assess the effects of hypertension on heart. It is a surface graphic recording of the changes in electrical potentials produced by the heart. Several studies have highlighted the late complications of hypertension.⁸ This study intends to look at ECG changes in newly diagnosed hypertensives.

Materials and Methods: It is a retrospective study conducted at Internal medicine department of Federal Teaching Hospital, Gombe where the data of hypertensive patient referred for ECG between January, 2012 and December, 2016 were retrieved and analysed. The study included 1015 adults newly diagnosed hypertensive patient (less than 6 months duration and or on antihypertensive for less than 2 weeks). Anthropometries, Systolic and Diastolic BP of

patients were obtained as recorded at presentation. The ECG results for the following parameters were obtained; Heart Rate (HR), Rhythm, Axis, P wave, PR interval, QRS complex, ST-segment, T wave changes, QTc interval etc. Data were analysed using SPSS (version 22, SPSS. Inc, Chicago). Demographic variables were summarized using means and standard deviation for continuous variable and proportion for categorical variables

Results: Out of the 1015 patients whose data were analysed, 519 (51.1%) were females while 496 (48.9%) were males. The mean age of patients was 49.3 ± 14.8 years. The mean BMI was 28.9 ± 6.5 kg/m². The mean systolic and diastolic BP were 154.7 ± 22.0 mmHg and 93.7 ± 12.5 mmHg respectively (Table 1). The mean ECG's Heart Rate (HR), PR interval and QTc interval were; 85.9 ± 16.8 ms, 154.1 ± 23.9 ms, and 433.5 ± 32.5 ms respectively.

The commonest ECG abnormality was left ventricular hypertrophy (LVH) seen in 315(31.0%) of the patients. Some other abnormal ECG findings include; Left Axis Deviation (LAD), Left Atrial Enlargement (LAE), Sinus Tachycardia (ST), Sinus Bradycardia (SB), Left Bundle Branch Block (LBBB) and Atrial Fibrillation (AF) Table 2. Only 284(29%) of the patients had normal ECG.



Table 1: Clinical Findings and Quantitative ECG parameters

Parameter	Range	Mean±SD
Age (years)	17 – 80	49.3±14.8
Height (cm)	102 – 198	164.1±9.6
Weight (kg)	30 – 156	72.4±17.1
Body Mass Index (BMI) (kg/m ²)	14.7 – 52.1	28.9.0±6.5
Waist Hip Ratio (WHR)	0.7 – 1.7	1.1±4.3
Systolic BP (mmHg)	100 – 240	154.7±22.0
Diastolic BP (mmHg)	60 – 150	93.7±12.5
Heart rate (bpm)	36 – 244	85.9±16.8
PR Interval (ms)	64 – 244	154.2±23.9
QRS Axis (°)	-150 – +210	17.9±39.1
QRS Duration (ms)	40 – 170	86.7±12.5
QTc Interval (ms)	280 – 644	433.5±32.5

Table 2: ECG Abnormalities among Newly diagnosed Hypertensives

ECG Abnormalities **	Frequency	Percentages (%)
Left Ventricular Hypertrophy (LVH)	315	31.0
Biventricular Hypertrophy (BVH)	3	0.3
Right Ventricular Hypertrophy (RVH)	10	1.0
Left Bundle Branch Block (LBBB)	16	1.6
Low limb voltage	6	0.6
Left Axis Deviation (LAD)	202	19.9
Right Axis deviation	12	1.2
Left Atrial Enlargement (LAE)	190	18.7
Bi-atrial Enlargement (BAE)	1	0.1
Sinus Tachycardia (ST)	143	14.1
Sinus Bradycardia	18	1.8
Atrial Fibrillation	5	0.5
Premature Ventricular Complexes (PVC)	27	2.7
First Degree AV Block	23	2.3

** : Some patients have more than one abnormality.

Discussion

Only 284(29%) of the study population has normal ECG. In comparison to study by Newaz *et al*,⁹ the ECG abnormalities correlate with those with moderate to severe hypertension and but at variance with Agomouh *et al* and Kwok *et al* who reported a higher prevalence of ECG abnormalities in

chronic hupertensives.^{10, 11} Most of these studies suggest increase ECG abnormalities with severity of hypertension. Therefore, ECG abnormalities of 71% from our study suggest late presentation with significant cardiac sequelae at diagnosis. Left ventricular hypertrophy, which is the most common ECG



change seen in 315(31%), is largely accounted for by late diagnosis and presentation to the hospital. The prevalence of LVH is higher in this study than normal population and corresponds to finding by Agomouh *et al.*¹⁰ Left Atrial Enlargement (LAE) in hypertensives varied between 6.2% and 52.1% with average of 38.1% in a systematic review.¹² Our study showed prevalence of 18.7%. Though studies have shown LAE as earlier features of hypertension than LVH.¹³ Most studies showing high prevalence have used imaging rather than ECG for detection of LAE.

Left Axis deviation (LAD) is found in 19.9% of the study population, which is higher than the general population (3% to 6%).¹⁴ But this is lower when compared to what was reported by Agomouh *et al* (30.3%) in chronic hypertensives.¹⁰

The causes of LAD in the general population are anterior fascicular block probably from ischemia and cryptogenic cardiomyopathy, left bundle branch block and not hypertension.¹⁵

Thus significant proportion affected in the study suggest early contribution from hypertension, though ischemic changes is also on the rise in black population.¹⁶

Atrial fibrillation (AF) occurs in 1% of the population in developed world but said to be lower in African settings.¹⁷ 0.5% of the studied population has AF lower than prevalence of 3.8% in chronic hypertensives reported by Agomouh *et al.*¹⁰

Our finding is in keeping with lower prevalence AF in blacks, especially in Nigeria. The relatively younger age of the study population could also be a factor.¹⁸

Conclusion:

Most of the newly diagnosed hypertensives have already developed one or more cardiac

related complications, which can be detected on ECG, at the time of diagnosis. This further emphasizes the need for public enlightenment on regular BP check because hypertension being a modifiable cardiovascular risk factor should be diagnosed early and treated. Policy geared toward early diagnosis and treatment should be put in place to reduce morbidity and mortality associated with hypertension and its complications.

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