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Clinical and demographic profile of end stage kidney disease hemodialysis patients at University Teaching Hospital of Kigali

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ABSTRACT

BACKGROUND: End stage kidney disease (ESKD) has become a major public health problem and is associated with considerable co-morbidity and mortality. In Rwanda, the extent and the distribution of ESKD have not been reported despite provision of dialysis services. This paper describes the clinical and demographic characteristics of ESKD patients in at a tertiary referral hospital in Rwanda.

METHODS: This was a retrospective descriptive study of ESKD hemodialysis patients treated at a tertiary referral hospital from January 2014 to December 2017, start of hemodialysis services to date. Demographic and clinical data were obtained regarding all eligible patients treated. Descriptive statistics were reported using frequency and percent for categorical data; median and Interquartile range (IQR) for continuous data. Analysis of survivors versus non-survivors was performed using Chi-square test for categorical variables and Wilcoxon rank sum test for continuous, nonparametric variables.

RESULTS: Over a three-year period, there were 64 patients with ESKD. Median age was 48 years (IQR: 35 to 57.5) and 42 (66%) were male. Edema (n=50, 78%) and anuria (n=40, 63%) were the most common presenting symptoms. Underlying comorbidities of ESKD included hypertension (n= 50, 78%), diabetes (n=24, 38%). Urea (n=52, 81%) and creatinine (n=57, 89%) were elevated in most patients.

CONCLUSION: ESKD is a the leading cause of hemodialysis in young adults who would otherwise be contributing to the national development. It is a challenging to clearly establish etiologies as the majority present with more than one comorbidity. Hence healthcare providers should be proactive in prevention and prompt management of chronic kidney disease.

Keywords (MeSH): Hemodialysis; Kidney disease; Rwanda; End stage kidney disease; Kigali University Teaching Hospital

INTRODUCTION

Chronic kidney disease (CKD) is an emerging global public health problem and a component of a new epidemic of chronic conditions [1]. Diabetes mellitus and hypertension account for the largest percent of cases (71.2%) followed by glomerular diseases (7.2%) [2]. The final stage of chronic kidney disease is end-stage kidney disease (ESKD). ESKD has become a major public health problem and is associated with considerable co-morbidity and mortality [1, 3]. The need for renal health care and renal replacement therapy (RRT) is increasing, however low and middle income countries hardly afford to meet the needs of all patient [4]. Maintenance dialysis therapy is the commonest mode of renal replacement therapy and demand for this service is increasing progressively worldwide [3].

More than 4.9 million people worldwide needed RRT with only 2.6 million people receiving treatment [5]. The greatest gaps in RRT

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coverage occur in low-income countries, particularly Asia and Africa [5, 6]. There are a wide range of factors impacting the availability of RRT in low-income countries, including resources, staff, and governmental support [6]. It is estimated that the prevalence of ESKD in Sub-Saharan Africa where Rwanda is located is 100 cases per million people [7]. There are no exact figures on the prevalence of kidney failure in Rwanda due to paucity of related published papers.

Rwanda is a densely populated low-developed country but it has a high prevalence of risk factors for CKD such as diabetes, hypertension and obesity [8]. Socioeconomic and environmental transformation has contributed to people tending to adopt a sedentary life [9]. Rwanda is among the first countries in the region to establish insurance covered access to dialysis therapy for patients with acute kidney injury, however not all insurances are able to support patients for maintenance dialysis in ESKD patients [2]. Health care administrative bodies have continued to expand dialysis services in terms of geographic coverage and capacity to cope with increasing demand. Kidney transplantation in Rwanda is limited by a shortage of nephrologists, full-time transplant surgeon and sufficient laboratory facilities for tissue-typing [3]. In addition, although it has not been studied, there might be cultural barriers about cadaveric kidney donation but also the Rwandan communities are not sensitized about kidney donation policies because there is no established transplant system [4]. Thus, the majority of patients with ESKD remain dialysis-dependent.

Study objective: Data regarding the epidemiology of ESKD and hemodialysis treatment in Rwanda are scarce. The etiology of ESKD in Rwanda has also not been reported. The purpose of this study is to develop a comprehensive description of the clinical and demographic profile for dialysis-treated ESKD at a tertiary referral hospital in Rwanda.

METHODS

Study design: This is a retrospective chart review of all patients with ESKD receiving treatment at the University Teaching Hospital of Kigali (Centre Hopitalier Universitaire de Kigali, CHUK) dialysis unit over a three-year period (January 2014 – December 2017).

Study site: CHUK is a public tertiary referral hospital that is located at the center of Kigali city, which is a cosmopolitan city and receives patients from all over the country and from neighboring countries. The dialysis unit has been fully functional since 2014 and it has been receiving and managing patients from the catchment area of CHUK and beyond.

Study population: Patients were identified through the dialysis unit register and files obtained from the archives department. All patients with a diagnosis of ESKD requiring hemodialysis were included in the study. Patients with ESKD (CKD stage 5) based on physician documentation were enrolled in the study.

Data collection instrument: Data was extracted from paper charts and included demographic and clinical characteristics. Data were collected using a predesigned data collection tool after piloting it. The data was entered into Microsoft Excel database and analyzed using STATA 13.0 (College Station, TX).

Statistical analysis: Descriptive statistics are reported with frequencies and percentages for categorical variables and medians and interquartile ranges (IQR) for continuous variables. Analysis of survivors versus non-survivors was performed using Chi-square test for categorical variables and Wilcoxon rank sum test for continuous, nonparametric variables.

Ethical considerations: This study was approved by the CHUK Ethics Committee. As this was a retrospective study of patient files, informed consent was waived.

RESULTS

Over a three-year period, there were a total of 157 patients who underwent dialysis at the CHUK dialysis unit. Of these, 64 patients with

Table 1: Patient demographic and clinical characteristics (n=64)

	Variable	n (%)
Gender	Male	42 (66)
	Female	22 (34)
Province	North	3 (5)
	South	4 (6)
	East	7 (11)
	West	9 (14)
	Kigali	40 (63)
	Other	1 (2)
Symptoms	Edema	50 (78)
	Anuria	40 (63)
	Nausea, vomiting	17 (27)
	Shortness of breath	7 (11)
	Fatigue, weakness	10 (16)
Comorbidities	Hypertension	49 (77)
	Diabetes mellitus	24 (38)
Social history	Alcohol	35 (55)
	Tobacco	32 (50)
Vital signs	Hypotension	10 (14)
	Tachycardia	10 (14)
Laboratory*	Elevated urea	52 (81)
	Elevated creatinine	57 (89)
	Elevated SGOT	29 (45)
	Elevated SGPT	28 (44)
	Elevated GGT	34 (55)
Imaging*	Abnormal Renal US	58 (91)
	Abnormal EKG	41 (64)
Time on dialysis	<1 year	12 (19)
	1-2 years	22 (34)
	2-3 years	17 (27)
	3-4 years	11 (17)
	>4 years	2 (3)

**** SGOT** = serum glutamic-oxaloacetic transaminase; **SGPT** = serum glutamic pyruvic transaminase;* **GGT** *= gamma glutamyl transferase;* ***US** = ultrasound;* **EKG** *= electrocardiogram*

ESKD were managed at the CHUK hemodialysis unit. Median age was 48 years (IQR: 35 to 57.5) and 42 (66%) were male (Table 1). Most (n=40, 63%) patients were from Kigali. Edema (n=50, 78%) and anuria (n=40, 63%) were the most common presenting symptoms. Etiologies for ESKD included hypertension (n=50, 78%), diabetes (n=24, 38%), and uremic encephalopathy (n=4, 6%). Tobacco (n=32, 50%) and alcohol (n=35, 55%) use were common. Urea (n=52, 81%) and creatinine (n=57, 89%) were elevated in most patients.

Table 1: Patient demographic and clinical characteristics (n=64)

		Survivors N=47	Non-survivors N=17	p-value
Age, years*		47 (33, 60)	50 (40, 53)	0.681
Gender	Male	28 (60)	14 (82)	0.090
	Female	19 (40)	3 (18)	
Province	North	1 (2)	2 (12)	0.638
	South	3 (6)	1 (6)	
	East	5 (11)	2 (12)	
	West	6 (13)	3 (18)	
	Kigali	31 (66)	9 (53)	
	Other	1 (2)	0	
Symptoms	Anuria	27 (57)	13 (76)	0.165
	Edema	37 (79)	13 (76)	0.847
	Nausea, vomiting	10 (21)	7 (41)	0.111
	Shortness of breath	6 (13)	1 (6)	0.436
	Fatigue, weakness	8 (17)	2 (12)	0.609
Comorbidities	Diabetes mellitus	18 (38)	6 (35)	0.826
	Hypertension	36 (77)	13 (76)	0.992
Social history	Alcohol	24 (51)	11 (65)	0.333
	Tobacco	21 (45)	11 (65)	0.335
Vitals	Hypotension	7 (15)	3 (18)	0.789
	Tachycardia	4 (9)	0	0.214
Laboratory**	Elevated urea	36 (77)	16 (94)	0.113
	Elevated creatinine	40 (85)	17 (100)	0.092
	Elevated SGOT	22 (47)	7 (41)	0.689
	Elevated SGPT	21 (45)	7 (41)	0.803
	Elevated GGT	26 (57)	8 (50)	0.652
Imaging**	Abnormal Renal US	41 (87)	17 (100)	0.122
	Abnormal EKG	28 (60)	13 (76)	0.213
Time on dialysis	<1 year	7 (15)	5 (29)	0.375
	1-2 years	15 (32)	7 (41)	
	2-3 years	13 (28)	4 (24)	
	3-4 years	10 (21)	1 (6)	
	>4 years	2 (4)	0	

**** Continuous variables reported as medians** (interquartile range). Statistical significance determines using Wilcoxon rank sum test. **** SGOT** = serum glutamic-oxaloacetic transaminase; **SGPT** = serum glutamic pyruvic transaminase; **GGT** = gamma glutamyl transferase; **US** = ultrasound;* **EKG** *= electrocardiogram*

An internist managed all patients in the dialysis unit. Median duration of dialysis was 694 days (IQR: 480, 1052). Two (3%) patients received a renal transplant and 17 (27%) patients died. Most patients (n=62, 97%) remained on hemodialysis.

There was no significant difference in characteristics between survivors and non-survivors (Table 2). The median duration of dialysis for survivors was 791 days (IQR: 496 to 1146) and the median duration of dialysis for non-survivors was 587 days (IQR: 292 to 868) (p=0.069).

DISCUSSION

The overall prevalence of ESKD in Rwanda is unknown. All patients receiving dialysis in this study were adult, with no children receiving dialysis for ESKD during this time period. Globally, children, adolescents, and young adults constitute less than 5% of the ESKD population and their 10-year survival ranges from 70-85% [10]. Their mortality rate is 30 times higher than their healthy peers [10, 11].

The leading causes of ESKD in our population were diabetes and hypertension, which is similar to other studies. In Libya, the most common cause of ESKD was diabetes (27%). Other common etiologies included glomerulonephritis (21%), hypertensive nephropathy (15%) and congenital or hereditary disease (12%) [3]. Generally, the prevalence of diabetes in Middle-Eastern region is high according to the International Diabetes Federation [12, 13]. Congenital and hereditary kidney disease accounted for a significant minority of ESKD in both prevalent and incident patients [14-16].

While there were no patients with diagnosed glomerulonephritis in this study, other studies report glomerulonephritis as a common cause of ESKD. The studies done in other countries found the following data on prevalence of glomerulonephritis with regard to etiology of ESKD: China and Kuwait of approximately 35%, Costa Rica (30%), Yemen (25%), Qatar (13%), Sri Lanka (12%), and Pakistan (10%) [18-26]. The low prevalence of glomerulonephritis in this study requires further investigation, but is likely secondary to the shortage of facilities able to perform renal biopsies and histology. Our study also identified that a substantial proportion of ESKD was attributed to hypertension but it is unclear what proportion of this represented hypertension secondary to primary renal disease.

The outcomes from this study were similar to other reports from sub-Saharan Africa. During the study period, 27% of our patients died. This is similar to other sub-Saharan African studies where 496 (16%) of 3197 adults in prevalent ESKD cohorts died or were presumed to have died [27]. This high mortality rate is likely to be due to the fact that patients with ESKD have other comorbidities but also their poor adherence due to the cost and other reason as seen in the study of Mukakarangwa et [28]. Only 2 (3%) patients in this study received renal transplants, which is similar to other sites in sub-Saharan Africa where 41 (1%) of 4483 adults in incident ESKD cohorts received transplants [27]. The low rate of renal transplant in Rwanda is due to the lack of renal transplant program in Rwanda. Only few patients who can afford the cost of

transplant abroad benefit from that modality of treatment. In addition, there may be limited awareness of transplant as an option and the cultural acceptance of transplant is poorly understood in the Rwandan context.

Study limitations: This study has several limitations. This is a small sample size from a single institution over a three-year period. However, as a tertiary referral hospital that serves a catchment area for a large proportion of the Rwandan population, we feel that this is fairly representative of the dialysis-dependent ESKD population in Rwanda. Further studies should compare ESKD in all Rwandan referral hospitals with dialysis units. The dialysis unit at CHUK is relatively new so we anticipate the demographics and etiology of ESKD may vary over time as this unit becomes more robust. This is a retrospective chart review which is limited by data recorded in the file. As such, the paper charts rarely reported specific values for laboratory parameters or radiology studies. Rather, the files reported nonspecific values such as "elevated", which limits further analysis. This study only included patients with ESKD receiving dialysis.

There are likely many patients with ESKD who are unable to get dialysis at CHUK for various reasons and therefore this study does not capture the complete picture of ESKD in Rwanda. However, this study does provide initial data on demographics and outcomes of patients with dialysis treated ESKD at a tertiary referral hospital in Rwanda. We recommend further prospective studies that would include all national dialysis units and other ESKD patients who are not able to come in dialysis for different reason to further characterize some aspects which are not taken here.

CONCLUSION

ESKD is a leading cause of hemodialysis treated patients in CHUK in young adults who would otherwise be contributing to the national development. It is a challenge to clearly establish its etiologies as the majority present with more than one comorbidity. Hence Rwanda health system should be proactive in prevention and establishing different and affordable renal replacement therapy to reduce mortality and morbidity associated with ESKD.

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