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Clinical characteristics and outcomes of patients on haemodialysis at Jimma medical center, Ethiopia: a 7-Year review

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Abstract

Background Haemodialysis is the primary kidney replacement therapy modality in Africa. In Ethiopia, the number of patients undergoing Haemodialysis is increasing, yet data on their outcomes is scarce. This study assesses the clinical characteristics and outcomes of Haemodialysis patients at Jimma Medical Center.

Methods A retrospective cross-sectional study was conducted from April 08 to 12, 2024, involving patients who underwent Haemodialysis at Jimma Medical Center from June 2017 to March 2024. The data were coded and entered into EpiData version 3.1, then exported to the Statistical Package for Social Sciences version 26.0 for analysis. Descriptive statistics summarized the patients' clinical characteristics and outcomes, and Kaplan-Meier curves were used to assess survival status.

Results During the seven-year study period, 68 patients underwent Haemodialysis at Jimma Medical Center, with a predominance of males (69.1%). The average age of patients was 42.7 (± 12.8) years with 69.1% (95% CI: 57.5–79.1%) diagnosed with chronic kidney disease, while 30.9% (95% CI: 20.9–42.5%) had acute kidney injury. Among chronic kidney disease patients, common clinical features included nausea and vomiting (100%), proteinuria (95.7%), and body swelling (82.9%), while acute kidney injury patients frequently presented with oliguria (100%), nausea and vomiting (90.5%), and hematuria (52.4%). Hypertensive nephropathy was the leading cause of chronic kidney disease (40.4%), and acute glomerulonephritis (38.1%) and severe malaria (33.3%) were the predominant causes of acute kidney injury. Mortality was observed at 47.6% (95% CI: 27.7–68.6%) in acute kidney injury patients and 40.4% (95% CI: 27.3–54.7%) in chronic kidney disease patients. Emergency vascular access was required in 95.7% of chronic kidney disease and 100% of acute kidney injury patients.

Conclusion This study highlights the substantial burden of chronic kidney disease and acute kidney injury among hemodialysis patients at Jimma Medical Center, revealing distinct clinical profiles and outcomes. Although acute kidney injury patients exhibited a longer median survival time, the significant mortality risk within the first year underscores the urgent need for improved treatment access and resource allocation. Enhancing early intervention

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and ensuring the availability of critical medications, such as erythropoietin, are essential for optimizing patient outcomes for both chronic kidney disease and acute kidney injury groups.

Clinical trial number:Not applicable

Keywords Acute kidney injury, Chronic kidney disease, Ethiopia, Haemodialysis

Introduction

Kidney Replacement Therapy (KRT), which includes haemodialysis (HD) and peritoneal dialysis, is the cornerstone of treatment for kidney failure worldwide, providing life-sustaining support for both acute and chronic kidney conditions [1]. In sub-Saharan Africa, and specifically in Ethiopia, HD remains the primary KRT modality due to limited access to kidney transplants [2]. KRT serves two distinct purposes depending on the underlying condition: in acute kidney injury (AKI), it temporarily supports kidney function until recovery [3], whereas in chronic kidney disease (CKD), it provides long-term management to slow disease progression and alleviate symptoms [4, 5].

KRT is essential in cases of kidney function decline, often arising from advanced CKD or severe, unresolvable AKI. Although data on CKD prevalence in Ethiopia are limited, existing studies indicate that kidney disease is a significant public health issue. A study conducted in a government hospital in Addis Ababa reported a CKD prevalence of 12.2%, with an increasing trend attributed to rising rates of diabetes and hypertension [6]. Whereas, AKI is another critical condition that can lead to kidney failure. Research in Ethiopia has shown varying mortality rates among individuals with AKI, ranging from 12.8 to 33.8% [7–9].

In Ethiopia, HD is the only available KRT option, and the number of HD units remains limited, with significant disparities in accessibility and service quality across facilities [10]. As of September 2021, there were 35 HD units in the country. Eleven of these units are subsidized by the federal or local governments and are located in government-run hospitals, while the rest are privately owned for-profit centers. Additionally, four units are standalone facilities, while the remaining 31 are situated in hospitals or clinics. These centers can accommodate 10 to 250 patients, with a median capacity of 22. Approximately 1132 patients were receiving HD treatment at the time of the survey, indicating a prevalence of about ten HD patients per million people [11, 12]. The scarcity of HD units, alongside barriers in dialysis access and limited healthcare infrastructure, contributes to poorer outcomes in Ethiopia compared to high-income settings [11].

This study aims to provide a review of the clinical characteristics and outcomes of patients undergoing HD at Jimma Medical Center (JMC) over seven years period. The findings will improve renal care in Ethiopia and similar settings, ultimately enhancing the quality of life and survival rates of patients with kidney failure.

Methods

Study design and setting

A retrospective cross-sectional study was conducted from April 8 to 12, 2024, involving patients who underwent hemodialysis at Jimma Medical Center (JMC) between June 2017 and March 2024. The center, located at Jimma University in Jimma town, southwest Ethiopia, is approximately 352 km from the capital city, Addis Ababa, and serves a population of over 20 million in the region. The HD unit at JMC was established in June 2017 and is staffed by one nephrologist and four nurses. It is equipped with two dialysis machines, both utilizing low-flux membranes.

Eligibility criteria

All adult patients who had at least one session of HD at JMC from 2017 to 2024 were included in the study. Patients with missing medical records were excluded.

Outcome operational definition

Outcomes for AKI and CKD patients were analyzed independently. For AKI, 'recovery' was defined as either full restoration of renal function or significant improvement allowing the discontinuation of HD [13]. For CKD, outcomes were analyzed based on long-term indicators, including survival rate, hospitalization frequency, and HD continuation.

Data collection

A clinical nurse was trained to collect the data. From April 8 to 12, 2024, the data collector identified patient charts for the study using registry books from the dialysis unit and retrieved them from the medical records department. Patient medical records and dialysis charts were the sources of data collection. The data collection tools included socio-demographic characteristics (such as age, sex, and source of funds), patient clinical characteristics (such as nausea and vomiting, shortness of breath, body swelling, oliguria, gross haematuria, haematuria, and blood pressure measurement), and laboratory features (such as serum creatinine, serum sodium, serum potassium, serum urea, hemoglobin, and proteinuria). Additionally, the indication for dialysis, the type of vascular

access for HD initiation, the type of vascular access in patients on maintenance HD, frequency and duration of HD sessions, length of stay in the HD unit, and patient outcomes were recorded.

Data processing and analysis

After checking data quality, the data were coded and entered into EpiData version 3.1 and then exported to the Statistical Package for Social Science (SPSS) version 26.0 for further analysis. Normality tests were conducted using visual inspections of histograms and Q-Q plots, as well as the Kolmogorov-Smirnov and Shapiro-Wilk tests. Descriptive statistics were used to summarize the characteristics of the study variables. Categorical variables were presented as frequencies and percentages, while continuous variables were described using mean and standard deviation (SD) or median and interquartile range (IQR). The comparison of continuous variables was conducted using the Student's t-test for variables with a normal distribution (SBP, DBP, serum creatinine and serum sodium) and the Mann-Whitney U test for non-normally distributed variables (serum potassium, serum urea and hemoglobin). The Fisher exact test was used for categorical variables. Additionally, Kaplan-Meier curves were used to evaluate survival status of patients with CKD during their hospital stay. A p-value of less than 0.05 was considered statistically significant.

Result

A total of 80 patients underwent HD over the 7-year period from June 2017 to March 2024 at JMC. Based on the inclusion criteria, which excluded patients with missing medical records, 68 (85%) of these patients were included in the study.

Socio-demographic characteristics of the patients

The overall mean age was 42.7 years (±12.78), ranging from 18 to 85 years, with a mean age of 39 years (±14) for AKI patients and 45 years (±12) for CKD patients. Among patients aged 50 years or younger, the majority had CKD (62.7%). Most of the patients in this study were male ($n=47$), with CKD patients comprising the majority (70.2%) (Table 1).

Table 1 Socio-demographic characteristics of the patients

Variables	CKD ($n=47$)	AKI ($n=21$)
Age in years		
≤ 50	32(62.7)	19(37.3)
> 50	15(88.2)	2(11.8)
Sex		
Male	33(70.2)	14(29.8)
Female	14(66.7)	7(33.3)
Source of fund		
Self-funded	47(74.6)	16(25.4)
Sponsored by the institution	0	5(100)

CKD: Chronic kidney disease; AKI: Acute kidney disease

Clinical and biochemical features at presentation

At presentation, 21 [30.9% (95% CI: 20.9–42.5%)] patients had AKI, 47 [69.1% (95% CI: 57.5–79.1%)] had CKD. Among CKD patients, the most common clinical features were nausea and vomiting (100%), dipstick proteinuria (95.7%), and body swelling (82.9%). In AKI patients, the most common features were oliguria (100%), nausea and vomiting (90.5%), and dipstick proteinuria (80.9%). The median hemoglobin level at presentation was higher among patients with AKI, at 9 g/dl (IQR: 6–10), compared to patients with CKD, who had a median hemoglobin level of 7 g/dl (IQR: 6–9), (p-value=0.089). Notably, oliguria, gross hematuria, and dipstick hematuria at presentation were significantly more common clinical features in AKI than in CKD ($p=0.002$, 0.001, 0.028, respectively). Additionally, systolic and diastolic blood pressures at presentation were significantly higher in CKD patients compared to AKI patients. Although no significant association was observed, the biochemical features of patients with CKD and AKI showed no notable differences (Table 2).

Factors associated with AKI and CKD

Among the patients with AKI who underwent hemodialysis, the primary causes identified were acute glomerulonephritis (8 cases, 38.1%) and severe malaria (7 cases, 33.3%), both of which demonstrated a significant association ($p<0.001$). Additionally, pregnancy-related disorders accounted for 5 cases (23.8%) and also exhibited a significant association ($p=0.002$). In contrast, hypertensive emergencies, comprising only 1 case (4.8%), did not reach statistical significance ($p=0.309$) (Table 3).

Among patients with CKD who underwent hemodialysis, the leading cause was hypertensive nephropathy, identified in 40.4% of cases, which showed a significant association ($p<0.001$). Chronic glomerulonephritis was the second most common cause at 27.7%, also demonstrating statistical significance ($p=0.006$). Diabetic nephropathy was identified in 14.9% of cases but did not reach significance ($p=0.09$) (Table 4).

Vascular access and treatment-related characteristics

All AKI patients and the majority of CKD patients (95.7%) required emergency vascular access, primarily through jugular venous catheters (95.7% for CKD, 95.2% for AKI). Among patients on maintenance dialysis, arteriovenous fistula (AVF) was the most common access for CKD patients (94.3%), while only 50% of AKI patients had AVF, with the other 50% relying on non-tunneled central venous catheters (CVC). In terms of hemodialysis sessions, CKD patients had a total of 6,436 sessions

Table 2 Baseline clinical and biochemical features of patients with CKD and AKI (*N* = 68)

Baseline characteristics	CKD, *n* (%)	AKI, *n* (%)	*p*-value
	47(69.1)	**21(30.9)**	
Clinical features			
Nausea and vomiting[†]	47 (100%)	19(90.5%)	0.092
Shortness of breath[†]	34(72.3%)	15(71.4%)	0.578
Body swelling[†]	39(83%)	14(66.7%)	0.220
Oliguria[†]	32(68.1%)	21(100%)	0.002*
Gross hematuria[†]	6(12.8%)	11(52.4%)	0.001*
Dipstick hematuria[†]	18(38.3%)	14(66.7%)	0.028*
Systolic blood pressure (mmHg)[¶]	160 ± 21	136 ± 40	0.002*
Diastolic blood pressure (mmHg) [¶]	93 ± 13	82 ± 24	0.014*
Laboratory			
Serum creatinine (mg/dl) [¶]	11.023 ± 4.26	10.26 ± 5.44	0.647
Serum sodium (mmol/l) [¶]	135.98 ± 5.66	136.29 ± 5.22	0.968
Serum potassium (mmol/l) [#]	6(5–6)	6(4–6)	0.266
Serum urea (mg/dl) [#]	164(117–210)	170(148–250)	0.403
Hemoglobin (g/dl) [#]	7(6–9)	9(6–10)	0.089
Dipstick proteinuria[†]	45(95.7%)	17(80.9%)	0.126

CKD: Chronic kidney disease; AKI: Acute kidney disease; mmHg: Millimetre of mercury; mmol: Millimole; mg: Milligram; dl: Decilitre; g: Gram; [†]presented in frequency with percentage and Fisher's Exact Test was used; [¶]presented in mean (SD) and Student's t-test was used, [#]presented in median (IQR) and Mann-Whitney test was used; **p*-value: significant (*p*-value < 0.05)

Table 3 Etiology of AKI for patients admitted for HD at JMC, 2024

Identified probable causes	Frequency (%)	Chi-square	*P*-value
Acute glomerulonephritis	8(38.1)	17.464	< 0.001*
Severe malaria	7(10.3)	17.461	< 0.001*
Pregnancy related disorder	5(23.8)	12.079	0.002*
Hypertensive emergency	1(4.8)	2.271	0.309

Fisher's Exact Test was used with**p*-value: significant (*p*-value < 0.05)

Table 4 Etiology of CKD for patients admitted for HD at JMC, 2024

Identified probable causes	Frequency (%)	Chi-square	*P*-value
HTN nephropathy	19(40.4)	11.781	< 0.001*
Chronic glomerulonephritis	13(27.7)	7.181	0.006*
Diabetic nephropathy	7(14.9)	3.487	0.09
ADPKD	2(4.3)	0.921	0.992
Multiple Myeloma	1(2.1)	0.453	0.899
unknown cause	5(10.6)	2.411	0.314

ADPKD: Autosomal dominant polycystic kidney disease; Fisher's Exact Test was used with**p*-value: significant (*p*-value < 0.05)

compared to 302 for AKI patients, with the majority of both groups undergoing two sessions per week (85.1% for CKD and 76.2% for AKI). Erythropoietin and intravenous iron replacement therapy were used in 27.7% of CKD patients but were not utilized in any AKI patients. The primary indications for hemodialysis were similar between the two groups, with uremic encephalopathy being the most common (66% for CKD and 66.7% for AKI), followed by refractory pulmonary edema (29.8% for CKD and 23.8% for AKI) (Table 5).

Outcome profile

Among the 29 patients who died (42.6%), mortality rates were 47.6% (95% CI: 27.7–68.6%) for AKI patients and 40.4% (95% CI: 27.3–54.7%) for CKD patients. Of the AKI group, 47.6% achieved recovery as defined by renal function improvement to a level that permitted HD discontinuation. In contrast, CKD outcomes were characterized by prolonged HD dependency, with 36.2% of CKD patients continuing maintenance HD (Table 6).

Survival status of patients with CKD

The Kaplan-Meier survival analysis for CKD patients revealed a median survival time of 43 months (95% CI: 21.243–64.757). At 6 months, the survival rate was 100%; however, this decreased to 65.4% by 12 months. By 60 months, 32.7% of CKD patients remained alive, despite a significant decline in survival after the 12-month mark (Fig. 1).

Discussion

In this institution-based cross-sectional study, we evaluated the clinical characteristics and outcomes of patients undergoing HD at JMC over a seven-year period. Of the 68 patients who underwent HD in the study, 29 (42.6%) died.

The findings of this study underscore the significant burden of CKD among patients requiring HD, with 69.1% (95% CI: 57.5–79.1%) of the study population presenting with CKD at the time of HD initiation, while 30.9% (95% CI: 20.9–42.5%) had AKI. These results aligned with existing literature on the prevalence of these conditions in HD populations. The high prevalence of CKD among

Table 5 Vascular access and treatment-related characteristics

Variables	CKD (*n* = 47)	AKI, (*n* = 21)
Timing during initial vascular access		
Emergency	45 (95.7)	21(100)
Non-emergency	2(4.3)	0
Line of access		
Jugular venous catheter	45(95.7)	20(95.2)
Femoral vein catheter	2(4.3)	1(4.8)
Line on maintenance (*n* = 41)		
AVF	33(94.3)	3(50)
Tunneled CVC	2(5.7)	0
Non-Tunneled CVC	0	3(50)
HD sessions	6436	302
Frequency per week		
One	1(2.1)	1(4.8)
Two	40(85.1)	16(76.2)
Three	6(12.8)	4(19)
Duration of individual dialysis sessions in hours		
Two	7(14.9)	16(76.2)
Three	1(2.1)	0
Four	39(83)	5(23.8)
Erythropoietin and IV iron replacement therapy		
Yes	13(27.7)	0
No	34(72.3)	21(100)
Indications for HD		
Uremic encephalopathy	31(66)	14(66.7)
Refractory pulmonary edema	14(29.8)	5(23.8)
Uncontrolled hyperkalemia	0	1(4.8)
Uremic pericarditis	2(4.3)	0
Uremic bleeding	0	1(4.8)

CKD: Chronic kidney disease; AKI: Acute kidney disease; AVF: Arteriovenous fistula; CVC: Central venous catheter; CKD: Chronic kidney disease; AKI: Acute kidney disease; HD: Haemodialysis; IV: Intravenous

Table 6 Outcome profile of patients who underwent HD

Outcome profile	CKD (*n* = 47)	AKI (*n* = 21)
Recovery and discharge (14.7%, *n* = 10)	0	10(47.6)
Death (42.6%, *n* = 29)	19(40.4)	10(47.6)
Lost follow up (13.2%, *n* = 9)	8(17)	1(4.8)
Referral for renal transplant (4.4%, *n* = 3)	3(6.4)	0
On maintenance HD (25%, *n* = 17)	17(36.2)	0

HD: Haemodialysis; CKD: Chronic kidney disease; AKI: Acute kidney disease

HD patients is consistent with studies conducted in both low- and middle-income countries (LMICs) [14–16] and high-income countries (HICs) [17–19], where CKD frequently accounts for the majority of cases requiring dialysis. The substantial percentage of AKI patients requiring dialysis in our cohort likely reflects delayed presentation to nephrologists, which can be attributed to late referrals and health-seeking behaviors. This finding underscores the importance of early detection and timely intervention to reduce the need for dialysis in AKI cases.

Our study indicated that oliguria, gross hematuria, and dipstick hematuria were significantly more prevalent in patients with AKI compared to those with CKD. This finding aligns with existing literature that emphasizes the acute nature of AKI, where oliguria is a common symptom due to the kidneys' sudden inability to filter waste effectively [20–22]. Hematuria is also frequently observed in AKI, especially in cases of acute glomerulonephritis, which can lead to rapid kidney dysfunction [23, 24]. In contrast, the significantly higher mean systolic [160mmHg (95% CI: 154–166), (±21)] and diastolic blood pressures [93mmHg (95% CI: 89–97), (±13)] observed in CKD patients at presentation reflect a different pathophysiological profile. This is consistent with other studies, suggesting CKD patients often present with hypertension, a significant risk factor for cardiovascular events and further renal deterioration [25, 26]. In this study, the average hemoglobin level was 7.82±1.99 g/dL, which is far below the recommended target of 11.5–12.5 g/dL [27]. Our findings are consistent with those of a multicenter international cohort study from Brazil, France, Germany, Japan, and the USA, which reported that anemia as a major complication of kidney failure [27]. This is why the majority of the patients in our study, 57 (83.8%), received blood transfusions at some point.

In our study, hypertensive nephropathy was identified as the most frequently presumed cause of CKD among patients undergoing HD, accounting for 40.4% of cases. This finding is consistent with existing literature suggesting that hypertension is a leading cause of CKD, especially in resource-limited settings where early detection and management of hypertension may be inadequate [28–30]. Despite a relatively young mean age of 42.7 years (±12.78) among the patient cohort, with CKD patients averaging 45 years (±12), hypertension remains a significant etiological factor, possibly due to the high prevalence of undiagnosed or poorly managed hypertension in the population.

The lower prevalence of diabetes-related CKD compared to hypertensive nephropathy and glomerulonephritis may reflect differences in local disease burden, healthcare access, and diagnostic practices. Additionally, the late presentation of patients for HD and limited diagnostic capabilities in our setting might contribute to a diagnostic bias toward more overtly symptomatic conditions, such as hypertension-related kidney disease. These factors likely influence the observed CKD distribution and emphasize the importance of improved hypertension screening and early intervention strategies in younger populations to prevent CKD progression.

For AKI cases, our study identified AGN and severe malaria as the predominant causes, accounting for 38.1% and 33.3%, respectively. These findings align with existing literature, which indicates that AKI can occur in up to 40% of patients with severe *Plasmodium falciparum* malaria, underscoring the critical nature of this

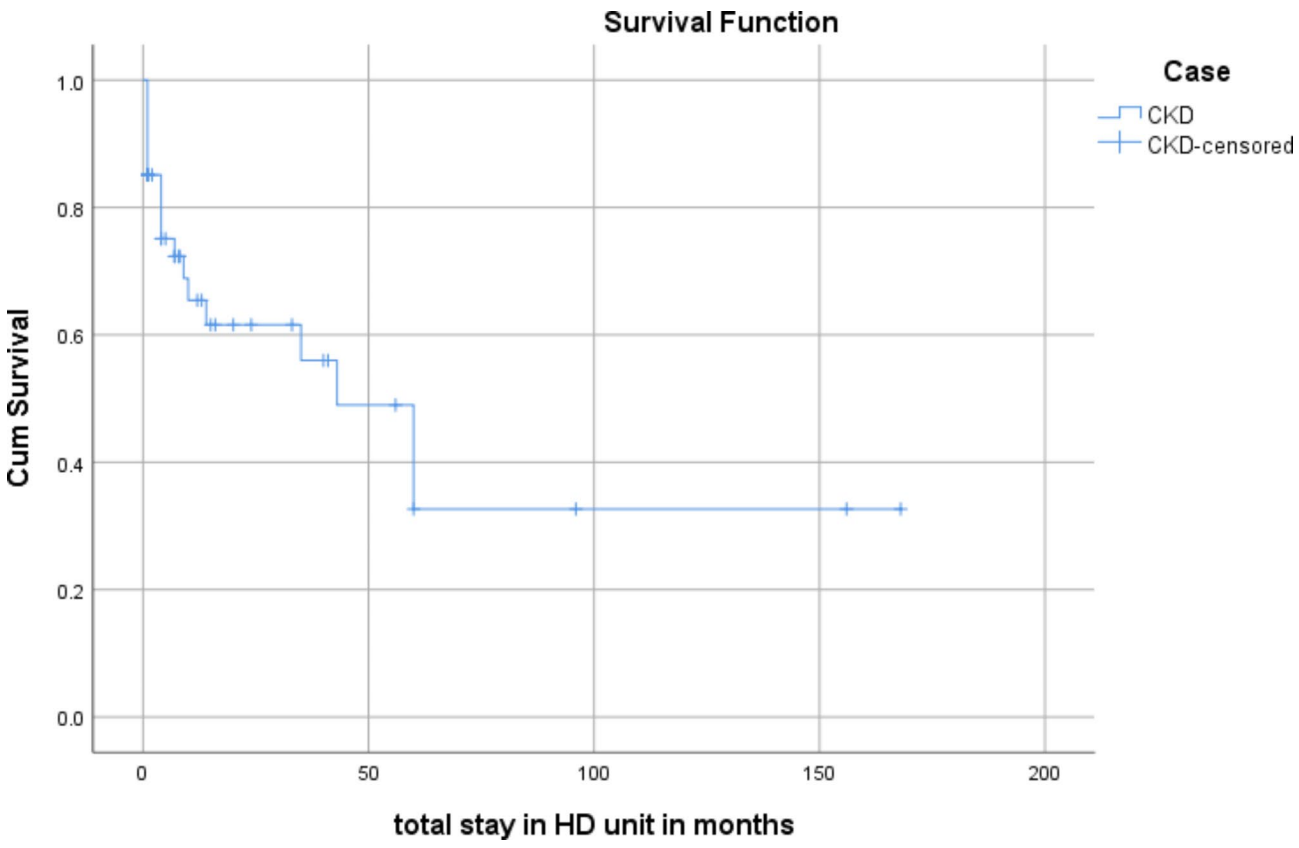

Fig. 1 Kaplan–Meier curves displaying the estimated survival time of patients with CKD who underwent HD at JMC from June 2017 to March 2024

complication in malaria-endemic regions [31, 32]. The pathophysiology of malaria-related AKI often involves hemodynamic instability, hemolysis, and direct renal injury from the parasite [32]. Additionally, while AGN is less common than acute tubular necrosis in AKI cases, it remains significant, particularly in specific populations, where immune-mediated processes and infections may trigger inflammatory responses leading to glomerular damage [33]. The absence of acute tubular necrosis ATN as a documented cause requiring HD in our cohort, despite ATN being a common form of AKI, reflects the prioritization of care for the most critically ill patients. In our setting, priority for HD was given to patients with severe *Plasmodium falciparum* malaria during outbreaks and those with glomerulonephritis who were anuric and presented with complications such as pulmonary edema. Therefore, while cases of ATN were present, they were not prioritized for HD, influencing the distribution of AKI etiologies observed in our study.

The study also sheds light on vascular access and treatment-related characteristics, revealing that All AKI patients and the majority of CKD patients (95.7%) required emergency vascular access. This finding underscores the urgent need for initiating HD due to advanced uremic symptoms, a factor that can significantly influence patient survival. This is consistent with the study by Parameswaran et al. (2011), which highlighted the impact of initial vascular access on HD outcomes [34]. In our study, three patients with AKI received AVFs for hemodialysis access. This decision was made due to initially uncertain prognoses, where prolonged dialysis support was anticipated. AVF placement, while typically reserved for patients requiring long-term dialysis, was selected as a more durable option over CVCs to support these patients' potential need for extended dialysis [35, 36]. However, each of these patients subsequently showed renal recovery, allowing discontinuation of dialysis [37]. This outcome underscores the challenges in predicting recovery trajectories in certain AKI cases, where a more permanent vascular access may be required if recovery is uncertain.

In our study, 80.5% of chronic HD patients were only able to undergo dialysis twice a week due to financial constraints. This is considerably below the international guidelines, which recommend at least three HD sessions per week [38]. Consequently, the majority of CKD patients received insufficient dialysis, potentially leading to multiple adverse health outcomes.

In this study, erythropoietin and intravenous iron replacement therapy were administered to 27.7% of CKD patients, while no AKI patients received these treatments and instead were on oral iron supplementation.

The approval of recombinant human erythropoietin (rHuEPO, also known as epoetin) in 1989 marked a significant advancement in treating anemia in CKD patients. Before its introduction, dialysis patients typically had hemoglobin levels averaging 7–8 g/dl, but now, on average, those levels have risen to 11–12 g/dl [39]. This observation suggests that patients with CKD often present late in the course of their illness, exhibiting severe uremic symptoms, poor blood pressure control, and moderate to severe anemia. These factors can have a major impact on survival. Hyperkalemia was observed in 53.8% of patients with AKI and 59.6% of those with CKD. In a notable observational study by Kovesdy et al. (2007), it was found that even after adjusting for potential confounding factors, hyperkalemia was linked to increased all-cause and cardiovascular mortality among patients undergoing maintenance HD [40].

A total of 29 patients [42.6% (95% CI: 31.4–54.5%)] in our study cohort died, with mortality rates of 47.6% (95% CI: 27.7–68.6%) in patients with AKI and 40.4% (95% CI: 27.3–54.7%) in those with CKD. Although the AKI group showed a slightly higher mortality rate, the overlapping confidence intervals suggest that this difference may not be statistically significant. Nevertheless, these mortality rates underscore the critical risks faced by patients with both AKI and CKD undergoing dialysis. Our findings align with existing literature, which generally indicates a high mortality risk for AKI patients, especially within the initial months of dialysis initiation. For instance, a study using the US Renal Data System found that kidney failure due to AKI was associated with an increased mortality risk within the first six months following dialysis initiation [41]. A large recent cohort study also reported a 23% mortality rate in AKI-related cases [42]. The notably overall high mortality rate observed in our setting may reflect unique regional challenges, including frequent service interruptions, insufficient technical support for dialysis equipment, shortages of essential supplies, and patient drop-out due to unaffordable treatment costs. Additionally, high rates of vascular access infections and limited access to necessary adjunctive treatments such as iron and erythropoietin further compound these risks. Addressing these barriers is essential to improving patient outcomes and reducing mortality in both AKI and CKD patients in similar low-resource settings.

The Kaplan-Meier survival analysis for CKD patients revealed a median survival time of 43 months (95% CI: 21.243–64.757). At 6 months, the survival rate was 100%; however, this decreased to 65.4% by 12 months, and by 60 months, only 32.7% of CKD patients remained alive. These findings are consistent with other studies that have reported significant declines in survival rates among CKD patients over time. For instance, a study conducted in Ethiopia found a mean survival time of 46.2 months for hemodialysis patients, with survival probabilities of 91% at one year and 65% at five years, indicating similar trends in mortality as observed in our cohort [7]. Additionally, research has shown that patients with advanced CKD often experience rapid declines in health status and increased mortality due to complications such as cardiovascular disease and infections, which are prevalent in this population [43, 44]. The marked decrease in survival after the first year in our study may reflect these underlying health challenges and the need for comprehensive management strategies to improve outcomes for CKD patients on dialysis [45].

Strength and limitation

The strengths of this study include detailed data collected over seven years, providing valuable insights into patient trends and outcomes in the HD unit at JMC. By analyzing socio-demographic, clinical, and biochemical characteristics of CKD and AKI patients, the study highlights specific needs and challenges within the HD unit. These findings emphasize the need for improved HD resources and management strategies and offer directions to address and overcome poor prognosis in HD patients.

However, the study also has limitations. The single-center design restricts the generalizability of the findings to other settings. The retrospective nature of the study introduces potential biases due to reliance on historical data. Additionally, the small sample size may impact statistical power and generalizability, while excluding patients with incomplete data could lead to skewed results, affecting the overall understanding of patient outcomes in the HD unit. This study primarily reviews HD-related outcomes and acknowledges that AKI and CKD have differing prognostic factors, which limits the ability to analyze long-term CKD-specific complications, such as cardiovascular outcomes and catheter infections, in the current dataset.

Conclusion

This seven-year review of HD patients at JMC highlights the significant burden of CKD and AKI among patients undergoing hemodialysis, with notable differences in clinical presentations and outcomes. CKD patients, primarily male and younger, commonly experienced symptoms such as nausea, vomiting, proteinuria, and elevated blood pressure, while AKI patients presented with oliguria and hematuria. Hypertensive nephropathy was identified as the most common cause of CKD among the studied population, while acute glomerulonephritis was the predominant cause observed in AKI cases. Both groups largely required emergency vascular access, though AKI patients faced a higher mortality compared to those with CKD. Despite CKD patients having a long median survival time, their survival dropped significantly

within the first year. These findings emphasize the need for early intervention, improved access to medications such as erythropoietin, and addressing resource limitations to enhance treatment outcomes for both CKD and AKI patients.

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Author contributions
Conceptualization: STT, MBW; Writing – original draft: STT, EGA; Statistical analysis: STT, EGA; Data curation: STT, MDM; Supervision: MBW; Writing – review & editing: STT, EGA, MDM, MBW; Validation: STT, EGA, MDM, MBW. All authors agreed to bear responsibility for all parts of the research work and approved the final version of the manuscript.

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Data availability
All relevant data are within the manuscript.

Declarations

Ethics approval and consent to participate
Ethical clearance was obtained from the Ethical Review Board of Jimma University Institute of Health, with letter number JUIH/IRB/037/24. The confidentiality of the patients was maintained throughout the study period, and only the principal investigator, supervisor, and data collectors had access to the patients' information. All information obtained from the patient data was kept confidential and was used for research purposes only.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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