

**A STUDY OF CARDIOVASCULAR ABNORMALITIES IN CHRONIC KIDNEY DISEASE
USING ELECTROCARDIOGRAM AND 2D-ECHOCARDIOGRAM**

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ABSTRACT

Cardiovascular disease is the leading cause of morbidity and mortality in patients with Chronic Kidney Disease. This increased risk of Cardiovascular Disease may begin during early stage of Chronic Kidney Disease much before the onset of kidney failure. This high burden of Cardiovascular disease mortality is well illustrated by comparing Cardiovascular disease mortality in dialysis population to general population. Our study aim is to identify Electrocardiographic and Echocardiographic changes in patients with chronic kidney disease. **Method:** A total of 50 Chronic Kidney Disease patients admitted to Rajah Muthiah Medical College Hospital, were included in this study. The patients were evaluated as per the history, general physical examination, systemic examination, Blood Urea, Serum Creatinine, Urine Routine, ECG and Echocardiography. **Results:** In the present study electrocardiographically determined cardiovascular abnormalities were observed in 72% of patients. LVH in 30% patients. Ischemia is observed in 16% patients. Intraventricular conduction disturbance is found in 8 patients (16%). P mitrale in noticed in 5 patients (10%). Arrhythmia found in 3 patients (6%). ECG was normal in 14 patients (28%). Echocardiographic abnormalities were observed in 34 patients (68%). Left ventricular hypertrophy was seen in 23 patients (46%). LA+LV dilatation was seen in 4 patients (8%). Regional wall motion abnormalities were seen in 6 patients (12%). Pericardial effusion was seen in 3 patients (6%). Left ventricular hypertrophy is the commonest morphological abnormality observed. **Conclusion:** Conduction abnormality is common in patients on HD. Left ventricular dysfunction is commonest cardiovascular abnormality detected. Myocardial ischemia, conduction disturbance were better made out electrocardiographically. Echocardiography is a more sensitive diagnostic procedure to detect left ventricular dysfunction

Keywords: Chronic Kidney Disease, Electrocardiogram, Cardiovascular disease. Left Ventricular Hypertrophy,

1. INTRODUCTION

The epidemicity of chronic kidney disease, the full spectrum of which ranges from asymptomatic state to obvious kidney failure is being increasingly noted. Kidney failure being the most visible aspect of this spectrum, it represents only a minimal of total population affected by kidney disease¹ Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in patients with CKD. This increased risk of CVD may begin during early stage of CKD much before the onset of kidney failure. This high burden of CVD mortality is well illustrated by comparing CVD

mortality in dialysis population to general population. The mortality due to CVD is 10-30 times higher in dialysis patients¹. In India the awareness level among the people is poor. At least 70% of the people live in rural areas with limited access to health care services with the result that CKD is often diagnosed in advanced stages. Cost of treatment of advanced CKD is substantial. Less than 10% of end stage renal disease patients have access to any kind of renal replacement therapy^{2,3}. In a country with limited resources, it is only appropriate that efforts are directed toward prevention of CKD rather than the treatment. National Kidney Foundation (NKF) in their clinical guideline for CVD in dialysis patients recommended baseline electrocardiogram and echocardiograph at the onset of dialysis and at annual interval. The clinical manifestation

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of CKD and CVD overlap substantially and often missed on clinical examination, hence these abnormalities has to be evaluated by non-invasive, easily available diagnostic method to prevent morbidity and mortality.

2.MATERIALS AND METHODS

Patients admitted to Rajah Muthiah Medical College Hospital with chronic kidney disease during September 2013 to October 2015.

Method of collection of data:

Methods: A minimum of 30 patients with features suggestive of chronic kidney disease are taken.

Selection Criteria: 1.Azotemia for more than 3 months. 2.Symptoms or signs of uremia. 3.Reduced Kidney size bilaterally.4.Broad casts in urinary sediment. 5.Symptoms or signs of renal osteodystrophy

Following investigation was done after detailed clinical evaluation in patients with features suggestive of CKD

1. a. Urine:PH, Specific gravity, Protein, Sugar, Microscopy
b. Blood:HB%, FBS/PPBS, Blood Urea, Serum Creatinine, Electrolyte, Calcium,Phosphorous

2. Ultrasound Abdomen was done using 3.5 mHz transducer.

3. All patients were subjected to 12 lead ECG and detailed Transthoracic echocardiography (ECHO) and Doppler evaluation using PHILIPS IE33 High Performance Echocardiography machine. Modified Simpson's technique was used to determine the end-diastolic volume (EDV), end-systolic volume (ESV) and ejection fraction (EF). EF of <50% was taken as abnormal.

Study Type

Descriptive-Cross sectional study.

Inclusion Criteria

1. Random selection of cases with CKD without considering the etiology.
2. Patient with chronic kidney disease on conservative management and on dialysis.
3. Age more than 18 years .

Exclusion Criteria

1. Documented ischaemic heart disease.
2. Congenital heart disease.
3. Valvular heart disease.
4. Age less than 18 years.

Stages of CKD were defined by Cockcroft-Gault equation. Previous coronary artery disease is defined as history of acute coronary syndrome- STEMI/ NSTEMI/ UNSTABLE ANGINA (as per patients' self documented past medical record); or a history of revascularization (CABG/STENTING).

3.OBSERVATION AND RESULTS

- In the present study male to female ratio was 4:1
- The age variation was 25-77years.
- The maximum no. of patients were in the age group 51-60years (32%).
- The level of the Hb % below normal level was observed in all the patients.
- The blood urea level >50mg/dl is observed in 100%.
- Creatinine clearance<30ml/min is seen in entire cohort.
- Level of serum potassium >5meq/l observed in 16 patients (32%).
- In the present study electrocardiographically determined cardiovascular abnormalities were observed in 72% of patients.
- LVH in 30% patients.
 - Ischemia is observed in 18% patients.
- Intraventricular conduction disturbance in found in 8 patients (16%),
- P mitrale in noticed in 5 patients(10%).
- Arrhythmia found in 2 patients (4%).
- ECG was normal in 14 patients (28%).

AGE DISTRIBUTION

TABLE 1: AGE DISTRIBUTION OF 50 CASES OF CKD

SI.NO	AGE GROUP IN YEARS	NO.OF CASES	PERCENTAGE
1	21-30	2	4
2	31-40	3	6
3	41-50	10	20
4	51-60	16	32
5	61-70	13	26
6	71-80	7	14
	TOTAL	50	100

SEX DISTRIBUTION

TABLE 2: SEX DISTRIBUTION OF PATIENTS

SI.NO	SEX	NO. OF CASES	PERCENTAGE
1	FEMALE	10	20
2	MALE	40	80
	TOTAL	50	100

ETIOLOGY OF CKD

TABLE 3: THE ETIOLOGY OF CKD

SINO	ETIOLOGY OF CHRONIC RENAL FAILURE	NO. OF CASES	PERCENTAGE
1	Diabetes mellitus	9	18
2	Hypertension	8	16
3	Chronic glomerulonephritis	3	6
4	Combined Diabetes Mellitus + Hypertension	22	44
5	Other	8	16

ECG CHANGES IN CKD PATIENTS.

TABLE 4: ELECTROCARDIOGRAPHIC CHANGES IN CKD PATIENTS

SINO	PARTICULARS	NO OF CASES	PERCENTAGE
1	NORMAL	14	28
2	LEFT VENTRICULAR HYPERTROPHY	15	30
3	LAD	6	12
4	CONDUCTION DISTURBANCES	8	16
5	SIGNS OF ISCHEMIA	8	16
6	ARRYTHMIA	2	4
7	P-MITRALE	5	10

TABLE 5: LVH BY ECG AND ECHO

SINO	LVH	NO. OF PATIENTS
1	ECG	15
2	ECHO	21
3	BOTH	11

TABLE 6: LVH IN CKD PATIENTS ON HD

SINO.	LVH	NO. OF PATIENTS
1	HD	10
2	NO HD	11

TABLE 7: ECHOCARDIOGRAPHIC CHANGES IN CKD PATIENTS.

SI NO	PARTICULARS	NO OF CASES	PERCENTAGE
1	Normal study	16	32
2	Left ventricular hypertrophy	21	42
3	LA+LV dilatation	4	8
4	Ischemia	6	12
5	Pericardial effusion	3	6

TABLE 8: ECHO CARDIOGRAPHIC CHANGES IN CKD PATIENTS.

SI NO	ECHO CARDIOGRAPHIC PARAMETERS	MEAN VALUES ±SD IN mm
1	IVS	11.60±2.4
2	RVID	17.56±4.3
3	LVESD	29.64±5.5
4	LVPW	11.28±2.5
5	LVEDD	43.44±6.4
6	EF	54±8.9
7	LAD	30.2±4.5

4.DISCUSSION

The age variation in the present study was 25-77 years. With the maximum number of the patients in the age group of 51-60 years. The mean age of the study population was 47.5±12.26. the mean age of the present study was compared with others studies, the mean age in the other studies are 41.1±12.1 years in N.P. Singh et al, 48.7± 13.5 years in the MichealDahan et al, 51±17 in Foley et al.

In the present study male to female ratio was 4:1. which was 0.85:1 in N.P. Singh et el, 4.67:1 in DS Chafekar et al., 1.8:1 in Foley et al., 0.96:1 in Gerard M. London et al., 1.85:1 in Michel Dahan et al.

The commonest cause for chronic kidney disease in present in the present study was diabetes mellitus in 9 patients (18%),chronic glomerulonephritis in 3 patient (6%),hypertension in 8 patient (16%),DM+HTN in 22 patient (44%),and other in 8 patient (16%). The data in other studies varies significantly with present study because of the random selection of the cases and regional variation in the incidence of diseases which are known to cause chronic kidney disease.

In the present study, electrocardiographically determined cardiovascular abnormalities were observed in 72% of patients. LVH in 30% patients, ischemia in 16% patients, intraventricular conduction disturbance in 8 patients (16%),pmitrale in 5 patients (10), arrhythmia in 2 patients (4%).ECG was normal in 14 patients (28%).

The above observation made in the present study is comparable with studies done by Krivoshev et al and A S Menon et al

In the present study, echocardiographic parameters like IVS, LVPW, LVEDD, LVEF, RVID, LVESD showed left ventricular dysfunction. The values are comparable with other studies done by N P Singh et al, D S Chafekar et al. Gerald M London et al and Michel Dahan et al

Even though the echo parameter indicate left ventricular dysfunction, the mean EF % was within normal limits 54.98 ±8.96 in present study.58.48± 8.50% in Chafekar et al. 56.02 ±6.66% in NP Singh, 69.7± 9.75 Gerald M London et al.

In the present study, the commonest echocardiographically detected left ventricular dysfunction was left ventricular hypertrophy which was observed in 21 patients (42%), and is not comparable with other studies 76.92% NP Singh et al, 73.9% in Foley as they have taken only ESRD patients in their study.

Left atrial and left ventricular dilatation was observed in 4 patients (8%) in present study which was 35.5% in Foley et al, 31% in Michel Dahan et al, but N. P Singh et al observed in 46.1% patients.

Pericardial effusion was observed in 3 patients (6%) in the present study, which was 32% in A S Menon et al.

5. CONCLUSION

- Left ventricular hypertrophy is the commonest morphological abnormality observed.
- Conduction abnormality is common in patients on HD.
- Left ventricular dysfunction is commonest cardiovascular abnormality detected.
- Myocardial ischemia, conduction disturbance were better made out electrocardiographically.

Echocardiography is a more sensitive diagnostic procedure to detect left ventricular dysfunction.

6. BIBLIOGRAPHY:

1. Schiffrin E L, Lipman Mark L, Mann Johannes F E .Chronic kidney disease: Effect on the cardiovascular system. *Circulation* 2007;116:25-97.
2. Wellens HJJ, Gorgels AP: The electrocardiogram 102 years after Einthoven. *Circulation* 2004; 109:652-70.
3. Agarwal SK, Srivastava RK. Chronic kidney disease in India: Challenges and solutions. *Nephron ClinPract.* 2009;111:c197-203.
4. Foley Robert, Parfrey Patrick, Harnett John, Kent Gloria, Martin Christopher et al. Clinical and echocardiographic disease in patients starting end-stage renal disease therapy. *Kidney Int*2000 :186-92
5. Singh NP, Chandreshekar, M Nair, Gopal K, Ajita J et al The cardiovascular and hemodynamic effects of erythropoietin in chronic renal failure. *JAPI* 1999; 47: 284-89.
6. Chafekar DS, RM Rajani, BA Krishna. Left ventricular function in end stage renal disease-Non invasive assessment in patients on hemodialysis. *JAPI* 1994; 42: 216-18.
7. Dahan M, Siohan P, Viron B, Michel C, Paillole C, R G Mignon et al . Relationship between left ventricular hypertrophy, myocardial contractility and overload condition in haemodialysis patients: An echocardiographic study. *Am J Kid Dis* 1997; 30; 780-85.
8. Gerard M. London, Francoise Fabiani, Sylvam J. Marchais, De Vernejoul MC, Guerin AP et Uremic cardiomyopathy: An inadequate left ventricular hypertrophy. *Kidney Int* 1987; 31: 973-80.
9. Krivoshiev S, Kiriakov Z, Antonov S. Electrocardiographic changes in patients with chronic kidney disease treated by periodic hemodialysis. *Vutr Boles* 1987;26:64-67.
10. Soman SS, Sandberg Keisha, Steven Borzak, Hudson Michael, Yee Jerry. The Independent association of renal dysfunction and arrhythmia in critically ill patients. *CHEST* 2002; 122: 669-677
11. Menon AS, Rajath Kumar K R Roa. Evaluation of clinical presentation in chronic renal failure pertaining to cardiovascular system. *JAPI* 1998; 46: 1-62.
