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ORIGINAL ARTICLE

The Ghana Renal Registry – a first annual report

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ABSTRACT

There are few data on the treatment of kidney disease in sub-Saharan Africa and no formal reports of kidney replacement therapy (KRT) in Ghana. We report data from the newly established Ghana Renal Registry on the prevalence, causes, and modality of treatment of kidney disease in Ghana. Using the web-based data capture system of the African Renal Registry, data were obtained for patients who had KRT in Ghana between January and December 2017. A total of 201 patients started KRT, giving an incidence rate of 6.9 per million population (pmp). There were 687 patients on KRT, a prevalence rate of 23.6 pmp. The median age of prevalent patients was 45.5 years and 63.6% were male. Hypertensive kidney disease was the most common primary kidney disease, reported in 39.9%. The overwhelming majority of patients (96.2%) were treated with haemodialysis, 3.5% had a kidney transplant, and only two were on continuous ambulatory peritoneal dialysis. The incidence and prevalence of KRT-treated kidney failure in Ghana is low, and the patients are younger than those on KRT in high- and upper-middle-income countries. The major cause of kidney failure is hypertensive kidney disease and the vast majority of the patients are treated with haemodialysis.

Keywords: end-stage kidney disease; kidney failure; renal registry; kidney replacement therapy; Ghana.

INTRODUCTION

The increasing prevalence of non-communicable diseases combined with a high prevalence of communicable diseases threatens the lives of many people in sub-Saharan Africa (SSA) and is likely to overwhelm the already inadequate health budgets of most African countries. Chronic kidney disease (CKD) is common in SSA, with systematic reviews estimating the prevalence in adults to be between13.9% and 15.8% [1,2]. In Ghana, the CKD prevalence is comparable at 13.3% [3]. Patients with CKD are at increased risk of developing kidney failure as well as cardiovascular disease, which is associated with increased morbidity and mortality.

There are few data on the incidence of kidney failure in SSA, but one study estimates this to be 239 per million population (pmp) in patients with diabetes mellitus and hypertension [4]. Most Africans who develop kidney failure are not able to access chronic dialysis and transplantation services. According to a recent systematic review, approximately half of the patients so affected had at least one dialysis session, but only 10% were able to continue dialysis beyond three months and only 1% continued dialysis for one year [5].

The major causes of kidney failure in Africa include hypertensive kidney disease, glomerulonephritis, diabetes, and HIV infection [6-10]. Renal registries that provide data on the burden of kidney failure, its treatment modalities and outcomes are critical to the planning and delivery of effective services for KRT. With the exception of

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South Africa [11], there are few active renal registries in Africa. To address this deficiency, the African Association of Nephrology (AFRAN), at its 2013 Congress in Accra, Ghana, took the decision to establish a renal registry for Africa. The African Renal Registry was formally established at a workshop held just before the World Congress of Nephrology in Cape Town, in 2015 [12]. Arising from this initiative, the Ghana Renal Registry was established in 2016 and here we report its first set of data, from 2017.

METHODS

This was a prospective survey of all patients on KRT in Ghana between 1 January and 31 December 2017. We used the web-based data capture platform of the African Renal Registry, developed by the South African Renal Registry [12], which resides on a Windows 10 server, runs Windows Internet Information Services (IIS) and uses HyperFileSQL as its relational database engine. Data capturers interface with the database via user-friendly web pages. Password protection ensures that treatment centres have access to their own data only. Data files are backed up daily and the full registry application is backed up weekly. Quality control is built into the system through logical checks, form field validation, and the use of controls such as checkboxes, radio buttons and drop-down lists, and limiting the number of fields which allow the entry of free text.

The following core data were collected on each patient: region, dialysis centre, unique identification number and name, date of birth, sex, ethnicity (tribe), primary kidney disease, date KRT started, first modality of treatment, current modality, sector (private or public), diabetes mellitus status (non-diabetic, type 1 or 2 diabetes mellitus, post-transplant diabetes mellitus), hepatitis B, hepatitis C, and HIV status. The African Renal Registry uses the latest set of diagnostic codes of the ERA–EDTA Registry [13]. Data were extracted from patient records and entered directly into the registry.

Numerical data have been summarised using means and standard deviations if normally distributed, and medians and interquartile ranges (IQR) if not. Counts and pecentages have been used for categorical data. In keeping with the descriptive nature of this report, statistical tests for differences between groups have not been performed.

Ethics approval, including a waiver of individual informed consent, was obtained from the Ghana Health Service Research Ethics Committee.

RESULTS

Ghana in 2017

Ghana is a lower-middle-income country and had a gross national income per capita for 2017 by the Atlas method (current US$) of $1 890 and by the purchasing power parity (PPP) method (current international US$) of $4 860 [14]. The Ghanaian health system includes public institutions under the Ghana Health Service, teaching hospitals which are controlled by the Ministry of Health, and several private health centres mostly situated in the urban areas. The population in 2017 was estimated at 29.1 million [15]. Of the 16 regions in Ghana, most of these hospitals and health centres are located in two main regions (greater Accra and Ashanti), where most patients with kidney disease receive their care.

Treatment centres

Only five of the 16 regions in Ghana have dialysis centres, namely Greater Accra, Ashanti, Northern, Central and the Volta Region (Figure 1). Seven treatment centres out of a total of nine which were operating in 2017 contributed data for this report; four in the public healthcare sector and three in the private sector. These centres reported on all patients under their care in 2017. The two centres that did not submit data had a total of fewer than 50 patients on dialysis. The omission of data from these units gives at most a 7.3% variation in the incidence and prevalence data presented in this report. Most patients (83.4%) were treated in public sector centres. All trained nephrologists are in two teaching hospitals and have oversight responsibility for some of the dialysis centres.

Incidence and prevalence of kidney replacement treatment

There were 201 patients who started KRT for the first time in 2017, an incidence rate of 6.9 pmp. The total number of patients on KRT in 2017 was 687, a prevalence of 23.6 pmp.

Treatment modality

Of the patients on KRT, 661 (96.2%) were on haemodialysis, and only two patients were being treated with peritoneal dialysis (0.3%). There were 24 patients (3.5%) with a functioning kidney transplant.

Demographics

The sex distribution of the patients on KRT reflected a male predominance (63.6%). The prevalence was 30.6 pmp in males and 16.4 pmp in females. Patients were

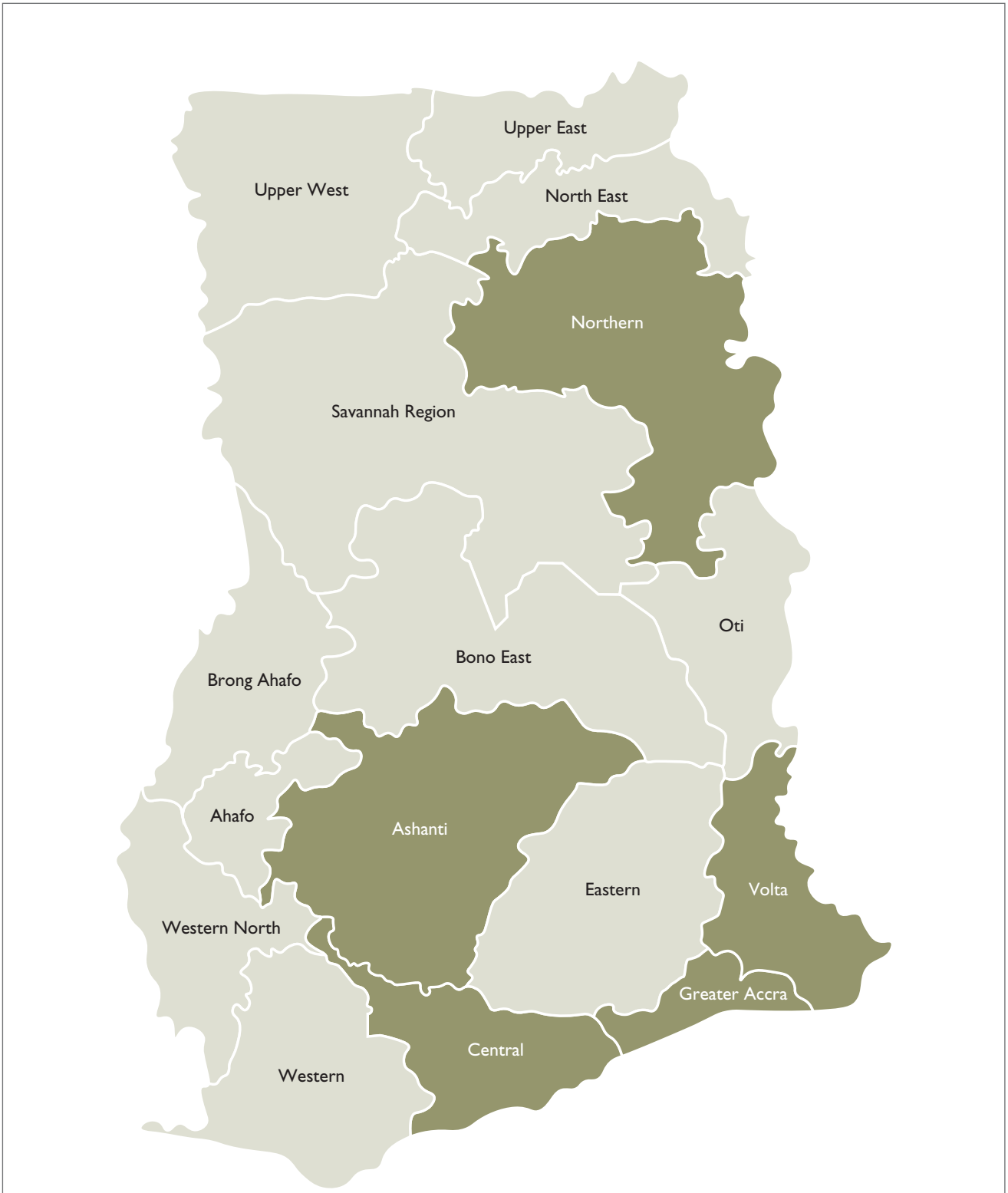

Figure 1. Map of Ghana showing the sixteen regions and the five regions (dark shaded areas) with dialysis centres.

generally young, with a median age of 45.5 years (IQR 33.6–55.6 years). The age distribution is shown in Figure 2. Female patients were younger than their male counterparts, with median ages of 41.6 years (IQR 29.1–54.6 years) and 46.8 years (IQR 37.2–56.4 years), respectively. The median age of patients treated in private sector units (51.5 years, IQR 39.8–61.0 years) was higher than in patients in the public sector units (43.8 years, IQR 32.9–54.6). The median duration of time on dialysis was 25.4 months with an interquartile range of 10.5–44.5 months.

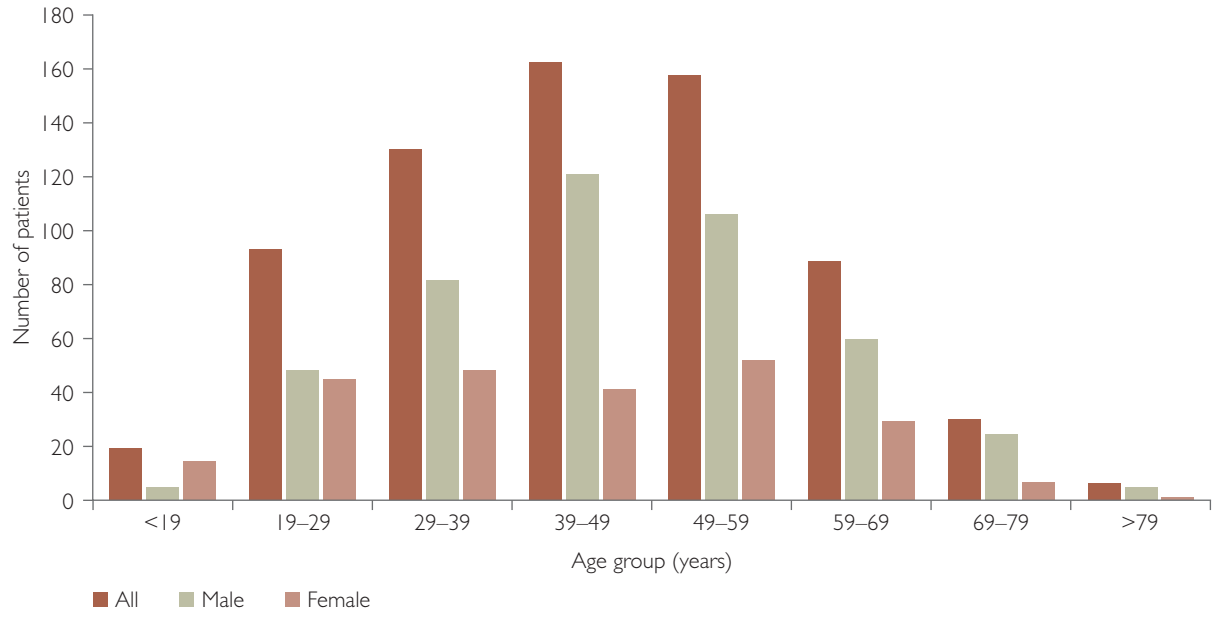

Figure 2. Age and sex distribution of Ghanaian patients on kidney replacement therapy in 2017.

Table 1. Causes of kidney failure in patients receiving kidney replacement therapy in Ghana.

Cause	Male No. (%)	Female No. (%)	All No. (%)
Hypertensive kidney disease	187 (42)	73 (31)	260 (38)
Diabetic nephropathy	34 (8)	29 (12)	63 (9)
Glomerulonephritis	29 (6)	24 (10)	53 (8)
Uncertain or not stated	133 (30)	63 (27)	196 (29)
Cystic kidney disease	3 (1)	2 (1)	5 (1)
Obstruction or reflux disease	4 (1)	3 (1)	7 (1)
Sickle cell disease	0	2 (1)	2 (0)
SLE*	0	3 (1)	3 (0)
HIV	20 (4)	6 (3)	26 (4)
All others	41 (9)	31 (13)	72 (11)
Total	451	236	687

*Abbreviations: SLE, systemic lupus erythematosus; HIV, human immunodeficiency virus.

Causes of kidney failure

The most common cause of kidney failure (Table 1) was hypertensive kidney disease, reported in 37.8%, followed by kidney failure of uncertain cause in 28.5%, diabetic nephropathy in 9.2%, and glomerulonephritis in 7.7%. HIV infection was present in 3.8% of the patients, 3.9% were hepatitis B surface antigen positive, and 0.8% were hepatitis C antibody positive.

DISCUSSION

In 2017, the incidence rate of patients starting KRT in Ghana was 7 pmp, which was much lower than the rate of 26 pmp reported in South Africa [8] and 127 pmp in Europe [16]. The prevalence of KRT in Ghana was 24 pmp and again this was much lower than the 183 pmp reported from South Africa [8] and the 854 pmp reported from Europe [17]. The low rates of KRT in Ghana are likely to reflect the situation in many African countries where

inadequate resources for health care limit the provision of KRT. Most Ghanaian patients with kidney failure pay out of pocket for dialysis, putting KRT out of reach for most patients. Using data on the prevalence of diabetes and hypertension, Anand and colleagues have modelled the incidence of kidney failure in SSA, estimating it at 239 pmp [4]. In Ghana, this would translate into a substantial shortfall, with only 2.9% of patients needing KRT being treated.

It is not clear why many more males than females received KRT. We speculate that this may be because women are disadvantaged in terms of accessing KRT in Ghana, although we have no evidence to support this. Alternatively, fewer women may develop kidney failure in Ghana. Future studies will examine these possibilities. Similarly, more males than females started KRT in the United Kingdom in 2016 (males 62.9%) [18], South Africa (59.2 %) [8] and Europe (62%) [17]. A review by Carrero et al. in 2018 speculated that the protective effect of oestrogen on kidney function in women and the damaging role of testosterone in men might account for the higher proportion of men starting dialysis [19]. Further reasons are an unhealthy lifestyle in men and also that elderly women tended to choose conservative treatment more readily than men [19].

The patients on KRT in Ghana are young individuals, and even younger than reported from South Africa (median age of 45.5 versus 51.5 years) [8]. They are much younger than the average age of patients in the United Kingdom (64.3 years) [18] and Europe (63.1 years) [17]. Kidney failure in Ghana is thus a disease of young, economically active people. Females on KRT were significantly younger than males; the reasons for this are unclear.

The principal reported cause of kidney failure was hypertensive kidney disease, followed by diabetes and glomerulonephritis. In Ghana, the prevalence of hypertension has risen from 4% in rural areas and 13% in urban areas in the 1970s, to 24–27% and 33% in the 2000s, respectively [20]. Osafo et al. reported an overall CKD prevalence in Ghanaian patients with hypertension of 47% [21]. The high prevalence of hypertensive kidney disease we are reporting in patients on KRT is comparable to that of South Africa (35%) [8] and other African regions (17–35%) [6, 7, 22, 23] but much higher than the 6% reported by the UK Renal Registry [18]. The ERA–EDTA Registry reported that 12% of prevalent patients had hypertensive kidney disease [16]. In 1993, we reported an autopsy study in which hypertensive kidney disease was the cause of kidney failure in 49% of cases [24].

We now know that two apolipoprotein L1 (APOL1) susceptibility gene variants (G1 and G2) are associated with hypertension-attributed CKD, focal segmental glomerulosclerosis and HIV-associated nephropathy in individuals of African ancestry [25-28]. The currently available evidence suggests that many patients with "hypertensive kidney disease" may have undiagnosed glomerular disease with secondary hypertension, rather than kidney disease resulting from primary hypertension [29].

Our report identifies diabetes mellitus as another major cause of kidney failure in Ghana. Interestingly, there were no cases of diabetic nephropathy reported in the autopsy series from 1993 [24]. Other studies from SSA also report diabetic nephropathy as an important cause of kidney failure in 4% to 15% of cases [6-8,10,22]. The prevalence of diabetes in Ghana has increased from less than 1% in the 1960s [30] to 6% in the 2000s [31]. The same pattern is seen in other African countries [32].

Glomerulonephritis was reported as the cause of kidney failure in 8% of our cases, lower than expected. We previously demonstrated histologically proven glomerulonephritis, mostly focal segmental glomerulosclerosis, in 42% of patients in the 1993 autopsy study [24]. The low prevalence of glomerulonephritis in the present study is probably because most patients presented late, with advanced CKD, and did not have a kidney biopsy. A high proportion of our patients therefore have kidney failure of uncertain aetiology. Future registry reports will analyse these patients in more detail. HIV infection was found in 4% of our patients; in contrast, in 1993, there were no cases of HIV recorded in our autopsy study. The national prevalence of HIV infection in Ghana in 2017 was 2% [33].

Limitations and challenges

For this first round of data collection, data were available from only seven of the nine dialysis units. Almost all patients presented late and required dialysis treatment on admission. This made it difficult to ascertain the cause of kidney failure reliably. The cause of the kidney failure was based on the clinical assessment of the attending physician as there were very few biopsies done. We did not analyse laboratory data for this report and do not yet have sufficient follow-up data to comment on survival and prognosis.

CONCLUSIONS

This first report of the Ghana Renal Registry provides much-needed data on the treatment of kidney failure in Ghana. Subsequent reports will include coverage of a greater number of regions and will report on important outcomes such as patient survival.

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