

REVIEW

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Burden of end-stage renal disease of undetermined etiology in Africa

Temesgen Fiseha^{1*} and Nicholas J. Osborne^{2,3,4}

Abstract

In the last two decades, there have been increasing recognition of excess cases of end-stage renal disease (ESRD) requiring renal replacement therapy without common underlying causes (diabetes, hypertension, glomerulonephritis, or any identifiable cause) in many parts of low-to-middle income countries. ESRD of unknown etiology mainly affects young working-age adults and is a global health problem with substantial morbidity, mortality and disability. In this review, we provide a comprehensive overview of the burden and outcomes of treated ESRD attributable to unknown etiology in African countries. Estimates indicate that up to 71% of adults and up to 53% children on dialysis suffer from ESRD due to unknown etiology. ESRD of unknown etiology affects mostly the economically productive young adults, males and those from rural areas. ESRD due to unknown etiology carries an almost twofold risk of mortality compared to traditional ESRD causes and account for up to 55% of the renal medical admissions burden. This review confirms that treated ESRD due to unknown etiology is a major public health issue in Africa. Future studies are urgent need for better characterizing the regional causative factors as well as for developing proactive and comprehensive approaches to prevent and treat this under-recognized disease.

Keywords End-stage renal disease, End-stage renal disease of unknown etiology, Dialysis, Africa

Introduction

Chronic kidney disease (CKD) is a major public health problem, and it can progress to end-stage renal disease (ESRD), requiring expensive therapies in the form of dialysis or renal transplantation for survival and has a major impact on healthcare costs, productivity and growth [1, 2]. Worldwide, the number of ESRD persons needing renal replacement therapy (RRT) is estimated between

4.902 and 9.701 million, with the majority occurring in low-to-middle income countries (LMICs) [3, 4]. It has also been estimated that as many as 3.2 million people die each year due to the inaccessibility of therapy, and thus, the majority of patients projected to reach ESRD in LMICs are unable to access RRT and die [3, 5]. Identification of underlying conditions of CKD leading to ESRD is of paramount importance to enable early diagnosis and treatment and thereby reduce the disease burden.

The global increase in ESRD is mainly attributed to the rise in prevalence of diabetes, hypertension, obesity and aging. In the last two decades, there have been increasing recognition of excess cases of ESRD requiring RRT without common underlying causes (diabetes, hypertension, glomerulonephritis, or any identifiable cause) in many parts of LMICs [6–8]. ESRD of unknown etiology mainly affects young working-age adults and is often fatal due to rapid disease progression and lack of dialysis or renal transplant options in the affected areas [7, 9]. It has resulted in thousands of deaths and placed an enormous

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burden on communities and healthcare systems, and is now recognized a serious public health concern requiring urgent action [6, 9, 10]. In Mexico, ESRD of unknown origin is the main cause of ESRD (54%) and accounts for the greatest global impact in terms of disability-adjusted life years [11, 12]. In El Salvador, 67% of new cases of ESRD were due to unknown etiology, and the condition is the leading cause of hospital deaths [13, 14]. Similar cases of unexplained ESRD have been reported in other Central and Latin American countries, regions within the Middle East and South Asia, and even in high-income countries with advanced diagnosis methods for kidney diseases [9, 15–19]. Across the reporting regions, the disease is attributed to environmental exposure to toxins and pollutants.

In Africa, CKD and consequent ESRD is increasingly recognized as a major public health threat mainly affecting young adults in their economically productive years, and seems to be of a more severe form than in developed countries [20, 21]. The prevalence of treated ESRD in Africa is relatively lower than incident CKD, which is at least 3–4 times more frequent than in developed countries, and this is likely due to late presentation (>75% requiring dialysis at presentation and severely ill with co-morbidities) and limited access to RRT (only ~5% of patients with ESRD are able to get treatment for longer than 3 months) [5, 20–23]. ESRD care is especially challenging in Africa, with large numbers of ESRD patients, inadequate facilities and funding, and lack of renal registries [24, 25]. Even in wealthier country South Africa, the majority of people who develop ESRD are not offered RRT because of scarce resources, social factors related to poverty and established protocols which accept only young patients without significant comorbid disease [26, 27]. Thus, implementing cost-effective preventive interventions against ESRD is the only realistic solution for Africa [21, 25].

Data regarding the burden and etiology of ESRD are lacking in Africa and are unclear due to lack of renal registries in many African countries. Available literatures have established that chronic glomerulonephritis and hypertension are the principal causes of ESRD patients on renal therapy, together with diabetes and HIV [23, 28, 29]. However, selection bias may have played a significant role in these observations as most patients selected for RRT were considerably younger, affluent and have fewer comorbidities, which disadvantage the most vulnerable [5, 26–28, 30]. Accordingly, it is important to estimate the growing burden of treated ESRD due to other causes, to understand potential risk factors and highly vulnerable populations that lack specific diagnostic interventions and attentions and underrepresented in studies [31]. Also, such approaches can help identify regions as

“hot spots” and have been a key first step in recognizing existing kidney disease of unknown cause epidemics in a given region [8].

In this review, we provide a comprehensive overview of the current evidence on the burden and outcomes of treated ESRD due to unknown etiology in Africa. The findings can be used to inform service providers, researchers, and regional and international agencies to a possible problem of treated ESRD of unknown cause in attempts to advocate for research, prevention, and treatment resources for kidney disease in general, and for unknown etiology of kidney disease in specific areas.

Methods

A literature search for relevant studies was performed using PubMed, Medline and the African Journals Online databases. Search terms used included: end-stage renal disease, ESRD, chronic renal failure, cause/etiology, unknown/undetermined/uncertain, renal replacement therapy, dialysis, AND Africa/country name in any combination in the title, abstract or MeSH terms. Reference lists from identified articles were also manually searched to identify any other relevant studies. Studies published in English language from the year 2000 onwards that contained data on treated ESRD due to unknown etiology in any African country and enrolled at least 50 adult participants were included. In general, ESRD of unknown etiology is a diagnosis of exclusion [8]. Accordingly, ESRD of unknown etiology refers to patients with ESRD or CKD stage 5 undergoing maintenance dialysis (hemodialysis or peritoneal dialysis), but without evidence of diabetes, hypertension, chronic glomerulonephritis, HIV, or any identifiable cause of ESRD (obstructive nephropathy, analgesic nephropathy, polycystic kidney disease, or other).

Results

ESRD of unknown etiology in adults

Published evidence on dialysis-treated ESRD due to unknown etiology in the last two decades was found for 24 African countries (Fig. 1) and those are divided into five regions for the clarity of present. Those are North Africa (n=18 studies), West Africa (n=13 studies), Central Africa (n=4 studies), Southern Africa (n=4 studies) and East Africa (n=6 studies). A summary of the studies reviewed is presented in Table 1.

In North Africa, the earliest reports on the occurrence of ESRD without a known underlying cause have been in the late 1980s [32]. In 2007–2011 reports of patients undergoing dialysis in Sudan, unknown etiology emerged as the leading cause of ESRD at 42.6–71.2% [33–35], while it accounted for 10.7% in a 2015 report [36]. According to the authors, the high rates of the

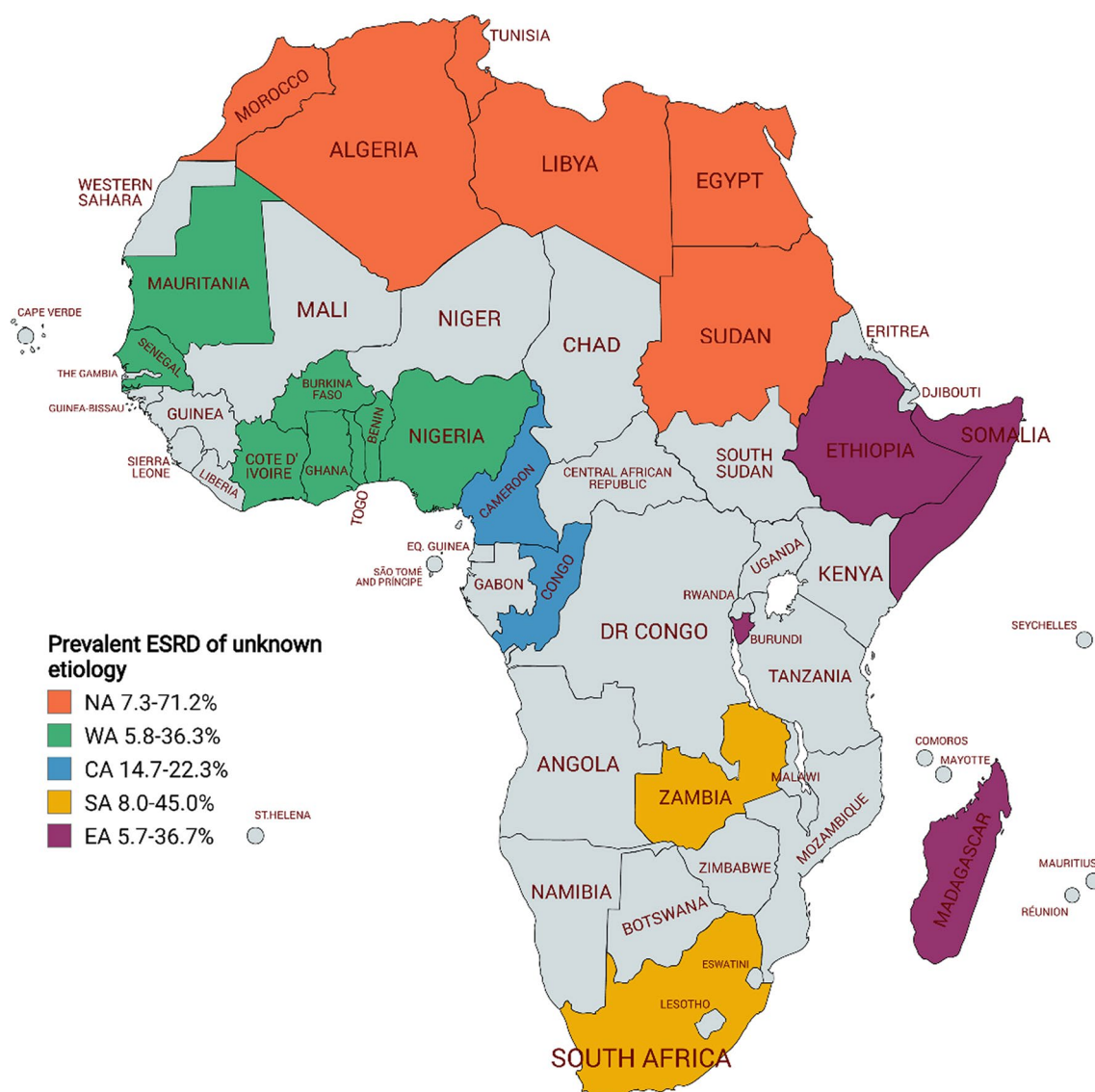


Fig. 1 Prevalent numbers of patients with ESRD of unknown etiology, in reporting African countries by region (NA: North Africa; WA: West Africa; CA: Central Africa; SA: Southern Africa; EA: East Africa)

ESRD cases with unknown etiology may reflect the lack of awareness of medical problems, lack of medical facilities in rural areas and/or delay in referral before arriving to the specialist physician. In Egypt, the etiology of ESRD patients on dialysis during the year 2006–2016 was dominated by unknown causes at 25–28% [37–39]. As of 2016–2020, estimates of Egyptian treated patients with ESRD of unknown etiology ranged from 13.7–19.5% [40–42]. In a 2012 study of 2417 prevalent dialysis patients in Libya, unknown etiology of ESRD was recorded at 7.3% [43]. Subsequent studies showed that unknown etiology accounts for 17.9–21.6% of treated ESRD patients [44–46]. In a 4-year Algerian study of 673 patients undergoing

hemodialysis, 19.6% of ESRD cases were of unknown etiology [47]. The authors suggested that the prevalence of unknown ESRD etiology remains significant due to the late diagnosis of the disease and the low proportion of patients who can undertake renal biopsy (only 4%). In the 2021 studies of dialysis-treated patient in Tunisia, ESRD was of unknown etiology in 11% and 12.8% of cases [48, 49]. In Morocco, a study including 163 dialysis patients reported ESRD of unknown etiology in 42.2% of cases [50].

ESRD of unknown etiology reported countries in West Africa are Nigeria, Senegal, Gambia, Burkina Faso, Togo, Ivory Coast, Mauritania, Benin and Ghana. The first

Table 1 Summary of studies reported on dialysis-treated ESRD of undetermined etiology among adults

Author	Year	Region	Country	Study period (duration)	N	Mean age (years)	Male (%)	Prevalent (%)
El-Amin et al. [33]	2007	North Africa	Sudan	NA	236	43.6 ± 15.6	71.6	71.2
Elamin et al. [34]	2010	North Africa	Sudan	NA	2858	46 ± 17	66	42.6
Elsharif et al. [35]	2011	North Africa	Sudan	Average 2.6 years	224	45.8 ± 17.2	67.8	53.6
Banaga et al. [36]	2015	North Africa	Sudan	Average 4.4 years	1583	49 ± 15.8	63.4	10.7
El-Minshawy [37]	2006	North Africa	Egypt	Average 5 years	614	44.6 ± 13.7	64	28
El Minshawy [38]	2011	North Africa	Egypt	NA	800	46 ± 13	65	27
El-Arbagy et al. [39]	2016	North Africa	Egypt	NA	1109	44.5 ± 12.3	65.7	25
Ghonemy et al. [40]	2016	North Africa	Egypt	NA	1004	52 ± 14.7	62.2	17.7
Hafez et al. [41]	2019	North Africa	Egypt	NA	1000	50.4 ± 14.4	60.5	13.7
Ahmed et al. [42]	2020	North Africa	Egypt	Average 5.3 years	2186	52.7 ± 11.7	54.8	19.5
Alashek et al. [43]	2012	North Africa	Libya	> 3 years	2417	49 (36 to 61)	58	7.3)
Gusbi et al. [44]	2021	North Africa	Libya	NA	2358	(18 to > 60)	61.7	17.9
Elamouri [45]	2021	North Africa	Libya	Average 5.4 years	261	51.8 ± 15	56.3	20.7
Alsaeiti et al. [46]	2021	North Africa	Libya	Average 8 years	292	51.1 ± 14	58.2	21
Berkache et al. [47]	2021	North Africa	Algeria	4 years	673	57.4 ± 17	55.4	19.6
Mesbahi et al. [48]	2021	North Africa	Tunisia	1 year	229	60.2 ± 15.3	58.5	11
Salem et al. [49]	2021	North Africa	Tunisia	27 year	304	46.5 ± 18.6	70	12.8
Abdelaali et al. [50]	2013	North Africa	Morocco	8 years	167	51.3 ± 15	61.3	44.2
Chijioke et al. [55]	2003	West Africa	Nigeria	4 years	127	(18–89)	59.8	14
Arogundade et al. [52]	2011	West Africa	Nigeria	19 years	760	40 ± 1.7	70.3	12
Okunola et al. [53]	2013	West Africa	Nigeria	5 years	180	49 ± 16.3	68.9	6.1
Amira et al. [54]	2017	West Africa	Nigeria	17 years	1388	46.1 ± 15.3	63.2	5.8
Niang et al. [56]	2014	West Africa	Senegal	7 years	62	47 ± 13	54.8	14.5
Abderraman et al. [57]	2018	West Africa	Senegal	7 years	315	50.7 ± 13.8	49.8	20.3
Sanyang et al. [58]	2020	West Africa	Gambia	3 years	170	43 ± 15	42.4	28.6
Gérard et al. [59]	2016	West Africa	Burkina Faso	Average 2.5 years	172	45.2 ± 12.4	61.6	22.1
Salou et al. [60]	2019	West Africa	Togo	> 4.3 years	95	46.6	64.2	10.5
Mélanie et al. [61]	2022	West Africa	Ivory Coast	7 years	255	41.5 ± 15.5	60	22.84
Salem et al. [62]	2022	West Africa	Mauritania	1 year	105	52 (30–69)	42.1	36.33
Ka et al. [63]	2014	West Africa	Benin	3 months	131	50.3 ± 12.2	62.9	12.1
Boima et al. [64]	2021	West Africa	Ghana	NA	687	45.5 (34–56)	63.6	29
Halle et al. [65]	2015	Central Africa	Cameroon	10 years	863	47.4 ± 14.8	66	14.7
Halle et al. [66]	2016	Central Africa	Cameroon	Average 2.7 years	97	51 ± 14	66	15.5
Halle et al. [67]	2016	Central Africa	Cameroon	10 years	661	46.3 ± 14.7	66	16.9
Sinomono et al. [68]	2021	Central Africa	Brazzaville	3 years	295	51.8 ± 15.2	59.1	22.3
Isla et al. [69]	2016	Southern Africa	South Africa	8 years	340	36.1 ± 11.9	52.1	45
Jardine et al. [70]	2020	Southern Africa	South Africa	4 years	6187	52.5 (41–63)	59.3	29.4
Molaoa et al. [71]	2021	Southern Africa	South Africa	3 years	363	40 (33–49)	56.2	11.6
Banda et al. [72]	2022	Southern Africa	Zambia	4 years	154	43 ± 14	56.5	8
Workie et al. [73]	2022	East Africa	Ethiopia	6 years	436	45 (33–55)	61.5	8
Desta et al. [74]	2023	East Africa	Ethiopia	5 years	139	35.8 ± 11.9	63.3	36.7
Mohamed et al. [75]	2022	East Africa	Somalia	1 year	135	52.7 ± 15	61.5	5.7
Rage et al. [76]	2022	East Africa	Somalia	Average 4.4 years	127	49.3 ± 12.3	66.1	24.4
Nyandwi et al. [77]	2019	East Africa	Burundi	4 years	65	52.2	86.1	21.7
Rakotoarisaona et al. [78]	2022	East Africa	Madagascar	NA	129	53.4	61.2	10.5

ESRD end-stage renal disease, NA not available

scientific evidence of unknown cause of chronic renal failure in Nigeria was reported in 1989 [51]. As of 2000, the reported prevalent numbers of patients with ESRD of unknown etiology in Nigeria ranged from 5.8 to 12% [52–54]. In one interesting study involving 127 Nigerians and 125 Caucasians, ESRD was of unknown etiology in 14% and 9% of cases, respectively [55]. The study noted that the prevalence, natural history and major etiological causes do vary from race to race and in location. In Senegal, dialysis-treated ESRD due to unknown etiology have been shown by two studies to be 14.5% and 20.3% [56, 57]. In the 2020 report of Gambian 170 patients under dialysis care over a 2-year period, unknown etiology was the second commonest cause of ESRD at 28.6%, following hypertension (42.9%) [58]. A study in Burkina Faso reported that 22.1% of 172 patients on chronic hemodialysis were due to ESRD of unknown etiology [59]. In a one-year study of 95 chronic hemodialysis patients in Togo, unknown etiology accounted for 10.5% of ESRD cases [60]. In a study of 255 patients on chronic hemodialysis during the year 2014–2020 in Ivory Coast, ESRD was of unknown etiology in 22.8% of cases [61]. In Mauritania, a study of 105 chronic hemodialysis patients showed that 36.3% of ESRD cases were due to unknown etiology [62]. In Benin, a study involving 131 chronic haemodialysis patients estimated ESRD of unknown etiology at 12.1% [63]. In Ghana, a prospective survey of 687 patients receiving dialysis estimated unknown etiology as the second common cause of ESRD at 28.5% [64].

In contrast, epidemiological data on treated ESRD due to unknown etiology in the other African regions is limited; this is likely due to low awareness of the condition. Reported ESRD of unknown etiology countries in Central Africa are Cameroon and Congo Republic–Brazzaville. In Cameroon, a study on the profile of 863 patients with ESRD covering a 10-year period reported ESRD due to unknown etiology in 14.7% of the cases [65]; while a study including 97 patients on hemodialysis estimated at 15.5% [66]. Another 10-year study of 661 Cameroonian haemodialysis patients showed an ESRD of unknown etiology of 16.9% [67]. In this study, the prevalent cases of ESRD due to unknown etiology ranged from 21.2% in 2002–2004 to 17.4% in 2011–2012, with a nadir at 9.0% in 2007–2008 and no significant difference. In Brazzaville, a 3-year study of 295 patients requiring emergency dialysis reported that 22.3% of the cases suffer from ESRD due to unknown etiology [68].

In Southern African countries, ESRD of unknown etiology cases are reported in South Africa and Zambia. In South Africa in 2016, a study involving 340 patients on chronic dialysis therapies over an 8-year period (2007–2014) showed the predomination of ESRD of unknown etiology at 45%, while stating late presentation play a

role in the disease [69]. Subsequent studies showed that 29.4% of 6187 patients starting RRT and 11.6% of the 363 patients referred for RRT access were attributable to unknown etiology, and these are patients mostly present with advanced disease and small kidneys [70, 71]. In Zambia, a 4-year study including 154 patients who started chronic dialysis at the three largest public dialysis centers reported that 8% of the ESRD cases were of unknown etiology [72].

Unknown cause of ESRD also affects East African countries such as Ethiopian, Somalia, Burundi and Madagascar. In Ethiopia, 8% of the 436 patients on chronic hemodialysis were attributable to ESRD of unknown etiology [73], while a study involving 139 hemodialysis patients estimated unknown etiology as the second commonest cause of ESRD at 36.7% [74]. In Somalia, studies involving 208 and 127 patients undergoing haemodialysis estimated ESRD due to unknown etiology to account 5.7% and 24.4% of all causes, respectively [75, 76]. In a 4-year study of 65 patients on chronic hemodialysis in Burundi, ESRD of unknown etiology was reported in 21.7% of cases [77]. In a study involving 129 chronic hemodialysis patients from five dialysis centers in Antananarivo Madagascar, ESRD was of undetermined etiology in 10.5% of the cases [78].

Characteristics of affected population

The reported prevalent numbers of patients with ESRD of unknown etiology in the region vary by age, gender or residence status in a statistically significant manner ($P < 0.05$). Studies have shown that young adults are disproportionately affected by ESRD due to unknown etiology. In Sudan, the majority of the affected patients were younger than 40 years, twofold higher than in the older age groups [35, 36]. In Libya, ESRD due to unknown etiology was 2.3-fold higher in patients younger than 50 years than in patients 50 years or older [43], while in Somalia it was 3.4-fold higher [76]. In Cameroon, the affected patients were younger than 50 years (19.8% vs 9.8%) and mostly unemployed [65]. In Algeria, these rates were up to 1.9-fold higher in patients younger than 65 years [47]. Studies have also shown a preponderance of male patients with ESRD due to unknown etiology. In Egypt, prevalent ESRD because of unknown etiology was up to 5.4-fold higher in males than in females [37, 40]. In Libya, ESRD due to unknown etiology in males (12.2%) was 1.7-fold higher than in females (7.1%) [43].

Data from Egyptian studies revealed that treated ESRD due to unknown etiology was up to 5.4-fold higher in the rural than in the urban residents [37, 38]. People who live in rural areas were also at 2.4-fold higher risk of developing ESRD of unknown etiology than those living in urban areas [79]. The high rates of ESRD attributed to unknown

etiology among rural communities might be ascribed to predisposition to farming with pesticides exposure and contaminated drinking water and food [37]. Indeed, people with a history of exposure to pesticides and drinking unsafe water were, respectively, reported to be at 2.1 and 2.8-fold risks of developing ESRD of unknown etiology [79]. According to the studies, people living in rural areas and those with lower socioeconomic status, lower educational status and limited health care facilities may have higher risk of etiology unknown ESRD that may be attributed to environmental factors. Other factor that provoke greater risk was use of different types of herbs for traditional treatments, which was higher in the rural areas [79].

Finally, patients with a family history of renal disease have been identified as the main group affected by ESRD with unknown etiology. In the Egyptian study, subjects with a family history of renal failure had a greater than threefold higher risk of ESRD of unknown etiology compared to those without such a family history [79]. In Libya, about 20.2–24.3% of the patients with ESRD of unknown etiology had a positive family history of renal failure [45, 46]. This suggests familial aggregation of the disease and that close relatives of ESRD of unknown etiology patients may benefit from directed screening and preventive efforts.

ESRD of unknown etiology in children

The prevalence of pediatric ESRD in Africa is on the rise and associated with poor outcome [22, 80, 81]. Primary causes of ESRD in children differ from those that are responsible for the adult onset of the disease. Although the spectrum of renal diseases in children in the continent may be similar to those of children in other regions of the world, there are unique features that bear material impact on the course of childhood ESRD in the continent [81]. Indeed, a recent review noted that in contrast to congenital anomalies of the kidneys and urinary tract as the leading cause of ESRD in children in Europe and

North America, glomerular disorder is the frequently reported causes of childhood ESRD in the continent [82]. But, the lack of a comprehensive pediatric renal registry in most African countries makes it difficult to obtain accurate estimates about the underlying etiology of ESRD in children.

Data from a Libyan study of 76 children on maintenance dialysis over 11-years (2006–2016) revealed that 52.6% of the ESRD cases were due to unknown etiology [83]. In Egypt, a study among children on regular hemodialysis for more than 1 year estimated an ESRD of unknown etiology of 23.3% [84]. In recent studies including 67 and 74 Egyptian children on maintenance hemodialysis, ESRD of unknown etiology accounted for 24% and 31.1% of all cases, respectively [85, 86]. In a 5-years study of 205 children with chronic renal failure at a tertiary pediatric nephrology in Sudan, unknown etiology was estimated at 39.1%, and patients present with small kidneys size [87]. The study further noted the pattern of late referrals and lack of intensive imaging modalities could play a role. In a study of Tunisian infants with ESRD who presented to the pediatric nephrology unit over 15 years (1998–2013), unknown etiology accounted for 12.5% of cases [88]. In Nigeria, a review of children on haemodialysis seen over a 3-year period reported ESRD of unknown etiology to be 20.0% [89]. In a study of South African children undergoing chronic dialysis, unknown ESRD etiology was reported in 3.7% of cases [90] (Table 2). If confirmed, these results would suggest the possibility that unknown etiology of ESRD may be occurring at an early age in the region.

Outcome with ESRD of unknown etiology

Studies have shown that patients receiving RRT are at increased risk of mortality when the etiology of their ESRD is unknown, apparently because this group mainly includes patients who present late with advanced disease who have not had the benefit of pre-ESRD specialist care. In South Africa, compared to patients with hypertension

Table 2 Summary of studies reported on dialysis-treated ESRD of undetermined etiology among children

Author	Year	Region	Country	Study period (duration)	N	Mean age (years)	Male (%)	Prevalent (%)
Sauod et al. [83]	2017	North Africa	Libya	11 years	76	8.5 ± 3.8	60.5	52.6
Hasan et al. [84]	2021	North Africa	Egypt	Average 3.4 years	29	13.5 ± 3	53.3	23.3
Moawad et al. [85]	2022	North Africa	Egypt	NA	67	13.6 ± 3	61	24
Youssef et al. [86]	2023	North Africa	Egypt	NA	74	13.5 ± 4	41.5	31.1
Ali et al. [87]	2009	North Africa	Sudan	5 years	205	9.8 (1–17)	60.5	39.1
Jellouli et al. [88]	2016	North Africa	Tunisia	15 years	24	0.7 (0.5–1.8)	66.6	12.5
Obiagwu et al. [89]	2012	West Africa	Nigeria	3 years	20	12 (6–15)	50	20
Obiagwu et al. y[90]	2018	Southern Africa	South Africa	NA	27	14.4 ± 4.8	51.9	3.7

ESRD end-stage renal disease, NA not available

as their ESRD cause, patients undergoing RRT with ESRD of unknown etiology have a twofold risk of mortality, while patients with diabetic ESRD did not have a significant difference in mortality [70]. In Cameroon, early mortality after the start of RRT was as high as 99% in patients with ESRD of unknown etiology compared to those with hypertensive ESRD [67]. Authors suggested that patients with ESRD of unknown etiology are more likely to carry a high burden of comorbidities, some of which on their own are highly fatal regardless of RRT. A mortality rates of 83% during a 1-year period have been also reported in Malawian children with ESRD of unclear etiology, and these were patients who presented with a much lower eGFR than other groups [91]. Additional studies are needed to increase our understanding of the increasing contribution of the problem in the African countries.

ESRD due to unknown etiology accounts for the largest fraction of the renal medical admissions burden. In Nigeria, a review of renal cases admitted over a 13-years period revealed that 51.6% of the patients were admitted on account of ESRD of unknown etiology [92]. A 5-year study of 1789 patients admitted to the nephrology and dialysis service in Brazzaville showed that 55.1% of admissions for ESRD were due to unknown etiology [93]. Of 712 chronic renal failure patients hospitalized in hemodialysis unit and cardiology service in Chad, 30.6% were of unknown etiology [94]. In a 6-year study of 384 chronic renal failure patients in adult internal medicine services in Senegal, 34.2% of the renal admissions were attributable to unknown etiology [95]. Other studies in Nigeria, Cameroon, Gambia and Ghana have also reported that 12.3–17.3% of all renal medical admissions and a mortality of 15% were attributable to ESRD of unknown etiology [52, 65, 96–99]. High medical admissions for ESRD due to unknown etiology adds an additional load onto the substantial healthcare burden and places a huge economic burden on the patients and families, including the cost of ESRD management. Indeed, patients who were hospitalized spent 50% more on their hemodialysis than not hospitalized patients [100]. Therefore, the presence of ESRD of unknown etiology identifies the subset of dialysis population in whom intervention might be most beneficial and economically attractive.

Despite the patients with ESRD of unknown etiology had the highest complexity in terms of the burden of comorbidities, rate of death and renal-related hospitalization, there is a dearth of published data regarding health-related quality of life of treated ESRD because of unknown etiology. The only study that estimated the quality of life associated with etiologies of ESRD demonstrated dialysis patient with ESRD of unknown etiology

to have a significantly lower quality of life score compared to patient with diabetes and hypertension as their etiologies of ESRD [101].

Conclusion

Based on the existing evidence, it is well established that treated ESRD due to unknown etiology is a major public health issue in Africa, accounting for up to 71% of the prevalent cases of ESRD in adults and up to 53% in children. ESRD of unknown etiology is a major economic issue for the region, as it affects mostly young adults in their economically productive age, males and the poor in rural areas. The public health impact of ESRD due to unknown etiology is significant, with a substantial increase in mortality and a larger contribution to the renal admission burden, which might be catastrophic financial burden to the society and healthcare systems. ESRD of unknown etiology is therefore a condition that African countries cannot afford to ignore, and these results should attract policy attention and potentially form the basis to review current approach to ESRD care in Africa. There is an urgent need for epidemiological studies for better characterizing regional causative factors as well as for developing proactive and comprehensive approaches to prevent and treat this under-recognized fatal disease. Provision of a more comprehensive public health strategy and better care plan for this complex disease should be achieved by future international collaborative efforts and research.

Abbreviations

CKD	Chronic kidney disease
ESRD	End-stage renal disease
LMICs	Low- to middle-income countries
RRT	Renal replacement therapy

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