

Assessment of ECG Changes in Patients with Chronic Kidney Disease

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Abstract

Background: To assess ECG changes in patients with chronic kidney disease. **Subjects and Methods:** Eighty- six adult patients of chronic kidney disease on maintenance haemodialysis were selected and parameters such as complete blood count, renal function test, liver function test, anaemia, hypertension, diabetes and ECG changes was recorded. **Results:** There were 54 male patients and 32 female patients. The mean age of patients was 48.2 ± 5.1 years. Anaemia was seen among 45, diabetes mellitus in 34, hypertension in 30. The mean serum creatinine level was 5.41 ± 1.5 mg/dl. ECG abnormalities observed were LV systolic dysfunction in 17 patients, LV diastolic dysfunction in 29 patients and left ventricular hypertrophy in 40 patients. The difference was significant ($P < 0.05$). **Conclusion:** Echocardiography is cost effective non- invasive diagnostic test which can detect early changes in cardiac parameters. Anaemic and hypertensive help us to check progress and prognosis of the disease. LVH is the most common structural defect and LV diastolic dysfunction is the most common functional cardiac defect in CKD patients on haemodialysis.

Keywords: Anaemia, Chronic kidney disease, Echocardiography, Left ventricular hypertrophy.

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Introduction

Chronic kidney disease (CKD) ranges from asymptomatic to total kidney failure is being widely alarming in India. CKD is characterized by reduced estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73m² for more than 3 months and by structural or functional abnormalities. Cardiovascular complications are commonly encountered symptoms in CKD or end stage renal disease (ESRD) patients including left ventricular hypertrophy (LVH), systolic and diastolic dysfunction.^[1] Also, patients with CKD have a high prevalence of traditional and non-traditional risk factors such as diabetes mellitus, hypertension, uraemia, dyslipidaemia, inflammation and oxidative stress.

The prevalence of CVD is increased among all patients with CKD, not only those with end-stage renal disease (ESRD). Left ventricular hypertrophy (LVH) is one of the common structural cardiac defects in CKD patients.^[2] LVH significantly increases the risk of cardiac ischemia, heart failure, and is a strong predictor of mortality in CKD patients. LV dysfunction is an initial precursor of CVD and leads to LVH in the follow-up period. The prevalence of LVH increases as glomerular filtration declines, and as many as 30% of patients reaching ESRD already have clinical evidence of ischemic heart disease or heart failure.^[3] Furthermore, it is important to note that patients with are reduced glomerular filtration rate (GFR) are more likely to die of CVD than they are to develop ESRD. With the advancement of technology, Electrocardiogram (ECG) and

Echocardiograph remains an essential tool for evaluation of cardiovascular disease.^[4] Changes in cardiac structure and function detected by echocardiography are common in patients with CKD undergoing haemodialysis, and have been considered as key outcome predictors.^[5] The cardiovascular mortality in these individuals is 10 to 20 folds more frequent than in the general population.^[6] Considering this, we conducted this study to assess ECG changes in patients with CKD.

Subjects and Methods

Eighty- six adult patients of chronic kidney disease on maintenance haemodialysis were selected after obtaining approval from ethical review committee of the institute. All gave their written consent for active participation. Inclusion criteria was patients with CKD on maintenance haemodialysis irrespective of etiology. Exclusion criteria was age < 18 years, HIV patients, advanced malignancy and pregnancy.

Demographic profile was recorded. Parameters such as complete blood count, renal function test, liver function test, anaemia, hypertension, diabetes etc. was recorded. All patients were subjected to 12 lead ECG and detailed transthoracic echocardiography (ECHO) was done and abnormalities were noted. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

Results

There were 54 male patients and 32 female patients in present study [Table 1]

Table 1: Patients distribution

Total- 86		
Gender	Male	Female
Number	54	32

Table 2: Demographic data

Parameters	Value
Mean age (years)	48.2± 5.1
Anaemia	45
Diabetes mellitus	34
Hypertension	30
Serum creatinine (mg/dl)	5.41±1.5

The mean age of patients was 48.2± 5.1 years. Anaemia was seen among 45, diabetes mellitus in 34, hypertension in 30. The mean serum creatinine level was 5.41±1.5 mg/dl.

Table 3: ECG changes among CKD patients

ECG changes	Number	P value
LV systolic dysfunction	17	0.05
LV diastolic dysfunction	29	
Left ventricular hypertrophy	40	

ECG abnormalities observed were LV systolic dysfunction in 17 patients, LV diastolic dysfunction in 29 patients and left ventricular hypertrophy in 40 patients. The difference was significant (P< 0.05) [Table 3, Figure 1].

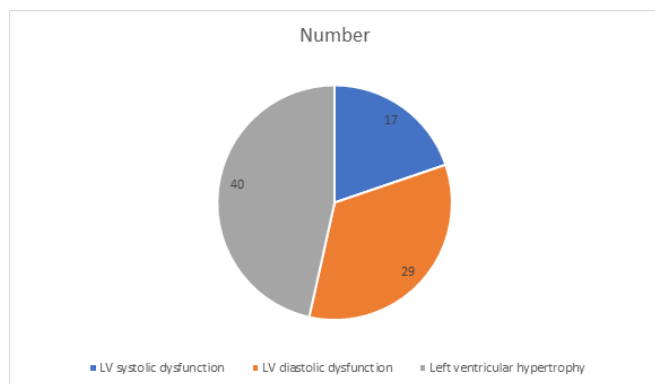


Figure 1: ECG changes among CKD patients

Discussion

Cardiovascular diseases are a leading reason for mortality in end stage renal disease largely as a result of the progressively increasing age of ESRD patient and the broad constellation of uraemia associated factors that can adversely affect cardiac function.^[2] This increased risk of cardiovascular disease may begin during the earlier stages of CKD before the onset of kidney failure.^[8] Notably, patients with CKD have a very high prevalence of cardiovascular disease risk factors such as diabetes and hypertension, but they are also exposed to other non-traditional, uraemia-related

cardiovascular disease risk factors.^[9,10] CKD patients have higher proportions of congestive heart failure that is associated with a higher mortality rate in these patients. Echocardiography is a valuable tool to assess the assess changes in function and structure of the heart that result from CKD.^[11] Abnormal LV geometry, reduction in interventricular septum strength, and changes in LV mass index are important parameters that are affected by CKD in patients with preserved EF.^[12,13] We conducted this study to assess ECG changes in patients with CKD.

There were 54 male patients and 32 female patients. Graham A. Stewart et al,^[14] concluded that LVH is present from the earliest stages of progressive renal disease. This, and other forms of uremic cardiomyopathy, is linked to increased QT interval and dispersal, and with minor rhythm abnormalities, providing a link with the high risk of sudden death.

We found that the mean age of patients was 48.2± 5.1 years. Anaemia was seen among 45, diabetes mellitus in 34, hypertension in 30. The mean serum creatinine level was 5.41±1.5 mg/dl. Bryan Kestenbaum et al,^[15] concluded that Longer QRS and corrected QT intervals were independently associated with incident HF, CHD, and mortality among participants with early CKD and without CKD. ECG findings may provide important prognostic information regarding long-term CV risk in the setting of CKD.

Our results revealed that ECG abnormalities observed were LV systolic dysfunction in 17 patients, LV diastolic dysfunction in 29 patients and left ventricular hypertrophy in 40 patients. These findings are comparable with study done by Krivoshiev et al,^[16] who also concluded that maximum patients came with findings of LVH in ECG. Jas Pal Dhamija et al concluded that cardiac structural as well as functional abnormalities are common in patients with ESRD, more so in those with hypertension and anaemia. LVH is the commonest cardiac abnormality in ESRD patients, followed by diastolic dysfunction. Both conditions are more marked in hypertensive patients and anaemic patients. LVH has got prognostic implications, because this group of ESRD patients have propensity of diastolic dysfunction or sudden cardiac death.

Jameel F et al,^[17] observed that the mean age of the patients was 46.9±12.8 years. There was male dominance with male/female ratio 63/37. There were 39% hypertensive and 62% anaemic patients. LV dysfunction was diagnosed in 31% of patients, LV diastolic dysfunction in 47% patients, and left ventricular hypertrophy (LVH) in 55% of patients. LVH was found in 74.3% hypertensive patients versus only 42.6% non-hypertensive patients (p-value 0.001). LV systolic dysfunction was also high in hypertensive patients, 46.1% versus 21.3% patients in non-hypertensive patients.

Conclusion

Echocardiography is cost effective non- invasive diagnostic test which can detect early changes in cardiac parameters. Anaemic and hypertensive help us to check progress and prognosis of the disease. LVH is the most common structural defect and LV diastolic dysfunction is the most common

functional cardiac defect in CKD patients on haemodialysis.

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