Original Article

LVH among Non-Diabetics Pre Dialysis

Left Ventricular Hypertrophy among Non-Diabetics Pre Dialysis Patients with Chronic Kidney Disease in Local Population

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ABSTRACT

Objective: To determine the frequency of left ventricular hypertrophy among non-diabetics pre dialysis patients with chronic kidney disease.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: This study was conducted at the DHQ Teaching Hospital Bannu from September 2017 to August 2018.

Materials and Methods: Patients with CKD were selected for study from out patients department of Nephrology under informed written consent. They were interviewed through a pre-designed research proforma. Base line BP, HR, height, Serum creatinine and RBS were recorded. Echocardiography was performed to detect and define LVH. Data was analyzed using SPSS version 16.

Results: A total of 931 CKD patients were screened to select 116 non diabetic patients. Mean age of 54.76 ±1.60 years. Male were 57.8%. Mean LVMI HR, SBP, DBP were121.89 ±31.06 gm/m^2, 76.16 ± 12.04, 146.81±30.08 & 87.41 ±14.89, respectively. Both Systolic (r=0.534, p<0.0001) and diastolic BP (r=0.339, p< 0.0001) were significantly correlated to LVMI. Frequency of LVH was 73.27% (85) with almost similar distribution among Male 45 (52.94%) vs. Female 40 (47.05%). Majority 37.06% (43) were having Mild LVH. Hypertension was found in 69% (80). Patients with Mild LVH, Mod LVH & Severe LVH were having 76.7% (n, 33), 90% (n, 9), 90.6% (n, 29) hypertension. Of the 80 (69%) hypertensive patients, 09 (7.8%) had normal LVMI.

Conclusion: Left ventricular hypertrophy is frequently present among non-diabetics predialysis patients with chronic kidney disease.

Key Words: Left Ventricular Hypertrophy, CKD, Predialysis, Cardiovascular Diseases, Non Diabetic

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INTRODUCTION

Chronic kidney disease is an international pandemic. About 1.8 million people are currently treated with renal replacement therapy (RRT) worldwide.[1] More than 10% of United States population is estimated to have CKD. The percentage is even higher for diabetic and hypertensive and among adults elder than 65 years.[2,1]

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Developing countries are facing a silent epidemic of CKD. Data from community-based studies in Pakistan reveal the overall CKD prevalence of 12.5% (95% CI).[3] Cardiovascular diseases are one of the most frequent complications of CKD. These include abnormalities of left ventricular structure and function including LVH, CAD and valvular dysfunctions. Uremic environment is the strongest risk factor leading to these complications in addition to other risk factors. Diabetes and hypertension are among the most common causes of CKD and CVD, thus compound the cardiovascular effects of CKD.[4]

LVH is the most important of all CKD associated cardiovascular diseases. In non-dialysis dependent CKD patients, LVH is one of the strongest predictors of progression to dialysis dependency[5] and increased mortality.[6] The clinical consequences of LVH include both systolic and diastolic cardiac dysfunction, CAD and predisposition to ventricular arrhythmias and sudden cardiac death.[7]

Many factors have been described as having association with CKD associated LVH. These include traditional

risk factors such as hypertension, inadequate dialysis dose, volume status and Anemia.[8] Diabetes mellitus is independently associated with LVH in a multi-ethnic sample. The presence of DM increased the risk of LV hypertrophy by about 1.5-fold. After adjusting for several potential confounders, multivariate logistic regression analyses showed significant association of LVH in non-diabetic male CKD patients.[9] For the same reason extensive research is being focused internationally on LVH in CKD.

This study aims to determine the frequency and severity of LVH in our local CKD Predialysis non diabetic population and thus pave the way for more research to enhance our understanding of this phenomenon. On the basis of the results of this study regular Echo-cardiographic screening of LVH can be suggested in CKD patients and hence to reduce morbidity and mortality by timely interventions.

MATERIALS AND METHODS

This hospital based cross-sectional study was carried out at Nephrology department in DHQ Teaching Hospital Bannu from September 2017 to August 2018. We evaluated non diabetic CKD patients, who were not on hemodialysis, from out patients department. Individual consent was obtained, following approval from the hospital ethical committee. Data was collected on preformed proforma.

The variables recorded were pertinent clinical history, CVD risk factors like HTN and DM. Base line heart rate, blood pressure, height, serum creatinine and RBS were measured. These patients then underwent transthoracic echocardiography to detect LVH.

Sampling: Sample size was 116 keeping 74%[7] frequency of LVH, 95% confidence interval and 8% margin of error using WHO sample size calculations. It was Consecutive non-probability sampling.

Inclusion criteria:

All patients (Age ≥18 years of either genders) with CKD not yet initiated on hemodialysis

Exclusion criteria:

Maintenance hemodialysis, volume overload status (confounding factor[10]) and DM.

LVH was calculated as Left Ventricular Mass Index (LVMI= LVM/Height) corrected for height. LVM was calculated by Echocardiography using Devereux's adjusted Formula through automated in built software. The severity of LVH was graded as per American society of Echocardiography criteria[11] as shown in table 1.

Chronic Kidney Diseases: It was defined as abnormalities of kidney structure or function, present for >3 months with either following;

1. Evidence of decreased GFR (GFR <60 ml/min/1.73 m^2)
2. History of CKD Albuminuria (≥30 mg/24 hours)
3. Abnormalities detected by histology
4. Structural abnormalities detected by imaging

Diabetes Mellitus: Patients were considered as diabetics if they self-reported diabetesor those with Random Blood sugar ≥ 200 mg/d and or FBS≥126 mg/dl.

Hypertension: it was defined as SBP ≥ 140 mmHg and or DBP≥90 mmHg pressure.

RESULTS

A total of 931 CKD patients were screened to select 116 non diabetic, who were not on hemodialysis, and satisfying the inclusion and exclusion criteria. Mean age was 54.76 ±1.6 (18-94 yr) and majorities were in 4th to 6th decade of life. Male (n, 67) to female (n, 49) ratio was 1.3 to 1 (Table 3). The Mean LVMI was 121.89±31.06 gm/m^2 (Table 2). Frequency of LVH was 73.27% (n, 85) with almost similar distribution among Male 45 (52.94%) vs. Female 40 (47.05%) patients [Table 3].The most frequent age group having LVH for both male 21 (18.1%) and female 21 (18.1%) was ≥55 years. Frequency of LVH in male vs. female (p=0.43) is shown in Table 3.

When LVH was sub-classified on the basis of severity, majority 37.1% (n, 43) were having Mild LVH while Mod and Severe LVH was 8.6% (n, 10) and 27.6% (n, 32), respectively (Figure 1).

Hypertension was found in 69% (n, 80), with the mean HR, systolic and diastolic BP were 76.16 ±12.04, 146.81±30.08 & 87.41 ±14.89, respectively [Table 2]. There were statistically no significant difference (p=0.62) between male 38.8% (n, 45) and female 30.2% (n, 35) distribution within hypertension prevalence.

Of the 80 (69%) hypertensive patients, 09 (7.8%) had normal LVMI, while out of 36(31%) Normotensive patients, 22(19%) had Normal LVMI, while 10 (8.6%) had Mild, 1(0.9%) Moderate, and 3 (2.6%) had Severe LVH (Table 4).

It was found that Hypertension was progressively more frequently present with worsening LVH severity. Patients with Mild LVH, Mod LVH & Severe LVH were having 76.7% (n, 33), 90% (n, 9), 90.6% (n, 29) hypertension [Table 4].Both Systolic (r=0.534, p<0.0001) and diastolic BP (r=0.339, p< 0.0001) were significantly correlated to LVMI. (Table 4).

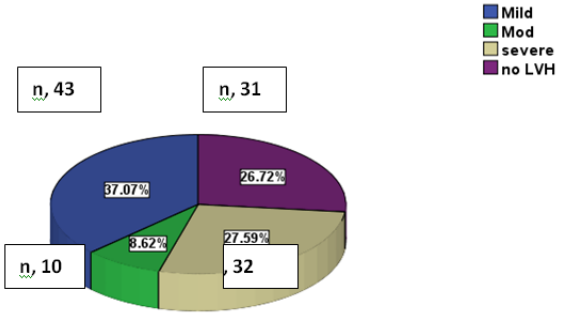

Figure No.1: LVH categories by severity

Table No. 1: Severity of LVH

	Women				Men			
Lvmi	Refrence range	Mild LVH	Moderate LVH	Severe LVH	Refrence range	Mild LVH	Moderate LVH	Severe LVH
LV mass/height(g/m)	41-99	100-115	116-128	≥129	52-126	127-144	145-162	≥163

Table No. 2: Statistical Means for Different Quantitative Variables

Statistics								
		Age	**Heart Rate**	**Systolic BP**	**Diastolic BP**	**Serum Creatinine (mg/dl)**	**Random Blood Sugar**	**Left Ventricular Mass Index**
N	**Valid**	116	116	116	116	116	116	116
	Missing	0	0	0	0	0	0	0
Mean		54.7672	76.1638	146.8103	87.4138	2.4466	123.1810	121.8991
Median		57.0000	71.0000	145.0000	90.0000	2.2000	124.5000	124.5000
Mode		61.00	68.00	145.00	90.00	1.80[a]	90.00	134.00
Std. Deviation		1.60669E1	12.04697	30.08970	14.89795	.82877	26.92456	31.06995
Range		76.00	48.00	150.00	80.00	3.00	158.00	169.00
Minimum		18.00	62.00	80.00	50.00	1.40	12.00	11.00
Maximum		94.00	110.00	230.00	130.00	4.40	170.00	180.00

a. Multiple modes exist. The smallest value is shown

Table No. 3: LVH categories by severity* hypertension cross tabulation

			Hypertension		**Total**
			Hypertensive	**Normotensive**	
LVH Categories by Severity	**Mild**	Count	33	10	43
		% within LVH by Severity	76.7%	23.3%	100.0%
		% within HTN	41.2%	27.8%	37.1%
		% of Total	28.4%	8.6%	37.1%
	Mod	Count	9	1	10
		% within LVH by Severity	90.0%	10.0%	100.0%
		% within HTN	11.2%	2.8%	8.6%
		% of Total	7.8%	.9%	8.6%
	severe	Count	29	3	32
		% within LVH by Severity	90.6%	9.4%	100.0%
		% within HTN	36.2%	8.3%	27.6%
		% of Total	25.0%	2.6%	27.6%
	No	Count	9	22	31
		% within LVH by Severity	29.0%	71.0%	100.0%
		% within HTN	11.2%	61.1%	26.7%
		% of Total	7.8%	19.0%	26.7%
Total		Count	80	36	116
		% within LVH by Severity	69.0%	31.0%	100.0%
		% within HTN	100.0%	100.0%	100.0%
		% of Total	69.0%	31.0%	100.0%

Table No. 4: Person Correlation of LVMI to Systolic & Diastolic BP

Correlations				
		Left Ventricular Mass Index	Systolic BP	Diastolic BP
Left Ventricular Mass Index	Pearson Correlation	1	.534**	.399**
	Sig. (2-tailed)		.000	.000
	N	116	116	116
Systolic BP	Pearson Correlation	.534**	1	.742**
	Sig. (2-tailed)	.000		.000
	N	116	116	116
Diastolic BP	Pearson Correlation	.399**	.742**	1
	Sig. (2-tailed)	.000	.000	
	N	116	116	116

DISCUSSION

Cardiovascular complications are the leading cause of death in patients with end-stage renal disease (ESRD), accounting for 43-52% of deaths in these patients. LVH is a frequent occurrence in patients with CKD and is an important adverse prognostic indicator.[12,13]

In the present study frequency of LVH was 74.14% with mean LVMI of 121.89 ±31.06 gm/m^2. Most of the studies show prevalence 40-80% of this cardiac geometric anomaly in the pre-dialysis patients.[14,15] Paoletti et al[7] demonstrated about similar LVH prevalence of 74% in 244 similar cohort of patients but higher mean LVMI of 160 ±50 gm/m^2. This higher LVMI could be because more than half of his patients were suffering from stages 3 to 5 CKD.

Advancing age was related directly to the increasing prevalence of LVH. The most frequent age group having LVH for both male 21 (18.1%) and female 21 (18.1%) was those with age equal or more than 55 years. Paoletti et al showed that age was directly related (P0.0013) to the LVMI.[7]

Gender has no significant effect (p=0.43) on LVH within age group with almost similar distribution of LVH among male 43.10% vs. female 31.03% patients in the present study. Zheni et al showed higher prevalence 81.9% of LVH in non-diabetics CKD patients before starting renal replacement therapy with only 22% of whom were women.[12]

When LVH was sub-classified on the basis of severity, the highest percentage of the patients 46.51% (n, 40) were having Mild LVH. This could possibly because of two reasons. First the prevalence of advance stage CKD patients, containing higher prevalence of LVH, are usually already on hemodialysis which were excluded from this study. Secondly there is low prevalence of advance CKD in population. Previously it was reported that the prevalence of LVH increased with progressive renal decline: 26.7% of patients with creatinine clearance (Ccr) greater than 50 mL/min had LVH and 45.2% of patients with severe renal impairment (Ccr<25 L/min) had LVH (P = 0.05).[16]

We observed that the prevalence of hypertension is 56.89% of the total CKD patients with the mean systolic and diastolic Blood Pressure of 146.81±30.08 & 87.41 ±14.89, respectively. Bregman et al[14] determined almost similar mean systolic & diastolic BP 143 ±27 and 83±16. Moreover LVH was significantly (p=0.0056) more prevalent in hypertensive than normotensive patients. Hypertension is thought to be the commonest factor responsible for LVH. Almost similar frequency of LVH 53.6% in hypertensive CKD patients was reported previously.[17]

Cardiovascular disease is still the major cause of death in end stage CKD[7]with a mortality rate approximately 10 to 30 times greater than that of the general population.[18] Heart disease or failure is the reason of morbidity and mortality in these population and advanced cardiomyopathy is caused by left ventricular hypertrophy.[19]

In a recent study by Covic et al, 86.4% of dialysis dependent patients had LVH at baseline. Serial echocardiography during follow up showed that LVH strongly correlated with hemoglobin level, Systolic BP, Pulse Pressure, serum phosphate, and serum calcium level. These patients were then managed according to Kidney Disease Quality Initiative and European Best Practice Guidelines. They achieved 62.1% regression in LVMI, over more than 12 months period of guideline implementation.[20]

This and other studies suggest that control of Risk factors causing LVH can result in regression of LVH and therefore its consequences.

CONCLUSION

This study has demonstrated that left ventricular hypertrophy is frequently present among non-diabetics' pre dialysis dependent chronic kidney disease patients.

Recommendations: On the basis of the results of this study regular Echocardiographic screening of LVH is suggested in all CKD patients. It is now clear some of its determinants are reversible factors. Thus, early detection can lead to preventive measures for LVH which will further help to bring down CVS mortality and morbidity in CKD patients.

Author's Contribution:

Concept & Design of Study:	Samiullah Khan
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Revisiting Critically:	Samiullah Khan, Sunehra

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