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Assessment of ECG and Echo Findings among With Chronic Kidney Disease Patients

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Abstract: Cardiovascular abnormalities are the leading cause of morbidity and mortality in Chronic Kidney Disease (CKD) patients which includes left ventricular hypertrophy (LVH), left ventricular dilation and left ventricular systolic and diastolic dysfunction. Cardiovascular complications lead in all causes of mortality among patients with CKD, accounting for approximately 50% of deaths. The present study designed to identify Electrocardiographic and Echocardiographic changes in patients with chronic kidney disease. A total of 50 CKD patients (23 males & 17 females) attending outpatient department were included. All patients were undergone for complete haemogram, ECG, Abdominal USG and Echocardiography. The results of present study showing, LVH with or without strain pattern in 62.5%, low voltage complexes in 15%, occasional ventricular premature complexes in 22.5% and non-specific ST – T changes in 30% of cases. 22.5% of Patients showed dilated LVH and 47.5% of showed concentric LVH. Systolic dysfunction was found in 27.5% of cases and diastolic dysfunction was found in 50% of cases. LVH is the commonest morphological abnormality observed. Echocardiographic study plays an important role in evaluating cardiac structure and functions as well as in stratifying prognostic risk. Periodic echocardiographic examination for diagnosis and treatment of cardiac abnormalities in patients with CKD is highly recommended.
Keywords: Chronic kidney disease (CKD), Echocardiography, Left ventricular hypertrophy (LVH), Systolic dysfunction, Diastolic dysfunction

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) <60ml/min/1.73m^2 for more than 3 months and by structural or functional abnormalities [1, 2]. Cardiovascular complications are commonly encountered symptoms in CKD or end stage renal disease (ESRD) patients including left ventricular hypertrophy (LVH), Systolic and diastolic dysfunction. In addition, patients with CKD have a high prevalence of traditional and non-traditional risk factors such as diabetes mellitus, hypertension, dyslipidemia Uremia, inflammation and oxidative stress [3].

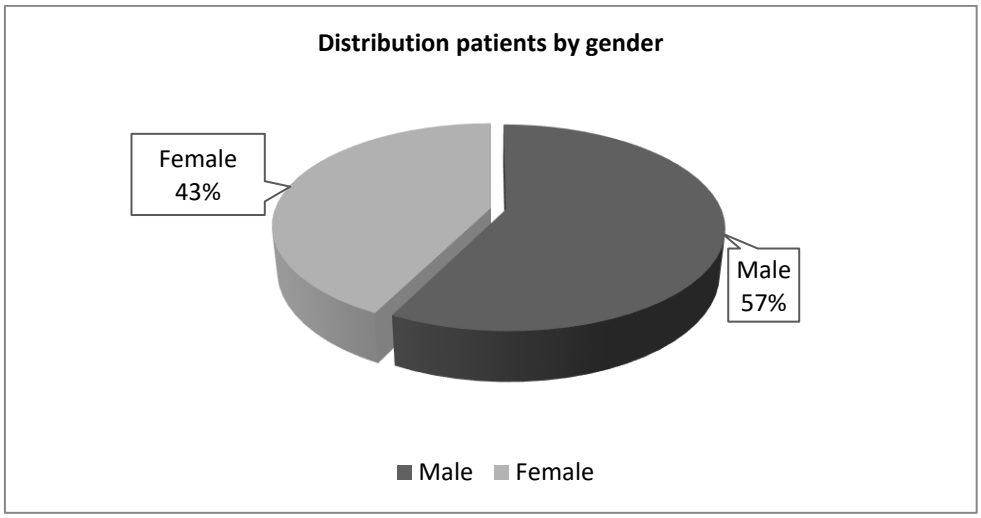
With the advancement of technology, Electrocardiogram (ECG) and Echocardiograph remains an essential tool for evaluation of cardiovascular disease [4, 5]. Echocardiographic study may play a critical role in evaluating cardiac functions especially for the assessment of left ventricular and right ventricular function [6].

From the above facts it is evident that, often there will be misinterpretation between CKD and CVD on clinical examination. It needs to be re-evaluated by easily available diagnostic procedures to prevent mortality and morbidity. The present was designed to investigate the electrocardiographic and echocardiographic changes in chronic kidney disease patients.

MATERIALS AND METHODS

The present study was conducted in Department of General medicine, Maheshwara Medical College and Hospital, Patancheru during June 2016 to April 2017. A total 50 patients (23 male & 17 female) with chronic kidney disease attending outpatient department were considered. Patients with GFR of 30-59 ml/min and with CKD were included and with Valvular Heart disease, Coronary artery disease, Systemic Hypertension on regular treatment and with poor pulmonary function was excluded from the study. All patients were undergone for complete haemogram, ECG, Abdominal USG and Echocardiography.

RESULTS



Graph-1: Distribution patients by sex

Table-1: Distribution of cases according to age group

Age (in years)	Males		Females		Total	
	No.	Percentage	No.	Percentage	No.	Percentage
0-20	**-**	**-**	**1**	**2.5%**	**1**	**2.5%**
21-30	**-**	**-**	**-**	**-**	**-**	**-**
31-40	**3**	**7.5%**	**3**	**7.5%**	**6**	**15%**
41-50	**8**	**20%**	**6**	**15%**	**14**	**35%**
51-60	**6**	**15%**	**6**	**15%**	**12**	**30%**
> 60	**6**	**15%**	**1**	**2.5%**	**7**	**17.5%**

Based on etiological distribution of patients 36% with diabetes mellitus, 14% with chronic glomerulonephritis, 12% chronic interstitial nephritis, 8% with obstructive nephropathy, 6% with hypertension and 4% with autosomal dominant polycystic kidney diseases. Diabetes Mellitus is the commonest etiology.

Table-2: EEG changes in chronic kidney disease patients.

S.N	Finding	No. Of patients	Mean
1.	**LVH**	**25**	**62.5%**
2.	**LVC**	**6**	**15%**
3.	**ST-T Changes**	**12**	**30%**
4.	**LBBB**	**1**	**2.5%**
5.	**VPC**	**9**	**22.5%**
6.	**Ischemia**	**24**	**60%**

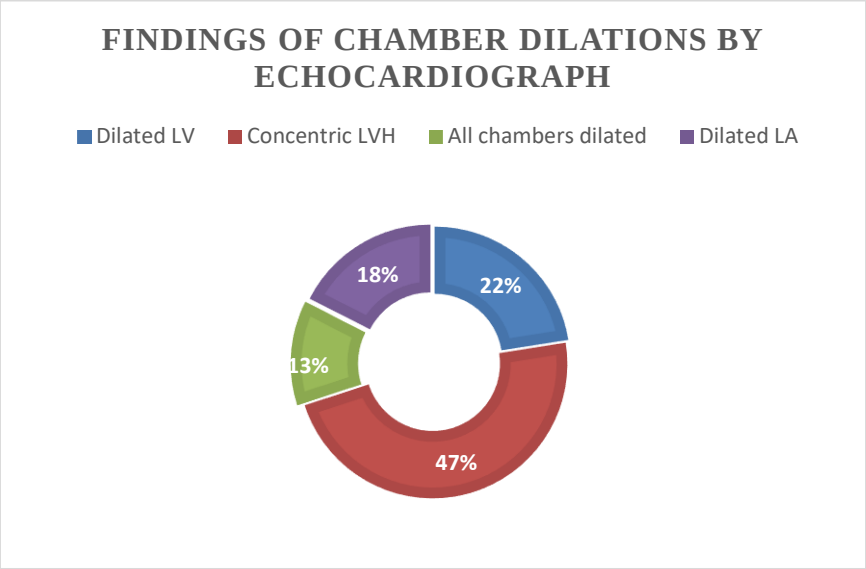


Fig-2: Echocardiographic finding in chronic kidney disease patients.

Table-3: Grading of regurgitations and LV function in CKD patients.

Grading	Mitral Regurgitation	Aortic Regurgitation	Tricuspid Regurgitation
Trivial	**4**	**3**	**1**
Mild	**7**	**4**	**4**
Moderate	**1**	**-**	**-**

Systolic dysfunction was found in 27.5% of cases, Type 1 diastolic dysfunction was found in 50% of cases.

DISCUSSION

Kidney and Heart are inseparably linked in terms of hemodynamic and regulatory functions. Their association exists at multiple levels including the renin-angiotensin aldosterone system, antidiuretic hormone, endothelin, the sympathetic nervous system and the natriuretic peptides. Globally, 40% of deaths in dialysis cases occurring by CVD [7].

In the present study, electrocardiogram showed evidence of LVH with or without strain pattern in 62.5%, low voltage complexes in 15%, occasional ventricular premature complexes in 22.5% and non-specific ST – T changes in 30% of cases. 22.5% of Patients showed dilated LVH and 47.5% of showed concentric LVH. The patients who have had long standing H/O Hypertension showed concentric LVH. These findings are comparable with studies done by NP Singh et al (76.92%), Foley *et al.* (73.9%) and Harnett *et al.* [8-10]. The prevalence of LVH in present study was observed in 62.5% of total cases. Study by McGregor et al found prevalence of LVH in 64-70% of males and 63-65% of females and by P. Danger *et al* found higher prevalence in females. Studies suggest that LVH is the strongest independent predictable factor of adverse cardiovascular signs [11-14]. In present study non-specific ST – T changes in 30% of cases which is comparable with Shakira OM *et al* (22-39%) [15].

In the present study, aortosclerosis and posterior mitral annulus calcification was found in 35% of cases. Age, duration and hyperparathyroidism have been cited as prime determinants of valvar calcification [16, 17]. Systolic dysfunction was seen in 27.5% of cases, Diastolic dysfunction was seen in 50% of cases. LV diastolic dysfunction was more common in all stages of CKD [18]. According to Kramer *et al*, factors contributing to development of CCF in patient with CKD are Volume over load, Valvar heart disease, Negative inotropic effects of Calcium, Cardiac arrhythmias, Pressure overload, Myocardial damage, Anemia [19]. In present study, patients with moderate LV dysfunction showed features of volume overload, anemia and long standing history. All our patients revealed type I relaxation abnormality of diastolic dysfunction.

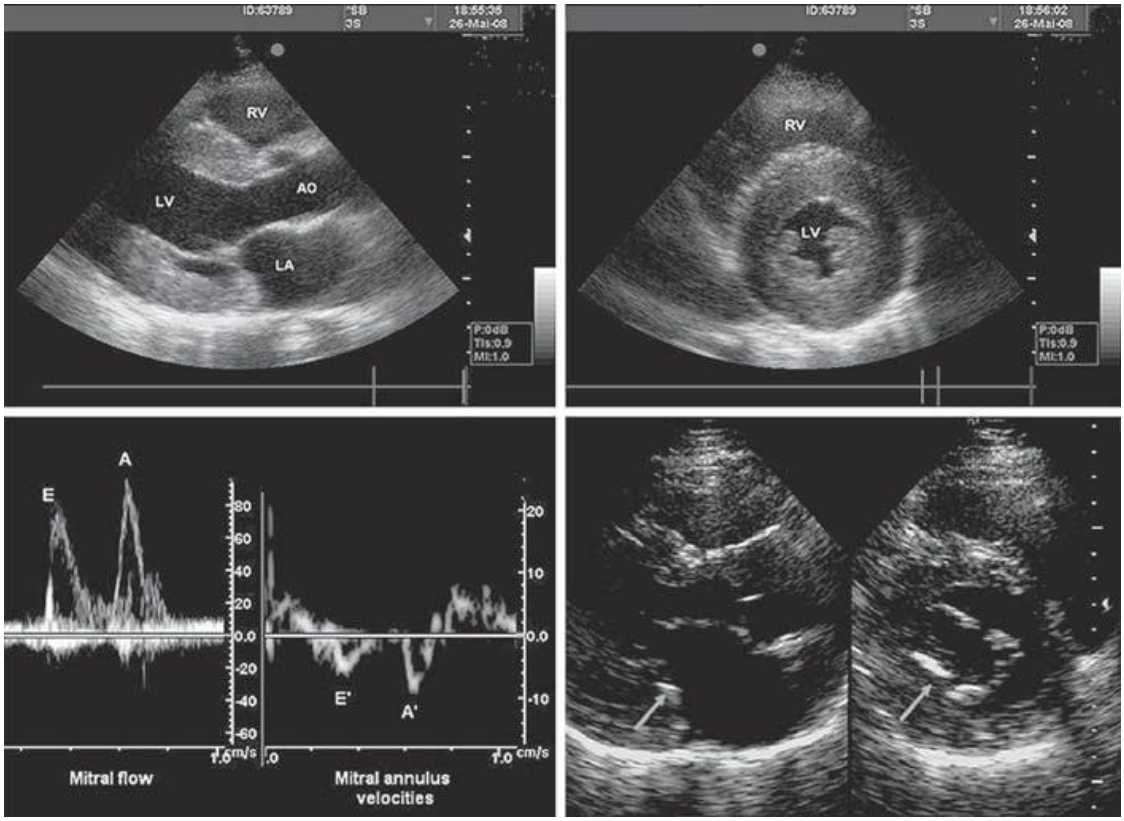


Fig-1: Representative images of echocardiographic findings commonly observed.
(a) **Parasternal longitudinal view showing a pattern of concentric left ventricular hypertrophy. (b). Parasternal transversal view of the same patient. (c). Classic pattern of abnormal relaxation, pointing to a mild diastolic dysfunction (left: early (E) and late (A) diastolic mitral flow velocities showing inversion of the E/A ratio; right: early (E') and late (A') mitral annulus velocities confirming the abnormal relaxation). (d). Mitral annulus calcification. LV = Left ventricle; RV = right ventricle; AO = aorta; LA = left atrium.**

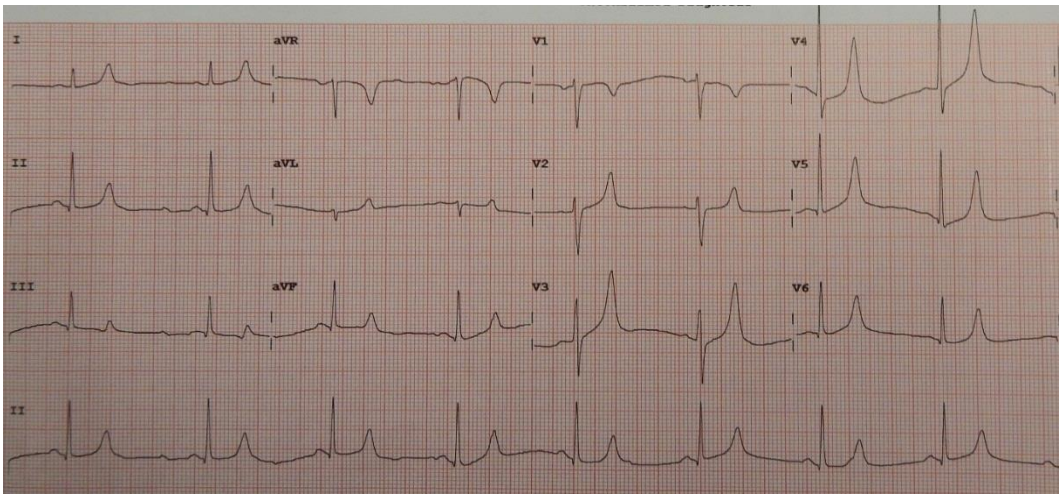


Fig-2: ECG changes of hyperkalemia in a patient with CKD

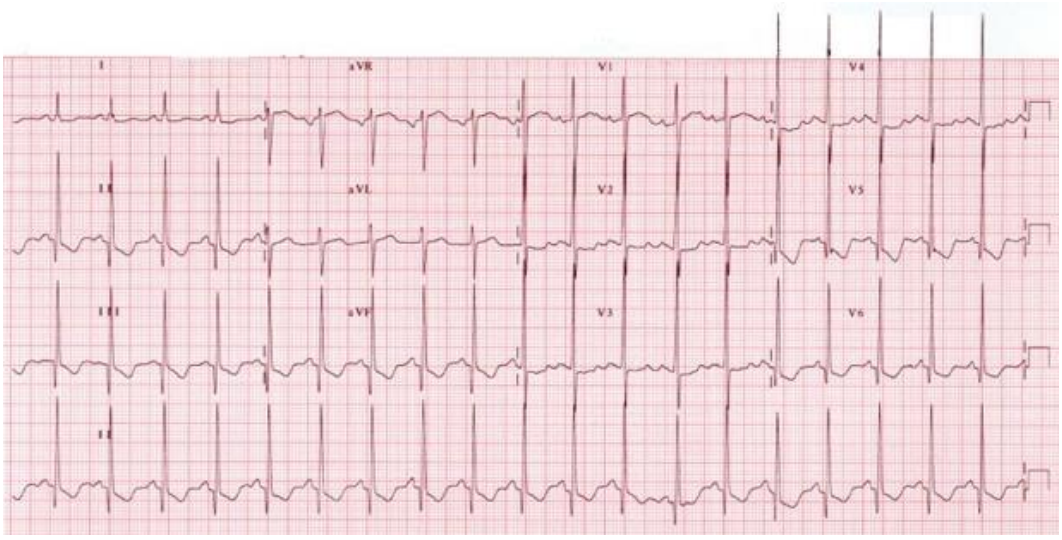


Fig-3: ECG showing left ventricular hypertrophy in a patient with CKD.

CONCLUSION

Electrocardiography and echocardiography are the non-invasive tools which can be used to identify cardiovascular disease early in the course of CKD. LVH was the most common echocardiographically detected abnormality. Diastolic dysfunction was present in 50% of cases and systolic dysfunction in 27.5% of cases. Periodic echocardiographic examination for diagnosis and treatment of cardiac abnormalities in patients with CKD is highly recommended.

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