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ECHOCARDIOGRAPHIC PROFILE IN THE PATIENTS OF CHRONIC KIDNEY DISEASE

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Abstract:

Background:- Chronic kidney disease can be defined as the presence of kidney damage, manifested by abnormal albumin excretion or decreased kidney function, quantified by measured or estimated glomerular filtration rate (GFR), that persists for more than three months. Although creatinine clearances can be calculated from the serum creatinine concentration by using either the Cockcroft-Gault equation. The need of this study, giving analysis of cardiac dysfunction and early management of patients suffering from chronic kidney disease.

METHODS:- we analysed a total of 122 patients and divide them into different staged of CKD according to their calculated eGFR by Cockcroft-Gault equation and kept 20 patients is in control group, which were evaluated from cardiac function by mean of echocardiography. Other parameters like weight, age, serum creatinine were used to calculate eGFR and IVSd, LVPWDd, LVIDd were used to calculate LV mass.

RESULTS:- Among patients of CKD 20.5% were females and 79.5% were males. The mean age group was 52.09 years. 8.2% patients were in CKD stage 1, 9.8% patients were in CKD stage II and stage III, 24.6% patients were in stage IV and 47.5% patients were in stage V. The mean creatinine clearance was 28.48. 30.3% patients with normal LV function, 22.1% with mild LV dysfunction, 24.6% patients with moderate LV dysfunction and 23.0% patients with severe LV dysfunction. The mean LV function was 43.39. In concern with LV mass 27.0% patients have severely abnormal LV mass, 23.0% have moderately abnormal LV mass, 19.7% have mildly abnormal LVmass and 30.3% patients with normal LV mass. The mean LV mass was 249.78 gms.

CONCLUSION: - In this study, we conclude that, patients having chronic kidney disease had significant cardiac dysfunction. Hence, LV mass increases with increase in stage of chronic kidney disease and LV dysfunction also increases with increase in staging of chronic kidney disease.

Keywords:
- Chronic kidney disease
- Glomerular filtration rate (GFR)
- Cockcroft-Gault equation
- Echocardiographic profile
- Cardiac dysfunction
- Albumin excretion

- Serum creatinine
- Creatinine clearance
- LV mass
- IVSd (interventricular septal thickness in diastole)
- LVPWDd (left ventricular posterior wall thickness in diastole)
- LVIDd (left ventricular internal diameter in diastole)
- CKD stages
- Echocardiography
- LV function
- LV dysfunction
- Cardio renal syndrome

INTRODUCTION

Chronic kidney disease (CKD) is a major health problem affecting approximately 13% of the population of United States [1,2] With increasing life expectancy as well as an increase in prevalence of life style diseases, US has seen a 30% increase in prevalence of chronic kidney disease (CKD) in the last decade[2]. In India overall prevalence of CKD in the SEEK India cohort study was 17.2% and prevalence of CKD stage 1,2,3,4,5 was 7%, 4.3%, 4.3%, % and 0.8% respectively [3].

The National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (KDOQI) created guidelines providing a clear definition and classification system for CKD. These guidelines define CKD as the presence of kidney damage or glomerular filtration rate (GFR) of <60 mL/min/1.73m2 for 3 months or more, irrespective of cause [5].

Although creatinine clearances can be calculated from urine creatinine concentration measured in a 24 hour urine collection and a concomitant serum creatinine concentration, a more practical approach in the office setting is to estimate GFR (estimated GFR or eGFR) from the serum creatinine concentration, using either the Cockcroft-Gault or the Modification of Diet in Renal Disease (MDRD) Study estimating equations [1].

Both, complications as well as the likelihood of progression to end-stage renal disease which necessitates renal replacement therapy are more likely to occur in patients with severe CKD. Early intervention will more commonly reduce serious CKD sequelae and slow CKD progression. To facilitate assessment of CKD severity, the National Kidney Foundation developed criteria, as a part of its Kidney Disease Outcomes Quality Initiative (NKF KDOQI), to stratify CKD patients into the following[6].

- Stage 1: normal eGFR ≥ 90 mL/min per 1.73 m2 and persistent albuminuria
- Stage 2: eGFR between 60 to 89 mL/min per 1.73 m2
- Stage 3: eGFR between 30 to 59 mL/min per 1.73 m2
- Stage 4: eGFR between 15 to 29 mL/min per 1.73 m2
- Stage 5: eGFR of < 15 mL/min per 1.73 m2 or end-stage renal disease

Progression of CKD is associated with many serious complications, such as increased incidence of cardiovascular disease, hyperlipidemia, anemia and metabolic bone disease. CKD patients should be assessed for the presence of one or many of these complications and given optimal treatment to reduce their morbidity and mortality. A multidisciplinary approach is required in order to achieve this goal.[1] Patients with chronic kidney disease (CKD) are at a significantly increased risk of morbidity and mortality from cardiovascular disease (CVD). Cardiac disease is the single most important cause of death in patients receiving long-term dialysis, accounting for approximately 44% of overall mortality[7] As part of the National Kidney Foundation Task Force on CVD, CVD mortality rates in the general population (2 million deaths) were compared with CVD mortality rates in dialysis patients (50,000 deaths). These results showed that annual CVD mortality rates are much greater in dialysis patients despite stratification for sex, race, or age group. Younger dialysis patients have an approximately 500-fold increased CVD mortality rate compared with their counterparts in the general population, and rates remain approximately five times higher, even among the oldest patients [8].

There are two potential reasons for the dramatically increased risk for CVD mortality in the dialysis population. The first is the high prevalence of CVD, and the second is the high case fatality rate in those who already have CVD. Numerous data have shown that dialysis patients have a greater prevalence of both clinical ischemic heart disease and congestive heart failure compared with the general population. In addition, the percentage of patients with left ventricular (LV) hypertrophy (LVH) is as high as 75% in dialysis patients [9].

It is reasonable to consider three pathological forms of CVD that are highly prevalent in patients with CKD. The first is an alteration in cardiac geometry and includes eccentric LVH, concentric LVH, and LV remodeling. In the case of concentric LVH, thickness of the wall increases to a greater extent than LV diameter, whereas in eccentric LVH, the increase in wall thickness is in proportion to the increase in LV diameter. Risk factors for concentric LVH include pressure overload secondary to hypertension, arteriosclerosis, or aortic stenosis, and risk factors for eccentric LVH include volume overload secondary to fluid retention, anemia, or arteriovenous fistulae[10].

The second pathological form of CVD is atherosclerosis. Atherosclerosis is the primary cause of ischemic heart disease in dialysis patients; however, it should be recognized that one study admittedly in the pre-erythropoietin era, has shown that as many as 50% of nondiabetic dialysis patients with angina may not have significant large-vessel coronary artery disease (CAD; defined by a luminal narrowing 50% on angiography).[11] Rather, the ischemia in the latter case is believed to result from small-vessel disease in combination with severe LVH. In comparison to the general population, coronary artery plaques in dialysis patients tend to be more advanced, with greater degrees of media thickening and calcification[12].

The third type of vascular disease that is more prevalent in patients withCKD is arteriosclerosis or disease of the large vessels, such as the carotid or aorta. This process involves vessel remodeling, loss of elasticity, and development of noncompliant vessels.[13]The latter results in increased pulse pressure, which in turn has been recognized as a factor for CVD outcomes in dialysis patients[14].
Patients with CKD have a high burden of cardiomyopathy, atherosclerosis, and arteriosclerosis. Although patients with CKD share many of the same cardiovascular risk factors with the general population, there are additional risk factors, such as anemia and abnormal calcium/ phosphorus metabolism, that place these patients at even greater risk for CVD mortality. Because CVD begins during the early stages of CKD, before ESRD, it is important to identify patients at risk long before the need for renal replacementtherapy and to address both the traditional and uremia-related risk factors. Finally, additional clinical trials with a goal to reduce CVD are urgently neededin CKD[8].

This study aims to study the echocardiography profile in patients of chronic kidney disease and also to study the association of the echocardiographic changes with the grade of chronic kidney disease.

AIM & OBJECTIVES

AIM:-

1. Echocardiographic profile in the subjects suffering from chronic kidneydisease.

Objectives:-

1. To study the comparison of LV mass between different stages ofchronic kidney disease.
2. To study the comparison of LV function between different stages ofchronic kidney disease.

MATERIALS AND METHODS

This study was conducted at Government Doon Medical College and Hospital, Dehradun. A hundered and twenty two patients of Chronic Kidney Disease were included in the study. 20 patients with normal renal function weretaken as control. The patients included in the study were from The Departmentof Medicine and Department of Emergency of Government doon medical college and hospital.

Study type:-
Case control study

Study Criteria Inclusion Criteria:
1. Patients with age of more than 18years of either sex.
2. Patients with CKD without considering the etiology.
3. Patients with CKD on dialysis.

Exclusion Criteria:
1. Age less than 18 years.
2. Documented ischemic heart disease.
3. Congenital heart disease.
4. Valvular heart disease.
5. Primary cardiomyopathies
6. Chronic smokers

Staging of Chronic Kidney
Chronic kidney disease has been divided into five stages based on the guidelines of the national kidney foundation [Kidney Dialysis Outcome Quality Initiative, KDOQI] depending on the estimated GFR(eGFR)

Stage	GFR (ml/min/1.73m)	Description
0	>90	Kidney injury with normal GFR but with risk factors for CKD
1	>90	Kidney injury with normal GFRwith kidney damage likeproteinuria, abnormal urine sediments etc.
2	60-89	Kidney injury with mild reduction in GFR
3	30-59	Kidney injury with severe reduction in GFR
4	15-29	Kidney injury with severe reduction in GFR
5	<15	End-Stage Reanal Disease

Glomerular Filtration Rate (G.F.R.) was calculated using Cockcroft-Gault Formula.
(140-Age) x Weight (kg)

Estimated creatinine clearance =
(ml/min) $\dfrac{72 \times \text{S. Creatinine (mg/dl)}}{\text{Multiple by 0.85 for women}}$

SOURCE OF DATA:
Data collection form was designed for the collection of data including patient information such as medication history, present illness, current medication, laboratory data

1- CLINICAL FEATURES:
a. History: a detailed history regarding duration of illness, any treatment received and past history of illness was taken. Age and sexof the patient was noted.

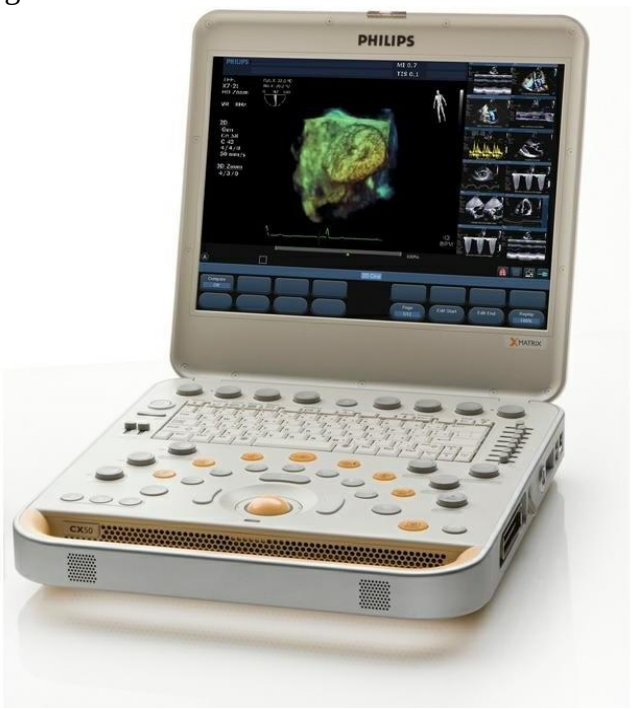
b. General Physical Examination: a detailed general physical examination was done with special reference to pulse rate andcharacter, blood pressure, jugular venous pressure, presence of pallor, clubbing or pedal edema.

c. Cardiovascular Examination: a thorough examination of chest and CVS was done with emphasis on features of emphysema and evidence of left ventricular overload i.e, shortness of breath,

pulmonary edema, orthopnoea and paroxysmal nocturnal dyspnoea, high pitched pan-systolic murmur at the apex, radiating to the back or clavicular area, etc.

2- ECHOCARDIOGRAPHY

Echocardiography was in ECHO lab of Cardiology unit in DoonHospital. Echocardiographic assessment was done using the Model



Philips CX50 x MATRIX.

Patients were examined in Left Atrial and supine position in quiet respiration.

a M Mode Echocardiography

Left ventricular dimensions were obtained by directing the ultrasonicbeam at the chamber the mitral valve echoes and papillary muscle echoes in the left parasternal long axis view. Following measurementswere made:

- Left ventricular internal diameters in diastole.
- Interventricular septum thickness in systole.

a- Two Dimensional Echocardiography

Apical four chamber view was employed to obtain the following measurements:

- Left ventricular volume in diastole and systole
- Ejection fraction.

An ejection fraction of >70% was considered as hyper dynamic, 50%-70% was consider normal, 40%-49% as mild, 30%-39% as moderate and <30% was considered severe decrease in ejection fraction.

Left Ventricular Indices were assessed and then they were used to calculate Left Ventricular Mass by using the cube formula proposed by Troy.

$$L\ V\ Mass\ (Troy) = 1.05([LVIDD + PWTD + IVSTD]^3 - [LVIDD]^3)g$$

Where LVIDD = left ventricular internal diameter in diastole
PWTD = posterior wall thickness in diastole
IVSTD = interventricular septum thickness in diastole

LV mass was classified as mild, moderate and severe. The reference range of LV mass varies with gender. In females the reference range is from 67-162g and in males the reference range is from 88-224g. In females, mildlyabnormal LV mass ranges from 163-186g and in males , it is from 225-258g. Similarly, moderately abnormal LV mass if female ranges from 187-210g and259-292g in males. More than 211g consider severely abnormal in females andmore than 293g is severely abnormal in males.

Patients included in the study will be treated as per the standard treatmentschedule. The data obtained will be analysed with appropriate stastical analysistools at the end of the study and conclusive evidence will be derived

OBSERVATIONS AND RESULTS

Table 1:- Baseline characteristics of case group

Variable		No.	%
Age Group	18 – 40yrs	21	17.2
	41 – 60yrs	65	53.3
	>60yrs	36	29.5
Sex	Female	25	20.5
	Male	97	79.5
CKD Stage	Stage I	10	8.2
	Stage II	12	9.8
	Stage III	12	9.8
	Stage IV	30	24.6
	Stage V	58	47.5
LV Function	Normal	37	30.3
	Mild LV Dysfunction	27	22.1
	Moderate LV Dysfunction	30	24.6
	Severe LV Dysfunction	28	23.0
LV Mass	Normal	37	30.3
	Mildly Abnormal	24	19.7
	Moderately Abnormal	28	23.0
	Severely Abnormal	33	27.0

Table 1 shows baseline characteristics, which signifies that number of patients were more in age group 41-60 years (53.3%) as compared to age group18-40 years and >60 years which is 17.2% and 29.5% respectively. In this tablemale were more in number (79.5%) as compared to females (20.5%) This tablesignifies more number of patients were in CKD stage V which was 47.5% as compared to other stages. In this table more number of patients were having moderate LV dysfunction (24.6%) as compared to mild and severe LV dysfunction which was 22.1% and 23.0% respectively Maximum number of patients were having severely abnormal LV mass which was 27.0%

Table 2:- Mean±SD of baseline characteristics of case group

Variable	Mean ± SD
Age	52.09 ± 11.85yrs
Creatinine Clearence	28.48 ± 27.37
LVEf	43.39 ± 14.71
LV Mass	249.78 ± 66.15

Table 2 reveals Mean±SD of baseline characters of study group, which signifies Mean±SD of 52.09±11.85yrs, 28.48±27.37, 43.39±14.71, 249.78±66.15 in age, creatinine clearance, LVEF, LV mass respectively.

Fig 1. Distribution of case group according to Age (n=122)

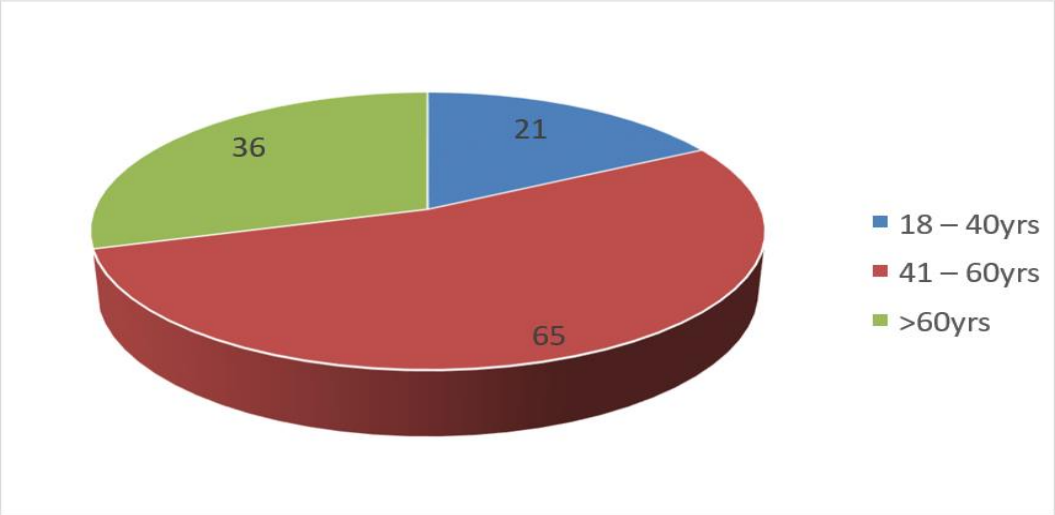


Fig 2:- Distribution of case group according to Sex (n=122)

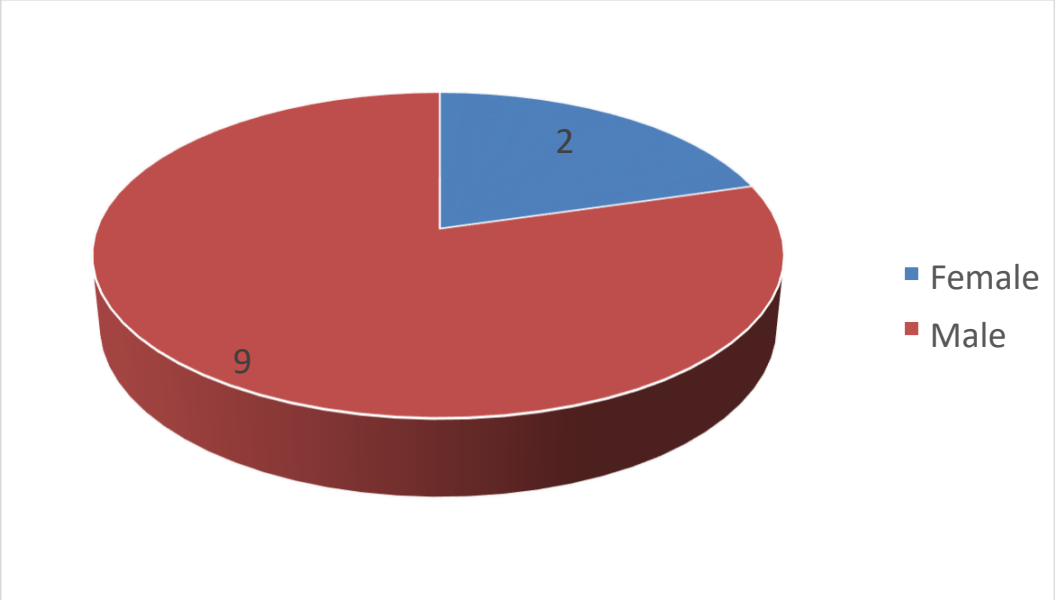


Fig 3:- Distribution of case group according to Stage of CKD (n=122)

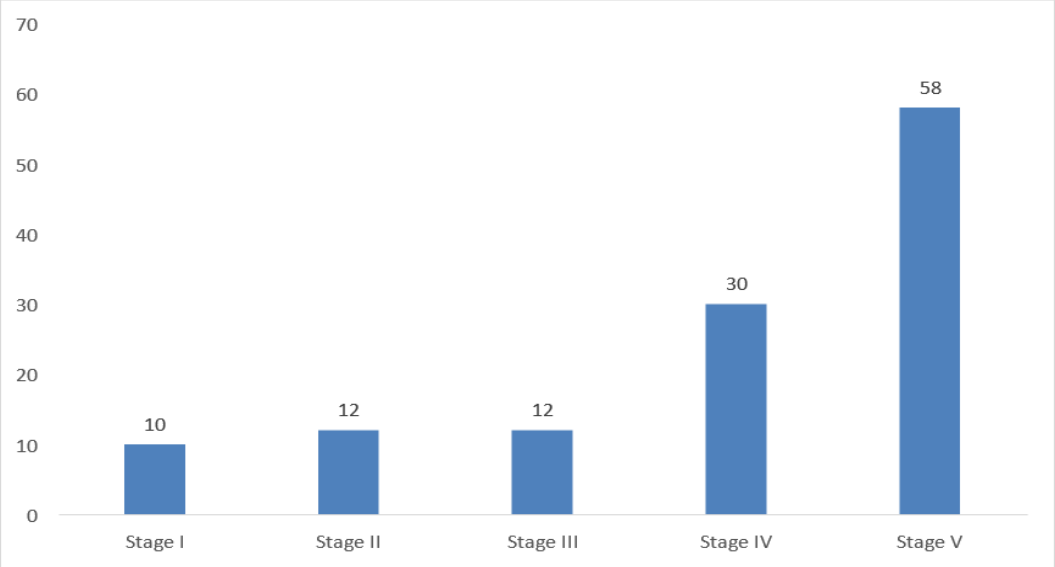
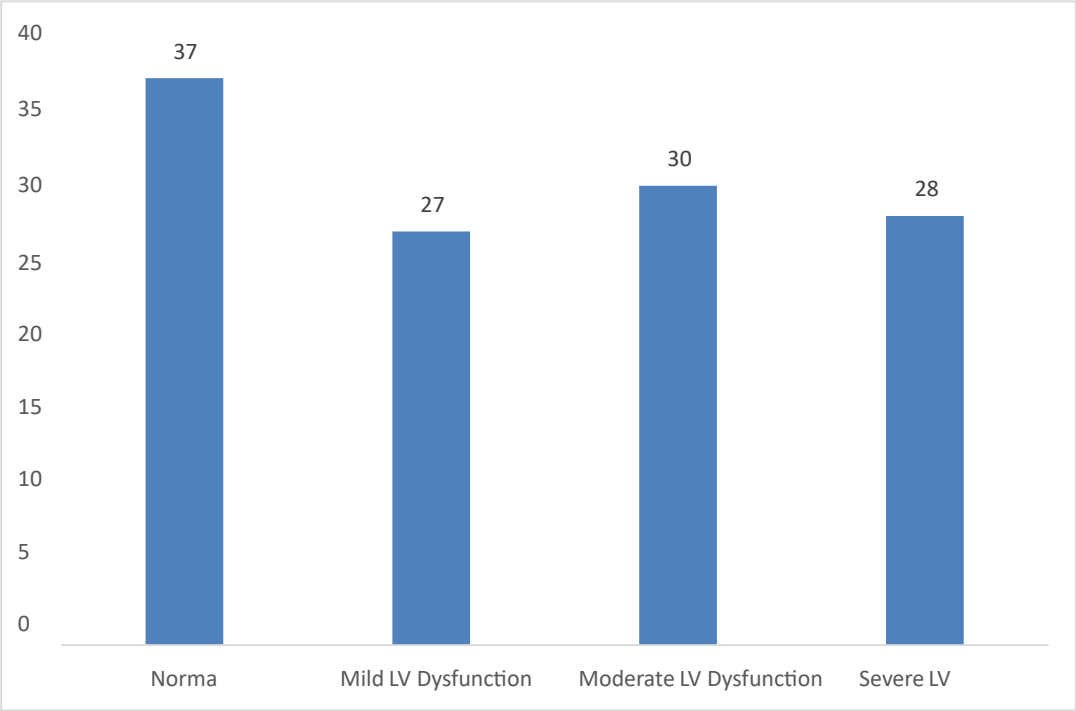


Fig 4:- Distribution of case group based on LV function (n=122)



Graph 5: Distribution of case group on the basis of LV mass (n=122)

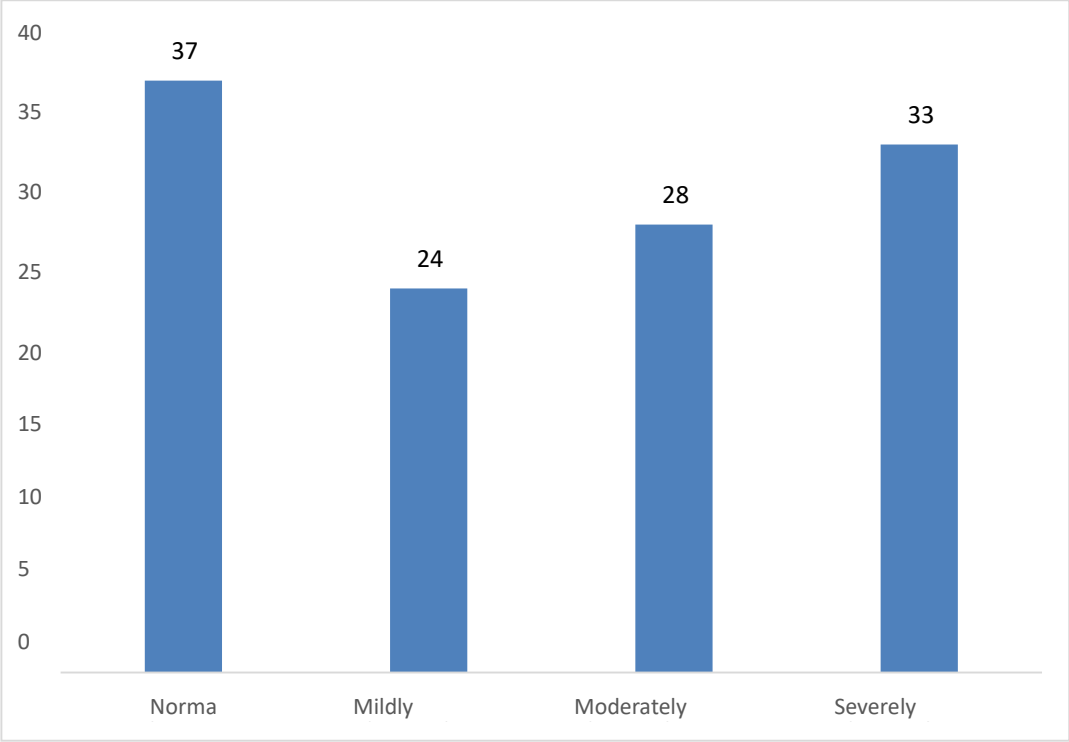


Table 3:- Baseline characteristics of control group

Variable		No.	%
Age Group	18 – 40yrs	5	25.0
	41 – 60yrs	11	55.0
	>60yrs	4	20.0
Sex	Female	8	40.0
	Male	12	60.0
LV Function	Normal	15	75.0
	Mild LV Dysfunction	3	15.0

	Moderate LV Dysfunction	1	5.0
	Severe LV Dysfunction	1	5.0
LV Mass	Normal	16	80.0
	Mildly Abnormal	2	10.0
	Moderately Abnormal	1	5.0
	Severely Abnormal	1	5.0

Table 3 shows baseline characteristics in control group, which signifies that number of patients were more in age group 41-60years(55.0%) as compared to age group 18-40 years and >60 years which is 25.0% and 20.0% respectively. In this table male were more in number (60%) as compared to females (40%) In this table more number of patients were normal(75.0%) as compared to mild and severe LV dysfunction which was 15.0% and 5.0% respectively Maximum number of patients having normal LV mass(80.0%)

Table 4 :- Mean ±SD of baseline characteristics of control group

Variable	Mean ± SD
Age	46.30 ± 13.10
Creatinine Clearence	136.85 ± 55.32
LVEf	54.05 ± 10.69
LV Mass	177.29 ± 59.25

Table 4 reveals Mean±SD of baseline characters of control group, which signifies Mean±SD of 46.30±13.10yrs, 136.85±55.32, 54.05±10.69, 177.29±59.25 in age, creatinine clearance, LVEF, LV mass respectively.

Fig 6. Distribution of control group according to Age (n=20)

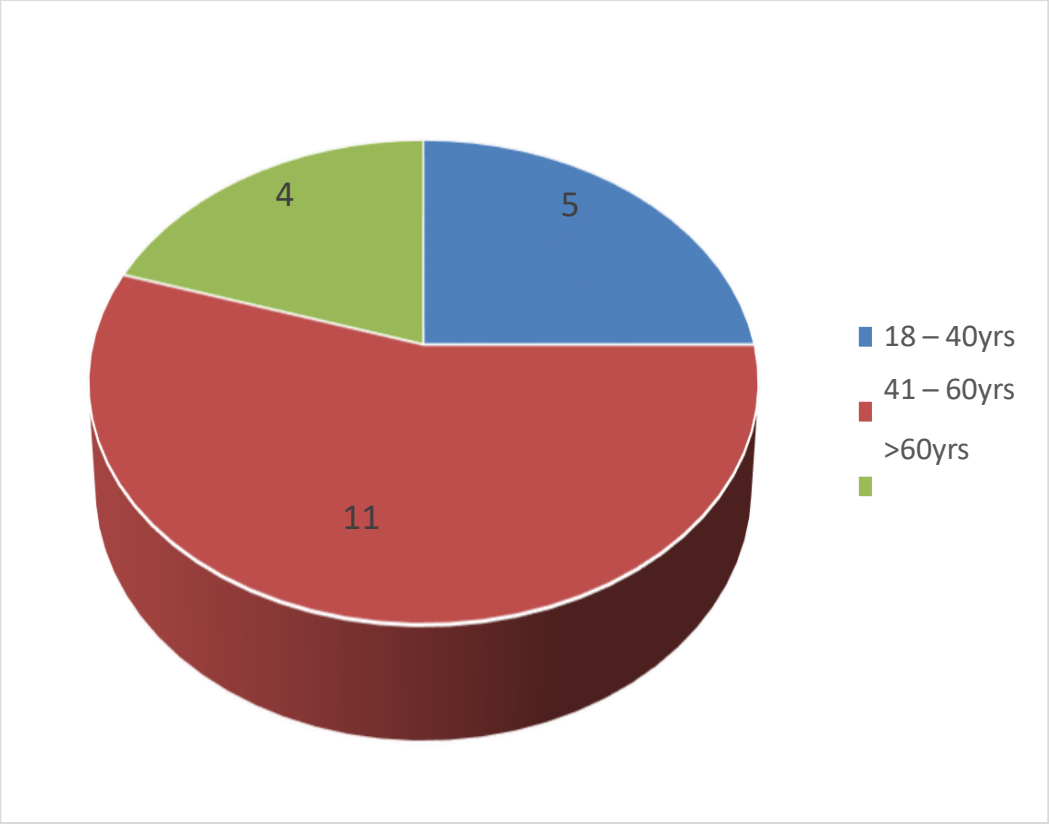


Fig 7:- Distribution of control group according to Sex (n=20)

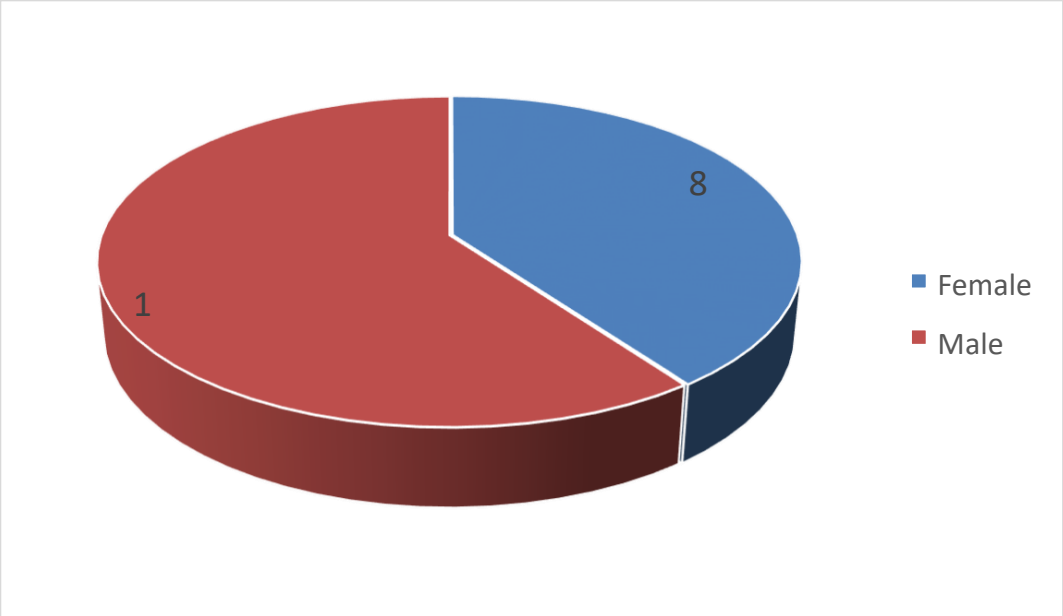


Fig 8:- Distribution of control group based on LV function (n=20)

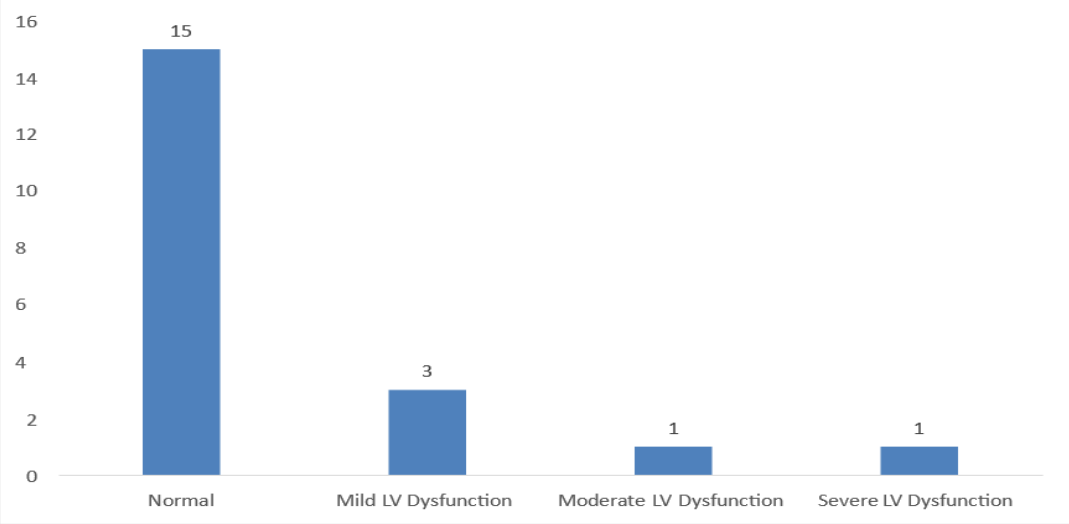


Fig 9: Distribution of control group on the basis of LV mass(n=20)

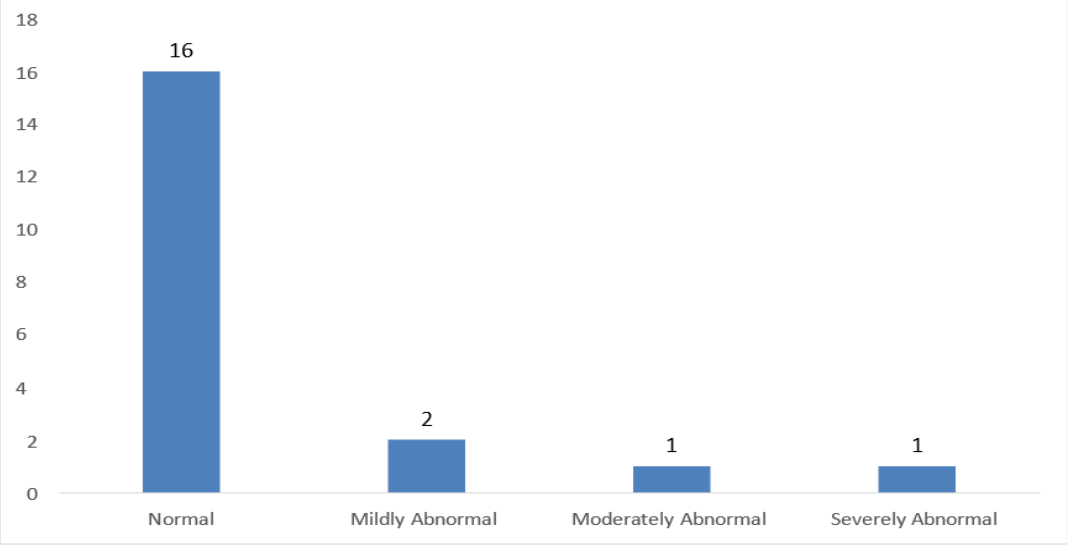


Table 5:- Association of age group and sex in cases and controls.

Variable		Controls		Cases		Total	p Value
		No.	%	No.	%		
Age Group	18 – 40yrs	5	19.2	21	80.8	26	0.57
	41 – 60yrs	11	14.5	65	85.5	76	
	>60yrs	4	10.0	36	90.0	40	
Sex	Female	8	24.2	25	75.8	33	0.06
	Male	12	11.0	97	89.0	109	

Table 5 shows the association of age group and sex in respect to casesand controls was found statistically non-significant (p>0.05).

Table 6:- Association of LV Dysfunction in cases and controls

Variable		Controls		Cases		Total	p Value
		No.	%	No.	%		
LV Dysfunction	Absent	15	28.8	37	71.2	52	0.01
	Present	5	5.5	85	94.4	90	

Table 6 shows differences of LV dysfunction in cases and controlswhich was statistically significant with P value of 0.01.

Table 7:- Association of LV mass in cases and controls

Variable		Controls		Cases		Total	P Value
		No.	%	No.	%		
LV Mass	Normal	16	30.2	37	69.8	53	0.01
	Increased	4	4.4	85	95.5	89	

Table 7 shows difference in LV mass in cases and controls which isstatistically significant with P value of 0.01.

Table 8:- Comparison of Mean±SD of baseline characteristics betweencontrol and study group

Variable	Controls	Cases	p Value
	Mean ± SD	Mean ± SD	
Age	46.30 ± 13.10	52.09 ±11.85yrs	0.06
Creatinine Clearence	136.85 ± 55.32	28.48 ± 27.37	0.001
LVEf	54.05 ± 10.69	43.39 ± 14.71	0.002
LV Mass	177.29 ± 59.25	249.78 ± 66.15	0.001

Table 8 signifies comparison of Mean± SD of baseline characters between control and study group, which shows that comparison of age was statistically non significant with P value <0.05. Whereas, it was significant increatinine clearance, LVEF and LV mass with p value >0.05.

Table9 :- Distribution of CKD as per age group

		Age Group						Total
		18 – 40yrs		41 – 60yrs		>60yrs		
		No.	%	No.	%	No.	%	
CKD Stage	Stage I	3	30.0	4	40.0	3	30.0	10
	Stage II	3	25.0	9	75.0	0	0.0	12
	Stage III	0	0.0	10	83.3	2	16.7	12
	Stage IV	9	30.0	16	53.3	5	16.7	30
	Stage V	6	10.3	26	44.8	26	44.8	58
Total		21	17.2	65	53.3	36	29.5	122

Table 9 shows the distribution of CKD as per age groups. In age group (18-40yrs) maximum number

of patients are in CKD stage IV (30.0%) and leastnumber of patients are in stage V(10.3%) and no patient in stage III.

While in age group (41-60) years 83.3% patients presented with stage III CKD, 53.3% with stage IV, 44.8% with stage V CKD and 40% and 75% patients are in stage I, stage II respectively. In age group >60 yrs, 44.8% presented with stage V CKD, 16.7% patients presented with both stage III andStage IV CKD and 30% patients are in stage I CKD.

Table 10 :- Distribution of stages of CKD as per sex

		SEX				Total
		Female		Male		
		No.	%	No.	%	
CKD Stage	Stage I	2	20.0	8	80.0	10
	Stage II	4	33.3	8	66.7	12
	Stage III	2	16.7	10	83.3	12
	Stage IV	3	10.0	27	90.0	30
	Stage V	14	24.1	44	75.9	58
Total		25	20.5	97	79.5	122

Table 10 illustrates the stages of CKD as per sex of the subjects. In stage IV CKD there was found male predominance with 90.0% males and 10.0% females. 83.3% males presented with stage III CKD as compared to females which was 16.7%. Even with stage V CKD male predominance was found with 75.9 % as compared to females 24.1%.

Table 11:- Comparison of CKD staging with LV Dysfunction

		LV Dysfunction				Total	OddsRatio	P Value
		Absent		Present				
		No.	%	No.	%			
Controls		15	75.0	5	25.0	20	1.00	
CKD Stage	Stage I	6	60.0	4	40.0	10	2.00	0.40
	Stage II	6	50.0	6	50.0	12	3.00	0.16
	Stage III	5	41.7	7	58.3	12	4.20	0.06
	Stage IV	9	30.0	21	70.0	30	7.00	0.003
	Stage V	11	19.0	47	81.0	58	12.82	0.001
Total		37	30.3	27	22.1	122		

Table 11 shows comparison of CKD stage with LV dysfunction in control and study group, which signifies the odds of LV dysfunction occurringin stage I, II, III were 2,3,4 respectively, compared to the control group. But theP value of these three stages was 0.4,0.16,0.06 respectively which was not statistically significant.

However, the odds of LV dysfunction occurring in stage IV and stageV was 7.00 and 12.82 with the corresponding P value being 0.003 and 0.001respectively, which was statistically significant.

Table 12:- Comparison of CKD stages with LV mass in control and studygroup

		LV Mass				Total	Odds Rato	p Value
		Normal		Increased				
		No.	%	No.	%			
Controls		16	80.0	4	20.0	20	1.00	
CKD Stage	Stage I	6	60.0	4	40.0	10	2.67	0.25
	Stage II	6	50.0	6	50.0	12	4.00	0.08
	Stage III	8	66.7	4	33.3	12	2.00	0.40
	Stage IV	6	20.0	24	80.0	30	16.0	0.001
	Stage V	11	19.0	47	81.0	58	17.09	0.001
Total		37	30.3	24	19.7	122		

Table 12 shows comparison of CKD stage with LV mass in control andstudy group, which signifies the odds of LV mass occurring in stage I,II,III were 2.67,4.00,2.00 respectively, compared to the control group. But the P value of these three stages was 0.25,0.08,0.40 respectively which was not statistically significant.
However, the odds of LV mass occurring in stage IV and stage V was 16.0 and 17.09 with the corresponding P value being 0.001, which wasstatistically significant

Table 13:- Comparison of Left Ventricular mass and Left VentricularEjection Fraction in CKD Cases with other studies.

Particulars	Chen et al [88]	Hayashi et al [79]	Singal et al[77]	Present study
LV Mass	167.1±45.9	52.6±12	249.76±69.35	249.78±66.15
LVEF	64.5±13.2	60.8±7.11	61.12±7.82	43.39±14.71

Table 13 reveals that in our study the mean ± Sd of LV Mass was 24.78±66.15 and LVEF was 43.39±14.71 which is almost similar with Singal et al with mean ± Sd of LV mass was 249.76±69.35 and LVEF was 61.12±7.82.
However in other studies the mean ± Sd of LV mass was 52.6 ± 12 and 167.1±45.9 and the mean ±Sd of LVEF was 60.8±7.11 and 64.5±13.2 in Hayashi et al and Chen et al respectively.

SUMMARY AND CONCLUSION

The study was conducted at Government Doon Medical College and Hospital, Dehradun. A hundered and twenty-two patients of Chronic Kidney Disease were included in the study. 20 other patients who were not suffering from kidney disease were taken as control subjects. The patients included in the study were from the Department of Medicine and Department of Emergency of Shri Mahant Indiresh Hospital.
The maximum number of patients were seen in the age group of 41-60 years (65 patients, 53.3%). The mean age at presentation was 52.09 ± 11.85yrs. The maximum number of patients in the control group were also in the age group of 41-60 years.
In the study subjects, males were more abundant than females (97 malesand 25 males) with a M: F ratio of 3.88:1. The M: F ratio for controls was 1.5:1.
The maximum number of patients were of end stage renal disease (stageV).
The mean creatinine clearance in the patients of chronic kidney disease was 28.48 ± 27.37 whereas the mean creatinine clearance in the control group was 136.85±55.32.
For the study subjects, the mean left ventricular ejection fraction was 43.39 ± 14.71 and for the control group it was, 54.05±10.69
The mean LV mass for the study subjects was 249.78 ± 66.15 whereas for the control group, it was 177.29±59.25.
For the study subject, in age group (18-40yrs) maximum number of patients are in CKD stage IV (30.0%) and least number of patients are in stageV (10.3%) and no patient in stage III.
While in age group (41-60) years 83.3% patients presented with stage III CKD, 53.3% with stage IV, 44.8% with stage V CKD and 40% and 75% patients are in stage I, stage II respectively
In age group >60 yrs, 44.8% presented with stage V CKD, 16.7% patients presented with both stage III and Stage IV CKD and 30% patients arein stage I CKD.
For the study subjects, in stage IV CKD there was found male predominance with 90.0% and 10.0% females. 83.3% males presented with stage III CKD as compared to females, which was 16.7%. Even with stage V CKD, male predominance was found with 75.9 % as compared to females 24.1%.
For the study subjects, comparison of CKD stage with LV dysfunction in control and study group signifies the odds of LV dysfunction occurring in stage I, II, III were 2,3,4 respectively, compared to the control group. But the Pvalue of these three stages were 0.4,0.16,0.06 respectively which were not statistically significant.
However, the odds of LV dysfunction occurring in stage IV and stage Vwas 7.00 and 12.82 with the

corresponding P value being 0.003 and 0.001 respectively, which was statistically significant. This implies that patients of stage IV and V chronic kidney disease, do have a higher chance of having LV dysfunction than normal subjects and this difference in incidence is statistically significant and not by chance.

For the study subjects, comparison of CKD stage with LV mass in control and study group signifies the odds of LV mass occurring in stage I,II,IIIwere 2.67,4.00,2.00 respectively, compared to the control group. But the P values of these three stages were 0.25,0.08,0.40 respectively which were not statistically significant.

However, the odds of LV mass occurring in stage IV and stage V was 16.0 and 17.09 with the corresponding P value being 0.001, which wasstatistically significant. This implies that patients of stage IV and V chronic kidney disease, do have a higher chance of having an increased left ventricular mass than normal subjects and this difference is statistically significant and not by chance.

Thus, from this study we can conclude that patients of chronic kidney disease have a higher mean left ventricular mass and lower left ventricular ejection fraction than that seen in the normal population. However, the difference seen between the study subjects and controls was significant only inpatients of stage IV and stage V chronic kidney disease and in the rest of the stages.

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