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ORIGINAL RESEARCH

A Study of Cardiovascular Profile in Elderly Patients with Chronic Kidney Disease

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ABSTRACT

Background: Chronic Kidney Disease (CKD) is a progressive disorder often linked to cardiovascular complications, the leading cause of morbidity and mortality in elderly patients. This study aims to assess the cardiovascular profile in elderly patients with CKD. **Methods:** This cross-sectional observational study was conducted at PES Hospital, Kuppam, with 81 CKD patients aged ≥60 years. The cardiovascular profile was assessed using clinical examinations, electrocardiography (ECG), echocardiography, and various biochemical markers. **Results:** Out of 81 participants, 72.8% were in CKD Stage 5. The most common cardiovascular manifestations included left ventricular hypertrophy (37%) and elevated systolic blood pressure (43.2% had SBP 160-180 mmHg). Biochemical parameters showed significant associations between CKD stage and serum creatinine, phosphorous levels, and eGFR. **Conclusion:** The findings highlight the high burden of cardiovascular abnormalities in elderly CKD patients. Regular cardiovascular monitoring is crucial for preventing complications and improving outcomes. **Funding:** No specific funding was received for this study.

INTRODUCTION

Chronic Kidney Disease (CKD) affects a significant portion of the elderly population, often leading to cardiovascular complications that contribute to increased mortality. Cardiovascular disease (CVD) is the leading cause of death among CKD patients, with higher prevalence in advanced stages. This study aims to evaluate the cardiovascular profile in elderly patients with CKD stages 3 to 5, providing insight into early detection and management of cardiovascular risks.

METHODS

This cross-sectional observational study was conducted from January 2021 to June 2022 at PES Hospital, Kuppam. A total of 81 elderly patients with CKD stages 3, 4, and 5 were recruited using purposive sampling.Patients aged ≥60 years diagnosed with CKD stages 3, 4, or 5, defined by eGFR <60 mL/min were included in this study. Patients with acute kidney injury were excluded.

Data Collection

Data on demographic factors, clinical symptoms, and cardiovascular signs were collected. ECG was analyzed for LVH and other changes, while echocardiography was used to detect abnormalities such as pulmonary artery hypertension (PAH).

Statistical Analysis

Data were analyzed using SPSS version 23. Descriptive statistics were employed, and associations between variables were tested using chi-square and t-tests.

RESULTS

The study included 81 elderly patients with CKD. The majority of patients (46.9%) were aged between 60-70 years, while 35.8% were between 70-80 years, and

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17.3% were older than 80 years. The mean age of the study population was 71.87 years (SD ± 7.58).

Among the study population, 61.7% were males (n=50) and 38.3% were females (n=31), yielding a male-to-female ratio of 1.61.

The leading cause of CKD in the study population was a combination of Diabetes Mellitus (DM) and Hypertension (HTN), observed in 46.9% of patients. Hypertension alone was the cause in 27.2%, while 24.7% had only diabetes as the underlying condition. One patient (1.2%) had CKD due to obstructive uropathy.

The majority of patients (72.8%) were in CKD Stage 5, while 24.7% were in Stage 4 and 2.5% in Stage 3. The distribution was highly skewed toward advanced CKD stages in the elderly population.

The most common symptom was decreased urine output (88.9%), followed by dyspnea on exertion (53.1%) and pedal edema (46.9%).

The mean systolic blood pressure was 157.8 mmHg (SD ± 19.32). Notably, 43.2% of the patients had SBP in the range of 160-180 mmHg, while 24.7% had SBP between 120-140 mmHg. Higher SBP was more commonly observed in CKD Stage 5 patients.

Left ventricular hypertrophy (LVH) was detected in 37% of patients.ST-segment changes were observed in 22.2% of the study population, and 23.5% had tall T waves.

Pulmonary artery hypertension (PAH) was identified in 8.64% of patients.37% of the patients had LVH as confirmed by echocardiography.The ejection fraction (EF) was >50% in 91.3% of patients, while 6.2% had EF between 40-49%, and 2.5% had EF <40%.

The mean serum creatinine level across the population was 6.19 mg/dL (SD ± 2.27), with 53.1% of patients having serum creatinine levels >6 mg/dL.The estimated glomerular filtration rate (eGFR) was inversely correlated with CKD stage, with a mean of 11.87 mL/min (SD ± 6.37).

The majority of patients (64.2%) had serum sodium levels between 121-135 mEq/L, with a mean of 133.04 mEq/L (SD ± 7.01).Hyperkalemia (serum potassium >5.5 mEq/L) was found in 21% of patients, with the remaining 79% having potassium levels within the range of 3-5.5 mEq/L.Elevated serum phosphorous levels (>4 mg/dL) were found in 80.2% of patients. This parameter showed a significant correlation with the CKD stage ($p = 0.021$).

Total cholesterol was >200 mg/dL in 17.3% of patients, and 14.8% had levels <150 mg/dL.High-density lipoprotein (HDL) levels were <30 mg/dL in 21% of patients, and low-density lipoprotein (LDL) levels were >130 mg/dL in 12.3%.

There was a significant association between CKD stage and both serum creatinine ($p <0.0001$) and eGFR ($p <0.00001$), confirming a strong inverse relationship between kidney function and disease severity.Phosphorous levels were also significantly associated with CKD stage ($p = 0.021$). No significant correlation was observed between CKD stage and serum sodium, potassium, cholesterol, HDL, or LDL levels.

DISCUSSION

This study highlights the significant cardiovascular burden in elderly patients with chronic kidney disease (CKD), particularly in the advanced stages (CKD stages 4 and 5). Cardiovascular disease (CVD) is a well-established cause of morbidity and mortality in CKD patients, especially among those on dialysis, and our study supports this finding by identifying a high prevalence of cardiovascular complications such as left ventricular hypertrophy (LVH), hypertension, and biochemical abnormalities.

The high incidence of LVH in our study (37% based on ECG and echocardiography findings) aligns with other studies that have identified LVH as a common cardiac complication in CKD patients. LVH in CKD is driven by a combination of factors, including hypertension, fluid overload, and increased afterload from arterial stiffness and vascular calcification [1]. The elevated prevalence of hypertension in CKD (75.3% had systolic blood pressure >140 mmHg in this study) exacerbates LVH and increases the risk of adverse cardiovascular outcomes [2]. These findings are consistent with prior research demonstrating that LVH significantly contributes to increased cardiovascular morbidity and mortality in CKD patients [3].

In CKD, disturbances in electrolyte and mineral metabolism are common. In our study, elevated serum phosphorous levels were significantly associated with advanced CKD stages, reflecting impaired phosphate excretion by the kidneys. Hyperphosphatemia is a known risk factor for vascular calcification and arterial stiffness, which can lead to increased cardiovascular risk [4]. In addition, hyperkalemia (found in 21% of patients) can predispose patients to arrhythmias and sudden cardiac death, a leading cause of mortality in CKD [5]. These biochemical derangements highlight the need for early detection and management to prevent cardiovascular complications [6].

Hypertension is both a cause and a consequence of CKD, with the two conditions often creating a vicious cycle of worsening renal and cardiovascular health [7]. In our study, 43.2% of the patients had systolic blood pressure between 160-180 mmHg, and another 27.2% had SBP of 140-160 mmHg, reflecting poorly controlled hypertension in a large proportion of the population. Hypertension in CKD is associated with increased left ventricular afterload, which contributes to the development of LVH and diastolic dysfunction [8]. The importance of managing blood pressure aggressively in CKD patients to reduce cardiovascular morbidity cannot be overstated, as demonstrated by previous studies [9].

Our findings are in agreement with other studies examining cardiovascular profiles in CKD patients. Mahishale et al. observed a similar prevalence of

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LVH (50%) and a strong association between hypertension and cardiovascular complications [10]. Studies like those by Goornavar et al. have also documented a high prevalence of cardiovascular abnormalities in CKD patients, especially in the advanced stages of the disease [11]. These findings reinforce the importance of routine cardiovascular assessment and management in CKD patients to prevent morbidity and mortality [12].

CLINICAL IMPLICATIONS

The findings of this study have important clinical implications. First, regular cardiovascular screening should be an integral part of CKD management, especially in elderly patients who are at higher risk for complications. Monitoring for LVH, blood pressure control, and early detection of biochemical abnormalities like hyperphosphatemia and hyperkalemia are essential to mitigate the cardiovascular risks associated with CKD [13]. Second, aggressive management of hypertension and mineral metabolism is crucial in preventing the progression of cardiovascular disease in CKD [14]. Multidisciplinary care involving nephrologists and cardiologists is necessary to ensure optimal outcomes for CKD patients [15].

LIMITATIONS OF THE STUDY

This study has some limitations. It was conducted at a single center, and the sample size was relatively small, which may limit the generalizability of the results. Additionally, the cross-sectional design of the study precludes establishing causality between CKD stage and cardiovascular outcomes. Longitudinal studies with larger sample sizes are needed to validate these findings and better understand the progression of cardiovascular complications in CKD patients.

CONCLUSION

Elderly patients with CKD are at a high risk of developing cardiovascular complications, particularly LVH and hypertension. Biochemical abnormalities such as hyperphosphatemia and hyperkalemia further increase this risk. Early and routine cardiovascular assessments, along with aggressive management of hypertension and electrolyte imbalances, are essential to improving outcomes in this vulnerable population. Future studies should focus on identifying more effective strategies for cardiovascular risk reduction in CKD patients.

REFERENCES

1. Go AS, Chertow GM, Fan D, McCulloch CE, Hsu C. Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization. *N Engl J Med*. 2004;351(13):1296-1305.
2. Foley RN, Parfrey PS, Harnett JD, Kent GM, Martin CJ, Murray DC, et al. Clinical and echocardiographic disease in patients starting end-stage renal disease therapy. *Kidney Int*. 1995;47(1):186-92.
3. London GM, Guerin AP, Marchais SJ, Metivier F, Pannier B, Adda H. Arterial media calcification in end-stage renal disease: impact on all-cause and cardiovascular mortality. *Nephrol Dial Transplant*. 2003;18(9):1731-40.
4. Block GA, Klassen PS, Lazarus JM, Ofsthun N, Lowrie EG, Chertow GM. Mineral metabolism, mortality, and morbidity in maintenance hemodialysis. *J Am Soc Nephrol*. 2004;15(8):2208-18.
5. Pun PH, Lehrich RW, Honeycutt EF, Herzog CA, Middleton JP. Modifiable risk factors associated with sudden cardiac arrest within hemodialysis clinics. *Kidney Int*. 2011;79(2):218-27.
6. Kovesdy CP, Quarles LD. The role of fibroblast growth factor-23 in cardiorenal syndrome. *Nephron Clin Pract*. 2013;124(1-2):51-60.
7. Ritz E, Rychlik I, Locatelli F, Halimi S. End-stage renal failure in type 2 diabetes: a medical catastrophe of worldwide dimensions. *Am J Kidney Dis*. 1999;34(5):795-808.
8. Parfrey PS, Foley RN. The clinical epidemiology of cardiac disease in chronic renal failure. *J Am Soc Nephrol*. 1999;10(7):1606-15.
9. Zoccali C, Benedetto FA, Mallamaci F, Tripepi G, Fermo I, Parlongo S, et al. Prognostic impact of the indexation of left ventricular mass in patients undergoing dialysis. *J Am Soc Nephrol*. 2001;12(12):2768-74.
10. Mahishale GS, Mahishale V, Medikeri RS, Avanthi E, Paik P. Cardiovascular profile in chronic kidney disease patients in a tertiary care hospital. *J Assoc Physicians India*. 2019;67(4):33-7.
11. Goornavar SM, Singla K, Goel M, Sharma P, Sharda M, Malhotra M. Study of cardiovascular changes in CKD. *J Indian Acad Clin Med*. 2015;16(4):285-90.
12. Parfrey PS, Harnett JD, Barre PE. The natural history of myocardial disease in dialysis patients. *J Am Soc Nephrol*. 1991;2(1):2-12.
13. Kooman JP, van der Sande FM, Leunissen KM. Cardiovascular aspects in dialysis patients: the importance of volume control. *Semin Dial*. 2004;17(4):300-7.
14. Levin A, Stevens PE. Summary of KDIGO 2012 CKD guideline: behind the scenes, need for guidance, and a framework for moving forward. *Kidney Int*. 2014;85(1):49-61.
15. McCullough PA, Chan CT, Weinhandl ED, Burkart JM, Bakris GL. Intensive hemodialysis, left ventricular hypertrophy, and cardiovascular disease. *Am J Kidney Dis*. 2016;68(5S1).