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Single-center cross-sectional study of outcomes in hemodialysis patients in Niger: experience from the hemodialysis center at Zinder National Hospital

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Abstract

Background/Objectives Chronic hemodialysis is a well-established supportive therapy for patients with end-stage kidney disease. However, this therapy is rarely implemented in low-income countries because of its high cost. We herein report a single-center experience in one of the poorest countries in the world, i.e., Niger, involving patients in whom hemodialysis was initiated.

Patients and methods This cross-sectional study included all incident patients presenting with serum creatinine levels greater than 1000 µmol/L between January 2018 and December 2022. All patients agreed to undergo self-funded chronic hemodialysis. Survival was assessed as of December 2024. A total of 544 patients initiated hemodialysis therapy. Among them, 423 (77.8%) underwent hemodialysis for less than 3 months: 240 (57%) died, 57 (13.5%) recovered renal function, and the others were either lost to follow-up or decided to discontinue hemodialysis. Only 121 patients (22.2%) who had undergone hemodialysis for the first 3 months were able to embark on a chronic hemodialysis program; most were male (sex ratio, 2.7). Their mean age was 48 years. Most patients (62%) were from rural areas. Additionally, 66% had low income, and 52% lived very far from the dialysis facility. Vascular access was predominantly a central venous catheter (75%). Non-adherence to hemodialysis was observed in 76% of patients. Dropouts and loss to follow-up occurred in 15.7% and 29% of cases, respectively. At the end of follow-up, only 10 patients (8.3%) were still alive.

Conclusions These findings call into question the utility of chronic hemodialysis in very low-income countries given its high cost and substantial mortality. When feasible, kidney transplantation abroad should be considered as supportive therapy as soon as the absence of renal recovery is established.

Keywords Patient survival, Niger, Zinder, Hemodialysis, Therapy withdrawal

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Introduction

Chronic kidney disease (CKD) represents a major global health burden. A recent study showed that, worldwide, both the age-standardized incidence rate and the age-standardized disability-adjusted life-years rate are increasing in almost all countries and regions, suggesting a growing impact of CKD on global health. Population growth and aging are key contributors to this increasing burden, particularly in China and in regions with a low sociodemographic index [1]. In Africa, CKD is a major public health problem, largely attributable to high-risk conditions such as hypertension, diabetes mellitus, and human immunodeficiency virus infection [2].

Niger is one of the poorest countries in the world (https://www.worldbank.org/niger). We previously conducted a six-month cross-sectional study at the university hospital of Zinder (Niger); during this period, 497 patients hospitalized for reasons other than CKD were screened. CKD stages 3 and 4, defined as a GFR lower than 60, were found in 18.3% of patients [3]. We also reported on 120 kidney biopsies performed at our center, predominantly in young patients. The main indication for kidney biopsy was glomerular syndrome in 62.5% of cases, including nephrotic syndrome in 50%. The most frequent histological findings were (i) glomerular diseases (58.4%) and (ii) tubulointerstitial lesions (31.8%) [4]. However, due to the severe shortage of nephrologists in low-income countries—estimated as an 80-fold difference compared with high-income countries [5]—and the fact that patients must self-pay for all medications, very few are able to adhere to nephrologists' prescriptions, leading rapidly to kidney failure.

Furthermore, when patients present with markedly elevated serum creatinine levels, the underlying condition may be either acute or chronic [6]. In such settings, renal ultrasonography may help distinguish between these two entities. Acute kidney injury accounts for approximately 85% of cases occurring in low-resource settings, where access to kidney replacement therapy is often limited or nonexistent [7]. Among patients receiving chronic dialysis therapy in sub-Saharan Africa, median survival remains poor, with reported values of 345 days in a multicenter survey across three hospitals in Ethiopia in 2021 [8], 17 months in Congo [9], and 46–47 months in longitudinal studies from Ethiopia [10, 11].

The aim of this study was twofold: (i) to assess patient outcomes within the first 90 days after initiation of hemodialysis therapy, and (ii) among patients surviving beyond 90 days, to determine long-term survival.

Materials and methods

This was a single-center cross-sectional study conducted between 01/01/2018 and 31/12/2022. We included all patients presenting with either acute kidney injury or end-stage kidney disease. Due to resource limitations, only patients with markedly elevated serum creatinine levels (> 1000 µmol/L) were considered; however, it was not possible to determine whether kidney dysfunction was related to acute kidney injury (AKI) or chronic kidney disease (CKD).

Up to September 2024, hemodialysis was not reimbursed in Niger, meaning that patients were required to pay a lifetime package of 230 euros before initiating dialysis. Since then, access to hemodialysis has been free of charge. However, patients had, and still have, to pay for the temporary femoral catheter (76 euros). Once patients accepted enrollment in a chronic hemodialysis program, they were required to pay for either a permanent catheter (168 euros) or the creation of an arteriovenous fistula (230 euros).

In the context of markedly elevated serum creatinine levels, hemodialysis was proposed as the renal replacement therapy, as peritoneal dialysis is not available in our setting. In addition, patients considered to have end-stage renal failure received clear information regarding kidney transplantation, bearing in mind that transplantation is performed abroad and is extremely costly. Patients who were subsequently transferred to another hemodialysis center were excluded from the analysis.

Hemodialysis was systematically initiated using a femoral venous catheter. Some patients who transitioned to chronic hemodialysis were offered the possibility of arteriovenous fistula creation as a self-funded procedure.

We included only patients who accepted at least one hemodialysis session. Hemodialysis sessions were scheduled according to individual clinical needs, including symptoms of uremia and/or fluid overload. For patients on chronic hemodialysis, two four-hour sessions per week were recommended; however, in many cases, patients attended dialysis sessions only when financially able to do so.

All patients were followed until 31/12/2024, death, or loss to follow-up. Patients were categorized into two groups: those who underwent less than 3 months of supportive therapy (i.e., hemodialysis) and those who were enrolled in a chronic hemodialysis program. In the latter group, the absence of renal recovery led to the assumption of a chronic kidney condition.

All patients provided written informed consent for publication of their data; consent was obtained when dialysis therapy was proposed as the only available therapeutic option.

The following variables were collected: sex, age, cause of kidney injury or disease, level of education or diploma, social status, occupation, financial condition, place of residence (urban vs. rural), distance from home to the hemodialysis center, use of traditional medicines or herbs, past medical history (including hypertension and diabetes), initial nephropathy (if a kidney biopsy had been performed), history of acute or chronic kidney disease, and previous surgical procedures. Hemodialysis-related variables included hemoglobin levels at initiation of the first hemodialysis session, type of vascular access, number of dialysis sessions per week, and adherence to dialysis therapy. A standardized questionnaire including these variables was completed at the time patients were informed that dialysis therapy was required.

Although electronic medical records were not available, paper medical files were used to extract the data. In addition, a dialysis registry was established, recording the name, surname, and date of birth of all patients referred for hemodialysis, even if dialysis was never initiated. This registry also included the date and cause of death, as well as whether patients discontinued dialysis therapy or were lost to follow-up.

The study was conducted in accordance with the Declaration of Helsinki. It was submitted to the local ethics committee and approved (FSS_UASZ_Niger_No 011/06/05/2024) to allow review of patients' medical records and reporting of the data. Informed consent to participate in the study was obtained from all participants.

Data collection and statistical analysis

A clinical nurse was trained to collect the data. The data collector identified patient charts eligible for the study using registry books from the dialysis unit and retrieved them from the medical records department. Patient medical records and dialysis charts served as the primary data sources.

Data collection tools included sociodemographic characteristics (such as age, sex, and source of funds); clinical characteristics (including nausea and vomiting, shortness of breath, body swelling, oliguria, gross hematuria, hematuria, and blood pressure measurements); and laboratory parameters (such as serum creatinine, serum sodium, serum potassium, serum urea, hemoglobin, and proteinuria). In addition, the indication for dialysis, the type of vascular access at HD initiation, the type of vascular access in patients on maintenance HD, the frequency and duration of HD sessions, length of stay in the HD unit, and patient outcomes were recorded.

Categorical variables were summarized as frequencies and percentages, whereas continuous variables were described using medians and ranges.

Results

During the study period, 544 patients required dialysis therapy and underwent at least one hemodialysis session. Four hundred and twelve patients (75.7%) underwent hemodialysis for less than 3 months (cohort 1), whereas the remaining patients ($n = 132$, 24.3%; cohort 2) were initiated on chronic hemodialysis for more than 3 months (see flow chart, Fig. 1).

All patients underwent renal ultrasonography to rule out obstructive nephropathy; in the majority of cases, renal size was reduced. However, due to the absence of electronic medical records, precise kidney size measurements were not available. The radiologist or nephrologist performing the renal ultrasound documented the presence or absence of dilation (yes/no) and kidney size as likely normal or reduced. Because of reduced kidney size, none of the patients underwent kidney biopsy.

In cohort 1 ($n = 412$), 57 patients (13.8%) recovered renal function (i.e., they had acute kidney injury and were discharged home). In contrast, 240 patients (58.2%) died. In addition, 60 patients (14.5%) decided to discontinue hemodialysis and returned home without follow-up

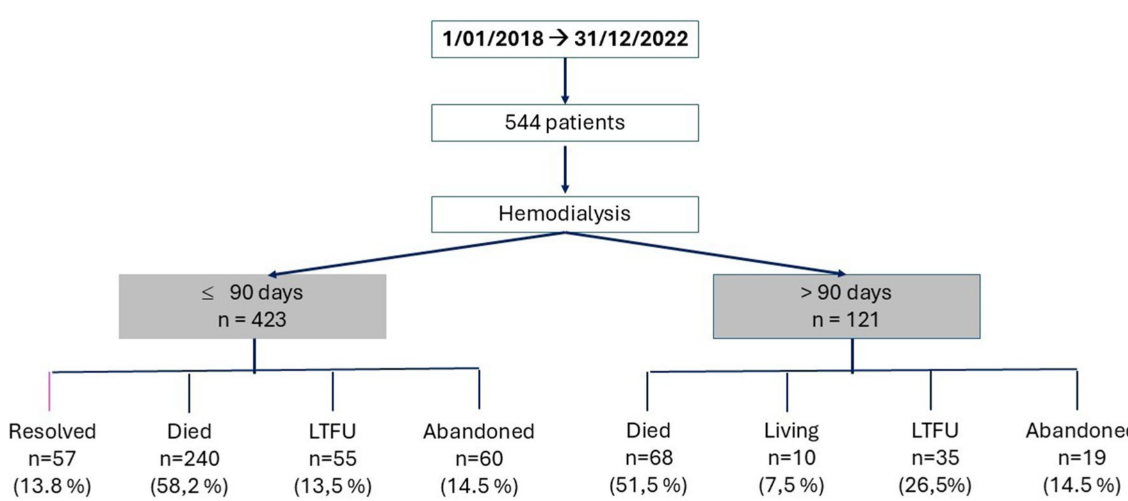

Fig. 1 Flow-chart of patients presenting with serum creatinine > 1000 µmol/L. Abbreviations: LTFU: Last to follow-UP; Abandoned, I.E; The patient choose to give-up hemodialysis

Table 1 Characteristics of patients who underwent chronic Hemodialysis (*n* = 132)

n **= 121**	
Median age (years)	47 (14–83)
Sex ratio (M/F)	98/34
Living (city / rural area)	49/83
Low social economical levels	88
More than 100 km from HD center	71
Illiterate	101
Vascular access:	
Femoral catheter	84
Tunneled catheter	17
AV fistula	31

Abbreviations: M, male; F, female; HD, hemodialysis; AV, arteriovenous

Table 2 Number of hemodialysis sessions per patient for those that were on hemodialysis therapy for more than 3 months

Number of hemodialysis sessions	Number of patients (*n*)	Percentage (%)
Less than < 30	80	66
[30–59]	25	20.7
[60 and above]	16	13.3

data, while 55 patients (13.5%) were lost to follow-up. It is likely that most of these 115 patients (28%) subsequently died, given the limited regenerative capacity of nephrons (see Fig. 1).

We subsequently focused on patients who underwent at least 3 months of dialysis therapy, corresponding to cohort 2 (*n* = 132) (see Tables 1 and 2). Most patients were aged 20–40 years (*n* = 49; 37.1%) or 41–60 years (*n* = 52; 39,4%). There were 98 men (74.25%). Regarding occupation, most patients were farmers (*n* = 38; 28.8%), merchants or storekeepers (*n* = 30; 22.7%), or housewives (*n* = 29; 22%). Eighty-three patients (62.9%) lived in rural areas. Most patients had a low socioeconomic status (*n* = 88; 66.6%), and 101 patients (76.5%) had no formal education.

Most patients lived far (50–100 km; *n* = 33; 25%) or very far from the dialysis center (> 100 km; *n* = 71; 53.8%), considering that there are no asphalt roads in our region. Regarding dietary habits, 56 patients (42.4%) reported the use of herbal medicines and/or decoctions prior to initiation of dialysis therapy. Most patients (*n* = 99; 75%) did not adhere to the dietary counseling provided by the dietitian and nephrologist.

Regarding past medical history, no comorbidities were reported in 16 patients (12.1%), whereas hypertension, type 2 diabetes, and heart disease were present in 58 (44%), 14 (10.6%), and 12 (9.1%) patients, respectively. At initiation of hemodialysis, hemoglobin levels were below 80 g/L in 63 patients (47.7%).

Regarding patient outcomes in cohort 2, most patients (*n* = 91; 69%) underwent fewer than 30 hemodialysis sessions (see Table 1). Dropout events, including death, loss to follow-up, or patient decision to discontinue hemodialysis, occurred in 70 patients (53%) within the first 6 months, in 29 patients (21.9%) during the subsequent 6 months, and in 23 patients (17.4%) during the following 24 months. Overall, 68 patients (51.5%) died, 19 (14.5%) discontinued hemodialysis therapy, and 35 (26.5%) were lost to follow-up. Of those who died the main cause of mortality was sepsis (*n* = 46, i.e., 67.6%). Finally, 10 patients (7.5%) remained alive and on hemodialysis for more than 3 years. Among these survivors (as of December 2024), eight initiated hemodialysis in 2019, one in 2021, and one in 2022.

Regarding vascular access, 84 patients had a femoral catheter, 17 had a tunneled catheter—of whom only two had catheter placement prior to initiation of hemodialysis—and 31 had an arteriovenous fistula, with only four fistulas created before starting hemodialysis.

Among the 10 patients who survived on chronic hemodialysis, five were aged 30–60 years, three were older than 60 years, and two were younger than 30 years. Seven were male. All patients had an arteriovenous fistula. Regarding occupation, three were housewives, one was a farmer, and the others were either state employees (*n* = 2) or merchants (*n* = 4). Socioeconomic status was average in seven patients and high in three patients. Regarding educational level, the seven male patients had a high level of education. Eight of the 10 patients lived near the hemodialysis facility. Finally, all surviving patients adhered to dietary counseling provided by the dietitian, including recommendations regarding water intake and potassium restriction.

Discussion

Our single-center cross-sectional study, conducted over five years in one of the poorest countries in the world, demonstrated that only a very small proportion of patients initiated on hemodialysis survived in the long term, with a survival rate of less than 10%. Throughout the study period, patients were required to self-fund both hemodialysis sessions and all associated medications.

Niger is among the world's poorest nations (https://www.aa.com.tr/fr/afrique/le-niger-l-un-des-pays-les-plus-pauvres-au-monde-face-aux-sanctions-%C3%A9conomiques/2961374). In 2022, the then-democratically elected government of Niger launched an ambitious Sanitary and Social Development Plan (2022–2026). However, this initiative was abruptly interrupted by a military coup in 2023, which dismantled democratic governance and led to the abandonment of planned reforms, with severe consequences for the population. The Human Development Index of Niger in 2023 was 0.419, ranking the country

189th out of 193 worldwide. Furthermore, more than half of the population lives on less than USD 2.15 per day (https://www.theglobaleconomy.com/Niger/human_development/).

In this economic context, the sustainability and relevance of allocating limited state resources to the management of chronic diseases such as kidney failure—particularly for the reimbursement of costly therapies like hemodialysis—remain highly questionable. South Africa provides an illustrative example of a more pragmatic health policy regarding kidney failure. In this setting, patients presenting with markedly elevated serum creatinine levels, whether related to acute or chronic kidney disease, are offered a one-month period of supportive dialysis therapy. If renal recovery does not occur within that timeframe, only patients eligible for kidney transplantation or those with private health insurance continue dialysis therapy, while others are transitioned to conservative management [12].

In South Africa, a country of approximately 60 million inhabitants, 822 new patients initiated kidney replacement therapy in 2022, corresponding to an incidence of 13.3 per million population (pmp). Most of these patients (77%) were treated in private centers. By December 2022, a total of 9,342 patients were receiving chronic dialysis or had undergone kidney transplantation, resulting in an overall prevalence of 151 pmp. However, this prevalence was markedly different between the private sector (771 pmp) and the public sector (45 pmp), highlighting substantial inequities in access to care [12]. In contrast, in Morocco, the prevalence of dialysis patients reaches 1066.9 pmp, with hemodialysis fully covered by the national healthcare system as of 2025 [13].

South Africa has chosen to prioritize chronic diseases with a broader public health impact, such as human immunodeficiency virus infection and tuberculosis [14]. In contrast, many African countries lack mid- or long-term health policies addressing the sustainability of maintaining large numbers of patients on chronic hemodialysis, particularly in the near absence of kidney transplantation programs across the continent.

Tannor et al. described the situation in Ghana, where, despite the first hemodialysis session being performed over 50 years ago, major inequities persist in the geographic distribution of dialysis centers. Ghana is characterized by a low prevalence of dialysis and a nephrology workforce of only 0.44 nephrologists per million population, despite a high burden of CKD. Moreover, the prohibitive cost of dialysis—approximately USD 53.9 ± 8.8 per session—is largely borne out-of-pocket, severely limiting accessibility [15]. In Morocco, a country of 38.4 million inhabitants, nearly 41,000 patients receive hemodialysis, with treatment fully reimbursed by the state. However, kidney transplantation remains underdeveloped, with fewer than 50 transplants performed annually, a situation that is unlikely to be sustainable in the short or long term.

The late presentation of patients with CKD to emergency departments at the stage of kidney failure is common in low-income countries. This phenomenon is largely explained by the shortage of nephrologists and the absence of CKD screening programs. Nevertheless, a subset of patients presenting with severe renal dysfunction may have acute kidney injury rather than chronic disease. Randrianarisoa et al. [6] from Madagascar reported that among 124 patients requiring emergency hemodialysis, 82.7% had kidney failure, whereas 17.3% had AKI and subsequently recovered renal function. Similarly, in our study, 13.5% of patients recovered renal function after dialysis initiation. In contrast, Tafese et al. in Ethiopia reported a higher AKI recovery rate of 31% among patients undergoing emergency dialysis [16]. Despite these variations, these findings collectively indicate that, in low-resource settings, the majority of patients initiating emergency dialysis are already in kidney failure.

In sub-Saharan Africa, hypertension and diabetes mellitus are the leading causes of progression to kidney failure [11, 17]. Tafese et al. reported hypertension (40.4%), chronic glomerulonephritis (27.7%), and diabetes (14.9%) as the main etiologies of CKD [16]. Our cohort showed a similar pattern, with most patients presenting with hypertension or diabetes.

Non-adherence rates were very high in our population. Among patients who underwent hemodialysis for less than 90 days, non-adherence was observed in 27.5%. In patients on chronic hemodialysis, non-adherence reached 44.7%. Despite patients' desire to continue treatment in order to survive, the need to self-pay for each hemodialysis session, combined with widespread poverty, frequently resulted in loss to follow-up or discontinuation of therapy. The most effective strategy to improve adherence would likely be state-funded reimbursement of hemodialysis sessions.

The self-funded nature of hemodialysis in many African countries inevitably leads to suboptimal dialysis quality, poor adherence, and high treatment abandonment rates. Halle et al. reported a non-adherence rate of 21.2% in a cohort of chronic hemodialysis patients over a two-month period, with only one patient (0.6%) having health insurance [18]. In our cohort, non-adherence was observed in 44.7% of patients on chronic hemodialysis: 15.7% voluntarily discontinued therapy, and 29% were lost to follow-up. Notably, in 23% of low-income countries, patients with kidney failure are required to pay more than 75% of dialysis costs, compared with only 4% in high-income countries [19]. Until January 2025, all dialysis-related expenses in Niger—including arteriovenous fistula creation—were entirely self-funded, substantially compromising patient adherence. The recent implementation of government-funded hemodialysis may help mitigate this issue.

Another critical factor influencing adherence is the health-related quality of life (HRQL) of patients receiving dialysis. Mathew et al. in South Africa reported higher anxiety and depression scores among hemodialysis patients compared with those managed conservatively, along with poorer physical and emotional well-being [20]. In Uganda, Bagasha et al. reported that 94.3% of patients with kidney failure scored below 50 (out of 100) on HRQL assessments, with no significant differences between patients receiving dialysis and those receiving conservative management [21]. Similarly, Teuwafeu et al. in Cameroon reported that among 434 patients, 76.2% had HRQL scores below 50, and that school dropout, unemployment, and social isolation were frequent after dialysis initiation [22]. Gebrie et al. in Ethiopia also highlighted overwhelmingly negative patient narratives regarding lived experiences on chronic dialysis [23].

Given the poor quality of life and high mortality associated with chronic dialysis in low-income countries, the relevance of maintaining patients on long-term dialysis programs must be questioned. In Congo, Mokoli et al. reported a median survival of 17 months among 250 patients on chronic dialysis, with financial constraints leading to treatment withdrawal in 18.4% of cases [9]. In Ethiopia, Workie et al. reported a median survival of 345 days among 436 dialysis patients, with major mortality predictors including rural residence, hypertension-related kidney failure, HIV infection, and use of central venous catheters [8]. Two longitudinal studies from Ethiopia reported survival durations of 46–47 months [10, 11]. In our series, only 10 of 121 patients (8.3%) survived beyond 3 years of dialysis, all of whom had arteriovenous fistulas.

Numerous studies have demonstrated that vascular access type significantly influences survival in dialysis patients. Catheter use is consistently associated with higher mortality compared with arteriovenous fistulas. Tafese et al. reported that in their Ethiopian cohort, nearly all patients with CKD or AKI required emergency catheter-based access, whereas 94.3% of patients on maintenance dialysis used arteriovenous fistulas [16].

We found that for those who were embarked on a chronic haemodialysis programs two-third of deaths were sepsis-related. Indeed, a study from Cameroon looked at the adverse outcomes of non-tunneled hemodialysis catheters and determinants in chronic hemodialysis patient. They found that the catheter-related infections were sepsis (11.8%), exit-site (29.4%) and both (58.8%); leading to death in 64.7% of cases [24].

Given the high mortality associated with chronic dialysis in sub-Saharan Africa, kidney transplantation appears to be a more viable long-term option. However, very few countries in the region have established sustainable transplantation programs [25–27]. Functional kidney transplant programs are mainly located in North Africa [27], Nigeria [28], South Africa [29], and Egypt [30]. In Cameroon, where living-donor transplantation has recently been implemented, Njamnshi et al. estimated that annual dialysis costs per patient are approximately 12 times the national average income. In contrast, kidney transplantation—particularly when supported by generic immunosuppressive therapy—could reduce long-term follow-up costs by 89% [31]. In Niger, no transplant program currently exists. However, in a cohort of 25 patients who underwent living-donor kidney transplantation abroad, we previously reported a 5-year patient survival rate of 84%, a graft survival rate of 56%, and a death-censored graft survival rate of 67% [32]. Although these outcomes remain inferior to those observed in high-income countries, they are markedly superior to the 8.3% survival observed in our chronic dialysis cohort.

Indeed, major disparities persist in access to dialysis therapy and dialysis modalities across Africa [33]. These disparities are largely driven by the high cost of dialysis, which in many settings is financed entirely through out-of-pocket payments [34]. In some Asian countries, a "peritoneal dialysis–first" policy has been successfully implemented, notably in Hong Kong and Thailand [35, 36]. In sub-Saharan Africa, however, peritoneal dialysis remains largely unavailable owing to inadequate hygienic conditions and the high cost of peritoneal dialysis solutions. Nevertheless, in Senegal, Niang et al. reported reasonable outcomes in a cohort of 62 patients on peritoneal dialysis, with 45 episodes of peritonitis diagnosed in 36 patients (58%), corresponding to a peritonitis rate of one episode per 20 patient-months (0.60 episodes per year) [37].

The nephrology workforce in Africa remains critically insufficient, as highlighted by multiple reports [15, 19, 38]. The number of nephrologists per million population ranges from approximately 1 pmp in South Africa to 40 pmp in Japan, with Senegal (2 pmp), Mexico (4 pmp), and Ukraine (9 pmp) also exhibiting major workforce shortages [38].

Low-income countries face a dual challenge: a critical shortage of nephrologists, largely concentrated in urban centers, and the absence of structured CKD prevention strategies. Consequently, patients with CKD are frequently diagnosed only at the terminal stage, when dialysis initiation becomes urgent and unavoidable, eliminating opportunities for early intervention, optimal vascular access planning, or timely evaluation for kidney transplantation.

Conclusions

Our study demonstrates that in a very low-income country, the vast majority of patients initiating self-funded hemodialysis in emergency settings already have end-stage kidney disease. Slightly more than one in five patients survive beyond 90 days after hemodialysis initiation. Among those who continue beyond this threshold, fewer than 10% achieve long-term survival, while the remainder either die while receiving dialysis or discontinue therapy because of financial constraints.

These findings challenge the relevance and sustainability of chronic hemodialysis programs in extremely resource-limited settings, given the prohibitive costs and high mortality associated with this therapy. When feasible, kidney transplantation should be prioritized as an alternative supportive strategy.

Abbreviations

AKI	Acute Kidney Injury
CKD	Chronic Kidney Disease
ESKD	End Stage Kidney Disease
ACEI	Angiotensin Converting Enzyme Inhibitor
HRQL	Health Related Quality of Life
HIV	Human immunodeficiency virus
HD	Hemodialysis
AV fistula	Arteriovenous fistula

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None.

Author contributions

Conceptualization, HMD, MBGDA, LR.; methodology; MBGDA.; software, MBGDA; validation, LR.; formal analysis, DAA, CL, AZH; investigation, DAA; resources, HMD; data curation, MBGDA; writing—original draft preparation, DAA, HMD; writing—review and editing, DB, LR; visualization, CL, AZH.; supervision, HMD; project administration, CL, AZH; funding acquisition, HMD. All authors have read and agreed to the published version of the manuscript.

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Data availability

Provided reasonable demand.

Declarations

Ethics approval and consent to participate

Informed consent to participate was obtained from all of the participants in the study. FSS_UASZ_Niger_No 011/06/05/2024. The research was conducted in accordance with the Declaration of Helsinki.

Consent for publication

As hemodialysis therapy is a live-saving procedure we just informed the patient that hemodialysis procedure was needed.

Institutional review board statement

Research authorization was granted by the dean of University Salifou of Zinder (Niger) on December 5th, 2024. The approval letter is enclosed with the manuscript.

Competing interests

The authors declare no competing interests.

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