e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(8); 121-125

Original Research Article

Patterns and Predictors of Left Ventricular Hypertrophy and Cardiovascular Risk in Chronic Kidney Disease Patients Not On Dialysis and on Maintenance Dialysis in Akash Hospital

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Received: 01-05-2026 / Revised: 15-06-2026 / Accepted: 21-07-2026
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Conflict of interest: Nil

Abstract

Introduction: Up to 50% of individuals with chronic kidney disease who get long-term haemodialysis die from cardiovascular disease. In people with chronic kidney disease, left ventricular hypertrophy is a major predictor of cardiovascular outcomes. People with end-stage renal illness have a poor prognosis because left ventricular failure frequently precedes left ventricular hypertrophy1. One indicator of cardiovascular morbidity in patients with chronic renal disease receiving haemodialysis is left ventricular mass index[2]. In research participants receiving haemodialysis, factors such anaemia, hypoalbuminemia, proteinuria, and decreased eGFR significantly predict LVH[1]. In people with chronic renal disease, congestive heart failure and left ventricular dysfunction increase morbidity and death.

Methods: Patients of both sexes with chronic kidney disease who are not receiving haemodialysis for Stages 2, 3, 4, and 5 and who are receiving maintenance haemodialysis for Stages 4 and 5 at the Department of General Medicine, Akash Institute of Medical Sciences and Research Center, Devanahalli, Bangalore Rural, will be the subject of a study. Patients with chronic renal disease who are willing to participate in the study will be found and subsequently recruited.

Results: Concentric Hypertrophy is more prevalent in the dialysis group versus the non-dialysis group. IVSTd, PWTd, LVM, LVMI, eGFR and RWT are significant predictors of LVH in non-dialysis group and maintenance dialysis group.

Conclusion: Echocardiographic parameters have prognostic significance in determining cardiovascular morbidity and mortality in CKD patients on haemodialysis.

Keywords: CVD, CKD, LVMI, SCD.

DOI: 10.25258/ijcpr.18.8.19

Introduction

Cardiovascular diseases (CVD) cause one-third of hospital admissions among patients with chronic kidney disease (CKD) and account for half of all deaths among patients on haemodialysis [1]. Patients with end-stage renal disease may be at risk for cardiovascular disease due to factors such as anaemia, proteinuria, fluid overload, hyperparathyroidism, uremic toxins, elevated homocysteine levels, and malnutrition, in addition to the standard risk factors (such as age, gender, high blood pressure, diabetes, and smoking) [2].

Patients starting renal replacement therapy had a high frequency of clinical and echocardiographic cardiovascular illness [3]. In patients with chronic kidney failure receiving haemodialysis, the left ventricular mass index (LVMI) is a predictor of cardiovascular morbidity1. We studied the structural cardiovascular alterations using echocardiographic parameters in various phases and major predictors of LVH in patients with chronic kidney disease (CKD) who were not receiving dialysis or were receiving maintenance dialysis.

To investigate the trends and indicators of left ventricular hypertrophy in patients with chronic renal disease who are receiving maintenance dialysis and those who are not. To forecast left ventricular hypertrophy, compute the left ventricular mass index. In an attempt to lower morbidity and mortality, cardiovascular disease

assessment and treatment should begin early in the course of CKD, keeping in mind that the majority of patients with early-stage CKD do not develop end-stage kidney disease.

Material and Mothed

Study Design: A Cross-Sectional Observational Study.

Study Period: August 2022 to January 2024.

Source of Data: In patients and out patients of Akash hospital. The following criteria were used in the selection of cases.

Inclusion Criteria: Consenting chronic kidney disease patients aged 18 years and above, not on hemodialysis and on maintenance hemodialysis after taking informed consent.

Exclusion Criteria:

The following will be excluded from the study.

1. Recent history of acute myocardial infarction(less than 6 months)
2. Recent percutaneous or surgical revascularization, unstable angina or cerebrovascular accident.
3. Patients with history of malignancy and post-renal transplant.
4. Blood pressure >160/100mmHg.
5. Anemia with Hemoglobin less than 10g%.
6. Valvular heart disease.
7. Decompensated congestive heart failure.
8. Pregnant women and lactating women.
9. Patients aged less than 18 years.
10. Patients not willing to give informed consent.
11. Patients who were lost to follow up or had fatal outcomes or switched dialysis modality.

Methodology

A thorough history, including age, sex, length of dialysis, and risk factors for cardiovascular illnesses, was evaluated in participants who met the inclusion criteria. A comprehensive clinical examination was performed, including measurements of blood pressure, height, weight, and a thorough evaluation of the cardiovascular system. A 12-lead surface ECG was performed.

A medical professional with echocardiography training and expertise conducted Doppler echocardiography. In order to minimise interobserver bias, a cardiologist and a medical professional with training and expertise in echocardiography procedures will carry out the procedure and measure the echocardiographic indices.

Results

Data was entered into Microsoft excel data sheet and was analysed using SPSS 27 version software. Illustration of analyzed data was done using tables. Quantitative variables were presented as mean ± standard deviation (SD) while qualitative variables were presented as proportions, n (%). Comparison of quantitative variables across two groups was done with Student's t-test while qualitative variables were compared across groups using Chi-squared test. Significant predictors of LVH were determined using logistic regression models. $P < 0.05$ was defined statistical significance.

Table 1: Sex Distribution

Sex distribution			
		Frequency	**Percent**
Sex	Male	72	72.0
	Female	28	28.0
	Total	100	100.0

Table 2: Shows Age Group Distribution

Age Distribution			
		Frequency	**Percent**
Age Group	<31 years	7	7.0
	31-40 years	7	7.0
	41-50 years	24	24.0
	51-60 years	20	20.0
	61-70 years	26	26.0
	>71 years	16	16.0
	Total	100	100.0

Table 3: Shows Distribution of Patients across Different CKD Stages

CKD Stage			
		Frequency	**Percent**
CKD Stages	stage 2	4	4.0
	stage 3A	8	8.0
	stage 3B	27	27.0
	stage 4	23	23.0
	stage 5	38	38.0
	Total	100	100.0

Table 4: Dialysis Status

Dialysis Status			
		Frequency	**Percent**
Dialysis Status	Not on dialysis	50	50.0
	Maintenance dialysis	50	50.0
	Total	100	100.0

Discussion

The primary cause of death for people with chronic renal disease receiving haemodialysis is cardiovascular problems1. Doppler echocardiography's ability to detect left ventricular abnormalities is essential for identifying people at higher cardiovascular risk, as well as for determining the prevalence of primary heart disease, examining its prognostic implications, predisposing factors, and the effectiveness of therapeutic interventions. A popular non-invasive test that combines many ultrasonic techniques into a single examination, the Doppler echocardiogram offers a thorough assessment of the structure and function of the heart.

The purpose of this study was to detect and explain the geometric patterns and predictors of Left Ventricular Hypertrophy in Chronic Kidney Disease patients on continuous dialysis and those not on dialysis. In a group of fifty non-dialysis patients and fifty maintenance dialysis patients, a 2D echocardiogram was performed to determine the left ventricular mass index in addition to biochemical screening tests such as haemoglobin, urine protein, and serum creatinine.

The patients in our study are 56±15.6 years old on average. The pre-dialysis group's mean age was 56±15.4 years, while the maintenance dialysis group's was 55.2±15.8 years. According to Kalu et al. [1], the mean ± SD age of study participants was 39.32 ± 8.68 years for haemodialysis patients and 46.75 ± 12.16 years for predialysis patients (P = 0.07). According to Suh et al.'s study, patients with hypertrophy had comparable mean ages (56.97 ± 10.5 and 59.17 ± 10.7 years for eccentric and concentric hypertrophy, respectively), but patients without any LVH had significantly lower mean ages (51.8 ± 12). An investigation by Ahmad et al. Higher BMIs up to 45 kg/m2 have been associated with improved survival and reduced cardiovascular mortality. While low body weight is strongly associated with an increased risk of cardiovascular and all-cause mortality, various mechanisms, such as haemodynamic stability, TNF-α receptor concentration, neurohumoral response, inflammation, blood pressure, etc., have been studied to explain the obesity paradox in patients receiving maintenance haemodialysis.

There were 12 men and 20 females among the 32 predialysis patients in the study by Kalu et al. [1], whereas there were 11 males and 14 females among the 25 maintenance dialysis patients (P = 0.62). In both the maintenance dialysis and non-dialysis groups of our study, there are more male patients—36 males and 14 females.(P = 1.000).

The pre-dialysis group's mean systolic blood pressure was 141.62±18.32 mmHg, while the maintenance dialysis group's was 144.98±14.31 mmHg. Similar to our study, where SBP was higher in the maintenance dialysis group, Kalu et al. [1] found that the pre-dialysis group's mean SBP (mmHg) was 140.63±14.58 mmHg and the maintenance dialysis group's was 142.00±8.17 mmHg. The pre-dialysis group's mean diastolic blood pressure was 84.28±12.1 mmHg, while the maintenance dialysis group's was 90.06±9.5 mmHg.

According to Kalu et al. the predialysis group's diastolic blood pressure (DBP) was 92.50±8.42 mmHg, while the maintenance dialysis group's DBP was 89.92±10.27 mmHg. This study supports your findings that the dialysis group had higher concentric remodelling (44%).According to Kalu et al. [1], 24 (75%) pre-dialysis CKD patients and 15 (60%) maintenance dialysis CKD patients had left ventricular hypertrophy. Eight (25%) of the predialysis patients had eccentric LVH and sixteen (50%) had concentric LVH. Six (24%) and nine

(36%) of the patients on maintenance dialysis showed concentric and eccentric LVH, respectively ($\chi 2 = 4.03$, $P = 0.13$).

Eccentric hypertrophy was more common in maintenance dialysis patients, according to a research by Kalu et al. Conversely, our research revealed that patients on maintenance dialysis were more likely to have concentric hypertrophy.

According to a research by Foley et al., a considerable number of haemodialysis patients had concentric hypertrophy and remodelling, indicating a high prevalence of LVH. Similar to our findings, which showed that only 8% of dialysis patients had no hypertrophy compared to 20% in the non-dialysis group, their results likewise revealed fewer instances of no hypertrophy.

Conclusion

When it comes to predicting cardiovascular morbidity and mortality in CKD patients receiving haemodialysis, echocardiographic measures are significant. Compared to the non-dialysis group, the dialysis group had a higher prevalence of concentric hypertrophy.

In both the maintenance dialysis group and the non-dialysis group, eGFR, PWTd, IVSd, LVM, LVMI, and RWT are significant predictors of LVH.

In order to enhance cardiovascular outcomes by targeted treatment, early screening and evaluation are advised to identify cardiovascular risk factors and LVH in CKD patients. Finding high-risk patients who will gain the most from interventions is the goal of risk prediction.

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