



Etiological Patterns of End-Stage Chronic Kidney Disease among Haemodialysis Patients in Southwestern Nigeria: A Multicenter Retrospective Study

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Abstract

Background: Chronic kidney disease (CKD) is a progressive condition characterised by irreversible deterioration of renal function and represents a major global public health concern. In sub-Saharan Africa, late presentation and limited access to preventive care contribute significantly to the burden of end-stage kidney disease (ESKD). This study provides a descriptive profile of the etiological patterns and sociodemographic characteristics of patients newly initiated on haemodialysis in Southwestern Nigeria. To describe the etiological distribution and sociodemographic characteristics of CKD among patients receiving haemodialysis in selected tertiary health institutions in Southwestern Nigeria. **Materials and Methods:** A multicenter retrospective descriptive study was conducted using secondary data extracted from haemodialysis registers of seven tertiary hospitals across Southwestern Nigeria between September 2017 and August 2022. All newly initiated adult haemodialysis patients with complete records were included (n = 1,250). Data were analysed using descriptive statistics and presented as frequencies, percentages, means, and standard deviations. **Results:** A total of 1,250 patients were analysed. The mean age was 48.57 ± 16.62 years, with the highest proportion occurring among individuals aged 41–60 years (41.4%). Males accounted for 70% of cases (male-to-female ratio 2.3:1). Hypertension was the leading etiological factor (50.2%), followed by glomerulonephritis (22.2%) and diabetes mellitus (17.1%). Obstructive uropathy accounted for 4.6% of cases, while combined hypertension and diabetes contributed 2.1%. Hypertension remained the predominant cause throughout the study period, with a gradual increase in diabetes-related CKD observed in later years. **Conclusion:** CKD requiring haemodialysis in Southwestern Nigeria predominantly affects middle-aged adults and is largely driven by hypertension, with an emerging contribution from diabetes mellitus. Strengthening early detection and effective management of hypertension and diabetes at the primary healthcare level is essential to reduce progression to end-stage kidney disease in the region.

Keywords: Chronic kidney disease, haemodialysis, hypertension, diabetes mellitus, Nigeria, multicenter study

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Introduction

Chronic kidney disease (CKD) is a progressively degenerative condition characterised by the gradual deterioration of renal function, representing a significant and pressing global health issue. CKD affects about 10% of the general population worldwide (Grant *et al*, 2023). Due in part to the rise in risk factors, such as obesity and diabetes mellitus, the number of patients affected by CKD has also been increasing, affecting an estimated 843.6 million individuals worldwide in 2017. Although mortality has declined in patients with end-stage kidney disease (ESKD), the Global Burden of Disease (GBD) studies have shown that CKD has emerged as a leading cause of worldwide mortality (Mallamaci *et al*, 2024). Almost innumerable determinants contribute to the development and progression of chronic kidney disease, including age, hypertension, genetic factors, diabetes, obesity, proteinuria, dyslipidemia, and environmental factors such as dietary salt intake. It is of paramount importance to point out that CKD is the fastest-growing chronic disease and is one of the most important causes of mortality. In fact, in the early nineties of the past century, CKD was the 36th cause of death among chronic diseases, and after 20 years, it is in 19th place in this macabre ranking, and forecasts for the coming decades are even worse. Indeed, the progression of CKD involves several interconnected mechanisms (Kovesdy 2022).

CKD poses a substantial burden on individuals, healthcare systems, and societies. CKD is associated with increased morbidity and mortality and often leads to costly renal replacement therapies such as dialysis and transplantation. Understanding the risk factors for CKD is crucial for developing effective prevention and management strategies. Globally, CKD is a significant public health concern, with an estimated 10-13% of the adult population affected. The prevalence varies across regions and populations, with

disparities linked to socioeconomic factors, healthcare access, and genetic predispositions. The major risk factors for CKD worldwide include:

Diabetes Mellitus, Hypertension, Glomerulonephritis, Age, Obesity, Family History, Traditional Medicine and environmental exposures, amongst many others. (Natan *et al*, 2024)

Methods and Materials

Study Design: This study employed a multicenter retrospective cross-sectional design using secondary data extracted from haemodialysis unit registers across selected tertiary health institutions in Southwestern Nigeria. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational research.

Study Setting: The study was conducted in seven tertiary health institutions across the six states that constitute Southwestern Nigeria (Ogun, Oyo, Osun, Ondo, and Ekiti States). The participating centres included:

1. Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Osun State
2. University of Osun Teaching Hospital (UTH), Osogbo, Osun State
3. Ladoke Akintola University Teaching Hospital (LAUTECH), Ogbomoso, Oyo State
4. Federal Teaching Hospital, Ido-Ekiti, Ekiti State
5. Federal Medical Centre (FMC), Abeokuta, Ogun State

1. Federal Medical Centre (FMC), Owo, Ondo State

These institutions are major referral centres providing nephrology services, including maintenance haemodialysis.

Healthcare financing in these facilities is predominantly out-of-pocket.

Study Population

The study population comprised all newly registered adult patients diagnosed with chronic kidney disease (CKD) and initiated on haemodialysis in the participating centres between September 2017 and August 2022.

Inclusion and Exclusion Criteria

Participants eligible for inclusion in this study were adult patients aged 18 years and above who had a documented diagnosis of chronic kidney disease (CKD) made by a consultant nephrologist, with an estimated glomerular filtration rate (eGFR) of less than 60 mL/min/1.73m² persisting for at least three months. In addition, eligible participants were those who were newly initiated on haemodialysis within the study period (September 2017 to August 2022) and whose medical records were complete and usable for analysis. Patients were excluded if they had a diagnosis of acute kidney injury (AKI), were younger than 18 years, or had incomplete or missing essential data in the haemodialysis register.

Sample Size and Sampling Technique

A census sampling technique was adopted. All eligible new haemodialysis patients meeting the inclusion criteria during the five-year study period were included. A total of 1,250 complete and usable patient records were analysed.

Data Source and Data Collection Procedure

Data were extracted from the haemodialysis unit “first-time dialysis” registers and nephrology records of the participating centres. These registers document demographic characteristics, primary etiological diagnosis of CKD,

and clinical information at initiation of dialysis. A structured data extraction form was developed to ensure uniformity across centres. Data were cross-checked for completeness and consistency prior to entry.

Data Analysis

Data were entered, cleaned, and analysed using the Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics were used to summarise the data. Continuous variables were presented as means and standard deviations, while categorical variables were summarised using frequencies and percentages. The distribution of CKD etiological factors was described overall and across the study period (2017–2022). Data were presented using tables and charts. Only complete-case records (n = 1,250) were included in the final analysis.

Results

Sociodemographic Characteristics of Participants

A total of 1,250 newly initiated haemodialysis patients were included in the study. The mean age of the participants was 48.57 ± 16.62 years, with an age range of 7 to 91 years. The most affected age group was 41–60 years (41.4%), followed by 20–40 years (30.6%), while patients aged below 20 years constituted 3.4% of the study population. Male patients accounted for 70% (n = 875) of cases, while females represented 30% (n = 375), resulting in a male-to-female ratio of approximately 2.3:1. Regarding occupation, traders constituted the largest proportion of participants (23.5%), followed by individuals categorized as “others” (23.5%), civil servants (14.2%), retirees (12.2%), artisans (10.6%), farmers (8.9%), and students (7.0%). The majority of participants were married (87.0%), while 12.2% were single. Widowed and divorced individuals accounted for less than 1% each (See Table 1).

Table 1: Sociodemographic Characteristics of Participants Living with CKD in Southwestern Nigeria

Variables	Categories	Frequency (n=1250)	Percent (%)
Age (in years)	<20	43	3.4
	20-40	383	30.6
	41-60	518	41.4
	61-80	280	22.4
	>80	26	2.1
	Range	7 to 91	
	Mean±SD	48.57±16.62	
Gender	Female	375	30.0
	Male	875	70.0
Occupation	Civil servants	178	14.2
	Farming	111	8.9
	Artisan	133	10.6
	Trading	294	23.5
	Retiree	152	12.2
	Students	88	7.0
	Others	294	23.5
Marital Status	Single	152	12.2
	Married	1087	87.0
	Widowed	1	0.1
	Divorced	10	0.8
Total		1,250	100.0

Distribution of CKD Cases by State

CKD cases were reported across all participating tertiary institutions in Southwestern Nigeria. The highest proportion of cases was recorded in Osun State (OAUTHC and UTH), accounting for 419 patients (33.5%). This was followed by Ogun State (FMC-Abeokuta) with 288 cases

(23.0%), Oyo State (LAUTECH) with 249 cases (19.9%), and Ondo State (FMC-Owo) with 192 cases (15.4%). Ekiti State (FTH-Ido) recorded the lowest number of cases, contributing 102 patients (8.2%) to the total study population (See Figure 1).

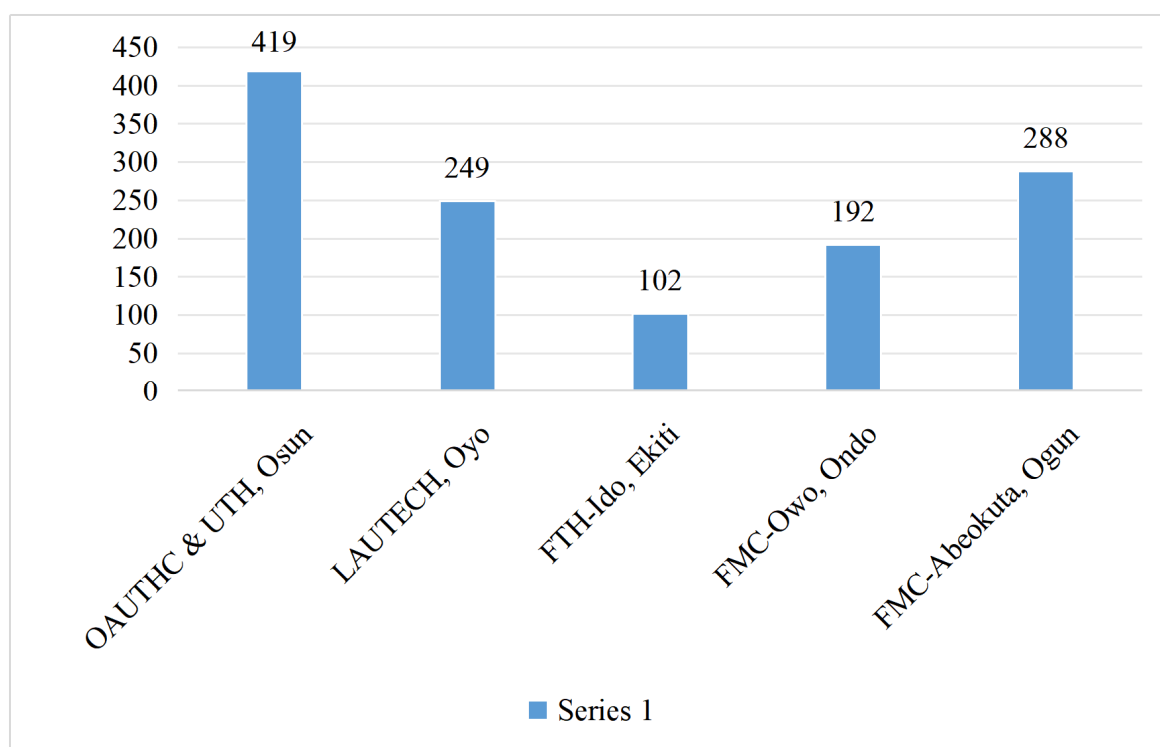


Figure 1: Multicentre Distribution of CKD by Case

Yearly Trend of CKD Etiologies (2017–2022)

Analysis of the yearly trend demonstrated that hypertension consistently remained the leading cause of CKD throughout the study period. Glomerulonephritis and diabetes mellitus alternated as the second most

common etiological factors across different years. A gradual increase in diabetes-related CKD was observed toward the latter part of the study period (See Figure 2).

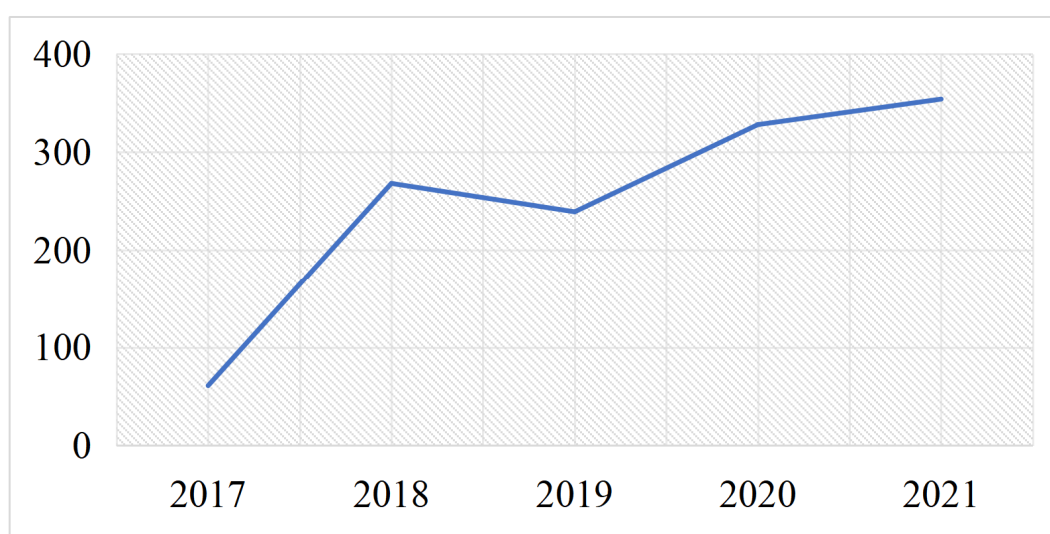


Figure 2: Trend of CKD cases in South-western Nigeria per Year

Overall Etiological Distribution of CKD

Hypertension was identified as the leading etiological factor, accounting for 50.2% (n = 628) of CKD cases. Glomerulonephritis was the second most common cause (22.2%, n =

278), followed by diabetes mellitus (17.1%, n = 214). Obstructive uropathy accounted for 4.6% (n = 58) of cases, while combined hypertension and diabetes mellitus contributed 2.1% (n = 26) (See Figure 3).

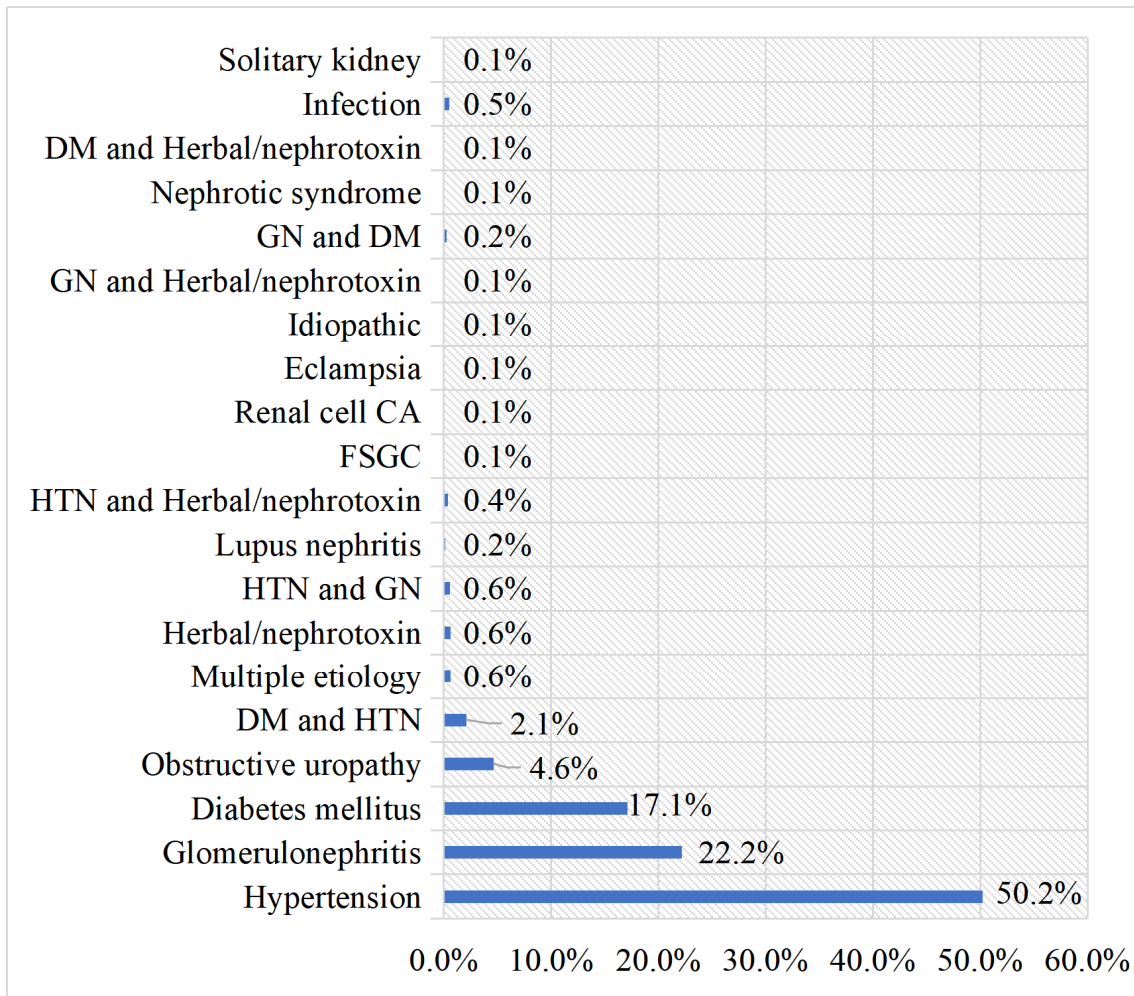


Figure 3: Overall Prevalent Risk Factors of CKD in Southwestern Nigeria (A graph)

Discussion

This multicenter retrospective study provides a descriptive overview of incident haemodialysis patients in Southwestern Nigeria between 2017 and 2022. The findings demonstrate that CKD requiring dialysis predominantly affects middle-aged adults, shows marked male predominance, and is primarily driven by hypertension, with

diabetes mellitus emerging as an increasing contributor.

The mean age of 48.57 ± 16.62 years observed in this study indicates that CKD requiring dialysis disproportionately affects individuals in their economically productive years. The highest burden was recorded among patients aged 41–60 years (41.4%). This pattern aligns with recent global analyses

demonstrating that in sub-Saharan Africa, CKD and end-stage kidney disease (ESKD) occur at younger ages compared to high-income regions (GBD Chronic Kidney Disease Collaboration, 2020; Kovesdy, 2022).

In contrast, registry data from high-income countries show a substantially higher mean age at dialysis initiation, often exceeding 60 years (United States Renal Data System [USRDS], 2023; ERA Registry, 2022). The younger age profile observed in this study reflects delayed detection of hypertension and diabetes, limited access to early nephrology care, and late presentation—patterns consistently described across low- and middle-income countries (Luyckx *et al.*, 2021; Stanifer *et al.*, 2022). This early onset of dialysis-dependent CKD represents a significant socioeconomic burden due to loss of productivity during peak working years.

The marked male predominance (70%) observed in this study is consistent with contemporary epidemiological data showing that although CKD prevalence may be slightly higher in women globally, men are more likely to progress to kidney failure requiring dialysis (GBD Chronic Kidney Disease Collaboration, 2020; Kovesdy, 2022).

Recent analyses suggest biological differences in renal disease progression, hormonal influences, and risk exposure patterns may partly explain this disparity (Carrero *et al.*, 2021). In addition, in resource-constrained settings, gender-based differences in health-seeking behaviour and financial prioritisation for dialysis therapy may influence treatment uptake (Luyckx *et al.*, 2021). The findings from this study, therefore, align with broader global patterns of male predominance among ESKD patients on renal replacement therapy.

Osun State accounted for the largest proportion of dialysis initiations (33.5%), followed by Ogun and Oyo States. As this was a hospital-based study, the distribution

likely reflects referral patterns, service availability, and dialysis capacity rather than true population-level CKD prevalence. Recent global nephrology reports emphasise that treated ESKD rates in low-resource settings are strongly influenced by dialysis infrastructure and financial accessibility (Kovesdy, 2022; Stanifer *et al.*, 2022). Therefore, variations observed across participating centres should be interpreted within the context of healthcare access rather than epidemiologic risk alone.

Hypertension was identified as the leading etiological factor, accounting for 50.2% of CKD cases. This finding is consistent with contemporary global burden analyses demonstrating that hypertension remains a major contributor to CKD progression, particularly in sub-Saharan Africa (GBD Chronic Kidney Disease Collaboration, 2020; Kovesdy, 2022). Poor awareness, inadequate blood pressure control, and limited continuity of care in primary health systems continue to drive hypertensive kidney disease in low- and middle-income countries (Luyckx *et al.*, 2021).

Glomerulonephritis accounted for 22.2% of cases. While the relative contribution of glomerular diseases has declined in many high-income settings due to improved infection control and early treatment, they remain significant in parts of Africa where infectious triggers and delayed diagnosis persist (Stanifer *et al.*, 2022).

Diabetes mellitus accounted for 17.1% of CKD cases in this study, and an upward trend was observed in later years. Globally, diabetes is now the leading cause of ESKD, particularly in high-income countries, where it accounts for approximately 40–45% of new dialysis cases (USRDS, 2023). The comparatively lower proportion in this study may reflect underdiagnosis, competing hypertensive etiologies, or earlier mortality before dialysis initiation. However, the

observed increase over time is consistent with epidemiological transition patterns across sub-Saharan Africa, where rising urbanisation, sedentary lifestyles, and metabolic risk factors are driving growth in diabetes-related kidney disease (GBD Chronic Kidney Disease Collaboration, 2020; Luyckx *et al.*, 2021).

Obstructive uropathy accounted for 4.6% of cases, representing a smaller but clinically important proportion. Similar proportions have been reported in contemporary African nephrology reviews, where structural and urological causes contribute modestly to dialysis initiation rates compared to hypertensive and metabolic causes (Stanifer *et al.*, 2022).

The persistence of hypertension as the leading cause throughout the study period underscores its entrenched role in CKD progression within the region. The gradual increase in diabetes-related CKD observed toward the latter years mirrors global data indicating a steady rise in diabetes-attributable kidney disease over the

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the retrospective design relied on secondary data extracted from haemodialysis registers, which limited the availability of detailed clinical and laboratory parameters and restricted analysis to documented variables. As with most record-based studies, the accuracy of findings depends on the completeness and quality of documentation. Second, the study was hospital-based and included only patients who had progressed to end-stage kidney disease (ESKD) and were initiated on haemodialysis. Consequently, the findings reflect patterns among treated advanced CKD cases and may not represent the true prevalence or etiological distribution of earlier-stage CKD in the general population. Third, variations in case distribution across participating centres may have been

past decade (GBD Chronic Kidney Disease Collaboration, 2020; USRDS, 2023). This trend suggests a shift toward metabolic risk factors alongside longstanding hypertensive pathology.

Recommendations for Further Research

Further research should explore health system factors influencing late presentation for dialysis, including financial barriers, referral pathways, and access to nephrology services. Qualitative studies examining health-seeking behaviour and gender disparities in dialysis initiation may also provide valuable insights.

Given the observed rise in diabetes-related CKD, future research should assess the impact of metabolic risk factors, lifestyle patterns, and urbanisation on kidney disease trends. Additionally, the establishment of a regional or national CKD registry would enhance surveillance, facilitate multicenter collaboration, and improve planning of preventive and therapeutic interventions.

influenced by referral patterns, dialysis capacity, and financial accessibility rather than actual state-level disease burden. Therefore, the observed geographic distribution should be interpreted cautiously. Additionally, the classification of primary etiological factors was based on the documented clinical diagnosis by managing nephrologists, and misclassification cannot be entirely excluded, particularly in settings where renal biopsy and advanced diagnostic investigations are not routinely available. Finally, the descriptive nature of the study precludes causal inference, and associations between sociodemographic characteristics and CKD etiologies could not be formally examined. Despite these limitations, the multicenter design and relatively large sample size provide valuable insight into the profile of dialysis-dependent CKD in Southwestern Nigeria.

Conclusion

This multicenter retrospective study provides a descriptive profile of patients newly initiated on haemodialysis in Southwestern Nigeria over five years. The findings indicate that chronic kidney disease (CKD) requiring dialysis predominantly affects individuals in their economically productive years, with a marked male predominance. Hypertension emerged as the leading etiological factor, accounting for approximately half of all cases, while glomerulonephritis and diabetes mellitus were also significant contributors. Notably, a gradual increase in diabetes-related CKD was observed over the study period. These findings underscore the substantial burden of advanced CKD in the region and highlight the continued dominance of hypertension as a major driver of kidney failure. The emerging contribution of diabetes mellitus suggests an ongoing epidemiological transition toward metabolic risk factors. Strengthening early detection of hypertension and diabetes, improving primary healthcare management, and enhancing access to preventive nephrology services are critical to reducing progression to end-stage kidney disease. Overall, this study contributes important multicenter data that may inform regional planning, resource allocation, and preventive strategies aimed at mitigating the growing burden of CKD in Southwestern Nigeria.

Conflicts of interest

The authors declare no conflicts of interest.

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All respondents are acknowledged

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