Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 12, 2023

ASSESMENT OF LEFT VENTRICULAR HYPERTROPHY IN CHRONIC KIDNEY DISEASE PATIENTS

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ABSTRACT

Left ventricular hypertrophy is major cardiovascular finding in CKD patients. The aim of present study is to find out the correlation of left ventricular hypertrophy (LVH) with severity of disease in CKD patients

METHODOLOGY:

A total of 100 chronic kidney disease patients admitted in government general hospital, Nellore; over a period of two years were taken as study population. Detailed history, clinical evaluation, laboratory investigations, ECG and echocardiography was carried out. The diagnosis of CKD was made on basis of serum creatinine more than 1.5 mg/dl for 3 or more months. Patients with mild, moderate and severe CKD were having serum creatinine level 1.5-3mg/dl, 3-6mg/dl and > 6mg/dl respectively. Glomerular filtration rate (GFR) was calculated by modification of diet in renal disease (MDRD) equation. Cut-off for CKD was taken to be an eGFR <60ml/min / 1.73m2 as per existing guidelines.

RESULTS:

Out of 100 patients were studied, 62 were males and 38 were females. All patients were selected randomly. Majority of the patients were in the age group was between 51-70 years. In the present study, it was found that left ventricular mass index (LVMI) which reflects LVH showed a progressive rise in severity of renal failure with 13.5 % of mild category of CKD having LVH as compared to 37.8% of moderate category and 48.6% of severe category of CKD.

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CONCLUSION:

In this study, that the patients with CKD have LVH, which was observed more in patients with severe CKD.

Keywords: left ventricular hypertrophy, serum creatinine and chronic kidney disease

INTRODUCTION:

Chronic kidney disease is a major health problem in recent days. The chronic kidney disease affects all the systems in our body results in various complications leads to increase the morbidity and mortality. Left ventricular hypertrophy (LVH) is a cardiovascular complication highly prevalent in patients with chronic kidney disease (CKD) and end-stage renal disease. LVH in CKD patients represents an independent risk factor for the development of arrhythmias, sudden death, heart failure and ischemic heart disease[1].

The main causes of LVH are increased preload from hypervolemia and increased afterload from increased peripheral resistance, giving rise to a mixture of excentric and concentric hypertrophy, but other factors (high cardiac output from anemia and arteriovenous (A-V) fistula, altered compliance of central arteries, and activation of local systems such as renin and endothelin) also play a role[2].

Pressure overload is secondary to preexisting hypertension, but also to a loss of elasticity of the vessels and to vascular calcifications, leading to augmented pulse pressure leads to the development of LVH[1]

Anemia has been identified as a risk factor for the development of LVH in dialysis and nondialysis CKD patients. A decrease in circulating endogenous erythropoietin caused by kidney disease may contribute to LVH among CKD patients. Erythropoietin receptors are present in cardiac tissue[3], and erythropoietin may have direct effects on myocardial function[4]

The aim of the present study was to correlate the prevalence of LVH with the stage of CKD classified according to eGFR and serum creatinine.

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METHODOLOGY:

The present study was conducted from September 2021 to November 2023 in the department of General Medicine, ACSR Government Hospital, Nellore, and A.P., India. Descriptive study was design, with a sample size of 100. The data for this study was collected from 100 CKD patients fulfilling the inclusion /exclusion criteria admitted in the hospital.

Inclusion criteria:

Patients with mild, moderate and severe chronic kidney disease attending the hospital and patients on dialysis. Underlying causes of CKD include diabetic nephropathy, hypertensive nephropathy, chronic glomerulonephritis, chronic tubulointerstitial disease, autosomal dominant polycystic kidney disease

- Mild CKD patients with serum creatinine (1.5- 3mg/dl),
- Moderate CKD patients with serum creatinine (3- 6mg/dl),
- Severe CKD patients with serum creatinine (>6mg/dl).

Exclusion criteria:

- Patients with other cardiac disorders, such as valvular heart disease, congenital heart disease,
- Patients with poor echo window.

Investigations:

The following investigations were done to all patients. Complete hemogram, Renal function test, Liver function test, Urine analysis, Renal ultrasound, Serum electrolytes, Chest x-ray, Electrocardiography-12 lead, 2D Echocardiography.

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All patients underwent 2-dimensional directed M-mode echocardiography performed in left lateral position. The following measurements were taken into account by Penn convention methods. [5] [6]

- Thickness of interventricular septum (IVSd),
- Thickness of posterior wall in end diastole. (PWd),
- Internal diameter of left ventricle at end diastole (LVIDd).

Left ventricular mass (LVM) and left ventricular mass index (LVMI) were calculated by using ECHO CUBE formula recommented by American Society of Echocardiography. [6]

- Left ventricular mass (LVM)= 0.8{[1.04 x (LVIDd + IVSd) + PWd) 3-LVIDd3]} + 0.6g
- Left ventricular mass Index (LVMI) = LVM/Body surface area.

Body surface area calculated by Du Bois formula: BSA=0.007184xW^0.425xH^0.725
W=weight in kilograms (kgs), H=height in centimeters (cms),

Left ventricular hypertrophy is defined in absolute terms:

- LVMI=more than 131g/m2 in men,
- LVMI=more than 100g/m2 in women.

Glomerular filtration rate (GFR) was calculated by modification of diet in renal disease (MDRD) equation. Cut-off for CKD was taken to be <60ml/min/1.73m2as per existing guidelines. The MDRD equation is only useful in estimating GFR in chronic kidney disease.

The stages of chronic Kidney Disease are classified as follows [7]:

- Stage 1 with normal or high GFR (eGFR > 90 mL/min)
- Stage 2 Mild CKD (eGFR = 60-89 mL/min)
- Stage 3 Moderate CKD (eGFR = 30-59 mL/min)
- Stage 4 Severe CKD (eGFR = 15-29 mL/min)
- Stage 5 End Stage CKD (eGFR <15 mL/min)

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Statistical analysis:

Data was collected in a structured performance, and all the relevant clinical and laboratory investigation details of the patients were collected. After entering data in Microsoft Excel and importing it into Statistical Package for the Social Sciences (SPSS) 20, analysis was performed. Frequency and percentage were used in descriptive analysis. Data were represented by using Tables.

RESULTS:

In present study, 62% were males and 38% were females in out of 100 chronic kidney disease patients. Majority of the patients were in the age group was between 51-70 years represented in table 1.

Table 1: Age and Gender distribution in study participants (n=100)

		Number of patients (n)	Percentage(%)
Gender	Males	62	62
	females	38	38
Age(in years)	41-50	22	22
	51-60	35	35
	61-70	40	40
	71-80	03	3

Table 2 shows etiology of chronic kidney disease; combined diabetes and hypertension was the leading cause of chronic kidney disease in 46 patients (46%), followed by diabetes in 33 patients (33%), hypertension in 18 patients (18%), obstructive pathology in 1 patient (2%), and adult polycystic kidney disease (APKD) in 1 patients (1%),respectively.

Table2: Etiology of Chronic kidney disease

Etiology of chronic kidney disease	Number of patients (n)	Percentage (%)

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Diabetes and hypertension	46	46
Diabetes	33	33
Hypertension	18	18
Obstructive uropathy	2	2
APKD	1	1

Table 3 shows that the patients were distributed based on eGFR, 59 patients (59%) have stage 5 CKD, 35 patients (35%) were in stage 4 CKD

Table 3: stages of CKD based on eGFR

Stage	Number of cases (n)	Percentage %
Stage1 (signs of mild kidney disease with normal or better GFR; eGFR>90%)	0	0
Stage2 (mild kidney disease with reduced GFR, eGFR60-89%)	0	0
Stage3 (moderate chronic renal insufficiency; eGFR 30- 59%)	6	6
Stage4 (severe chronic renal insufficiency; eGFR 15- 29%)	35	35
Stage5 (end stage renal disease; eGFR <15%)	59	59
TOTAL	100	100

Table 4 shows, mild, moderate and severe CKD were having serum creatinine level 1.5-3mg/dl, 3-6mg/dl and > 6mg/dl respectively

Table 4: levels of serum creatinine

Level of serum creatinine (mg/dl)	Number of cases (n)	Percentage %
1.5-3 (mild CKD)	18	18
3-6 (moderate CKD)	39	39
>6 (severe CKD)	43	43

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Total	100	100

Table 5 shows, that the various laboratory parameters in chronic kidney disease patients, severe anemia (Hb < 6gm/dl) present in 42% patients, hyperkalemia (>5.5mEq/L) seen in 56%patents.

Table 5: laboratory investigations of chronic kidney disease patients

Lab parameter		Number of patients(n)	Percentage%
Hemoglobin (gm/dl)	<6gm/dl	42	42
	6-8gm/dl	39	39
	8-10gm/dl	17	17
	>10gm/dl	2	2
Serum potassium (mEq/l)	<3.5mEq/l	5	5
	3.5 – 5.5mEq/l	39	39
	>5.5mEq/l	56	56
Blood urea (mg/dl)	50-100	25	25
	101-150	45	45
	151-200	27	27
	>200	3	3

Table 6 shows Left ventricular hypertrophy on ECG and 2D ECHO was present in 74 patients of CKD. Out of these LVH was present in 13.5% mild CKD, 37.8% in moderate CKD, and 48.6% in severe CKD cases.

Table 6: ECG and Echocardiographic assessment of LVH in CKD patients

Severity of CKD	LVH present	Percentage %	No LVH	Percentage %
Mild CKD	10	13.5%	8	30.7%
Moderate CKD	28	37.8%	11	42.3%
Severe CKD	36	48.6%	7	27%
Total	74	100%	26	100%

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DISCUSSION:

LVH is a major risk factor for cardiovascular morbidity and mortality in ESKD patients[9]. Left ventricular disease occurs frequently in dialysis patients. It may be manifest as concentric LV hypertrophy, LV dilatation with or without LV hypertrophy, or systolic dysfunction.

Echocardiography provides an excellent noninvasive method to delineate details of the anatomy of cardiac cavity, wall dimensions and wall movements.LV hypertrophy is single strongest independent predictor of adverse cardiovascular events. LVH is a major echocardiographic finding in uremic patients.

In the present study, it was found that left ventricular mass index (LVMI) which reflects LVH showed a progressive rise in severity of renal failure. In the study of Dangiri P et al, Agarwal S et al, Adeera Levin et al who also found similar trend of LVMI in patients of CKD [6]

In the present study out of 100 patients, 74 (74%) patients had left ventricular hypertrophy on ECG and 2d ECHO. In the study by Stewart GA et al and Gansevoort RT et al [10], the reported prevalence of LVH is nearly 75 to 80%, with a higher prevalence among patients with ESKD or near ESKD, which was similar finding, was observed in our study.

Out of 74% of patients with LVH, 10 (13.5 %) of mild category of CKD, 28 (37.8%) of moderate category and 36 (48.6%) of severe category of CKD patients were having LVH as compared to 40% of mild and moderate and 97% in severe CKD category as shown by Dangiri P et al and 30% in mild to moderate category and 53.2% in severe category as shown by Agarwal S et al. [6]

CONCLUSION:

Patients with CKD have LVH, which was observed more in patients with severe CKD. From the above study it is concluded that patients with chronic kidney disease have higher left ventricular mass index (LVMI) and higher prevalence of left ventricular hypertrophy (LVH) with respect to severity of chronic kidney disease.

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So, the patients with CKD should be conducted periodically cardiovascular examination even if there were asymptomatic, and measures to prevent LVH, during the early stages of renal insufficiency, such as strict control of hypertension, anemia.

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