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RESEARCH

Economic cost of end–stage renal disease in Africa: a systematic review

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Abstract

Background Chronic kidney disease (CKD) is a progressive and irreversible condition that contributes substantially to global morbidity and mortality. In Africa, the burden of CKD is compounded by limited healthcare resources, poverty, and the dual challenge of communicable and non-communicable diseases. The economic impact of end-stage renal disease (ESRD) is considerable, yet evidence from the region remains scarce.

Methods This systematic review, conducted in accordance with PRISMA 2020 guidelines, examined the economic burden of ESRD in Africa. Data were extracted on study characteristics, patient populations, cost components, and financing mechanisms. All reported costs were standardized to 2025 USD.

Results Eighteen studies, involving 2,634 patients, were included. The majority received haemodialysis (HD) (95.9%), with limited data on peritoneal dialysis (PD) (2.7%) and kidney transplantation (1.4%). Annual HD costs varied widely, from $2,003.48 in Burkina Faso to $41,957.69 in South Africa, with a pooled median of $18,741.00. PD costs, reported in three studies, ranged from $11,161.98 in Egypt to $47,837.05 in South Africa. First-year transplantation costs plus follow-up varied between $33,120.18 in Cameroon and $46,293.59 in Nigeria. Direct medical costs dominated expenditures, with drugs and laboratory investigations representing major cost drivers.

Conclusion Renal replacement therapy in Africa is costly, heterogeneous, and predominantly financed out-of-pocket. These findings highlight profound affordability challenges and underscore the urgent need for financial protection strategies, expanded insurance coverage, and sustainable models of kidney care.

Keywords Chronic kidney disease, Renal replacement therapy, Dialysis, Economic burden, Healthcare costs, Africa, Sub-Saharan Africa, End-stage renal disease

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Introduction

Chronic kidney disease (CKD) is a progressive and irreversible condition characterized by a sustained decline in kidney function, defined as a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m² for more than three months. The Kidney Disease: Improving Global Outcomes (KDIGO) guidelines classify CKD into five stages based on estimated GFR, with stage 5 representing kidney failure [1, 2].

Globally, CKD is a major cause of morbidity and mortality, affecting more than 800 million individuals, or over 10% of the world's population [3]. The burden is disproportionately high in low- and middle-income countries (LMICs), where access to timely diagnosis, preventive care, and treatment remains inadequate [4]. In Africa, CKD represents an escalating public health challenge, exacerbated by the continent's dual burden of communicable and non-communicable diseases. The prevalence of CKD in Africa is estimated at 15.8% for stages 1–5 and 4.6% for stages 3–5 [5]. Projections suggest that by 2030, more than 70% of individuals with end-stage kidney disease will reside in Africa [6]. Contributing factors include limited healthcare infrastructure, poverty, high exposure to infections, and genetic predisposition to renal disease [7].

Africa, the world's second-largest continent, is home to more than 1.5 billion people across 57 countries [8]. Despite vast natural resources, widespread poverty restricts access to essential healthcare, including renal replacement therapies for end-stage renal disease (ESRD) management [7]. The financial burden of ERSD in Africa is substantial, encompassing direct medical costs such as dialysis, transplantation, medications, and hospitalizations, as well as indirect costs including lost productivity and premature mortality. Dialysis, in particular, is prohibitively expensive, with annual costs far exceeding the per capita gross domestic product (GDP) of most African nations [9]. According to the International Labour Organization, the median minimum monthly wage across African countries in 2023 was approximately $96, with more than half of nations setting wages below $100 [10]. Only a few countries, including Seychelles ($492), Morocco ($315), and South Africa ($239), reported wages above $200. Given that dialysis costs several thousand dollars annually, this disparity highlights its extreme unaffordability for the vast majority of patients.

Health insurance coverage across sub-Saharan Africa is critically low, leaving most patients to self-fund their care. In a review of 36 countries, only 7.9% of the population had any form of health insurance, with just four countries reporting coverage rates above 20%: Rwanda (78.7%), Ghana (58.2%), Gabon (40.8%), and Burundi (22.0%) [11]. Consequently, the financial burden of CKD is borne primarily by households, often resulting in catastrophic health expenditures.

Despite the growing recognition of ERSD as a pressing health and economic concern, comprehensive data on its financial impact in Africa remain limited. This study seeks to synthesize available evidence to assess the economic burden of ERSD across the continent, with the aim of informing policy and highlighting the urgent need for improved prevention, early detection, and cost-effective management strategies.

Method and material

This systematic review was conducted per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [12]. The protocol was registered in the PROSPERO database (CRD420250656310).

Eligibility criteria

Eligible studies included observational designs such as cross-sectional, cohort, and cost-analysis studies published in English. All studies focused on patients with ESRD, classified according to the KDIGO criteria [2], who were receiving renal replacement therapy (RRT), including haemodialysis, peritoneal dialysis, or kidney transplantation. The primary outcome was the direct medical cost of RRT. This included expenditures related to dialysis (equipment, consumables, staff wages, and utilities), laboratory, imaging services, and medications. The latter covered erythropoiesis-stimulating agents, antihypertensives, diuretics, phosphate binders, vitamin D analogues, intravenous iron, and immunosuppressants for transplant patients, along with other supportive drugs. Editorials, literature reviews, opinion pieces, and studies involving non-dialysis patients were excluded from the review.

Search strategy

A comprehensive search strategy was conducted across several databases, including PubMed, Scopus, Embase, Google Scholar, and African Journals Online (AJOL), from the 1st -the 15th of December 15, 2024. Search terms included relevant keywords associated with Chronic Kidney Disease (CKD) and its economic burden, such as "Chronic Kidney Disease," "CKD," "End-Stage Renal Disease" OR "ESRD," AND "Economic burden" OR "Cost" OR "Healthcare expenditure," AND "Dialysis" OR "Kidney transplantation," AND "Africa" OR "Sub-Saharan Africa." The full search strategy is available in the supplementary file.

Study selection

Two independent reviewers used Rayyan (a web-based review tool) to screen titles and abstracts against the eligibility criteria. Full-text articles of all potentially relevant studies were then assessed to confirm inclusion. Discrepancies were resolved through discussion or by consulting a third reviewer. Additionally, we screened references and citations of included articles.

Data extraction
Data extraction was performed using a standardized form. Two independent reviewers collected study characteristics, including year of data collection, sample size, and population type (adult or paediatric). Cost data were categorized by modality (haemodialysis, peritoneal dialysis, or kidney transplantation) and included dialysis frequency, source of cost data, and funding origin. In addition, we extracted the cost components included in each study's dialysis cost (e.g., consumables, staff, laboratory, and medications). For studies that reported costs on a per-session, weekly, monthly, or quarterly basis, values were annualized to ensure uniformity in reporting. A third reviewer validated the extracted data, and any discrepancies were resolved through discussion. To enable comparison across studies carried out at different periods, all estimated costs were converted to adjusted 2025-dollar rates using the consumer price index [13]. For studies spanning multiple years of data collection, the final year of data collection was used as the reference point for adjustment.

Data synthesis
Data was synthesized using a structured narrative approach. Cost outcomes were grouped into key categories: haemodialysis, peritoneal dialysis, kidney transplantation, medications, and laboratory services. Given the heterogeneity in study designs, costing methods, and components included, findings were summarized using descriptive statistics, including ranges, medians, and interquartile ranges (IQRs).

Risk of bias assessment
The risk of bias in included studies was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Economic Evaluations [14]. Two independent reviewers conducted the assessments, with disagreements resolved by consensus.

Results
Overview
The initial search identified 1,827 citations. After removal of duplicates and screening against eligibility criteria, 56 full-text articles were assessed, of which 18 met inclusion criteria [15–32] (Fig. 1). These studies included 2,634 patients: 2,527 (95.9%) receiving HD, 70 (2.7%) on peritoneal dialysis (PD), and 37 (1.4%) transplant recipients. Paediatric patients accounted for 0.7% (n = 19), with most studies focusing on adults. Sixteen studies reported dialysis costs (predominantly HD), three reported on PD [15, 17, 30], and four on transplantation [16, 23, 30, 32]. Two additional studies provided costs limited to transport and erythropoietin therapy [26, 29]. Data sources were primarily provider-based (n = 9), with fewer patient-reported (n = 3) or mixed (n = 5). Summaries are presented in Table 1, with detailed cost components in the Supplementary File.

Methodological quality
Overall study quality ranged from moderate to high, with six rated high and twelve moderate. Most provided adequate methodological detail, including research questions, alternatives, and measures of effectiveness. However, gaps in sensitivity analyses, incremental cost evaluation, and generalizability limited the comprehensiveness of the economic assessments (Supplementary File).

Financing of ESRD care
ESRD care was largely financed out-of-pocket, with limited government or insurance support. In Cameroon, annual HD costs were $19,421.53, with patients contributing $5,078.11 and government subsidies covering $14,343.42 [16]. Transplant surgery costs ($12,172.92) were fully subsidized. In a Nigerian study, the National Health Insurance Authority covered only 50% of the first six HD sessions, after which patients bore the entire cost [19].

Haemodialysis costs
Dialysis frequency (one to three sessions per week) and per-session charges contributed to wide variation in annual costs. Per-session costs ranged from $52.46–$127.96 in Nigeria [24] to $223.24 in South Africa [30]. Annual HD costs across 16 studies varied from $2,003.48 in Burkina Faso to $41,957.69 in South Africa. The pooled median annual cost was $18,741.00 (IQR $9,642.44–$33,313.83). South Africa reported the highest median of $39,102.35 (IQR $37,674.67–$40,530.02), followed by the Democratic Republic of the Congo ($39,025.00) and Tanzania ($37,261.00). In Nigeria, the median was $21,052.03 (IQR $14,477.51–$27,221.58), while Cameroon reported $19,081.27. Lower estimates were observed in Ethiopia ($7,519.55) and Sudan ($7,660.34). Patient-reported studies, such as those from Burkina Faso and Sudan, yielded markedly lower costs, largely because staff wages and facility services were excluded. Only three studies explicitly separated direct and indirect costs, showing that direct medical costs dominated (77–93%) [22, 28, 31]. A summary table contextualizing costs relative to GDP, CKD prevalence, and health expenditures is provided (Table 2).

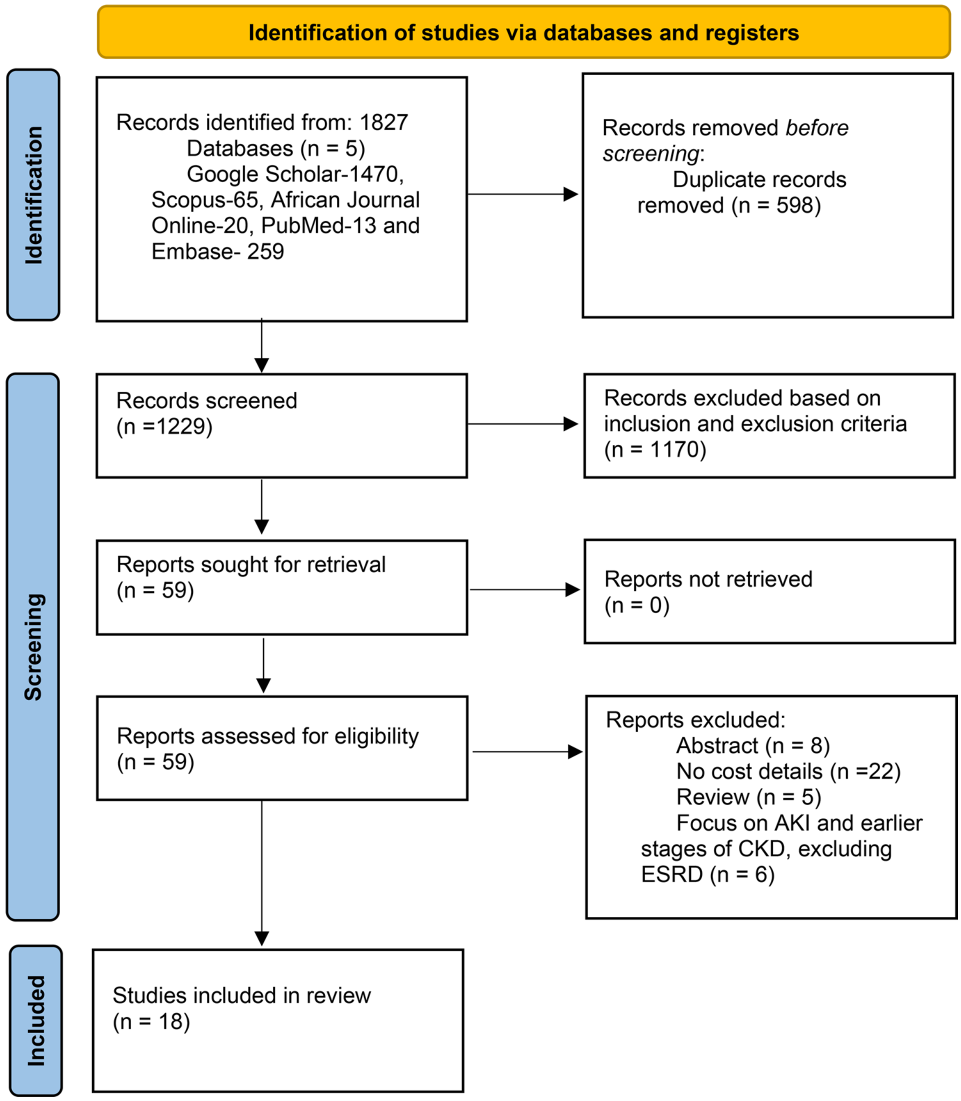

Fig. 1 PRISMA flow diagram of the study selection process

Peritoneal dialysis costs

Three studies reported PD costs. South Africa reported the highest median at $43,553.00 (IQR $33,156.32–$47,837.05) [15, 17]. El Matri et al. documented lower costs in Egypt ($11,161.98) and higher costs in the Democratic Republic of the Congo ($38,269.64), reflecting significant regional variation [30].

Transplantation costs

Four studies reported transplantation costs, with wide variation depending on the inclusion of surgery, medications, and follow-up. In Cameroon, initial transplant costs ($12,172.92) were fully subsidized [16]. First-year follow-up costs were estimated at $20,947.26 with branded medications (96% drug-related) versus $2,375.93 with generics. In Sudan, first-year costs reached $22,214.03, with $15,960.70 in subsequent years [23]. El Matri et al. estimated $19,134.82 in Sudan, $23,918.53 in Tunisia, and $31,891.37 in South Africa [30]. In Nigeria, Lang et al. reported total first-year transplant costs of $46,293.59, including surgery, medications, and follow-up, with recurring annual costs of $8,333.49 [32].

Medication and laboratory costs

Twelve studies reported medication costs. In Nigeria, annual expenditures included epoetin ($4,477.21), intravenous iron ($895.44), vitamin D ($137.76), phosphate binders ($229.60), and B-complex/folic acid ($29.85) [32]. Additional therapies for transplant rejection included anti-thymocyte globulin ($717.50) and intravenous immunoglobulin ($717.50). In Morocco, annual costs were $4,078.36 for CERA, $4,426.29 for EpoB, and $219.40 for iron. In Cameroon, medications represented 43.2% of transplant costs [26].

Table 1 Characteristics of included studies

Citation	Data year	Sample Size	Age category	Cost Frequency	Hemodialysis	Cost	Dialysis Frequency	Peritoneal	Transplant	Data source	Who Pays
Makhele et al., 2019 (South Africa) [15]	2017	46 (32-HD, 14-PD)	Adults	Annual	41,957.69	DC	3	33,156.32	-	Provider	-
Njamnshi et al., 2023 (Cameroon) [16]	2022	228 (4 transplants)	Adults/pediatrics	Annual	19421.53	DC	2	-	12172.929 (transplant); 20947.26 (brand drug 1st year); 2375.93 (Generics drug 1st year)	Provider	Government (73.5%), Patients (26.5%)
Malatji et al. (2019) (South Africa) [17]	2007–2012	182 (126-HD, 56-PD)	Adults	Annual	36,247	DC	3	43,553	-	Provider	Government
Amira et al., 2017(Nigeria) [18]	2012–2014	57	Adults	Weekly	15935.50 ± 6506.1	DC	1–3	NS	-	Patient	Out-of-pocket by patients or family
Agada-Amade et al., 2023 (Nigeria) [19]	2018	230	Adults	Annual	30,380.65	DC	3	-	-	Provider and patient	Insurance andppatients
Izeidi et al., 2019 (Democratic Republic of the Congo) [20]	2013	92	Adults	Quarterly	39,025	DC	2–3	-	-	Provider and patient	Family members (45.7%) and employers (40.2%)
Mushi et al., 2015 (Tanzania) [21]	2014	34	Adults	Annual	37,261	DC	3	-	-	Provider	Minority covered by insurance but majorly out of pocket
Kassa et al., 2020 (Ethiopia) [22]	2017	172	Adults	Annual	5857.75 ± 1608.23 (total); 4504.88 (direct); 1350.87 (indirect)	DC + IC	3	-	-	Provider	Patient and relative
Elsharif et al., 2010 (Sudan) [23]	2009	111 (78 dialysis, 33 transplant)	Adults	Annual	10,259.63	DC	2	-	11726.71 (transplant); 22214.03 (total cost, 1st year); 15960.7 (total, subsequent years)	Provider	-
Akpan et al., 2020 (Nigeria) [24]	2014–2018	613	Adults	Per session	10,103.52 ± 5,051.76	DC	1–3	-	-	Provider	Patients
Yousif et al., 2020 (Sudan) [25]	2016–2017	130	Adults	Annual	5,061.05	DC	2	-	-	Patient	Patients and insurance
Maoujoud et al., 2016 (Morocco) [26]	NS	75	Adults	Annual	CERA: 4078.36, EpoB: 4426.29	DC	-	-	-	Provider	-

Table 1 (continued)

Citation	Data year	Sample Size	Age category	Cost Frequency	Hemodialysis	Cost	Dialysis Frequency	Peritoneal	Transplant	Data source	Who Pays
Toure et al., 2022 (Burkina Faso) [27]	2020	290	Adult/peadiatrics	Monthly	2003.48	DC	2	-	-	Patient	Out-of-pocket by patients (45.5%) and family
Baye et al., 2024 (Ethiopia) [28]	2021	128	Adult	Annual	9181.35 ± 3361.53; 7630.29 (direct); 1551.06 (indirect)	DC + IC	3	-	-	Provider and patient	Patients and insurance
Bello et al., 2018 (South Africa) [29]	2015	19	Paediatrics	Monthly	Transport – 1162.25	DC	3	PD transport cost: 13/ month → 156/year	-	Caregiver	Caregiver
El Matri et al., 2007 (Africa) [30]	2004–2006	-	NS	Per session/annual	HD: 103 (Tunisia), 191.35 (Nigeria), 223.24 (South Africa)	DC	NS	11161.98 (Egypt), 38269.64 (DRC), 47837.05 (South Africa)	19134.82 (Sudan), 23918.53 (Tunisia), 31891.37(South Africa)	Provider	-
Halle et al., 2017 (Cameroon) [31]	2012 –2013	154	Adults	Annual	18740.87 (Total); 17490.04 (Direct), 1250.83 (Indirect)	DC + IC	-	-	-	Patient and provider	Patients and government subside
Lang et al., 2022 (Nigeria) [32]	2014–2020	73	Adults	Annual	26,168.56 ± 3,562.32	DC	2–3	-	32294.1 (trans-plant), 46293.59 (1st yr); 8333.49 (recurring)	Provider and patient	Patients

All costs are presented in USD, with annual figures unless otherwise specified

Abbreviations: NA, not available; PD, peritoneal dialysis; HD, hemodialysis; CERA, continuous erythropoietin receptor activator; EpoB, epoetin beta; DC, direct cost; DC + IC, direct and indirect cost

Bello et al., 2018 (South Africa) [29] reported only transportation costs; Maoujoud et al., 2016 (Morocco) [26] reported only erythropoietin therapy costs

Table 2 Demographic, economic, and health indicators with mean annual Hemodialysis (HD) costs in selected African countries

Countries	Population (Year)	GDP per capita (USD)	Estimated CKD Patients	Health expenditure per capita (USD, 2022)	Median annual HD cost (USD)
South Africa	64,007,187	6,253.40	10,111,134	570	39,102.35
Cameroon	29,123,744.00	1,762.40	4,603,553	72	19,081.27
Ethopia	132,059,767	1,011.10	20,873,436	27	7519.55
Nigeria	232,679,478	806.9	36,767,363	91	$21,052.03
Sudan	50,448,963	989.3	7,971,940	32	7,660.34
Tanzania	68,560,157	1,185.70	10,836,493	36	37,261.00
Democratic Republic of Congo	109,276,265	647.4	17,265,650	51	39,025
Morroco	38,081,173	3,993.40	6,019,834	199	-
Burkina Faso	23,548,781	987.3	3,720,703	57	2003.48
Tunisia	12,277,109	4,350.40	1,939,787	266	-
Egypt	116,538,258	3,338.50	18,418,041	171	-

Estimated CKD prevalence (15.8%) was derived from Kaze AD, Ilori T, Jaar BG, Echouffo-Tcheugui JB. *Burden of chronic kidney disease on the African continent: a systematic review and meta-analysis*. BMC Nephrol. 2018;19:125. https://doi.org/10.1186/s12882-018-0930-5

Population, health expenditure per capita, and GDP per capita (USD) were obtained from World Bank Open Data (https://data.worldbank.org/, accessed 19 August 2025)

Laboratory costs were reported in 14 studies. In Nigeria, annual pre-dialysis laboratory expenses were $2,298 and post-dialysis $1,641.65 [32]. In South Africa, laboratory services contributed 37.1% of HD and 25.9% of PD variable costs [15]. In Morocco, laboratory tests accounted for 3.4% of dialysis-related direct costs [26].

Discussion

CKD is a progressive condition that often culminates in ESRD. The kidneys are essential for maintaining homeostasis across multiple physiological systems; therefore, ESRD has severe and widespread effects on overall health [33]. Beyond its clinical consequences, ESRD imposes an immense economic burden, particularly in low-resource settings such as Africa, where healthcare systems already face significant financial constraints.

Economic burden of ESRD in Africa

The findings of this review highlight the considerable economic impact of ESRD in Africa, with substantial variation in costs across countries and treatment modalities. Haemodialysis, peritoneal dialysis, and kidney transplantation all incur prohibitively high expenses, often far beyond the financial reach of patients and health systems. The median annual cost of RRT in Africa is estimated at $18,741.00 (IQR $9,642.44–$33,313.83), a figure that greatly exceeds the per capita gross domestic product (GDP) of every African country [9]. For instance, Seychelles has the highest GDP in Africa at $17,879.20 [9], yet this remains lower than the median cost of RRT.

Country-level comparisons further emphasize this disparity. In South Africa, the median annual cost of haemodialysis is $39,102.35 (IQR $37,674.67–$40,530.02), while peritoneal dialysis costs $43,553.00 (IQR $33,156.32–$47,837.05), both nearly six times higher than the national per capita GDP of $6,022.50 [9]. In Nigeria, the median cost of haemodialysis is $21,052.03 (IQR $14,477.51–$27,221.58), which exceeds the per capita GDP more than twenty-five-fold [9]. These figures underscore the unsustainable nature of ESRD management in Africa without substantial government subsidies and international support.

Cost structures and modality-specific challenges

Our findings reveal important differences between dialysis and transplantation in terms of cost structure. Haemodialysis incurs high recurring expenditures, including consumables, laboratory investigations, and frequent clinical visits. By contrast, kidney transplantation, while costly in the first year, becomes more cost-effective in the long term. For example, a Nigerian study reported first-year transplant costs of approximately $46,293.59, primarily due to surgery and initial care, followed by annual maintenance costs of $8,333.49 [32]. In contrast, first-year haemodialysis costs were $26,168.56 ± $3,562.32, with subsequent annual expenses of $24,719.96. By the third year, transplantation had become the more economical option. These findings are consistent with global evidence demonstrating that transplantation not only improves survival but also reduces long-term healthcare expenditures [34].

Despite its advantages, transplantation remains largely inaccessible in Africa. Only eight countries in sub-Saharan Africa have established transplant programs [35]. Even where programs exist, such as in Nigeria and South Africa, they face limitations related to workforce shortages, donor availability, and inadequate funding. For comparison, Europe has approximately 30 trained nephrologists per million population, whereas most African nations have fewer than one per million [36]. Financial barriers further hinder access. Many patients must pay out-of-pocket for both direct medical costs and indirect expenses, including travel, accommodation, and lost income. A study from Eastern Nigeria reported that only 6 of 126 kidney transplants were performed domestically, with most procedures conducted abroad at even greater cost [37].

Limited access, morbidity, and mortality

The high costs of treatment, combined with limited healthcare infrastructure, directly contribute to increased morbidity and mortality. Essential diagnostics and medications are frequently unavailable or unaffordable. A survey found that only one-third of respondents in low-income settings had regular access to essential kidney medications in community health facilities [38]. Even when available, these drugs often remain financially inaccessible, further exacerbating treatment discontinuation.

In low-income countries, up to 98% of individuals with kidney failure lack access to RRT, compared with approximately 30% in high-income countries [7]. Alarmingly, 88% of those without access reside in Africa or Asia. In Nigeria, the median time to discontinuation of haemodialysis was only 10 days, with just 28.5%, 15.3%, and 8.3% of patients continuing treatment beyond 30, 90, and 180 days, respectively [39]. All discontinuations were attributed to financial constraints, and nearly all patients (98.4%) died within six months, with less than 1% receiving a transplant [39]. These findings contrast starkly with outcomes in high-income countries such as the United States, where ESRD qualifies patients for Medicare benefits regardless of age [7].

Strategies to address the economic burden

Addressing the economic burden of CKD in Africa requires a multifaceted approach. Cost-effective screening, early detection, and prevention strategies are essential to reduce progression to ESRD [7]. The WHO's Integrated Kidney Care program provides a valuable model, emphasizing community-based interventions and affordable treatment options [40]. Screening high-risk populations, such as individuals with diabetes and hypertension, can facilitate earlier diagnosis and reduce the need for costly RRT.

Adopting universal health coverage frameworks is also critical to ensuring equitable access to dialysis, transplantation, and essential medications [41]. The International Society of Nephrology's 2023 Global Kidney Atlas highlights the importance of improving accessibility, affordability, and delivery of kidney care across Africa [42]. Investments in healthcare infrastructure, especially in rural areas, are needed to expand dialysis centres, train nephrology specialists, and ensure consistent availability of essential drugs.

International collaborations and public–private partnerships could improve affordability and access. For instance, India's Pradhan Mantri National Dialysis Programme provides free dialysis for patients below the poverty line through public–private partnerships and may serve as a model for African nations [43]. Additionally, community education and patient empowerment initiatives can improve adherence to treatment protocols and promote preventive practices.

Limitations

This review has several limitations. Although studies were identified from multiple African countries, evidence remains sparse across large regions, particularly in rural and conflict-affected areas. This limits the generalizability of findings. Moreover, most included studies were from countries with relatively stronger health systems, such as South Africa, Nigeria, and Morocco, which may not reflect the situation in less-resourced settings. Heterogeneity in costing methodologies, cost components, and data sources (provider-reported vs. patient-reported) introduces bias and restricts comparability. Lastly, while costs were standardized to 2025 USD, fluctuations in exchange rates, inflation, and healthcare financing systems may affect the accuracy of these conversions.

Conclusion

CKD places a severe economic burden on African nations, with treatment costs far exceeding per capita GDP in most countries. The review highlights the urgent need for multifaceted interventions, including early detection, preventive strategies, expansion of healthcare infrastructure, and adoption of universal health coverage. Without immediate and sustained action, the financial and health consequences of CKD in Africa will continue to escalate, disproportionately affecting low-income and underserved populations.

Abbreviations

CKD	Chronic kidney disease
HD	Haemodialysis
PD	Peritoneal dialysis
ESRD	End-stage renal disease
GDP	Gross domestic product
KDIGO	Kidney Disease: Improving Global Outcomes
LMIC	Low- and middle-income countries
IQRs	Interquartile ranges
RRT	Renal replacement therapy
NA	Not available
CERA	Continuous erythropoietin receptor activator
EpoB	Epoetin beta
DC	Direct cost
DC + IC	Direct and indirect cost

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12882-025-04478-5.

Supplementary Material 1

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Author contributions
AOY contributed to the conceptualization, data curation, formal analysis, methodology, resources, software, supervision, validation. OTO contributed to the data curation, formal analysis, methodology. FIL contributed to the methodology and formal analysis, and participated in writing the original draft and its subsequent revisions. OMA contributed to the methodology and assisted in writing and reviewing the manuscript. TCM contributed to the methodology and participated in the writing and review of the manuscript. OEO contributed to the methodology and was involved in writing the original draft and reviewing the manuscript. TB contributed to the methodology and took part in drafting and editing the manuscript. HA contributed to the methodology and participated in the writing and review of the manuscript.All authors read and approved the final manuscript.

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Data availability
All data generated or analyzed during this study are included in this published article and its supplementary materials. The full search strategy is available in supplementary File.

Declarations

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Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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