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A Study of Electrocardiography and Echocardiography Changes and to Find out Prevalence DF Ischaemic Heart Disease in Chronic Kidney Disease Stage-V Patient in a Tertiary Care Centre, Kolkata

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ABSTRACT
Chronic kidney disease affects 20 million US adults, with 571,414 patients having end-stage renal disease and 172,553 having transplanted kidneys in 2009. It's an independent risk factor for coronary artery disease. To study of ECG and echocardiography changes in chronic kidney disease stage-v patient amongst in hospital patients in a tertiary care center. The present study was a observational study with Cross sectional. This Study was conducted from 18 months at KPC Medical College and Hospital, Jadavpur, Kolkata-700032. Total 100 patients were included in this study. In our study, 22 (22.0%) patients had Systolic dysfunction-ECHO The value of z is 7.9196. The value of p is <.00001. The result is significant at p<.05. In our study, 22 (22.0%) patients had Systolic dysfunction-ECHO the value of z is 7.9196. The value of p is <.00001. The result is significant at p<.05. In our study, 25 (25.0%) patients had Global hypokinesia-ECHO. The value of z is 7.0711. The value of p is <.00001. The result is significant at p<.05. In our study, 30 (30.0%) patients had IHD. The value of z is 5.6569. The value of p is <.00001. The result is significant at p<.05. The study highlights the connection between CKD stage V and cardiovascular health, emphasizing the need for comprehensive cardiac evaluations and tertiary care centers for optimal patient care.

INTRODUCTION

Chronic Kidney Disease (CKD) is defined as either kidney damage or a decreased glomerular filtration rate (GFR) of <60mL/min/1.73m2 for at least 3 months. Irrespective of the underlying etiology, once the loss of nephrons and reduction of functional renal mass reaches a certain point, the remaining Neophron begin a process of irreversible sclerosis that leads to a progressive decline in GFR. Estimation of GFR is done by using CKD-EPI Creatinine 2009 Equation or by using Cockcroft-Gault Formula in patients with extremes of age or weight. Chronic kidney disease (CKD) is a major health problem worldwide. Approximately 20 million adults in the United States have CKD with or without decreased glomerular filtration rate (GFR). According to the USRDS (United States Renal Data System), 571,414 patients had end-stage renal disease (ESRD) and 172,553 patients had transplanted kidneys in the United States in 2009[1]. Chronic kidney disease is an independent risk factor for the development of coronary artery disease (CAD). Coronary artery disease is the leading cause of morbidity and mortality in patients with CKD. Atypical presentation of CAD in patients with CKD often leads to delay in diagnosis and treatment. Furthermore, the outcomes of CAD are poorer in patients with CKD than non-CKD counterparts. This review highlights recent advances in the epidemiology, pathogenesis, diagnosis and management of CAD among CKD patients. The renal origin of cardiovascular disease (CVD) was first suggested by Richard Bright in 1836. Studies have confirmed that patients with chronic kidney disease (CKD) have more frequent and severe CVD compared to the general population. CKD is considered a coronary artery disease equivalent and early CKD patients are more likely to die from CVDs than progress to end-stage renal disease (ESRD). However, evidence-based management of CVD in CKD is lacking, which has significant treatment implications. The concept that CVD and CKD can initiate and perpetuate each other led to the creation of cardio renal syndrome as a separate clinical entity. The mechanism underlying the increased risk of cardiovascular events in CKD patients is not well defined, but CKD appears to be the major factor in determining cardiovascular morbidity and mortality. To study of ECG and echocardiography changes in chronic kidney disease stage-v patient amongst in hospital patients in a tertiary care center and to assess the IHD burden and to scrutinize the ECG and echocardiography abnormalities among chronic kidney disease (stage-5) between in-hospital patients in KPC MCH.

MATERIALS AND METHODS

Study Design: Patients with CKD were identified and diagnosed according to KDIGO criteria 2012. Then the cause for development of cardiovascular disease and ECG and echocardiography Changes were searched for by proper history taking, clinical examination, lab investigations, urine examination and imaging findings. For evaluating patients of Cardiovascular risk on chronic kidney disease (stage-5) (MHD), firstly the patient is classified to an appropriate stage according to GFR which was calculated using the CKD-EPI Creatinine 2009 Equation. Then the ECG Changes in a known case of CKD (stage-5) was evaluated. If the CKD patients were within Stage 1-4 and not requiring hemodialysis, they were excluded from the study.

Ethical Clearance:

- A written permission from the concerned authority was obtained prior to the study.
- Consent was taken from the patient before conducting the study.
- Confidentiality and anonymity of the subjects was maintained.

Statistical Analysis: Parametric and non-parametric tests with appropriate statistical software. P value <0.05 is considered significant.

Plan of Study:

- **Preparatory Phase:** 1st September, 2022 to 31st October, 2022.
- Selection of topic.
- Protocol formation.
- Permission was taken from the Institutional Ethics Committee.
- **Data Collection Phase:** 1st November, 2022 to 31th October, 2023.

After proper ethical clearance from the Institutional Ethics Committee, informed consent was taken from all patients fulfilling inclusion/exclusion criteria admitted in General Medicine, KPC Medical College and Hospital. Detailed history taking was done. Inclusion criteria fulfilled patient's blood reports data was collected.

- **Data Entry:** 1st November, 2022 to 31th October, 2023. test, viral serology, ANA, ANCA, C3, C4(where relevant).
- **Sepsis Profile:** Blood C/S, Urine C/S, Infective profile.
- (MP, MPDA, Dengue NS1, TyphidotM, Leptospira IgM, Scrub Typhus IgM) (Where relevant).
- **Urine Examinations:** Routine examination, culture and sensitivity, urine spot ACR.
- Ultrasonography of whole abdomen (W/A)/ Kidney.
- Ureter Bladder (KUB) +/- Prostate.
- Chest X-Ray (PA).
- ECG-12 leads.
- 2D Doppler Echocardiography.

Blood Samples: Complete hemogram was measured using MINDRAY BC-5380 auto cell analyzer. Urea, Creatinine, Liver function test was measured using DIASYS 400 auto cell analyzer. Viral Serology was done by ELISA method. Measurement of HbAlc is done by immunoturbidimetric method using Siemens Biorad D10.

Inclusion Criteria: Patients admitted with CKD (Stage-5).

Exclusion Criteria:

- Patients <18 years.
- CKD patients(Stage I-IV).
- Pre-existing heart disease in CKD (STAGE-V)[MHD].
- Patients not giving consent to participate in the study.

RESULT AND DISCUSSIONS

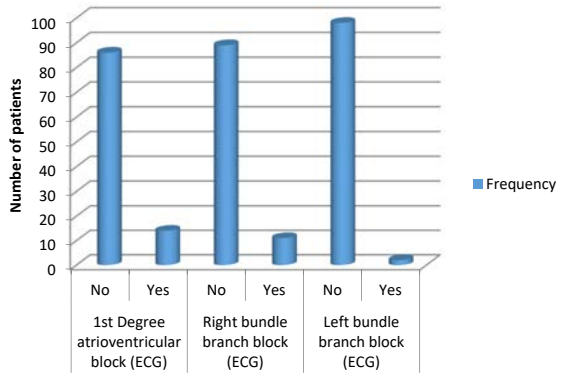

Fig. 1: Distribution of 1st Degree Atrioventricular Block (ECG), Right Bundle Branch Block (ECG) and Left Bundle Branch Block (ECG)

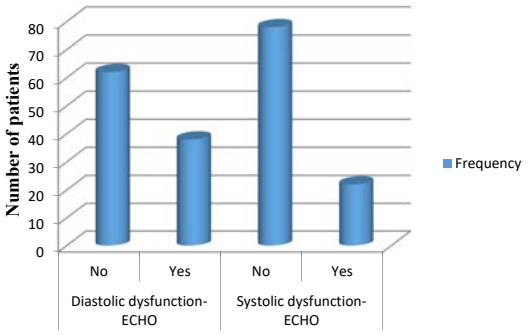

Fig. 2: Distribution of Diastolic Dysfunction-ECHO and Systolic Dysfunction-ECHO

In our study, 25 (25.0%) patients had Ischemia-Pathological Q wave (EGG) The value of z is 7.0711. The value of p is <.00001. The result is significant at p<.05. In our study, 10 (10.0%) patients had Ischemia-Inverted T wave (ECG). The value of z is 11.3137. The value of p is <.00001. The result is significant at p<.05. In our study, 18 (18.0%) patients had Ischemia-ST Segment depression (ECG).The value of z is 9.051. The value of p is <.00001. The result is significant at p<.05. In our study, 10 (10.0%) patients had Ischemia-ST Segment elevation (ECG) The value of z is 11.3137. The value of p is <.00001. The result is significant at p<.05. In our study, 20 (20.0%) patients had Chamber dilatation-Left atrial enlargement (ECG) The value of z is 8.4853. The value of p is <.00001. The result is significant at p<.05. In our study, 1 (1.0%) patient had Chamber dilatation-Right atrial enlargement (ECG) The value of z is 13.8593. The value of p is <.00001. The result is significant at p<.05. In our study, 2 (2.0%) patients had Chamber dilatation-Right ventricular hypertrophy (ECG). The value of z is 13.5765. The value of p is <.00001. The result is significant at p<.05. In our study, 25 (25.0%) patients had Chamber dilatation-Left ventricular hypertrophy (ECG) The value of z is 7.0711. The value of p is <.00001. The result is significant at p<.05. In our study, 14 (14.0%) patients had 1st Degree atrioventricular block (ECG) The value of z is 10.1823. The value of p is <.00001. The result is significant at p <.05. In our study, 11 (11.0%) patients had Right bundle branch block (ECG). The value of z is 11.0309. The value of p is <.00001. The result is significant at p<.05. In our study, 2 (2.0%) patients had Left bundle branch block (ECG) The value of z is 13.5765. The value of p is <.00001. The result is significant at p<.05. In our study, 38 (38.0%) patients had Diastolic dysfunction -ECHO the value of z is 3.3941. The value of p is .0007. The result is significant at p<.05. In our study, 22 (22.0%) patients had Systolic dysfunction-ECHO the value of z is 7.9196. The value of p is <.00001. The result is significant at p<.05.

The present study was an Observational Study with Cross sectional. This Study was conducted from 18 months at KPC Medical College and Hospital, Jadavpur, Kolkata-700032. Total 100 patients were included in this study. Toraman[2] found that Carotid intima-media thickness (CIMT) measurement and coronary artery calcification score (CACS) were performed by the same radiologist. A 12-lead electrocardiogram recording was used to detect fQRS. The mean age was 55.1±15.1 years. fQRS was detected in 45% of patients but In our study, out of 100 patients most of the patients were 61-70 years old [39 (39.0%)]. Which was statistically significant (p<.00001), (z=5.588) and In our study, the mean Age of patients was [70.3300±9.1982]. Babua[3] examined that Cardiac evaluation was done using resting electrocardiography and transthoracic echocardiography performed for all study participants and findings entered into a data sheet. One hundred eleven (51.2 %) of the 217 participants were male but We found that, male population was higher [58 (58.0%)] than the female population [42 (42.0%). Male: Female ratio was 4.3:1 but this was no statistically significant (p=.02382). Park[4] found that Among the

Table 1: Distribution of Ischemia-Pathological Q Wave (EGG) and Ischemia-Inverted T Wave (ECG)

		Frequency	Percent
Ischemia-Pathological Q wave (EGG)	**No**	75	75.00%
	Yes	25	25.00%
Ischemia-Inverted T wave (ECG)	**No**	90	90.00%
	Yes	10	10.00%

Table 2: Distribution of Ischemia-ST Segment Depression (ECG) and Ischemia-ST Segment Elevation (ECG)

		Frequency	Percent
Ischemia-ST Segment depression (ECG)	**No**	82	82.00%
	Yes	18	18.00%
Ischemia-ST Segment elevation (ECG)	**No**	90	90.00%
	Yes	10	10.00%

Table 3: Distribution of Chamber Dilatation-Left Atrial Enlargement (ECG) and Chamber Dilatation-Right Atrial Enlargement (ECG)

		Frequency	Percent
Chamber dilatation-Left atrial enlargement (ECG)	**No**	80	80.00%
	Yes	20	20.00%
Chamber dilatation-Right atrial enlargement (ECG)	**No**	99	99.00%
	Yes	1	1.00%

Table 4: Distribution of Chamber Dilatation-Left Ventricular Hypertrophy (ECG) and Chamber Dilatation-Right Ventricular Hypertrophy (ECG)

		Frequency	Percent
Chamber dilatation-Left ventricular hypertrophy (ECG)	**No**	75	75.00%
	Yes	25	25.00%
Chamber dilatation-Right ventricular hypertrophy (ECG)	**No**	98	98.00%
	Yes	2	2.00%

detailed ECG diagnoses, sinus tachycardia, myocardial ischemia, atrial premature complex and right axis deviation were proposed as important ECG diagnoses also We found that, lower number of patients had Ischemia-Fragmented QRS complex (ECG) [40 (40.0%)]. It was statistically significant (p=.00466), (z=2.8284). Park[4] found that Among the detailed ECG diagnoses, sinus tachycardia, myocardial ischemia, atrial premature complex and right axis deviation were proposed as important ECG diagnoses but we examined that, lower number of the patients had Ischemia-Pathological Q wave (EGG) [25 (25.0%)] and it was statistically significant (p<.00001), (z=7.0711). Mulia[5] showed that 176 (92.1%) patients with at least one form of ECG abnormalities. Prolonged QTc interval (36.6%), fragmented QRS complex (29.8%), poor R wave progression (24.6%), peaked T wave (22.0%) and left ventricular hypertrophy (16.7%) were the most common abnormalities. ECG abnormalities are common among non-dialysis late-stage CKD patients but we found that, lower number of patients had Ischemia-Inverted T wave (ECG) [10 (10.0%)] and it was statistically significant (p< .00001), (z=11.3137). Park[4] found that Among the detailed ECG diagnoses, sinus tachycardia, myocardial ischemia, atrial premature complex and right axis deviation were proposed as important ECG diagnoses but We examined that, lower number of the patients had Ischemia-ST Segment depression (ECG) [18 (18.0%)]. Which was statistically significant (p<.00001), (z=9.051). We found that, lower number of patients had Ischemia-ST Segment elevation (ECG) [10 (10.0%)]. It was statistically significant (p<.00001), (z=11.3137). Chijioke[6] examined that left ventricular hypertrophy (LVH) (27.6%), left atrial enlargement (LAE) (21.6%), combination of LVH and LAE (17.2%) and ventricular premature contractions (6%) but we examined that, majority of the patients had Chamber dilatation-Left atrial enlargement (ECG) [20 (20.0%)] and it was statistically significant (p<.00001), (z=8.4853). We found that, lower number of patients had Chamber dilatation-Left ventricular hypertrophy (ECG) [25 (25.0%)]. It was statistically significant (p<.00001), (z=7.0711). We examined that, lower number of the patients had Chamber dilatation -Right atrial enlargement (ECG) [1 (1.0%)] and it was statistically significant (p<.00001), (z=13.8593). We found that, lower number of patients had Chamber Dilatation-Right ventricular hypertrophy (ECG) [2 (2.0%)] and it was statistically significant (p<.00001), (z=13.5765). We examined that, lower number of the patients had Right bundle branch block (ECG) [11 (11.0%)]. Which was statistically significant (p<.00001), (z=11.0309). We found that, lower number of patients had Left bundle branch block (ECG) [2 (2.0%)]. It was statistically significant (p<.00001), (z=13.5765). Di Lullo[7] found that cardiovascular diseases such as coronary artery disease, congestive heart failure, arrhythmias and sudden cardiac death represent main causes of morbidity and mortality in patients with chronic kidney disease (CKD). We examined that, lower number of the patients had Non-specific ST-T changes (ECG) [25 (25.0%)] and it was statistically significant (p<.00001), (z=7.0711). We found that, lower number of patients had Prolonged QT interval (ECG) [20 (20.0%)] and it was statistically significant (p<.00001), (z=8.4853). Mulia[5] showed that 176 (92.1%) patients with at least one form of ECG abnormalities. Prolonged QTc interval (36.6%), fragmented QRS complex (29.8%), poor R wave progression (24.6%), peaked T wave (22.0%) and left ventricular hypertrophy (16.7%) were the most common abnormalities but We examined that, lower number of the patients had Peaked T wave (ECG) [15 (15.0%)]. Which was statistically significant (p<.00001), (z=9.8995). We found that, higher number of patients had Left ventricular hypertrophy-ECHO [54 (54.0%)]. It was not

statistically significant (p=.25848), (z=1.1314). We examined that, majority of the patients had Ischemia-ECHO [15 (15.0%)] and it was statistically significant (p<.00001), (z=9.8995). We found that, lower number of patients had Pericardial effusion-ECHO [22 (22.0%)]. It was statistically significant (p<.00001), (z=7.9196). Reddy[8] showed that 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. We examined that, lower number of the patients had RWMA-ECHO [5 (5.0%)]. Which was statistically significant (p<.00001), (z=12.7279). We found that, lower number of patients had Global hypokinesia -ECHO [25 (25.0%)]. It was statistically significant (p<.00001), (z=7.0711). We examined that, majority of the patients had IHD [30 (30.0%)] and it was statistically significant (p<.00001), (z=5.6569).

CONCLUSION

In conclusion, our study sheds light on the intricate relationship between chronic kidney disease (CKD) stage V and cardiovascular health, particularly ischemic heart disease (IHD). Through electrocardiography (ECG) and echocardiography assessments, we elucidated significant cardiac changes among CKD stage V patients within our tertiary care center. The prevalence of ischemic heart disease emerged as a pertinent concern in this cohort, emphasizing the necessity for comprehensive cardiac evaluations in CKD management protocols. These findings underscore the imperative for heightened vigilance and tailored interventions to mitigate cardiovascular risk in individuals with advanced renal disease. Moreover, our study underscores the pivotal role of tertiary care centers in addressing the multifaceted healthcare needs of CKD patients, advocating for integrated approaches that prioritize both renal and cardiovascular health. Moving forward, further research endeavors and clinical interventions are warranted to refine risk stratification strategies and optimize therapeutic interventions for this vulnerable patient population.

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