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Original Research Article

Severity and clinical causes of chronic kidney disease among outpatients from selected hospitals in Nairobi County, Kenya

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ABSTRACT

Background: Chronic kidney disease (CKD) is a worldwide public health issue with high prevalence (8% and 16%) among adults. The severity of CKD and associated clinical features are less characterized in Kenya. We set to determine severity and clinical features of CKD among outpatient attendees in selected hospitals in Nairobi county.
Methods: In this hospital based analytical cross-sectional study design, we collected data from Kenyatta National Hospital (KNH), Aga Khan University Hospital (AKUHN) and Mater Misericordiae Hospital. We recruited 336 adult CKD outpatients aged 18 years and above attending nephrology clinics between January and July, 2020 using a simple random sampling. A self-administered questionnaire was used to collect social-demographic data while data on severity and clinical features were retrieved from patient's files of those who had given an informed consent. Descriptive and inferential statistics were performed using statistical package of social science version 26.0.
Results: Majority of CKD patients (61.9%) had severe disease. Among patients with CKD, the following clinical features were statistically significant with severe disease; diabetic nephropathy (OR 3.43, 95% CI; 1.72, 5.67), glomerulonephritis (OR 2.52, 95% CI; 2.07, 4.05), hypertensive nephrosclerosis (OR 1.95, 95% CI; 1.87, 3.11), polycystic kidney disease (OR 1.26, 95% CI; 1.12, 2.61) and systemic lupus erythematosus (OR 1.16, 95% CI; 1.06, 1.39).
Conclusions: Among outpatient attendees in Nairobi County, severe CKD is likely to be found in patients with diabetic nephropathy, glomerulonephritis, hypertensive nephrosclerosis, polycystic kidney disease and systemic lupus erythematosus. Therefore, the patients with these features need proper follow up and treatment to slow down progression of CKD to severe stages. However, more studies are needed to ascertain that the clinical features are responsible for severe CKD.

Keywords: Chronic kidney disease, Severity, Clinical features

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide public health issue. It is defined as kidney structural abnormalities or kidney functionality of below 60 ml/min/1.73 m^2 in at least 3 months.[1] Globally, prevalence of CKD ranges between 8% and 16% of adult population.[2] In Sub-Saharan Africa, currently, about 16% of the population is affected, a rise from 14% reported in 2014.[3,4] A global study conducted in 2016 reported 10·6% prevalence of severe CKD.[5] A hospital based study conducted in Ethiopia at a tertiary hospital among outpatients reported that, majority of CKD patients had mild CKD (17.9%) and 0.4% had severe CKD.[6] A hospital based study conducted in Kericho, Kenya reported a prevalence of 0.41% among inpatients.[7] It is estimated that, by 2030, Kenya will have 4.8 million people suffering from CKD.[8]

Diabetic nephropathy is a leading cause of CKD.[9] More than 23% of CKD patients have diabetic nephropathy.[10] However, some studies ranked diabetic nephropathy second leading cause of CKD.[11,12] Hypertension nephrosclerosis has been ranked second leading cause of CKD.[13] According to Marín et al, nephrosclerosis was second most frequent cause of ESRD and first cause of nephrology consultations.[14] However, hypertensive nephrosclerosis was ranked third in a study conducted in Japan. Some studies reported glomerulonephritis as a predominant cause of CKD.[15] For instance, in a study conducted in Ghana showed that glomerulonephritis led in development of CKD by 33%.[11] In 1990s, chronic glomerulonephritis was known to lead in development and progression of CKD.[12] Other studies reported similar findings.[16,17] However, due to availability of aggressive treatment of glomerulonephritis and improved public health hygiene, the pattern has changed.[18] In Australia, CKD caused by genetic diseases, obstruction, infections, urological conditions and drugs accounted for 30% of CKD cases.[19] Polycystic kidney disease accounts for 7% to 15% of CKD patients.[20] Obstructive nephropathy was ranked 4th leading cause of CKD in Nigeria.[21] On the other hand, unknown causes accounted for 14%.[9] However, different presentations of CKD have been scarce and not readily available. Despite that, there is limited local data on severity and clinical features of CKD among outpatients in Kenya.

METHODS

We designed a hospital based cross-sectional study and collected data from CKD defined patients attending nephrology outpatient clinics at Kenyatta National Hospital (KNH), Aga Khan University Hospital (AKUHN) and Mater Misericordiae Hospital. The aim of the study was to determine the severity and clinical causes of CKD among outpatients attending selected hospitals in Nairobi County, Kenya. The hospitals were selected because they have a clear criterion for referring their patients with elevated creatinine levels of more than 90 millimoles per decilitre for women and 110 millimoles per decilitre for men to nephrology clinics.[1] The data was collected between January and July, 2020. A simple random sampling technique was used to recruit 336 CKD patients who met inclusion criteria. That is, adult defined CKD patients who were 18 years and above whose serum creatinine results were ready and not older than one month. Successful kidney transplant recipients who were attending nephrology clinic were excluded. The sample size was obtained proportionately that is, 166, 130 and 40 study participants were recruited from KNH, AKUHN and Mater Misericordiae Hospital respectively. A written informed consent was obtained from all study participants. Data on social-demographic characteristics were collected using a structured self-administered questionnaire. Data on severity and clinical features were obtained from patients' files of those who had consented to participate in the study. We determined severity of CKD as follows; mild CKD as glomerular filtration rate above 45 ml/min/1.73 m^2 while severe CKD as glomerular filtration rate below 45 ml/min/1.73 m^2 using CKD-Epi calculator 2009.[22]

Data collected was entered, cleaned, coded and analysed using statistical package for the social sciences (SPSS) version 26.0. Categorical data was summarized into proportions and frequencies. Inferential statistics such as Pearson's chi-square ($\chi 2$) test and binary logistic regression were used. Statistical significance was tested at 95% confidence interval (95% CI) (alpha ≤ 0.05). Participation in the study was on voluntary bases. All the documentations, data and information related to the study were treated with confidentiality and anonymity. Privacy of the respondents was also assured by adopting codes in study tools; actual names of participants were not used. The study was approved by ethics and research committees of Kenyatta University, KNH, AKHUN and Mater Misericordiae Hospital.

RESULTS

Characteristics of study participants

Three hundred and thirty six CKD patients were recruited for the study. Most patients were female (58.9%).

Table 1: Demographic characteristics of CKD patients (n=336).

Variables	Categories	Frequency	Proportion (%)
Sex	Male	138	41.1
	Female	198	58.9
Age in years	<20	8	2.4
	20-29	21	6.3
	30-39	37	11.0
	40-49	54	16.1
	50-59	64	19.0
	60-69	75	22.3
	>70	77	22.9
Religion	Christian	285	84.8
	Hindu	8	2.4
	Muslim	36	10.7
	Others	7	2.1
Education	Primary	68	20.2
	Secondary	120	35.7
	Tertiary	118	35.1
	Others	30	9.0
Marital status	Single	110	32.7
	Married	163	48.5
	Divorced	22	6.6
	Widowed	41	12.2
Employ-ment status	Employed	68	20.2
	Retired	108	32.2
	Others	160	47.6

Most of the patients (22.9%) were in the 70 years and above age group. About 80.4% of the study participants aged 40 years and above. Majority of the study participants had secondary level of education (35.7%) followed by tertiary level (35.1). Also, most of the study participants were Christians (84.8%). Concerning marital status of study participants, majority were married (48.5%) and 47.6% had other forms of employments, that is, not employed neither had they retired (Table 1).

Severity of CKD

Severity of CKD was determined through staging. CKD patients were classified into stage 1 to 5 using CKD-Epi calculator 2009. Among the CKD patients, majority (28.0%) were in stage 5 and the least in stage 3a (8%). Majority of the patients (61.9%) had severe disease (Figure 1).[1]

Binary logistic regression model showed that males had higher odds of having severe CKD compared to females (OR 2.73, 95% CI; 1.12, 6.67). CKD patients aged 40 years and above were 2.62 times more likely to have severe CKD than those below 40 years (OR 1.62, 95% CI; 1.97, 6.05) (Table 2).

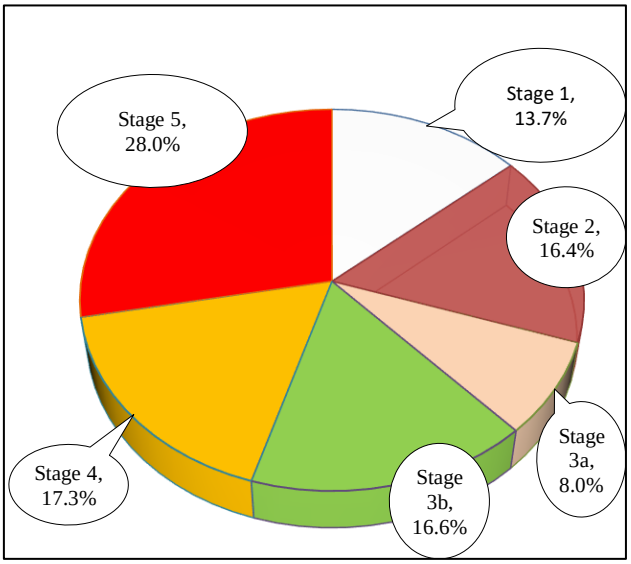

Figure 1: Proportion of CKD by staging.

Table 2: Severity of CKD by sex and age.

Variables	Category	Frequencies (%)	P	OR	95% C.I	
					Lower	Upper
Sex	Male	139 (41.4)	0.003	2.73	1.12	6.67
	Female	197 (58.6)				
Age in years	< 40	66(19.6)				
	≥ 40	270(80.4)	0.001	2.62	1.97	6.05

* p-value < 0.05 is significant; OR= odds ratio; C.I= confidence interval

Table 3: Distribution of identified clinical features of CKD.

Clinical features	Frequency	Proportion (%)	Rank
Diabetic nephropathy	105	31.3	1
Glomerulonephritis	62	18.5	2
Hypertensive nephrosclerosis	50	14.9	3
Polycystic kidney disease	31	9.2	4
Systemic lupus erythematosus	18	5.4	5
Obstructive nephropathy	12	3.6	6
Pyelonephritis	11	3.3	7
Idiopathic	10	3.0	8
Nephrolithiasis	10	3.0	9
Ischemic nephropathy	8	2.4	10
Multiple myeloma	6	1.8	11
Post kidney transplant reintroduction	5	1.5	12
Bilateral kidney artery stenosis	4	1.2	13
Other factors (such as drug induced nephropathy and nephrotoxins)	4	1.2	14
Total	**336**	**100**	

Table 4: Cross tabulation of clinical causes and severity of CKD.

Variables	Proportion (%)	Severity of CKD		P value
		Mild (%)	Severe (%)	
Diabetic nephropathy	105 (31.3)	27 (26.7)	78 (33.2)	0.002
Glomerulonephritis	62 (18.5)	16 (15.8)	46 (19.6)	0.030
Hypertensive nephrosclerosis	50 (14.9)	10 (3.0)	40 (11.9)	0.004
Polycystic kidney disease	31 (9.2)	5 (1.5)	26 (7.7)	0.011
Systemic lupus erythematosus	18 (5.4)	1 (0.3)	17 (5.1)	0.002
Obstructive nephropathy	12 (3.6)	0 (0)	12 (3.6)	0.004
Pyelonephritis	11 (3.3)	4 (3.9)	7 (3.0)	1.000
Idiopathic factors	10 (3.0)	0 (0.0)	10 (3.0)	0.016
Nephrolithiasis	10 (3.0)	4 (3.9)	6 (2.6)	1.000
Ischemic nephropathy	8 (2.4)	2 (0.6)	6 (1.8)	0.715
Multiple myeloma	6 (1.8)	1 (0.3)	5 (1.5)	0.414
Post kidney transplant reintroduction	5 (1.5)	2 (0.6)	3 (0.9)	1.000
Bilateral kidney artery stenosis	4 (1.2)	0 (0.0)	4 (1.2)	0.302
Other factors (such as drug induced nephropathy and nephrotoxins)	4 (1.2)	2 (0.6)	2 (0.6)	0.637

* p<0.05 is significant

Table 5: Clinical causes and severity of CKD.

Variables	Category	Frequencies (%)	P value	OR	95% C.I	
					Lower	Upper
Diabetes nephropathy	Mild	27 (26.7)				
	Severe	78 (33.2)	0.001	3.43	1.72	5.67
Glomerulonephritis	Mild	16 (15.8)				
	Severe	46 (19.6)	0.001	2.52	2.07	4.05
Hypertensive nephrosclerosis	Mild	10 (3.0)				
	Severe	26 (7.7)	0.007	1.95	1.87	3.11
Polycystic kidney disease	Mild	5 (1.5)				
	Severe	17 (5.1)	0.021	1.26	1.12	2.61
Systemic lupus erythematosus	Mild	1 (0.3)				
	Severe	12 (3.6)	0.042	1.16	1.06	1.39
Obstructive nephropathy	Mild	0 (0)				
	Severe	12 (3.6)	0.073	0.86	0.76	0.89
Idiopathic factors	Mild	0 (0.0)				
	Severe	10 (3.0)	0.061	0.41	0.21	0.69

* p<0.05 is significant

The clinical features of the CKD study participants were identified and ranked. The study identified diabetic nephropathy, glomerulonephritis, hypertensive nephrosclerosis, polycystic kidney disease and systematic lupus erythematosus as the five leading clinical features of CKD. However, the unknown causes (idiopathic) took position 8 (Table 3).

Among all clinical features studied, only diabetes nephropathy (p=0.002), glomerulonephritis (p=0.030), hypertensive nephrosclerosis (p=0.004), polycystic kidney disease (p=0.011), systemic lupus erythematosus (p=0.002), obstructive nephropathy (p=0.004) and idiopathic factors (p=0.016) were associated with severe CKD (Table 4).

Multivariate analysis of and severity of CKD

Multivariate analysis in terms of binary logistic regression modelling was used to determine independent clinical causes associated with severity of disease. Results from Pearson's chi-square ($\chi 2$) showed that diabetes nephropathy, glomerulonephritis, hypertensive nephrosclerosis, polycystic kidney disease, systemic lupus erythematosus, obstructive nephropathy and idiopathic factors had a statistically significant association with severe disease. However, the logistic regression model

revealed that CKD patients with diabetic nephropathy were 3.43 times more likely to have severe disease than those without (95% CI; 1.72, 5.67). CKD patients with glomerulonephritis were 2.52 times more likely to have severe disease than those without (95% CI; 2.07, 4.05). CKD patients with hypertensive nephrosclerosis were 1.95 times more likely to have severe disease than those without (95% CI; 1.87, 3.11). Those with polycystic kidney disease were 1.26 times more likely to have severe disease than those without (95% CI; 1.12, 2.61) and those with systemic lupus erythematosus were 1.16 times more likely to have severe disease than those without (95% CI; 1.06, 1.39).

DISCUSSION

Our study found out that, approximately, 38.1% of the CKD patients had mild disease (glomerular filtration rate of above 45 ml/min/1.73 m^2) and 61.9% had severe disease (glomerular filtration rate below 45 ml/min/1.73 m^2). The findings of this study concurred with some other studies that showed that most of the CKD patients are in advanced stages. The findings could be explained by the fact that, CKD is a silent disease and unless detected early and controlled it can rapidly progress to severe stages.[5] Also, the study reported that, male CKD patients and those aged 40 years and above had statistical significant association with severe CKD.

This study revealed that diabetic nephropathy (31.3%) was leading cause of CKD and had a statistical significant association with severity of CKD (OR 3.43; 95% CI; 1.72, 5.67). The findings of this study were similar to results of a study conducted in Malaysian.[9] However, different findings reported that, diabetic nephropathy was second leading cause of CKD.[11,12] Similarly, our study found out that, more than 23% of CKD patients have diabetic nephropathy.[10] This study found out that, glomerulonephritis (18.5%) was second leading cause for CKD and had a statistical significant association with severity of CKD (OR 2.52;95% CI; 2.07, 4.05). Similar findings were reported by studies conducted elsewhere.[15,19] However, the findings were different from some other studies due to availability of aggressive treatment of glomerulonephritis and improved public health hygiene.[12,18] Hypertensive nephrosclerosis (14.9%) was ranked third as a cause of CKD and had a statistical significant association with severity for CKD (OR 1.95; 95% CI; 1.87, 3.11). Similarly, a study conducted at Japan reported same findings.[15] On the other hand, some studies conducted elsewhere seemed to differ with our findings.[12,13] This study ranked polycystic kidney disease (9.2%) fourth cause of CKD (OR 1.26; 95%CI; 1.12, 2.61). Polycystic kidney disease was reported to have had a statistical significant association with severity of CKD. Similarly, polycystic kidney disease accounted for 7% to 15% of CKD patients.[20] However, the results differed from a study conducted in Japan.[15]

This study ranked systemic lupus erythematosus (5.4%) firth leading cause of CKD. Systemic lupus erythematosus was reported to have had a statistical significant association with severity of CKD (OR 1.16, 95% CI; 1.06, 1.39). However, this study found out that, obstructive nephropathy, pyelonephritis, nephrolithiasis, ischemic nephropathy, multiple myelomas, post kidney transplant reintroduction and bilateral kidney artery stenosis did not have statistical significant association with severity of CKD despite having been ranked highly as causes of CKD.

CONCLUSION

Among outpatient attendees in Nairobi County, severe CKD is likely to be found in patients with diabetic nephropathy, glomerulonephritis, hypertensive nephrosclerosis, polycystic kidney disease and systemic lupus erythematosus. Therefore, the patients with these clinical features need proper follow up and treatment to slow down progression of CKD to severe stages. However, more studies are needed to ascertain that the clinical features are responsible for severe CKD.

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