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Echocardiographic Findings of Patients of Chronic Kidney Disease

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Abstract

Introduction: *Reduction in the glomerular filtration rate (GFR) can act as a risk factor for causing cardiovascular abnormalities. Various cardiac abnormalities can complicate chronic kidney disease which range from concentric left ventricular hypertrophy to dilated cardiomyopathy.* ***Aim:*** *To enlist the echocardiographic findings of chronic kidney disease patients.* ***Materials and Methods:*** *This observational cross-sectional study was conducted in the cardiology unit of Rangpur Medical College Hospital between August 2022 to August 2023. A total of 88 patients of CKD were included in the analysis. Two-dimensional transthoracic echocardiography was done in each patient for LV study.* ***Results:*** *The mean age of the patients was 43.32±10.67 years. There was male dominance with male/female ratio 1.9. LV systolic dysfunction was diagnosed in 44%(39/88) of patients, LV diastolic dysfunction in 65.5%(55/88) patients, and concentric left ventricular hypertrophy (LVH) in 68%(60/88) of patients. Also DCM in 17% and IHD and pericardial effusion both in 15% of CKD patients.* ***Conclusion :*** *Concentric LVH is the most common structural defect in CKD patients followed by LV diastolic dysfunction, LV systolic dysfunction, Ischaemic heart disease, dilated cardiomyopathy and pericardial effusion.*

Keywords: *Chronic Kidney Disease.*

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Introduction:

Chronic kidney disease (CKD) leads to reduction of renal blood flow and GFR which thereafter causes cardiac abnormalities. CKD patients with GFR ≤59 mL/min/1.73 m^2 have a 38% higher risk of cardiovascular disease (CVD)[1]. CVD in the form of Ischaemic heart disease (IHD) is the leading cause of deaths in CKD patients. Patients of CKD having CVD had three to thirty times higher risk of mortality as compared to the general population[2]. Left ventricular hypertrophy (LVH) specially concentric LVH is one of the common structural cardiac defects in CKD patients[3]. LV dysfunction both systolic and diastolic dysfunction contributes to LVH. Diastolic dysfunction is more frequent causing increased volume of left atrium. Furthermore, cardiomyopathy may complicate the scenario which may occure due to reduction of coronary perfusion during diastole and chamber enlargement with significant reduction in ejection fraction[4]. Sudden cardiac death among these patients are due to increase excitability.Two dimensional echocardiography is a standard diagnostic tool for the assessment of chamber dimensions and LV systolic and diastolic function[5,6]

Materials and Methods:

This Cross-sectional study was conducted in the department of Cardiology, Rangpur Medical College Hospital , Rangpur from August 2022 to August 2023. Sample size was 88. Inclusion criteria were all patient of CKD diagnosed by nephrology department of Rangpur Medical College and Hospital, Rangpur and send for echocardiography in cardiology department were included in this study. Exclusion criteria were known case of Valvular heart disease, congenital heart disease, primary cardiomyopathy and known case of coronary artery disease prior to diagnosis of CKD. Method was all patients who met the inclusion criteria was enrolled in the study after obtaining written informed consent. Detailed physical examination

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was performed in all cases. Transthoracic Echocardiography was done in all patient and all standard aqoustic window were observed. LV systolic function was measured by Ejection fraction using Teicholz method. LV diasolic function was measured by Mitral pulse wave Doppler and Tissue Doppler indices. Regional wall motion was assesessed in standard views. Data was analyzed by SPSS software.

Result:

This table shows baseline data of study population . Mean age for the study group was 43.32±10.67 year.

Table I: Baseline data of Study Population(n=88)

Variable	Mean±SD
Age (year)	43.32±10.67
Weight(kg)	68.7±27.24
Serum creatinine(mg/dl)	4.8±1.9
Hb(gm)	7.2±1.4
Urban area(%)	52.3%%

Data was expressed as Mean±SD

This Pie chart showing male predominance in study population. Among total 88 patient 58 patients were male (66%) and 30 patients were female (34%). Male and female ratio was 1.9.

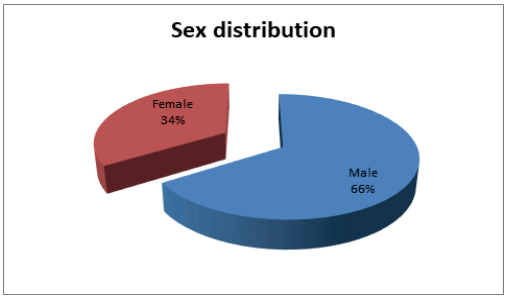

Fig 1: Sex distribution in study population

This table shows different clinical presentation of study population. Majority patients presented with Edema and respiratory distress. 62% patient were hypertensive and 71% were anaemic.

Table II: Distribution of clinical presentation in study population (n=88)

Clinical presentation	Percentage
Edema	80.5%
Respiratory distress	78.4%
Oliguria	53.2%
Hypertension	62.7%
Anaemia	71.6%
Chest pain	48.6%

Table III : Echocardiographic data(n=88)

Variable	Mean±SD
IVSd(mm)	15.1±9.3
LVPWd(mm)	15.9±8.7
LVIDd(mm)	43.8±13.6
EF(%)	52.1±19.4
E/A ratio	0.9±0.5
E/e'	10.4±3.8

IVSd=Inter ventricular septum thickness in diastole, LVPWd=Left ventricular posterior wall thickness in diastole, LVIDd= Left ventricular internal dimension in diastole, EF=ejection fraction

Mean EF was 52.1±19.4 % and mean IVSd and LVPWd was increased.

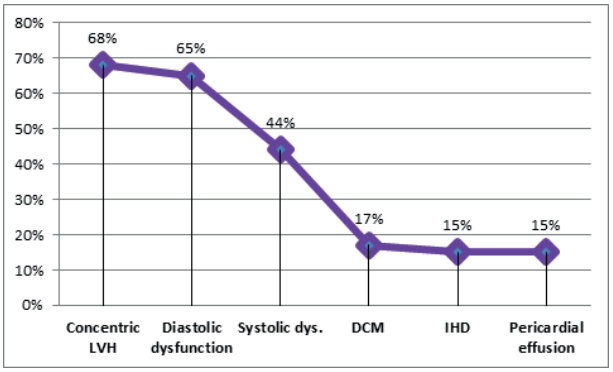

Fig-2: Echocardiographic findings in CKD patients

LV systolic dysfunction was diagnosed in 44%(39/88) of patients, LV diastolic dysfunction in 65.5%(55/88) patients, and concentric left ventricular hypertrophy (LVH) in 68%(60/88) of patients.

Discussion:

Anaemia and hypertension are two key factor for development of cardiac defect in CKD patients as they changes LV dimension and mass index along with LV volume as well as systolic and diastolic function[7,8]. In this study 62% patient were hypertensive and 71% were anaemic. A study by Tsilonis et al. reported hypertension in 22% of patients of CKD patients on HD [9]. Most common structural defect was concentric left ventricular hypertrophy (LVH) in 68% followed by LV diastolic dysfunction in 65.5% , LV systolic dysfunction in 44% , DCM in 17%, IHD and pericardial effusion in 15%. A study conducted by Jameel F et al 2020 described LV dysfunction was diagnosed in 31% of patients, LV diastolic dysfunction in 47% patients, and left ventricular hypertrophy (LVH) in 55% of patients. There were 39% hypertensive and 62% anemic patients[10]. LV dysfunction is an initial precursor of CVD and leads to LVH in the follow-up period. Cardiomyopathy among CKD patients is due to the presence of coronary artery obstruction, reduction in coronary reserves, and left ventricular physiological-structural abnormalities secondary to volume and pressure overload[10]. Many other studies have observed similar findings. Some are listed below:

Shivendra et al.	LVH in 48% of patients, diastolic dysfunction in 51.42% patients, and systolic dysfunction in 28.57% patient[11]
Agarwal et al.	LV diastolic dysfunction in 53.2% patients and LV systolic dysfunction in 30% of patients[4]
Laddha et al.	LVH in 74.3% patients, LV diastolic dysfunction in 61.4% patients, and systolic dysfunction in 24.3% patients[12]
Ahmed et al.	LVH in 80% of patients, LV diastolic dysfunction in 53.3% patients, and LV systolic dysfunction in 36.3% patients[13]

McIntyre CW et al and Siqueira TMA et al	LV systolic dysfunction in almost all patients but they used the positron emission tomography scan[14,15]

Conclusion:

Concentric LVH is the most common structural defect in CKD patients followed by LV diastolic dysfunction , LV systolic dysfunction, Ischaemic heart disease, dilated cardiomyopathy and pericardial effusion

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