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Research article

Prognostic significance of electrocardiography in chronic kidney disease patients

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ABSTRACT

For patients with chronic kidney disease, cardiovascular disease(CVD) is the leading cause of morbidity and death.Even though myocardial infarction (MI) is a contributing factor in nearly half of fatalities from cardiovascular (CV)causes, cardiac arrest and cardiac arrhythmias are thought to be responsible for around a quarter of all deaths reported in chronic kidney disease patients. Electrocardiograms (ECGs), which are straightforward and non-invasive, can identify people who are more susceptible to fatalities.100 patients with chronic kidney disease were included in this cross-sectional research.The patients were evaluated as per the history, general physical examination, systemic examination, Blood Urea, Serum Creatinine, Urine Routine, ECG and Echocardiography. The study shows 72% of patients had cardiovascular abnormalities identified by electrocardiography. Ischemia is seen in 16% of individuals and Left ventricular hypertrophy (LVH) in 30% of patients. In 8 cases (16%), an abnormality in intraventricular conduction was discovered. In 10 individuals (10%), P mitrale was discovered. Six individuals (about 6%) had arrhythmia. The most often observed morphological anomaly is left ventricular hypertrophy. Electrocardiographically, myocardial ischemia and conduction disruption were more clearly visible.

Keywords: Electrocardiogram, Chronic Kidney Disease, LVH, Heart, Nephrology, Cardiovascular disease

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INTRODUCTION

Cardiovascular alterations in Chronic kidney disease (CKD) patients, such as arterial stiffness, left ventricular hypertrophy, and LV (Left Ventricular) diastolic dysfunction, have been linked to a poor prognosis.[1] Although underlying CV problems are common, many CKD patients may not have symptoms [2,3]. Through early discovery of these anomalies, therapeutic actions may be made to halt the development of the illness, lessen complications, enhance quality of life, and increase survival rates. The shortcomings of present imaging modalities in evaluating preclinical CVD may be solved by a variety of developing cardiac and vascular imaging technologies. An ultrasonic imaging technique called speckle tracking echocardiography has demonstrated to be sensitive to spot early and subtle changes in LV function [4,5]. In patients with mild to severe CKD, the aortic pulse wave velocity, which is measured by arterial tonometry, is a sign of subclinical arteriosclerosis [6].

In India, chronic kidney disease (CKD), which can vary from asymptomatic to completely irreversible renal failure, is a serious concern. Reduced estimated glomerular filtration rate (eGFR) 60 ml/min/1.73 m2 for more than 3 months, as well as structural or functional problems, are symptoms of CKD [7,8]. Patients with CKD or end-stage renal disease (ESRD) may experience cardiovascular problems, such as left ventricular hypertrophy (LVH), systolic dysfunction, and diastolic dysfunction. Additionally, classic and non-traditional risk factors such diabetes, hypertension, and dyslipidemia are highly prevalent in CKD patients. Inflammation, oxidative stress, and uremia [9].

The Electrocardiogram (ECG) and Echocardiograph are still crucial tools for assessing cardiovascular illness despite technological advancements [10,11]. Especially for the evaluation of left ventricular and right ventricular function, an echocardiographic scan may be crucial in assessing cardiac functions [12].

In individuals with CKD, cardiovascular disease is responsible for around 50% of all fatalities. An estimated 65% of these individuals have left ventricular dysfunction. Renal replacement treatment helped all patients with mild to severe left ventricular systolic dysfunction return to normal heart function. The study's objective was to examine individuals with chronic renal disease's electrocardiographic and echocardiographic results. at the time of

diagnosis, to assess the biochemical, radiological, and ultrasonographic facets of chronic kidney disease.

MATERIALS AND METHODS

Patients with CKD who were hospitalized to the Department of Nephrology at the Superspecialist Block of Sanjay Gandhi Memorial Hospital and Shyam Shah Medical College in Rewa (M.P.) participated in the research. The patients were assessed based on their medical histories, general physical examinations, systemic exams, blood urea, serum creatinine, regular urine tests, abdominal USGs, ECGs, and echocardiograms. The selection of cases was based on the following criteria. The study was done after the approval of the ethics committee of the institute.

Statistical methods were selected in the study. Tests to find the association include chi square test and with p value of <0.05 was considered significant.

Inclusion Criteria

- Random selection of CKD patients without taking the etiology into account.
- Dialysis patient with chronic renal disease.
- Patients whose GFR is between 30 and 59 ml/min
- Patients with inadequate cortical medullary differentiation and bilaterally constricted kidneys on abdominal ultrasound.
- Patients with established CKD with no known cause.

Exclusion Criteria

- Documented ischemic heart disease.
- Congenital heart disease.
- Valvular heart disease.
- Age less than 18 years.

RESULTS & DISCUSSION

Table 1: Demographical distribution of CKD patients

Gender distribution of CKD patients			
	Gender	No. of cases	Percentage
1	Female	20	20%
2	Male	80	80%
Age distribution of CKD patients			
Age group in years		No. of cases	Percentage
1	21-30	4	4%
2	31-40	6	6%
3	41-50	20	20%
4	51-60	32	32%
5	61-70	22	22%
6	71-80	14	14%
7	>80	4	4%
Total		100	100%

The present study compromise 100 cases of chronic kidney disease admitted to Super-speciality block of Shyam Shah Medical College and Hospital Rewa. In the current study, the range of ages was 25 to 95. The majority of the patients 32 individuals, or 32% were in the 51–60 age range.

Figure 1 : ECG change in CKD patients

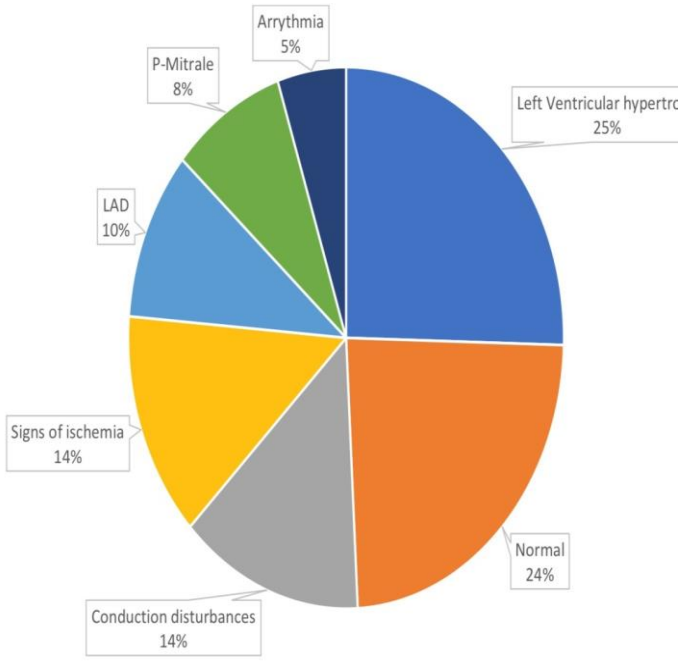


Table 2 : Electrocardiographic changes in CKD patients

Electrocardiographic findings	No. Of cases	Percentage
Normal	24	24%
Left Ventricular Hypertrophy	25	25%
Lad	10	10%
Conduction disturbances	14	14%
Signs of ischemia	14	14%
Arrythmia	5	5%
P-mitrale	8	8%

Table 3 : Comparison of ECG changes in CKD patients

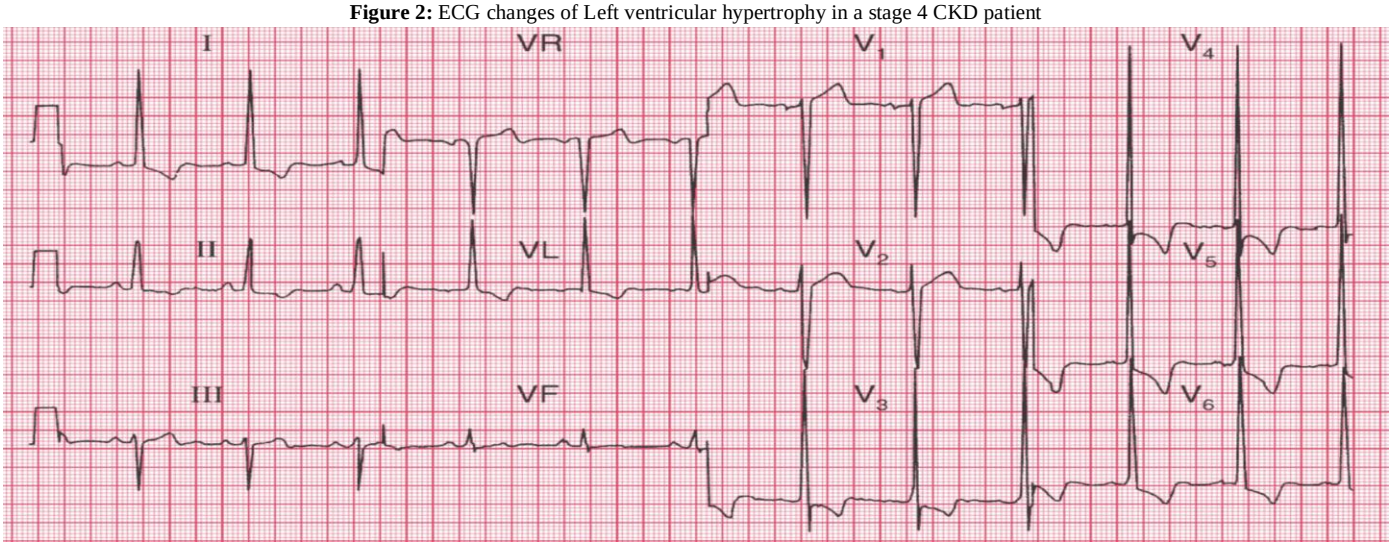
Ecg findings	Soman[13]	A.s. Menon[14]	Krivoshie V[15]	Present study
Normal	-	-	19.1%	24%
Left Ventricular Hypertrophy	18%	12%	33.6%	25%
Lad	-	12%	-	10%
Conduction Disturbances	15%	8%	10.9%	14%
Signs of ischemia	32%	20%	29.1	14%
Arrythmia	5%	-	-	5%
P-mitrale	-	12%	-	8%

The patients' average age was 58.9 ±13.83 years. the mean age in the other studies are 41.1±12.1 years[16], 48.7 ±13.5 years in the [17], 51±17 [18]. There were 20 females and 80 (80%) males. The ratio of male to female was 4:1 which was 0.85:1[16], 4.67:1 [19], 1.8:1[18], 0.96:1 [20] and 1.85:1[17].

In this study, 76 individuals (76%) had electrocardiographic abnormalities. In 25 individuals (25%), left

ventricular hypertrophy was discovered.

Figure 2: ECG changes of Left ventricular hypertrophy in a stage 4 CKD patient



There was a left axis deviation in 10 individuals (10%). In 14 patients (14%), conduction anomalies were seen. In 14 patients (14%), ischemia-related changes were present. In 8 patients (8%), P mitrale was discovered. Five patients (5%) experienced arrhythmia. The above observation made in the present study is comparable with studies [14,15](Table 3).

All of the LVH patients had high blood pressure. In 4 cases (4%), left axis deviation was linked to LVH. Four individuals (4%) with serum potassium levels greater than 6 mEq/L showed signs of hyperkalemia. In 8 individuals (8%), P mitrale was linked to LVH. Two patients were diagnosed with atrial fibrillation (Table 2). Six patients (six percent) had left bundle branch blocks, and eight patients (8 percent) had right bundle branch blocks. Twenty individuals on routine Hemodialysis(HD) who had LVH.14 individuals had ischemia alterations, however only 4 of them were on HD. Conduction abnormality was observed in 14 patients, 9 of whom were HD patients.

In 68 individuals (68%), echocardiographic abnormalities were found. In 42 patients (42%), left ventricular hypertrophy was seen. There was LA+LV dilatation in 8 individuals (8%). Twelve individuals (12%) had anomalies in the regional wall motion. Six individuals (about 6%) had pericardial effusion. It was not much comparable with other studies 76.92% [15], 73.9 % [18] as they have taken only ESRD patients in their study. Left atrial and left ventricular dilatation was observed in 4 patients (8%) in present study which was 35.5% [18], 31%[17], but observed in 46.1% patients [16].

In the current investigation, the time from the diagnosis of chronic renal failure varied from 1 to 30 months. The mean amount of time since the chronic renal disease diagnosis was 20.29 months.

Etiologically diabetes mellitus was the main contributor to 18 individuals' chronic renal disease (18%). Six patients (six percent) had chronic glomerulonephritis; eight had hypertension; 36 had combined diabetes mellitus and hypertension; and 32 had other conditions. (which also include IgA nephropathy, analgesic nephropathy, pyelonephritis, and chronic urinary tract blockage).The data in other studies varies significantly with present study because of the random selection of the cases and regional variation in the incidence of diseases which are known to cause chronic kidney disease.

40 patients (40%) in the current study were receiving hemodialysis. In the current study, the time from the start of hemodialysis therapy ranged from 1 day to 5 years. The average amount of time from the start of hemodialysis was 15.7 months. The range of blood urea level in the present study was between 52- 260 mg/dl. Maximum number of patients ’i.e. 50 patients (50%) had blood urea in the range of 50- 100 mg/dl. The mean urea level was 114.18±42 which is comparable with the study [16] In a study [19] the mean blood urea level was 77.07±25.39 mg/dl.

The range of serum creatinine level in the present study was between 2.5- 21.8 mg/dl. The maximum no. of patients i.e., 36 patients (36%) had serum creatinine in the range of 2.1-4mg/dl. The mean serum creatinine was 6.630±3.5931.The level of mean serum creatinine varies with other studies.

The range of Hb% in present study was 4-12 gm%. The level of Hb<9 gm% in 64 patients (64%). The mean Hb% level was 8.38gm% which is comparable with the study [19] . The range of serum potassium level in the present was 2.8- 7mEq/L. Serum potassium level >5mEq/L was observed in 32 patients (32%). The mean serum potassium level was 4.73 ±1.13 while mean K+ level was 4.73±1.13mEq/dl which is comparable with the study [16]. The range of serum bicarbonate level in the present study was 4.9-29mEq/L. Serum bicarbonate levels <20mEq/L was observed in 54

patients (54%). The mean serum bicarbonate levels were 18.24±4.44.

CONCLUSION

Left ventricular hypertrophy is the commonest morphological abnormality observed. Conduction abnormality is common in patients on HD. Left ventricular dysfunction is commonest cardiovascular abnormality detected. Myocardial ischemia, conduction disturbance was better made out Electro cardiographically .Therefore, a normal ECG reading in CKD patients' needs to be evaluated carefully. Echocardiography was a more sensitive diagnostic procedure to detect left ventricular dysfunction.

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