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A STUDY OF ELECTROCARDIOGRAPHIC AND ECHOCARDIOGRAPHIC CHANGES IN PATIENTS OF CHRONIC KIDNEY DISEASE

General Medicine

Samridhi Ladhani

Dr. Y N Verma

ABSTRACT

Introduction: Chronic kidney disease is defined as the presence of kidney damage or an estimated glomerular filtration rate less than 60 ml/min/1.73 mt2, persisting for 3 months or more, irrespective of the cause. It is a state of progressive loss of kidney function ultimately resulting in the need for renal replacement therapy . A cardiovascular mortality that is 15 to 30 times greater than the age-adjusted cardiovascular mortality in the general population affects roughly 50% of people with ESRD. Therefore this study was undertaken for assessing electrocardiographic and echocardiographic findings in CKD patients. **Method:** In this study 50 pts of chronic kidney disease as per KDIGO criteria were enrolled over a period of six months (Jan-June 2022).All relevant data were recorded and analyzed. **Results:** Among 50 pts, 26 percent of the patients each belonged to the age group of 61 to 70 years. 62 percent of the CKD patients were males while the remaining were females. While assessing the ECG findings among CKD patients, LVH and arrythmias were seen in 52 percent and 44 percent of the patients. While assessing the correlation of ECG findings with CKD severity grading, it was seen that ECG variables were significantly deteriorate with increasing severity of CKD grading . While analysing ECHO findings among CKD patients, abnormal findings were seen in 88 percent of the patients . While assessing the correlation of ECHO findings with CKD severity grading, it was seen that ECHO variables were significantly deteriorate with increasing severity of CKD grading. **Conclusion :** LVH, LAE were very common ECG and ECHO abnormalities in CKD patients. Cardiac disorders are highly prevalent in patients with progressive CKD. All CKD patients must be evaluated for cardiac co-morbidities, since it might help to establish adequate treatment that may potentially improve patient's prognosis.

KEYWORDS

INTRODUCTION:

A significant contributor to world morbidity & mortality are chronic diseases. Previously thought being a health issue that only existed in affluent nations, four out of every five deaths related to chronic diseases now take place in developing low- and middle-income nations. However, the rise in the prevalence of CKDs progressing to ESRD, along with associated financial burden of RRT, in both developed & developing countries, has brought attention to CKD and its risk factors. The prevalence of CKD is quickly rising over the world.[1,2]

One of the recent published research involving Kidney disease evaluation showed that prevalence rate of type 1 CKD, type 2 CKD, type 3 CKD, type 4 CKD and type 5 CKD to be 7 percent, 4.3 percent, 4.3 percent, 0.8 percent and 0.8 percent respectively.[3]

One of the frequent structural cardiac abnormalities in CKD patients is left ventricular hypertrophy (LVH). In CKD patients, LVH greatly raises the risk of myocardial ischemia, heart failure, and is a reliable indicator of mortality. LV dysfunction is the initial sign of CVD and, with time, progresses to LVH. Additionally, the existence of coronary artery obstruction, a decrease in coronary reserves, and physiological-structural anomalies in the left ventricle as a result of volume and pressure overload all contribute to cardiomyopathy in hemodialysis (HD) patients. The left ventricle adapts when left cardiac preload is not lowered, which results in a reduction in capillary density, diastolic dysfunction, problems in intraventricular conduction, dilatation, and increased compensatory hypertrophy. These phenomena make patients more susceptible to electrical excitability, which might result in abrupt cardiac death. The most reliable diagnostic method for identifying structural and functional problems in the heart is echocardiography.[4,5]

Hence; under the light of above-mentioned data, the present study was undertaken for assessing electrocardiographic and echocardiographic findings in CKD patients.

AIMS AND OBJECTIVES

AIM:

- To study Electrocardiographic and Echocardiographic changes in patients with chronic kidney disease.

OBJECTIVE:

- To describe the electrocardiographic and echocardiographic findings in patients with chronic kidney disease.
- To study and correlate the relationship between electrocardiogram and the abnormalities with clinical profile of patients with chronic kidney disease.
- To study the relationship between echocardiographic findings and clinical profile in patients with chronic kidney disease.

MATERIAL AND METHODS

In this Descriptive, Cross- sectional, analytical clinical study, in all patients, a detailed history was taken, along with the duration of symptoms noted. Cardiovascular symptoms, like dyspnea, chest pain, pedal edema, pallor was noted and if present, patients were excluded from study. Blood pressure was measured thrice and the average was taken. Cardiovascular examination was done. Complete haemogram, blood urea, serum creatinine, serum electrolytes, serum calcium, phosphorus and uric acid, serum lipid profile was measured. Patients was subjected to abdominal ultrasonography and chest X-ray. Creatinine clearance was calculated in all patients using the Cock Croft-Gault equation. Evidence of left ventricular hypertrophy, low voltage complexes, ischemic changes was looked for.

OBSERVATIONS AND RESULTS

The present study was undertaken for assessing electrocardiographic and echocardiographic changes in patients of chronic kidney disease. A total of 50 subjects with CKD were enrolled.

26 percent of the patients each belonged to the age group of more than 70 years and 61 to 70 years. 24 percent of the patients belonged to the age group of 51 to 60 years. Mean age of the patients was 59.98 years. 62 percent of the CKD patients were males while the remaining were females. Hence; a male preponderance was seen among CKD patients.

While evaluating the clinical profile, pedal edema and dyspnoea was found to be present in 44 percent and 78 percent of the patients respectively while chest pain, palpitations and vomiting were seen in 18 percent of the patients.

While assessing the ECG findings among CKD patients, LVH and arrythmias were seen in 52 percent and 44 percent of the patients respectively. LAE, ischemic changes and peak T-wave was seen in 12 percent, 4 percent and 32 percent of the patients respectively. Normal findings were seen in 30 percent of the patients.

While assessing the correlation of ECG findings with CKD severity grading, it was seen that ECG variables (LVH, LAE, ischemic changes, Peak T-wave and arrythmias) were significantly deteriorate with increasing severity of CKD grading (p- value < 0.05).

While analysing ECHO findings among CKD patients, abnormal findings were seen in 88 percent of the patients while normal ECHO

findings were seen in 12 percent of the patients. Mean IVSd was 1.3 cm. LVH was seen in 64 percent of the patients while DD was seen in 48 percent of the patients. Mean LVEF was 51.12%. Mean LA volume was found to be 29.64 ml/m^2. Dilated LA was found to be present in 42 percent of the patients while LVSD was seen in 36 percent of the patients. Overall, normal findings were seen in 12 percent of the patients.

While assessing the correlation of ECHO findings with CKD severity grading, it was seen that ECHO variables were significantly deteriorate with increasing severity of CKD grading (p- value < 0.05).

Table 1: Age And Gender-wise Distribution Of Patients

Age group (years)	Number of patients	Percentage
≤ 40 years	3	6
41 to 50 years	9	18
51 to 60 years	12	24
61 to 70 years	13	26
More than 70 years	13	26
Total	50	100
Mean ± SD	59.98 ± 12.39	
Gender	Number of patients	Percentage
Males	31	62
Females	19	38

Table 2: ECG findings

ECG findings	Number	Percentage
LVH	26	52
LAE	6	12
Ischemic changes	2	4
Peak T-wave	16	32
Arrythmias	22	44
Normal findings	15	30

LVH: Left Ventricular hypertrophy
LAE: Left atrial enlargement

Table 3: Correlation of ECG findings with CKD grading

ECG findings	Stage 1 N=2	Stage 2 N=6	Stage 3 N=22	Stage 4 N=15	Stage 5 N=5	p-value
LVH [n (%)]	0 (0%)	1 (16.67%)	10 (45.45%)	11 (73.33%)	4 (80%)	0.015*
LAE [n (%)]	0 (0%)	0 (0%)	0 (0%)	3 (20%)	3 (60%)	0.038*
Ischemic changes [n (%)]	0 (0%)	0 (0%)	0 (0%)	1 (6.67%)	1 (20%)	0.041*
Peak T-wave [n (%)]	1 (50%)	1 (16.67%)	3 (13.64%)	8 (53.33%)	3 (60%)	0.018*
Arrythmias [n (%)]	1 (50%)	1 (16.67%)	6 (27.27%)	10 (66.67%)	4 (80%)	0.029*
Normal findings [n (%)]	1 (50%)	4 (66.67%)	10 (45.54%)	3 (20%)	0 (0%)	0.022*

*: Significant

Table 4: ECHO Findings

ECHO findings	Mean/Number	SD/Percentage
IVSd (cm)	1.3	0.07
LVH (n)	32	64
LVEF (%)	51.12	5.29
DD (n)	24	48
LA volume (ml/m2)	29.64	6.98
Dilated LA	21	42
LVSD	18	36
Normal findings	6	12

DD: Diastolic dysfunction
IVSd: Interventricular septal diameter
LVH: Left Ventricular hypertrophy
LVEF: Left Ventricular ejection fraction
LVSD: Left ventricular systolic dysfunction

Table 5: Correlation Of ECHO Findings With CKD Grading

ECHO findings	Stage 1 N=2	Stage 2 N=6	Stage 3 N=22	Stage 4 N=15	Stage 5 N=5	p-value
IVSd (cm)	1.14	1.21	1.29	1.31	1.45	0.002 *
LVH [n (%)]	1 (50%)	3 (50%)	14 (63.64%)	10 (66.67%)	4 (80%)	0.012 *
LVEF (%) *: Significant	61.2	60.2	52.36	50.15	43.62	0.027 *
DD [n (%)]	0 (0%)	1 (16.67 %)	9 (40.9%)	10 (66.67%)	4 (80%)	0.023 *
LA volume (ml/m^2)	22.5	23.33	25.72	34.6	40.33	0.000 *
Dilated LA [n (%)]	0 (0%)	0 (0%)	7 (31.82%)	10 (66.67%)	4 (80%)	0.017 *
LVSD [n (%)]	0 (0%)	0 (0%)	7 (31.82%)	8 (36.36%)	3 (60%)	0.033 *
Normal findings [n (%)]	1 (50%)	2 (33.33 %)	2 (9.09%)	1 (6.67%)	0 (0%)	0.096

DISCUSSION

Among patients with chronic renal disease, cardiovascular disease (CVD) is a significant contributor to death and morbidity .Renal function impairment, indicated by reduced estimated glomerular filtration rate (eGFR), is a powerful prognostic predictor of mortality, cardiovascular events, and hospitalization.[6] It has been established that cardiac abnormalities, particularly aberrant left ventricular (LV) geometry and functions, are frequently found in CKD patients and are associated with high rates of cardiovascular mortality/morbidity and all-cause mortality. Therefore, early detection of these high-risk patients could enable medical professionals to optimise therapeutic measures, thereby reducing morbidity and mortality.[7-9]

26 percent of the patients each belonged to the age group of more than 70 years and 61 to 70 years. 24 percent of the patients belonged to the age group of 51 to 60 years. Mean age of the patients was 59.98 years. In a study conducted by Muli EPB et al, 62.3 percent of the patients were of age group of more than 50 years with a mean age of 52.2 years[10] 62 percent of the CKD patients were males while the remaining were females. Hence; a male preponderance was seen in CKD patients. In a study conducted by Mahishale GS et al, 69 percent of the patients were males.[11] Garg P et al and Islam T et al, in their studies respectively also reported higher proportion of male population among CKD patients (63.3 percent and 58 percent respectively).In another study conducted by Krishna MV et al, 68 percent of the patients were males.[12,13]

While assessing the ECG findings among CKD patients, LVH and arrythmias were seen in 52 percent and 44 percent of the patients respectively. LAE, ischemic changes and tall T-wave was seen in 12 percent, 4 percent and 32 percent of the patients respectively. Normal findings were seen in 30 percent of the patients.LVH in CKD patients occurs both due to pressure and volume overload. Pressure overload occurs as a result of pre existing hypertension, but also because of loss of elasticity of the vessels and vascular calcifications, leading to augmented pulse pressure.[14]

While analysing ECHO findings among CKD patients, abnormal findings were seen in 88 percent of the patients while normal ECHO findings were seen in 12 percent of the patients. Mean IVSd was 1.3 cm. LVH was seen in 64 percent of the patients while DD was seen in 48 percent of the patients. Mean LVEF was 51.12%. Mean LA volume was found to be 29.64 ml/m^2. Dilated LA was found to be present in 42 percent of the patients while LVSD was seen in 36 percent of the patients. Overall, normal findings were seen in 12 percent of the patients.

LVH in patients of CKD occurs as a result of both pressure and volume overload. The most significant mechanism for the development of eccentric LVH in ESRD patients is cyclic water overload, which results in left ventricular volume overload. Concentric LVH is caused by a number of factors, including arterial hypertension, which may

have nephrogenic or renovascular origin.[15]

While assessing the correlation of ECG findings with CKD severity grading, it was seen that ECG variables (LVH, LAE, ischemic changes, Peak T-wave and arrythmias) were significantly deteriorate with increasing severity of CKD grading (p- value < 0.05). While assessing the correlation of ECHO findings with CKD severity grading, it was seen that ECHO variables were significantly deteriorate with increasing severity of CKD grading (p- value < 0.05).[16]

CONCLUSION

Under the light of above obtained results, following conclusion can be withdrawn:

- LVH, LAE were very common ECG and ECHO abnormalities in CKD patients.
- Hence, cardiac disorders are highly prevalent in patients with progressive CKD. All CKD patients must be evaluated for cardiac co-morbidities, since it might help to establish adequate treatment that may potentially improve patient's prognosis.
- An ECG and ECHO should be enlisted in the initial investigation in CKD patients as a screening test which guides the clinician for further evaluation of cardiovascular disease.

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