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STUDY OF ELECTROCARDIOGRAPHIC CHANGES IN PATIENTS OF CHRONIC KIDNEY DISEASE

General Medicine

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ABSTRACT

CKD and its associated risk factors cause a rise in tendency to develop the cardiovascular (CV) diseases. the spectrum of CVD consists of left ventricular hypertrophy, congestive heart failure, ischemic heart disease, peripheral vascular disease and arrhythmias. The present study designed to identify electrocardiographic changes in patients with chronic disease. A total of 100 CKD patients (63 males & 37 females) attending OPD & IPD were included. All patients were undergone for CBC, KFT, Urine routine microscopy, Abdominal USG, ECG. The present study shows subjects with electrocardiographic changes in chronic kidney disease. Maximum 36% cases were with LVH, followed by 22% cases being normal, 10% each were with ischemia and conduction abnormalities, Hyperkalemia 3%, Atrial fibrillation seen in 2% cases. Regular monitoring of ECG is required to identify any sign of CVD occurrence at the earliest.

KEYWORDS

CKD (chronic kidney disease), CVD (cardiovascular disease), ECG (electrocardiography), LVH (left ventricular hypertrophy).

INTRODUCTION -

Chronic Kidney Disease (CKD) consists of various pathophysiologic processes that are linked with abnormal function of kidney, leading to decrease in the glomerular filtration rate.[1] CKD is being explained as abnormality in the different stages of kidney, affecting its function and structure, lasting for more than 3 months of time and having different health implications.[2] CKD is being categorised into five different stages. Stage 1 shows a slight disturbance in kidney function; having a normal or relatively high GFR (≥90 ml/min/1.73m^2) with constant albuminuria. In Stage 2 CKD, mild reduction in GFR (60–89 ml/min/1.73m^2) is observed with damage to kidney. Stage 3 shows a moderate level of reduction in GFR (30–59 ml/min/1.73m^2).

In stage 4 CKD, there is severe reduction in GFR (15–29 ml/min/1.73m^2), and in Stage 5, an established failure of kidney (GFR <15 ml/min/1.73m^2) is observed, that require a permanent renal replacement therapy.[1]

In patients suffering with CKD, increased susceptibility to CVD has increased the mortality rate more commonly and even before time. In patients with CKD and ESRD, the spectrum of CVD consists of congestive heart failure, ischemic heart disease, peripheral vascular disease and arrhythmias. The incidence of CVD was found to be 20-30times more in patients with ESRD, but now CVD risk is being observed in all CKD stages.[2]

Regular monitoring of ECG is required to identify any sign of CVD occurrence at the earliest. ECG also helps in detecting the signs of myocardial ischemia, disturbances in heart rhythm, abnormalities in chambers and cardiacconduction.[8] Thus, the present study was conducted to analyze the electrocardiographic changes in CKD patients in Muzaffarnagar medical college and their significance with Stages of CKD.

MATERIALS AND METHODS

Study design: Descriptive cross-sectional study

Study place:
Department of General Medicine, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P.

Study Duration: One year (From 1st April 2021 to 31st March 2022)

Sample Size: 100 patients

Sample Technique:
Outdoor and indoor patients of chronic kidney disease (undergoing dialysis also) attending department of General Medicine, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P. will be evaluated before being taken up for the study.

Inclusion Criteria:

a) Selection of cases with CKD without considering the etiology.
b) Patients with chronic kidney disease on dialysis.

Exclusion Criteria:

a) Documented ischemic heart disease.
b) Congenital heart disease.
c) Valvular heart disease.
d) Age less than 18 years.

Study Method: .
The study will be conducted in Muzaffarnagar Medical College and Hospital, Muzaffarnagar, U.P. on both indoor and outdoor patients of General Medicine department by following inclusion and exclusion criteria, history taking, general physical examination and relevant clinical examinations and interpretation of electrocardiograph by taking 12 lead ECG.

Data Collection Method:
The data of the patients will be collected in Case Record Form. The collected data will be entered into Microsoft Excel spreadsheet.

RESULTS

Table no. 1: Distribution of Study Subjects According to Gender

Gender	Number of patients (n)	Percentage (%)
Female	37	37.0
Male	63	63.0
Total	100	100.0

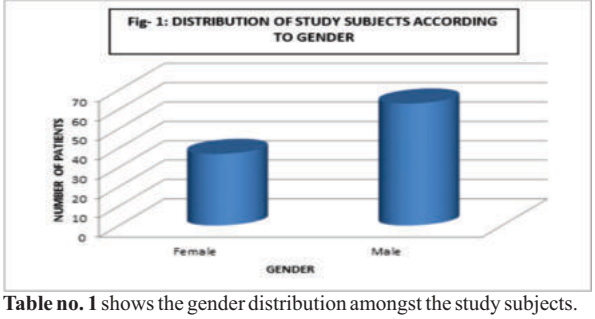

Table no. 1 shows the gender distribution amongst the study subjects. Out of 100 patients included in the study 63 were males and 37 females.

Table no. 2: Distribution of Study Subjects According to Stage of CKD

Stage	Number of patients (n)	Percentage (%)
Stage 3.00	9	9.0
Stage 4.00	27	27.0
Stage 5.00	64	64.0
Total	100	100.0

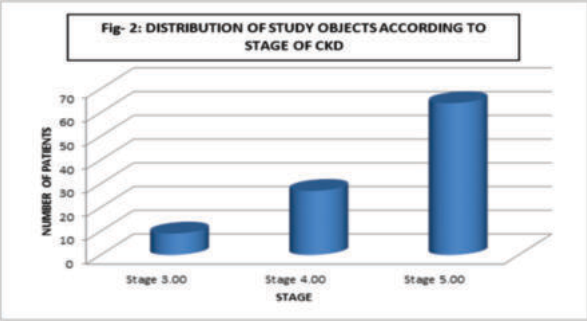

Table no. 2 shows the distribution of study subjects according to stage. Maximum 64% cases were having stage 5, followed by 27% subjects with stage 4 and 9% with stage 3.

Table no. 3: Mean Biochemical Parameters

	Minimum	Maximum	Mean	Std. Deviation
Blood urea	46.00	467.00	159.8400	72.14320
Serum creatinine	1.20	20.70	6.8280	3.99657
Na+	116.00	142.00	130.35	28.491
K+	2.90	8.00	4.8910	.92301
Cl-	98.00	108.00	101.5800	1.74182
Ca+2	5.50	9.80	7.9770	.99512
Bicarbonate	8.00	23.00	17.04	3.123

Table no. 3 shows mean of various biochemical parameters. Mean Blood urea was 159.84±72.14, mean Serum creatinine was 6.82±3.99, mean Na+ levels was 130.35±28.4, mean K+ was 4.89±0.92, mean Chloride was 101.58±1.74, mean calcium was 7.97±0.99 and mean Bicarbonate levels was 17.04±3.12.

Table no.4: Study of Electrocardiographic Changes in Chronic Kidney Disease

ECG CHANGES	FREQUENCY	PERCENTAGE (%)
ISCHEMIA	15	15
ATRIAL FIBRILLATION	2	2
CONDUCTION	10	10
HYPERKALEMIA	3	3
LEFT AXIS DEVIATION	2	2
LEFT ATRIAL ENLARGEMENT	2	2
LEFT VENTRICULAR HYPERTROPHY	36	36
SINUS TACHYCARDIA	8	8
NORMAL	22	22
TOTAL (N)	100	100

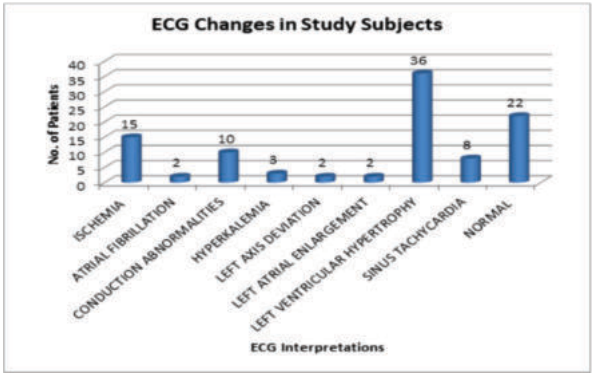

Table no.4 shows study subjects with electrocardiographic changes in chronic kidney disease. Maximum 36% cases were with LVH, followed by 22% cases being normal, 15% each were with ischemia and 10% conduction abnormalities.

DISCUSSION –

Mean Blood urea was 159.84±72.14, mean Serum creatinine was 6.82±3.99, mean Na+ levels was 130.35±28.4, mean K+ was 4.89±0.92, mean Chlorine was 101.58±1.74, mean calcium was 7.97±0.99 and mean Bicarbonate levels was 17.04±3.12. In accordance with our study, **Singh KD et al.** found that the mean blood urea level was 114.18±42.95 mg/dl which is comparable with the study of **Singh NP et al.** [60] (121.2 ± 30.6), **Foley et al.** (117 ± 15.3). In **Chafekar DS et al.** the mean blood urea level was 77.07±25.39 mg/dl which is in discordance with the present study. Similar to our study, **Singh KD et al.** found that mean serum creatinine level was 6.63±3.59 mg/dl. The level of mean serum creatinine varies with other studies for example **Singh NP et al.** (3.5 ± 1.0) and **Chafekar DS et al.** (5.75 ± 1.32). The studies in literature say that hyperkalemia is the most common electrolyte abnormality in chronic kidney disease. In the **Singh KD et al.** study 32% of patient had K+ level >5 meq/l, with the mean K+ level was 4.73±1.13 mEq/dl which is comparable with the study of **Singh NP et al.**

Similar to our study, **Soren J et al.** found that left ventricular hypertrophy (LVH) and left atrial enlargement (LAE) were seen in 14.76% and 8.3% of patients respectively. Atrial fibrillation was present in 4.3% of patients. Left axis deviation (LAD 7%), right axis deviation (RAD 6%), atrial ectopics (2.6%) and tall T waves (7.3%) were the other ECG changes observed.

Singh KD et al. electrocardiographically determined cardiovascular abnormalities that were observed in 72% of patients. LVH in 30% patients, ischemia in 16% patients, intraventricular conduction disturbance in 16 patients (16%), p mitrale in 10 patients (10%), arrhythmia in 6 patients (6%). ECG was normal in 28 patients (28%). The above observation is comparable with study done by **Krivoshiev S et al.** who also concluded that maximum patients came with findings of LVH in ECG whereas **Soman et al. and Menon AS et al.** concluded that maximum patients came with findings of ischemia in ECG.

It was observed that almost all of the abnormal ECG findings occurred mostly in the later stages of CKD i.e., stage 4 and 5. Hence, it is imperative to monitor regularly the patients of CKD to assess the changes in ECG. Progression of CKD stage increases the occurrence of abnormal ECG findings, especially in the later stages.

CONCLUSION –

- CKD emerged as a main public health issue, with an approximate prevalence rate of 11-13% worldwide, and mainly stage 3 being most common. The main causes of increased prevalence are rise in cases suffering with diabetes and hypertension. In patients suffering with CKD, increased susceptibility to CVD has increased the mortality rate more commonly and even before time. Although CVD is the main cause of mortality in CKD patients, but it has been observed that mortality rate is even higher in patients who are not undergoing dialysis.
- Electrocardiogram (ECG) is a useful, simple and non-invasive diagnostic tool being used to assess incidence of morbidity and mortality due to CVD in late-stage CKD patients. The abnormalities noticed in ECG can be the predictor for diagnosing CVD independently ECG also helps in detecting the signs of myocardial ischemia, disturbances in heart rhythm, abnormalities in chambers and cardiac conduction.

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