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Awareness, knowledge and perception of chronic kidney disease in a rural community of South-West Nigeria

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Abstract

Background: Awareness and education on kidney disease impact on its effective management and will reduce the significant economic and public health burden. Knowledge of CKD and risk factors increases the perception of being at high risk and increasing health seeking behavior.

We conducted a cross-sectional descriptive study to assess the level of awareness, knowledge and conventional risk factors of CKD in the community to strategize on preventive modalities using the information gathered from this population.

Methods: We used a pretested structured questionnaire to draw information on sociodemography, knowledge and risk factors of CKD from 563 residents aged >18 years.

Results: A total of 454 residents completed this study, mainly farmers, with a mean age of 45.8 ± 19.0 years and male: female ratio of 0.8:1. Only 33.7% had heard of kidney disease with 59.3% from the media and 35.3% from health workers; the level of knowledge of CKD was good in 27.1%. The majority (67.0%) do not know the correct location of the kidneys. Only 10.6% could mention at least one function of the kidneys with only 24.5% agreeing that NSAIDs can cause kidney disease. A laboratory test for kidney function was known by 4.4%; 45.9% and 47.8% believe that CKD can be cured by spiritual means and herbal concoctions respectively. Only 11.1% agreed that CKD can be hereditary. Abdominal obesity and cigarette smoking were seen in 14.6% and 16.6% respectively. Hypertension was seen in 26.5% while 17.8% actually knew they were hypertensive. Diabetes mellitus was found in 3.4%. None of the patients with CKD who had diabetes or hypertension was aware of kidney disease.

Conclusion: There are a misconception and low level of awareness and knowledge of CKD, including those with risk factors, in the community. Efforts should be made to create awareness and educate people on CKD and prevention of its risk factors.

Key words: Awareness, chronic kidney disease, knowledge, perception

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Introduction

Chronic kidney disease (CKD) is defined as abnormalities of kidney structure or function, present for >3 months, with implications for health.[1] Between 1990 and 2010, the rapidity at which CKD climbed the ladder in the lists of causes of total number of global death from 29th to 18th position was alarming with the poorest populations being at the highest risk.[2]

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Increasing burden of CKD is not just exclusive to the western nations. The prevalence of CKD was reported to be 11.4–18.8% in community studies in Nigeria.[3,4] The prevalence is likely to continue to rise as risk factors such as diabetes mellitus and hypertension are projected to increase in the coming years in emerging economies.[5,6] Likewise is the increase incidence of infectious diseases leading to nephropathies, which have also been reported to be high in the sub-region.

In a report, renal outpatient attendance represents about one-quarter of all medical outpatient attendance in South-East Nigeria.[7] End-stage kidney disease accounts for 4.0–11.0% of admissions to medical wards in Tertiary Hospitals.[7-9] The major challenge of CKD patients in developing countries is the late presentation with most patients in an advanced stage. This could have stemmed from a poor level of awareness and knowledge of the disease as reported by many authors.[10,11] Worse still, the majority affected are unable to sustain hemodialysis and other adjunctive treatments of end-stage renal disease (ESRD).[12-14]

Epidemiological studies in developed countries have also shown a low level of awareness, knowledge and risk factors of CKD. In the United States (US), the awareness of CKD among people with glomerular filtration rate (GFR) 15–60 ml/min was 24.3%[15] while in Australia, only 2.8% and 8.6% of the population studied were able to cite hypertension and diabetes respectively as risk factors of CKD.[16] In a study among African Americans, only 23.7% knew at least one laboratory test for kidney disease and <3.0% agreed that CKD is an important health condition.[17] However, awareness of CKD was higher among people with advanced CKD at which level much damage had been done.[18]

Early identification and treatment of CKD will reduce the associated morbidity, mortality,[19] and the significant economic and public health burden. There is a need for a shift from expensive hospital-based intervention to a less expensive approach because the health benefits and economic value of prevention are greatest, especially, when implemented at the earliest opportunity.[20] And since lifestyle and environmental factors influence the major risk factors of CKD, population-based preventive strategies appear the cheapest and best solution. Creating awareness about health risk improves health behavior,[21] drives the determinants of health and impacts positively on effective management of kidney disease.[22] Knowledge of CKD and risk factors increases risk perception and availability for screening to make an early diagnosis.[23] This gives room for early treatment; reduce morbidity, mortality, and health care costs. Low level of awareness is associated with lower perceived susceptibility to CKD.[24] In view of these daunting challenges of poor sustainability of treatment, limited health resources and socioeconomic implications of CKD which pervaded resource-poor countries, its prevention through creation of awareness and risk factors would add value to the quality of life and increase productivity.[25]

There is an immediate need for dissemination of basic CKD information, given the high prevalence of CKD, its risk factors and the low estimated awareness of CKD. Information on awareness of CKD in Nigeria is scanty to the best of our knowledge and this study is conducted to determine factors associated with respondents' level of CKD awareness and knowledge in order to strategize on preventive modalities using the information gathered from this population. Our hypothesis is that the level of awareness of CKD should be high considering the presence of health personnel from our teaching hospital who have been consulting in the Community Health Centre for quite a while.

Methods

This is a cross-sectional descriptive study conducted in a Rural Community of Ilie, Olorunda Local Government, Osun state, South-West Nigeria. It is part of the study on the prevalence of CKD in the communities in the South-West, Nigeria. Ilie Township has a Comprehensive Health Centre, which is being manned as a collaboration of staff and facilities of Hospitals Management Board of Osun State and Ladoke Akintola University of Technology Teaching Hospital (LTH), Osogbo, Osun State, Nigeria. This collaboration has been in existence since the inception of LTH till the time this paper is being published. Health personnel (doctors inclusive) run clinics in the health center and our medical students and resident doctors are on postings to this hospital on a regular basis. It is an extension for community health posting of Department of Community Health of LTH, and it is residential.

We adopted a multistage sampling technique to recruit 563 residents. A pretested structured questionnaire was used to draw information on sociodemography, awareness, knowledge and beliefs about CKD from 563 participants aged >18 years. Four hundred and fifty-four had an adequate data for analysis.

Interviewers were trained, and questionnaires were administered in the local language. Permission to enter the community was taken from the community leader. Informed written consent was taken from each of the participants who were visited in their homes.

The awareness of kidney disease was by a positive response to a question "Have you heard of kidney disease before?" Knowledge and beliefs about CKD were assessed by asking about the location, number and functions of the kidney, symptoms of kidney disease and knowledge of the risk factors. Knowledge of participants was scored arbitrarily as

good, fair or poor based on the proportion of total score. The total score was 28 and 50% and above was good, 30–40% was fair and <30% was poor knowledge. Definitions of clinical conditions were done.

Hypertension was defined as the average measurement (at least 2 readings) of systolic or diastolic blood pressure (BP) ≥140 or ≥90 mmHg, respectively. Diabetes mellitus is described as fasting plasma glucose ≥7.0 mmol/L (126 mg/dl) or 2 h plasma glucose ≥11.1 mmol/L (200 mg/dl). Obesity was assessed as body mass index ≥30kg/m2. Dyslipidemia was assessed as defined by National Cholesterol Evaluation Programme Adult Treatment Panel III (NCEP-ATP III) definition. Estimated GFR (eGFR) was calculated using the Chronic Kidney Disease-Epidemiological Collaboration (CKD-EPI). Kidney disease was defined using single assessments of eGFR, according to the kidney disease outcomes quality initiative staging guidelines. Other protocols of the participants' examination findings were as reported in our previous publication.[4]

Participants with no formal education of less than primary school education were classified as low level of education while those with secondary school and above were classified as high level of education for the purpose of this study.

Statistical methods

Data were analyzed using SPSS version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). Data are presented as mean ± standard deviation categorical variables were compared using Chi-square and contingency tables. Continuous variables were compared using *t*-test.

Multivariable logistic regression using variables whose univariate analysis was significant was used to estimate the independent association between CKD awareness and knowledge and risk factors and markers of kidney damage. The level of significance was set at $P \leq 0.05$.

Results

A total of 454 residents, mainly farmers with a mean age of 45.8 ± 19.0 years and male: female ratio of 0.8:1 completed the study. Table 1 shows the sociodemographic characteristics of the participants. One hundred and one (88.6%) and 172 (83.1%) of farmers and traders respectively had low level of education. Only 33.7% had heard of kidney disease with 91 (59.3%) and 54 (35.3%) through the media and health workers respectively.

More males than females have heard of kidney disease (48.2% vs. 23.0%, $P < 0.001$), had higher level of education, smoked cigarette and had better knowledge of CKD (49.7% vs. 19.6%, $P < 0.001$) as shown in Tables 1 and 2. Females, however, have a higher prevalence of obesity, hypertension and CKD ($P < 0.05$) than male participants. Thirty (49.2%) participants who are educated, farmers (39.2%) and traders (26.9%) have heard of kidney disease ($P = 0.006$). When corrected for level of education, more farmers with a high level of education have heard of kidney disease than those with a low level of education (69.2% vs. 35.6%, $P = 0.003$). Similarly, knowledge of CKD was good among farmers with a high level of education than those with a low level of education (46.2% vs. 20.8%, $P = 0.001$).

Hypertension and diabetes were seen in 120 (26.5%) and (16) 3.6% respondents respectively. Only 17.8% and 25% actually knew they had hypertension and diabetes. Sixty-six (14.6%), 60 (13.4%) and 98 (21.5%) had abdominal obesity, hematuria and leukocyturia respectively. Seventy-five (16.6%) were current cigarette smokers while 10 (2.3%) had a history of regular usage of skin lightening cream and soaps.

The knowledge of CKD was good in 27.1%. About two-third (67.0%) do not know the correct location of kidneys [Table 2]. Only 47 (10.6%), 20 (4.4%) and 109 (24.5%) could state at least one function of the kidney, knew the laboratory test for kidney disease and that chronic usage of painkillers such as Non-steroidal anti inflammatory drugs (NSAIDs) could damage kidney disease respectively. Two hundred and eight (45.9%) and 47.8% believed that CKD could be cured by spiritual means and use of local herbal concoctions respectively. On risk factors, 193 (43.6%), 171 (38.3%), and 47 (11.1%) believed hypertension, diabetes, and family history of CKD could be associated with CKD [Table 2]. Only 85 (19%) and 256 (44.6%) agreed that herbal concoctions and high salt intake could be associated with kidney disease.

As regards symptoms of CKD, 188 (32.8%), 142 (24.7%) and 179 (31.2%) recognized bloody and frothy urine and body swelling respectively as possible symptoms of CKD. More males than females are likely to know the location ($P < 0.001$) and functions of the kidneys ($P = 0.001$), symptoms ($P < 0.001$) and the likely risk factors of CKD ($P < 0.001$). The statistical significance is still sustained when corrected for level of education.

More participants aged <65 years when compared with those ≥65 years have heard of CKD (87% vs. 13%, $P < 0.005$). The statistical significance was maintained after correcting for the level of education.

The awareness of kidney disease and having good knowledge were associated with age <65 years, male gender, high education and the presence of hematuria $P < 0.05$ [Table 3] participants with reduced GFR <60 ml/min/1.73 m^2 were less likely to have heard about kidney disease and also less

Table 1: Baseline characteristics of participants by gender

Characteristics	Male *n* (%)	Female *n* (%)	All *n* (%)	*P*
Mean age	43.6±20.5	47.8±17.4	45.9±18.9	0.026
SCr	104.03±24.59	92.88±25.80	97.80±25.84	0.00
High education	92 (47.7)	46 (18.5)	138 (31.3)	0.00
Occupation				
Farming	80 (40.6)	38 (14.8)	118 (26.0)	0.00
Trading	26 (13.2)	186 (72.7)	212 (46.8)	
Schooling	47 (23.7)	13 (5.1)	60 (13.9)	
Cigarette smoking	26 (13.8)	0 (0)	26 (6.8)	0.00
Alcohol	71 (38.8)	8 (3.6)	79 (19.5)	0.00
Use of bleaching soap	6 (3.3)	4 (1.6)	10 (2.3)	0.20
Hypercholesterolemia	18 (11.1)	12 (5.9)	30 (8.2)	0.05
Low HDL	31 (19.1)	83 (40.7)	114 (31.1)	
Elevated triglyceridemia	11 (6.8)	15 (7.4)	26 (7.1)	0.84
Elevated LDL	9 (5.6)	7 (3.4)	16 (4.4)	0.23
History of hypertension	30 (15.5)	61 (24.0)	91 (20.4)	0.01
On treatment for hypertension	19 (63.3)	39 (65.0)	58 (64.4)	0.57
BMI				
Overweight	11 (5.7)	42 (16.9)	53 (12.0)	0.00
Obesity class 1	1 (0.5)	8 (3.2)	9 (2.0)	
Obesity class 2	0 (0.0)	3 (1.2)	3 (0.7)	
WC	4 (2.1)	60 (24.6)	64 (14.6)	0.00
eGFR (CKD-EPI) <60	10 (6.2)	39 (19.1)	49 (13.4)	0.00
BP (≥140/90)	52 (26.9)	73 (28.9)	125 (28.0)	0.43
Awareness of CKD	95 (48.2)	59 (23.0)	154 (34.0)	0.00
Knowledge of CKD (good)	85 (43.1)	38 (14.9)	203 (27.1)	0.00
Hematuria	27 (14.8)	37 (15.5)	64 (15.2)	0.45
Albuminuria	14 (10.3)	27 (14.8)	41 (12.9)	0.67
Proteinuria	43 (24.0)	55 (23.1)	98 (23.5)	>0.40

CKD-EPI=Chronic kidney disease-Epidemiological collaboration; HDL=High density lipoprotein; LDL=Low density lipoprotein; WC=Waist circumference; eGFR=Estimated glomerular filtration rate; GFR=Glomerular filtration rate; BMI=Body mass index; BP=Blood pressure; SCr=Serum creatinine

Table 2: Participants' knowledge and perception of kidney disease by gender

Questions	All participants with correct answer to questions asked			Participants who are aware of CKD with correct answers to questions		
	Male *n* (%)	Female *n* (%)	*P*	Male *n* (%)	Female *n* (%)	*P*
Where is the kidney located?	106 (54.1)	39 (15.5)	0.00	61 (64.2)	17 (29.3)	0.00
How many kidneys do a normal individual has?	130 (67.0)	71 (28.0)	0.00	71 (74.7)	26 (44.1)	0.00
Does the number of kidneys vary from male to female? yes	92 (49.7)	65 (27.5)	0.00	50 (54.3)	26 (45.6)	0.30
Do these habits make one at risk of CKD?						
Cigarette smoking	125 (64.4)	131 (51.6)	0.00	67 (71.3)	40 (69.0)	0.76
Alcohol	115 (59.0)	136 (53.3)	0.25	64 (68.1)	40 (67.8)	0.97
Herbal ingestion	40 (20.7)	45 (17.7)	0.46	25 (26.9)	17 (28.8)	0.79
Poor diet (e.g., high salt)	122 (63.5)	134 (53.4)	0.03	64 (67.4)	36 (62.1)	0.50
Lack of exercise	90 (47.1)	94 (37.3)	0.04	47 (52.2)	28 (47.5)	0.56
Risk factors of CKD						
Hypertension	105 (54.7)	88 (35.1)	0.00	51 (54.8)	24 (41.4)	0.10
Diabetes	95 (49.0)	76 (30.2)	0.00	48 (51.1)	25 (42.4)	0.29
Pain killers (e.g. NSAIDs)	60 (31.2)	48 (19.1)	0.00	37 (39.4)	17 (28.8)	0.18
Living with person with CKD	110 (58.5)	90 (36.1)	0.00	60 (66.7)	30 (51.7)	0.06
Family history of CKD	23 (12.8)	24 (9.9)	0.43	13 (14.8)	6 (10.9)	0.50
UTI	48 (24.9)	29 (11.5)	0.00	29 (30.5)	8 (13.6)	0.01
Kidney disease can be healed by;						
Spiritual means	124 (64.2)	119 (46.7)	0.00	68 (73.9)	31 (52.5)	0.00
Use of herbs	86 (44.6)	122 (48.0)	0.50	43 (46.7)	34 (57.6)	0.19

Participants who responded appropriately to the questions asked were considered here. CKD=Chronic kidney disease; UTI=Urinary tract infection; NSAIDs=Nonsteroidal anti-inflammatory drugs

Table 3: Risk factors of CKD, awareness and knowledge of kidney disease in all participants

Factors	Participants who were aware of kidney disease			Participants with good knowledge of CKD		
	n (%)	OR (95% CI)	*P*	*n* (%)	OR (95% CI)	*P*
Age <65 years	134 (36.9)	2.07 (1.21-3.57)	0.01	115 (31.7)	4.81 (2.25-10.27)	0.00
Male gender	95 (48.2)	3.11 (2.07-4.66)	0.00	85 (43.1)	4.35 (2.79-6.80)	0.00
High level education	69 (49.3)	2.71 (1.78-4.12)	0.00	68 (49.3)	4.80 (3.06-7.52)	0.00
Abdominal obesity (WC)	17 (26.6)	0.76 (0.50-1.17)	0.20	16 (25.0)	0.73 (0.44-1.22)	0.19
Obesity (BMI >30 kg/m^2)	5 (41.7)	1.24 (0.63-2.44)	0.55	6 (50.0)	2.77 (1.05-3.40)	0.07
Current cigarette smoking	11 (42.3)	1.44 (0.64-3.23)	0.40	9 (34.6)	1.48 (0.62-3.31)	0.40
Alcohol	39 (44.4)	2.25 (1.37-3.72)	0.00	26 (32.9)	1.40 (0.83-2.38)	0.26
History of hypertension	29 (31.9)	0.87 (0.53-1.41)	0.53	14 (15.4)	0.41 (0.22-0.76)	0.01
History of diabetes	0 (0.0)	0.60 (0.17-2.10)	0.56	0 (0.0)		1.00
On treatment for HBP	18 (31.0)	0.9 (0.34-2.15)	0.81	8 (13.8)	0.48 (0.16-1.43)	0.05
Hematuria	31 (45.6)	1.83 (1.08-3.08)	0.02	26 (38.2)	1.83 (1.06-3.14)	0.02
Albuminuria	44 (28.3)	0.98 (0.53-1.80)	0.95	44 (28.3)	1.03 (0.53-2.00)	0.33
Hypertension	41 (32.5)	0.93 (0.69-1.25)	0.49	19 (15.1)	0.48 (0.30-0.74)	0.00
Diabetes	2 (20.0)	0.60 (0.17-2.10)	0.62	3 (30.0)	0.87 (0.25-3.10)	0.76
GFR <60	9 (18.4)	0.48 (0.26-0.88)	0.01	9 (18.4)	0.52 (0.28-0.95)	0.04

The table is based on the proportion of 454 participants. CKD=Chronic kidney disease; BMI=Body mass index; WC=Waist circumference; OR=Odds ratio; CI=Confidence interval; HBP=High blood pressure; GFR=Glomerular filtration rate

Table 4: Sociodemography, clinical variables, knowledge and awareness among participants with CKD (*n*=49)

Variables	Knowledge of kidney disease among participants with CKD (*n*=49)			Awareness of kidney disease among participants with CKD (*n*=49)		
	Good knowledge	Poor knowledge	*P*	Aware of kidney disease	No awareness	*P*
Number	9	40		9	40	
Male gender *n* (%)	4 (44.4)	6 (15.0)	0.07	4 (44.4)	6 (15.0)	0.07
Education *n* (%)	2 (22.2)	1 (2.6)	0.08	1 (11.1)	2 (5.1)	0.50
Albuminuria *n* (%)						
Normal	5 (62.5)	26 (68.4)	0.90	5 (55.6)	26 (70.3)	0.27
30-300 mg/g	1 (12.5)	3 (7.9)		2 (22.2)	2 (5.4)	
>300 mg/g	2 (25.0)	9 (23.7)		2 (22.2)	9 (24.3)	
CKD stage 3 *n* (%)	9 (100.0)	33 (82.5)	0.39	9 (100.0)	33 (82.5)	0.39
Age (years)	48.78±19.56	64.23±13.60	0.01	50.66±15.59	64.63±15.08	0.02
SBP (mmHg)	124.94±10.33	139.06±25.76	0.01	132.33±12.68	139.57±27.11	0.27
DBP (mmHg)	75.50±5.83	79.93±13.21	0.33	77.33±8.06	79.57±13.94	0.48
MABP (mmHg)	91.98±6.31	99.63±16.64	0.02	95.67±9.12	99.57±17.61	0.52
WC (cm)	74.88±5.86	82.89±8.70	0.01	83.123±9.31	81.61±8.67	0.75
BMI (kg/m^2)	20.01±2.58	22.17±3.40	0.08	23.34±3.21	21.42±3.45	0.80
Total cholesterol (mmol/L)	3.41±0.88	3.84±0.91	0.21	3.91±0.91	3.77±0.96	0.49
HDL (mmol/L)	1.18±0.44	1.52±0.47	0.05	1.21±0.50	1.53±0.45	0.06
TC/HDL	3.26±1.55	2.76±1.16	0.27	3.71±1.70	2.63±0.98	0.09
LDL/HDL	1.76±1.24	1.48±1.01	0.46	2.30±1.48	1.34±0.84	0.09
LDL (mmol/L)	1.73±0.69	1.94±0.87	0.50	2.29±0.79	1.84±0.87	0.73
Uric acid (mmol/L)	0.30±0.13	0.29±0.12	0.84	0.34±0.16	0.29±0.11	0.39
SCr (mmol/L)	136.55±28.75	129.00±49.09	0.66	139.22±27.70	130.20±52.20	0.43
GFR <60 (ml/min/1.73 m^2)	55.2±4.90	51.00±10.14	0.07	53.05±4.14	50.15±10.39	0.01

CKD=Chronic kidney disease; GFR=Glomerular filtration rate; SBP=Systolic blood pressure; DBP=Diastolic blood pressure; MABP=Mean arterial blood pressure; HDL=High density lipoprotein; TC=Total cholesterol; LDL=Low density lipoprotein; SCr=Serum creatinine; WC=Waist circumference; BMI=Body mass index

likely to have good knowledge of kidney disease than those with GFR >60 ml/min/1.73 m^2 [Table 4].

Participants who have heard of kidney disease were younger, and they had higher GFR than those who never heard about kidney disease ($P < 0.05$) [Table 3]. They also have a higher level of education. Participants with good knowledge as compared to poor knowledge of kidney disease were also younger with lower systolic BP and mean arterial BP ($P < 0.05$) [Table 4].

Participants who were aware of kidney disease had good knowledge of CKD than those who were not aware

($P = 0.001$). The mean score of knowledge of participants who were aware of kidney disease is higher than those without awareness (14.27 ± 5.32 vs. 9.67 ± 5.74, $P < 0.001$).

Kidney disease awareness among CKD subjects was 18.4% (9/49) [Table 4]. Only 7 (14.3%) out of 49 who had CKD (GFR <60 ml/min/1.73 m^2) had good knowledge of kidney disease. Participants with hypertension and those with albuminuria who had CKD, none and only 4 (26.7%) respectively had heard about kidney disease [Figure 1]. Similarly, none of those with diabetes has heard of CKD.

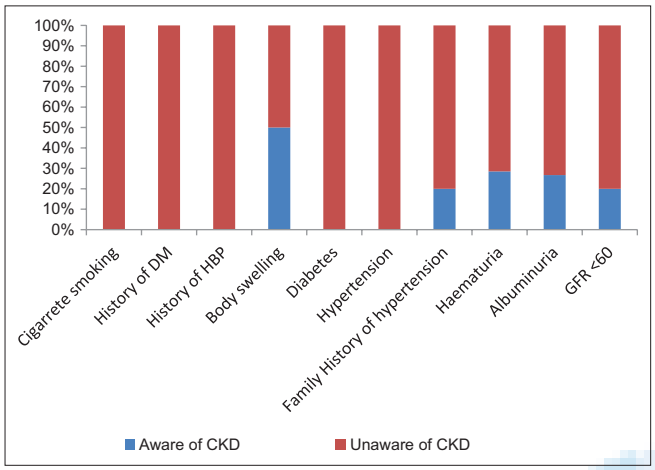

Figure 1: Awareness of kidney disease among participants with chronic kidney disease who had selected risk factors and symptoms of chronic kidney disease. Note: Participants with chronic kidney disease (glomerular filtration rate <60 ml/min/1.73 m2) were 49 while those with albuminuria: 15, hematuria: 7, hypertension: 15, diabetes: 5 and history of hypertension: 9. Each of the risk factors was taken as 100%. HBP - High blood pressure, DM - diabetes, GFR - Glomerular filtration rate

Table 5: Factors influencing awareness of kidney disease

Factors	*B*	SE	*P*	OR
Age <65 years	0.957	0.394	0.015	2.60 (1.20-5.64)
Male gender	1.194	0.264	<0.001	3.30 (2.0-5.54)
High level of education	0.769	0.288	0.008	2.20 (1.23-3.79)
BP <140/90 mmHg	0.372	0.323	0.251	1.45 (0.77-2.73)
Hematuria	0.146	0.332	0.660	1.16 (0.60-2.22)
History of hypertension	0.349	0.334	0.296	1.42 (0.74-2.73)
Obesity by BMI	1.259	0.717	0.079	3.52 (0.86-14.35)

BMI=Body mass index; SE=Standard error; OR=Odds ratio; BP=Blood pressure

Table 6: Predictors of good CKD knowledge

Factors	*B*	SE	*P*	OR
Age <65 years	0.857	0.487	0.078	2.36 (0.91-6.11)
Male gender	1.392	0.296	0.000	4.02 (2.25-7.18)
High level of education	1.122	0.304	0.000	3.07 (1.69-5.57)
BP <140/90mmHg	1.089	0.398	0.006	2.97 (1.36-6.49)
Hematuria	0.227	0.354	0.522	1.26 (0.63-2.51)
Obesity by BMI	0.126	0.534	0.814	1.13 (0.40-3.23)

BMI=Body mass index; CKD=Chronic kidney disease; SE=Standard error; OR=Odds ratio; BP=Blood pressure

With multivariate analysis, male gender, high level of education and younger age group (<65 years) were independently associated with awareness of kidney disease. Male gender and a high level of education independently positively influenced knowledge of kidney disease [Tables 5 and 6]. Participants with normal BP have higher odd of good knowledge of kidney disease.

Discussion

The results of this study show a low level of awareness and poor knowledge of kidney disease in the community. Prevalence of awareness and good knowledge of kidney disease in the general population of participants were 33.7% and 27.1%, respectively. However, among participants with CKD as measured by GFR < 60 ml/min/m^2, the prevalence of awareness and good knowledge is 18.4% and 14.0%, respectively. This is similar to the report of other studies.[10,11,26-29] However, it is higher than 10.0% level of awareness reported by Tamura *et al*.,[27] but slightly lower than in Shah *et al*.[28] Low level of awareness, knowledge and misconceptions in the general population and among those with CKD and risk factors may explain why most patients present in an advanced stage with the attendant poor outcome. Late presentation affects the outcome of patient management.[12-14,30,31] Awareness encourages adopting lifestyle modifications and better management of risk factors.[21-23,32] Early identification and treatment of CKD reduce the rate of progression, burden of the cardiovascular complications and improve the quality of life of the affected people.[21]

There is a positive influence of high level of education on awareness and knowledge of kidney disease in this study. Farmers who had a high level of education among the participants had increased awareness and knowledge of CKD than their counterparts with low educational level. Educational attainment influences health literacy and has been reported to influence significantly awareness and knowledge of chronic illnesses.[32-36] High level of education facilitates good communication between caregivers and patients and they are better involved in their management.[37] More than half of Nigerian population resides in rural communities where the literacy rate is 47.0%.[38] Efforts should, therefore, be made to improve the quality of formal education and consequently literacy in the region. Limited literacy is associated with delayed diagnosis, poor control of cardiovascular diseases and increased hospitalization rates and all-cause mortality in ESRD.[39]

Although, gender disparity in access to education in the region is minimal, this study shows that more males than females were of higher educational attainment, and they had a higher proportion of awareness and better knowledge of CKD. Similarly, elderly participants were less educated, less likely to be aware of kidney disease and had poor knowledge of CKD. This group, in addition to female participants should be targeted for regular and comprehensive health education on kidney disease since the prevalence of CKD in other studies is reported to be higher among elderly people[40] and females.[4,41] Furthermore, the high prevalence of markers of CKD has been reported among people with low level of education. Participants who were aware of kidney disease still indulge in alcohol intake and use of skin lightening creams. In spite of awareness and knowledge of CKD, denial of CKD or its risk factors and nonadherence, are the possible psychosocial challenges which could lead to a natural progression and eventually poor outcome.[18]

The awareness of CKD and its knowledge was low among participants with GFR <60 ml/min/1.73 m^2 and albuminuria. This is worse among participants who had CKD and risk factors such as hypertension and markers as hematuria where only 20% and 26.7% respectively have heard about kidney disease. Surprisingly, there are no participants with GFR <60 ml/min/m^2 who have either been diagnosed before or during the period of study for diabetes or hypertension that have heard of kidney disease [Figure 1].

In one perspective, the low prevalence could be that the participants have not been making themselves available for screening and clinic attendance or that the attending health personnel did not communicate for lack of awareness and knowledge about kidney disease and its associated risk factors.[42] All these actually worth exploring in other studies to adequately stem the tide of rising prevalence increased morbidity and mortality associated with CKD and its risk factors. Participants who have heard of CKD, on the other hand, had better knowledge and then probably took measures to prevent its occurrence and risk factors. For instance, participants with normal BP have increased odds of good knowledge of CKD in this study [Table 6].

Knowledge of kidney disease and symptoms of its impairment should be communicated to patients in order to take an informed decision. Less than half and about one-third of the population studied believed that hypertension and diabetes respectively could cause CKD while about 90% did not agree that CKD could be hereditary. Hypertension and diabetes are the leading causes of CKD globally with chronic glomerulonephritis coming next to hypertension in many developing countries. Information and education should be towards reducing the risk factors by adjusting lifestyle behavior, use of over-the-counter drugs, especially write in full and put in the bracket at first mention especially NSAIDs which are commonly prescribed. About 70% of the participants did not believe that NSAIDs could adversely affect kidneys. Similarly, the use of herbal concoctions which many in this study believed could treat CKD should be discouraged. Reports from Nigeria had shown herbal concoctions as a common cause of acute kidney injury[43,44] which is now a risk factor for CKD and aside, is associated with acute decompensation of a stable CKD thereby increasing the morbidity and burden of CKD.

Effort should be made to screen patients for markers of kidney disease. Results should be comprehensively interpreted to allow an informed decision. The effect of avoiding risk factors of CKD progression to ESRD should be stressed as the majority of patients could not afford the cost of maintenance renal replacement therapy (RRT).[12] The cause of death in the majority is the inability to sustain or procure RRT. CKD is not just a burden on the affected individual but on the entire family, and it has no health insurance coverage in Nigeria as of now. Treatment is therefore essentially out-of-pocket. The disease can be delayed from progression if detected early as the sequelae of the progression, vis-a-vis, high burden of cardiovascular disease is usually devastating.

Age <65 years, male gender and high level of education were independently associated with greater odds of awareness. Similarly, male gender and high level of education were associated with increased level of knowledge of CKD. Emphasis should therefore be placed on health educational intervention program that will be geared toward improving women awareness and knowledge and also inform the elderly people of the various risk factors and the increased tendency to develop CKD on account of the various physiological changes that are usually associated with old age.

Limitations of this study are the cross-sectional nature where participants were visited only once for urine samples and blood collection. The awareness of kidney disease was also self-reported, and so the concern of recall bias is of importance. Also in view of the cross-sectional nature of our study, we suggest that further prospective studies about the association between the knowledge of CKD and progression of renal function could be done. The strength of our study, however, is the multi-stage random sampling method, and to a large extent a good coverage of the community where the study was carried out.

Conclusion

The level of awareness and knowledge of kidney disease is low. Concerted effort should be made to improve level of

education and correct certain psychosocial belief among the dwellers in the community with a view to a better understanding of the burden of CKD and the solutions to reduce the burden of its related risk factors community. CKD should be discussed in the clinic with anybody with risk factors and abnormal markers of kidney dysfunction. Screening programs should incorporate more awareness talks on the disease.

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