

## A STUDY OF ELECTROCARDIOGRAPHY AND KIDNEY FUNCTION TEST IN NEWLY-DIAGNOSED HYPERTENSIVE PATIENTS IN COASTAL ANDHRA PRADESH

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### ABSTRACT

#### BACKGROUND

As per the fact sheet published by World Health Organisation, South East Asia, nearly one billion people have high blood pressure and are one of the most common causes of premature death worldwide. About one third of the adult population in the South East Asia region is having hypertension. In our country, the number of people with hypertension are undiagnosed and untreated, so early detection and treatment of hypertension will decrease the complication of hypertension and premature death due to it.

#### MATERIALS AND METHODS

This is a prospective study conducted in the Department of General Medicine, Konaseema Institute of Medical Sciences, Amalapuram, from May 2015 to August 2017. This study was started with an aim to know that electrocardiographic abnormalities and kidney function at the time of diagnosis of hypertension in a patient in coastal Andhra Pradesh.

#### RESULTS

We have found ECG changes in both the stages of hypertensive group patients. In stage-1 hypertensive group patients, out of 80 patients, 6 patients having sinus tachycardia, 2 having sinus bradycardia, 4 patients having left bundle-branch block and 6 having right bundle-branch block. ST elevation was found in 1 patient and ST depression was found in 8 patients. AV block was present in 2 patients. Right ventricular hypertrophy was present in 1 patient and left ventricular hypertrophy was present in 4 patients. T-wave inversion was found in 4 patients. In stage-2 hypertensive patients, sinus tachycardia in 6 patients and bradycardia in 1 patient, LBBB was found in 8 patients. ST depression was found in 6 patients and ST elevation was found in 2 patients out of 40 patients. AV block was present in 3 patients. Left ventricular hypertrophy patients 16 out of 40, but right ventricular hypertrophy was only 1. T-wave inversion was found in 6 patients.

#### CONCLUSION

In our study, we have found that stage-2 hypertensive patients have higher BMI, serum urea and creatinine than stage-1 patients. We have found that stage-2 hypertension is associated with increase in PR and QT interval. Left ventricular hypertrophy was commonest ECG abnormality detected. In our study, at the time of diagnosis, already some have developed cardiac manifestation. So, early diagnosis and management of hypertension is essential for further progress of disease.

#### KEYWORDS

Kidney Function Test, Hypertension, Electrocardiography.

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#### BACKGROUND

As per the fact sheet published by World Health Organisation, South East Asia, nearly one billion people have high blood pressure and are one of the most common causes of premature death worldwide. About one third of the adult population in the South East Asia region is having hypertension.<sup>1</sup> Most hypertensive people have no symptoms

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at all. Hypertension is a serious warning sign that significant lifestyle changes required. So, it is a silent killer.<sup>2</sup>

Hypertension doubles the risk of cardiovascular diseases, ischaemic and haemorrhagic stroke, renal failure and peripheral arterial diseases.<sup>3</sup>

In our country, the number of people with hypertension are undiagnosed and untreated, so early detection and treatment of hypertension will decrease the complication of hypertension and premature death due to it.<sup>2</sup>

Hypertension is defined as a systolic blood pressure equal to or above 140 mm of Hg and/or diastolic blood pressure equal to or above 90 mm of Hg.<sup>2</sup>

As per JNC->2003, it is classified as-<sup>4</sup>

	SBP (mm of Hg)		DBP. (mm or Hg)
Normal:-	<120	and	<90
Pre Hypertension	120-139	or	80-89
Hypertension Stage-I	140-159	or	90-99
Hypertension Stage-II	>160	or	>100

Present study is designed to know the electrocardiographic abnormality and the kidney function of all the study group patients who has been normally diagnosed as hypertensive.

**MATERIALS AND METHODS**

This is a prospective study conducted in the Department of General Medicine, Konaseema Institute of Medical Sciences, Amalapuram, from May 2015 to August 2017. This study was started with an aim to know that electrocardiographic abnormalities and kidney function at the time of diagnosis of hypertension in a patient in coastal Andhra Pradesh patients. During above-mentioned period, 120 (one hundred twenty) newly-diagnosed hypertensive patients were included in the study as per exclusion and inclusion criteria. This study protocol is approved by institutional ethics committee. A written informed consent was obtained from all individual before including then in study.

Inclusion Criteria	Exclusion Criteria
Newly diagnosed	Known case of diabetes mellitus
Age 35 to 70 yrs.	Renal disorder, thyroid dysfunction
Both sexes	Any medication
SBP >140 mm of Hg DBP >90 mm	Pregnancy and lactation

After selection of the patients, height, weight, body mass index and heart rate were measured. A 5 mL blood was collected from all patients for estimation of serum urea and creatinine. Serum urea was estimated by enzymatic urease method and serum creatinine was estimated by Jaffe’s method.<sup>5</sup> Blood pressure was measured by mercury sphygmomanometer. Electrocardiography of all the patients was done by same machine Philips Page Writer Tc20, 12 leads. ECG of all the subjects were done in resting state and various parameters like heart rate, P wave, PR interval, QRS interval, QRS axis, QT interval, ST segment and T-wave were recorded. Various abnormalities were also recorded like sinus tachycardia, sinus bradycardia, left/right bundle-branch block, ST elevation/depression, AV block, RT/left ventricular hypertrophy and T-wave inversion.

**RESULTS**

Total 120 subjects were included in this study. Out of 120 subjects, 80 were having stage-1 hypertension at the time of diagnosis and 40 patients were having stage-2 hypertension. Among 80 stage-1 hypertensive subjects, 58 were males and 22 were females, similarly among stage-2 patients, 30 were males and 10 were females.

Parameters (Mean)	Stage of Hypertension	
	Stage-1	Stage-2
Number	80	40
Age (yrs.)	46.4	54.2
Sex (M/F)	58/12	30/10
BMI	27.6	28.4
HR	76.2	78.8
SBP (mm of Hg)	148.4	168.6
DBP (mm of Hg)	96.2	106.2

Sr. urea (mg/dL)	32.84	34.26
Sr. creatinine (mg/dL)	0.90	0.99

**Table 1. Comparison of Various Clinical Characteristics in Patients**

Parameters (mean)	Hypertension Stages	
	Stage-1	Stage-2
PR interval (secs.)	0.148	0.156
QRS interval (secs.)	0.086	0.0892
QT interval (secs.)	0.40	0.42
QRS axis (°)	55.6	53.8

**Table 2. Relation between Stage of Hypertension and Parameters of ECG**

ECG Changes	Hypertension Stages	
	Stage-1 Number (%)	Stage-2 Number (%)
Sinus tachycardia	6 (7.5%)	6 (7.5%)
Sinus bradycardia	2 (2.5%)	1 (1.25%)
LBBB	4 (5%)	6 (7.5%)
RBBB	6 (7.5%)	8 (20%)
ST elevation	1 (1.25%)	2 (5%)
ST depression	4 (5%)	6 (15%)
AV block	2 (2.5%)	3 (7.5%)
RVH	1 (1.4%)	1 (1.25%)
LVH	4 (5%)	16 (40%)
T-wave inversion	4 (5%)	6 (7.5%)

**Table 3. ECG Changes in Hypertensive Patients**

Mean age of patients in stage-1 group was 46.4 yrs., and in stage-2, it was 54.2 yrs. Body mass index of the patients in stage-1 hypertension patients were 27.6 kg/m<sup>2</sup>, and stage-2 hypertension patients, it was 28.4 kg/m<sup>2</sup>. Mean heart rate of stage-1 hypertension patients were 76.2/min. and stage-2 hypertensive patients were 78.8/min. Mean systolic blood pressure in stage-1 hypertensive group was 148.4 mm of Hg and in stage-2 group was 168.6 mm of Hg. Similarly, diastolic blood pressure in stage-1 group was 96.2 mm of Hg and in stage-2 group was 106.2 mm of Hg. Serum urea in stage-1 group was 32.84 mg/dL and stage 2 group was 34.26 (mg/dL). Similarly, mean value of creatinine in stage-1 hypertensive group was 0.90 mg/dL and in stage-2 group was 0.99 mg/dL.

Regarding various parameters of ECG in stage-1 hypertensive patient, PR interval was 0.148 secs, which was 0.156 secs in stage-2 group. QRS interval was 0.086 secs in stage-1 and 0.0892 secs in stage-2. QT interval was 0.40 secs in stage-1 and 0.42 secs stage-2 group. Similarly, QRS axis was 55.6 degrees in stage-1 and 53.8 in stage-2.

We have found ECG changes in both the stages of hypertensive group patients. In stage-1 hypertensive group patients, out of 80 patients, 6 patients having sinus tachycardia, 2 having sinus bradycardia, 4 patients having left bundle-branch block and 6 having right bundle-branch block. ST elevation was found in 1 patient and ST depression was found in 8 patients. AV block was present in 2 patients. Right ventricular hypertrophy was present in 1 patient and left ventricular hypertrophy was present in 4 patients. T-wave inversion was found in 4 patients.

In stage-2 hypertensive patients, sinus tachycardia was present in 6 patients and bradycardia in 1 patient. LBBB was

found in 8 patients. ST depression was found in 6 patients and ST elevation was found in 2 patients out of 40 patients. AV block was present in 3 patients. Left ventricular hypertrophy patients 16 out of 40, but right ventricular hypertrophy was only 1. T-wave inversion was found in 6 patients.

## DISCUSSION

In present study, we have found that the number of patients with stage-2 hypertension was less than the patients with stage-1 and there was male predominance. Body mass index and average age of the patients were also more in stage-2 patient than stage-1. It was found in the study of Bulpitt and Breckenridge<sup>6</sup> that blood urea used to increase in hypertensive patients as the duration of hypertension increases. In our study, we have also found that in stage 2 hypertensive, the blood urea is more than in stage 1, which is again similar to the study of M. Cirillo et al.<sup>7</sup> Serum creatinine was little higher in stage-2 hypertensive than stage-1. But, both were towards higher side, which is similar to the study of Neil B Shulman et al<sup>8</sup> and Josef Coresh et al.<sup>9</sup>

Regarding ECG changes in two stages of hypertension in stage-2, PR interval was higher than stage-1 as per Gosse P et al.<sup>10</sup> AV (atrioventricular) conduction time and PR interval increases with age and hypertension often presented with accelerated ageing of heart and arteries, so PR interval used to increase, which is similar to our study. In our study, the QRS complex and QT interval was towards higher side in stage-2 than stage-1, which indicates the vulnerability to cardiovascular diseases. This is similar to the observation of Lasse Oikarinen et al.<sup>11</sup>

In both the group, we have found that RBBB is more common than LBBB, which is similar to the study of Thrainsdottir IS et al.<sup>12</sup> RBBB used to increase with age and have significant association with hypertensive, similarly LBBB is associated LVH and having increased risk of cardiac mortality, which is as per study of Li-Z et al.<sup>13</sup>

ST-depression was more common in stage-2 than stage-1 and is more frequent than ST-elevation, which is similar to the study of Sakir et al<sup>14</sup> and Uen S.<sup>15</sup> et al.

Left ventricular hypertension was more common in stage-2 hypertension patients. It is a physiological adaptation of the heart and is more common in hypertensive patients. This finding is supported by the study of Thomas Kahan et al.<sup>16</sup>

There is higher incidence of T-wave inversion in stage-2 hypertensive patient. It was found in stage-1 also. T-wave inversion is associated with LVH and present in stage-2 hypertensive patients. This finding is supported by the study of Salah et al.<sup>17</sup>

## CONCLUSION

We conclude that in our study, we have found that stage-2 hypertensive patients have higher BMI, serum urea and creatinine than stage-1 patients. We have found that stage-2 hypertension is associated with increase in PR and QT interval. Left ventricular hypertrophy was commonest ECG abnormality detected. In our study, at the time of diagnosis, already some have developed cardiac manifestation. So,

early diagnosis and management of hypertension is essential for further progress of disease.

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