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Socioeconomic Determinants of Knowledge of Kidney Disease Among Residents in Nigerian Communities in Lagos State, Nigeria

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ABSTRACT

Objectives: We sought to estimate the knowledge, sociodemographic determinants, and risk-inducing lifestyles of kidney disease (KD) among Nigerians living in Lagos State. ***Methods***: We conducted a cross-sectional descriptive study to assess the level of knowledge of KD and its associated sociodemographic factors of individuals living in urban and semi-urban communities of Lagos State, Nigeria. It is hoped that the results of this study will help to inform preventive modalities. We used a pretested, structured questionnaire to draw information from 1171 Nigerians aged ≥ 15 years. ***Results:*** The mean age of respondents was 33.5±11.1 years. In our cohort, 72.4% of respondents were knowledgeable of KD, with media as their major source of information (41.6%). Knowledge of KD was significantly associated with age ($p = 0.044$), education ($p < 0.001$), marital status ($p < 0.001$), and place of residence ($p = 0.048$). The established KD risk-inducing lifestyle factors were habitual use of herbal supplements, significant alcohol consumption, and diabetes ($p < 0.050$). Significant predictors of knowledge of KD included primary education (Odds ratio (OR) = 0.367, 95% confidence interval (CI): 0.11–1.22; $p = 0.102$), secondary education (OR = 0.296, 95% CI: 0.17–0.51; $p < 0.001$), Igbo ethnic group (OR = 1.471, 95% CI: 0.99–2.17; $p = 0.047$), and place of residence (OR = 1.332, 95% CI: 1.00–1.77; $p = 0.048$). Age 30–39 years (OR = 0.749, 95% CI: 0.48–1.18; $p = 0.214$), 40–49 years (OR = 1.083, 95% CI: 0.69–1.69; $p = 0.727$), and not working (OR = 1.178, 95% CI: 0.88–1.57; $p < 0.269$) were non-significant predictors of knowledge of KD. ***Conclusions:*** Our cohort had inadequate knowledge of linking risk-inducing lifestyles to KD development. Effective measures and efforts should be made to create awareness and educate the general population on KD and prevention measures related to risk-inducing lifestyles to reduce the burden of KD among Nigerians.

Kidney disease (KD) can be acute or chronic. Chronic kidney disease (CKD) is diagnosed using internationally accepted criteria when there is an estimated glomerular filtration rate (GFR) < 60 mL/min/1.73 m^2 and/or persistent albuminuria.[1] KD has five defined stages, and CKD includes stages three to five, where it can be deduced that approximately 50% of kidney function has been lost. This significantly increases the risk of morbidity and premature death.[2] End-stage renal disease (ESRD), also known as kidney failure, is the most severe form of CKD because, at this stage, death is inevitable without renal-replacement therapy, which can be done either with dialysis or a kidney transplant.[3]

CKD has been estimated to affect as much as 10–15% of the population worldwide, which has increased the disease burden of morbidity and mortality.[4,5] For instance, the median prevalence of CKD was 7.2% in persons aged 30 years or older from a systematic review of 26 studies in different populations including 10 studies from America, eight studies from Europe, and eight studies from Asia and Australia;[6] the overall prevalence of CKD varied from 23.4% to 35.8%.[7] However, the increasing burden of CKD prevalence is not just limited to western countries, but also in sub-Saharan Africa where both infectious and non-communicable diseases contribute risk to poor health outcomes. For instance, the estimated prevalence of CKD is 13.9%

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in sub-Saharan Africa, which is similar to global prevalence estimates of 13.4%.[5,8,9] The incidence rate of CKD is projected to increase disproportionately. Countries in sub-Saharan Africa face numerous problems where health transitions are characterized by rapid urbanization, low life expectancy, structural difficulties, unemployment, gender imbalances in access to social well-being, and poverty. Thus, poor health infrastructures and the absence of health screening and prevention programs are systemic factors that further accentuate the risk of KD.

Community studies in Nigeria have reported the prevalence of CKD to be 11.4–18.8%.[2,7] For instance, in one study, the enormity of CKD in Nigeria (with the situation in tertiary healthcare in Southeast of Nigeria as a reference) revealed that ESRD cases accounted for 8% of all medical admissions and 42% of renal admissions.[10] However, there is a dearth of community-based data on the epidemiology of CKD in Nigeria. The prevalence of CKD in Nigeria ranges from 8–45%, and the reported prevalence largely depends on the population studied (urban/rural or general/at-risk population) and methodology.[2,11,12] Similarly, proteinuria, a well-accepted marker of CKD, is common in the general population ranging from 4.7% in South-south Nigeria[13] to 23.9%[14] in Southwest Nigeria. Thus, the prevalence is likely to increase as KD risk factors are projected to increase in the coming years, especially in countries with emerging economies.[8,15]

In Nigeria, and as well as in many other African countries, biomedical risk factors such as hypertension, diabetes, and chronic glomerulonephritis are common in the general population. Thus, poor knowledge of the health implications of these biomedical risk factors often underscore the need for screening and early detection of the disease.[2,10,16] Other causes, which include genetic (hereditary) and modifiable causes (socioeconomic, lifestyle, and culture), have also been identified as risk factors. In Nigeria, there is low knowledge and awareness of KD risk factors in certain populations.[10] In some instances, the causes may be unclear because of the advanced nature of the disease, and could be associated with unknown causes from in and around the environment. Also, the scarcity of kidney replacement therapy facilities is significantly associated with economic and public health burden where few severe KD patients can afford to pay for renal-replacement therapy.[10]

In Nigeria, the peak prevalence of CKD is between the third and fifth decade of life, which contributes to manpower shortages and economic waste.[16,17] The burden of the disease has increased significantly and the lack of a national renal registry and coordinated national health policies have affected the equitable allocation of resources and restricted the efforts towards effective planning and control measures.[18] The initial stages of KD can be asymptomatic, and early detection is problematic for many patients. Besides, undiagnosed and untreated KD sufferers may gradually advance to ESRD, and costly renal therapy treatment becomes essential to sustain the patients' life.[10]

The major challenge of individuals with KD is the late presentation in an advanced stage which is stemmed from poor knowledge of the disease and its risk factors as cited by many studies.[2,19] To a great extent, knowledge is central to social behavior and the level of knowledge on any issue/phenomenon will have implication for man's disposition towards it. Knowledge affects the ability to make informed decisions. Thus, medical knowledge of any health condition will inform an individual's actions towards the health condition and health-seeking behavior.[20] Specifically, knowledge of KD will make people take actions to avoid kidney problems and get knowledge on how to manage one if it exists.

Epidemiological studies have shown a low knowledge of KD risk factors in developed countries. For instance, in the US, the awareness of CKD among individuals with a GFR of 15–60 mL/min was 24.3%,[21] while in Australia only 2.8% and 8.6% of the population studied were able to cite hypertension and diabetes, respectively, as CKD risk factors.[22] In a study among African Americans, only 23.7% knew at least one laboratory test for KD, and < 3.0% agreed that CKD is an important health condition.[23] However, awareness of CKD was higher among people with the advanced stage of the disease.[24] However, studies on knowledge and awareness of KD in Nigeria is scanty, as most were hospital-based.

Improving the public's knowledge of KD and its risk factors is an important strategy for CKD prevention. Therefore, this study sought to estimate the level of knowledge of KD and its main sociodemographic determinants in order to strategize on preventive modalities using the information gathered from Nigerian population in Lagos State.

METHODS

We conducted a cross-sectional study in six urban and two semi-urban local government areas of Lagos State, located in the Southwestern part of Nigeria. The six urban (Agege, Ajeromi-Ifelodun, Lagos Island, Lagos Mainland, Kosofe, and Somolu) and two semi-urban (Epe and Ikorodu) areas were randomly selected from sixteen urban and four semi-urban local government areas in Lagos State. Lagos State was selected for this study owing to the fact that it was featured prominently as one of the KD-prone states in 2015.[25]

An earlier hospital-based study highlighted the enormity of CKD in Nigeria reporting a prevalence that ranged from 8% to 42%,[10] while a previous community-based study reported a prevalence of 27.2%.[26] The sample size of this study was extrapolated from that value with 95% confidence interval (CI) and 5% error margin using the appropriate formula for study population > 10 000[27] giving us 1071 participants. Participants had to be ≥ 15 years to be included in the study. This number was increased to 1757 to make allowance for 10% possible non-responders and increase the scope of the study. Respondents who were ≥ 15 years, non-Nigerian by nationality, and those who did not give informed consent were excluded from the study.

A multi-stage systematic sampling technique was used. According to the National Population Commission (NPC) of Nigeria census of 2006, the estimated population of the six urban and two semi-urban areas selected for this study, projected to 2016, was 2 741 396. The projection formular was adopted from similar studies.[2,28] There are 246 wards in Lagos State and 24 wards were randomly selected by balloting, and these served as sampling units for this study. One hundred and thirteen enumeration areas (EAs) (representing 30%) of the total EAs were selected randomly. The population aged 15 years and above in the selected EAs was estimated using the NPC figures giving 421 757. Dividing this estimated population (421 757) by the sample size (1757) gave the sampling interval for the systematic selection of participants, which was approximately 1:10. Hence, one in every ten respondents was enrolled for the study. Selected houses where every 10th respondent was residing were given unique numbers for identification. The Kish conversion sheet was used to select the participants in each household.[29,30] In situations where selected EAs were not adjoined, the first house in the next EA was regarded as a continuation of the previous EA and the selection procedure continued.

The questionnaire used in this study was developed based on the KD knowledge evaluation questionnaire originated from the National Kidney Disease Education Program. Also, several previous KD knowledge surveys[2] were used for this purpose. Its validity was confirmed by a panel of experts, including five medical sociologist professors, health demographers, and public health professionals. The questionnaire was pretested in a pilot study comprised of 200 respondents to ensure its clarity and relevance. The pilot study results were reviewed critically and further minor modifications were made to improve the clarity and comprehensibility of the questions. The estimated time for completing the questionnaire was approximately 15 minutes.

The results of the pre-test were not included in the final analysis. In addition, the questionnaire had two parts. The first part concerned demographics and comprised of questions concerning educational status, age, occupation, religion, ethnicity, employment status, and household income. The second part was composed of 30 multiple-choice questions to determine knowledge of KDs, which was the outcome of interest in this study. With a score range of 0–59, a binary variable was created with a mean score of 28.37, where knowledge score of 0–28 were coded '0' (low knowledge) and score of 29–59 were coded '1' (high knowledge). The predictor variables/sociodemographic factors (age, sex, educational status, marital status, religion, ethnic group, employment status, and monthly income) were used to explain the outcome variable. Other explanatory variables were the risk-inducing lifestyles (including both modifiable and biomedical risk factors) to give a composite lifestyle pattern of Nigerians residing in Lagos State.

The study was approved by the University of Ibadan Social Sciences and Humanities Research Ethics Committee (SSHEC), Nigeria (UI/SSHEC/14/0003).

The data were analyzed using the SPSS Statistics (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) The data were presented as mean±standard deviation for continuous variables and proportions for categorical variables. The chi-square test was used to explain the associations of the predictor variables

on the outcome variable. Binary logistics regression was used to estimate the influence of the independent variables (sociodemographic factors) as a predictor of the outcome variable (knowledge levels).

RESULTS

A total of 1171 respondents completed the study; 586 respondents who took part in the study did not complete either questionnaire or did not have any knowledge of KD and were excluded from the analysis. Table 1 shows the sociodemographic characteristics of the respondents. The mean age of respondents was 33.5±11.1 years with a male to female ratio of 1:0.9 completed the study. Two hundred and sixty (30.1%) respondents and 139 (45.3%) respondents in urban and semi-urban areas, respectively, were aged 30–39 years old. Over half had tertiary education (59.3%) in the urban areas and over three-quarters (77.9%) in semi-urban areas. A greater proportion of the respondents were employed (74.7%) and had a high socioeconomic status (50.7% in urban areas and 48.2% in semi-urban areas) [Table 1].

Figure 1 shows respondents with low and high levels of knowledge of KD. The results revealed that the majority of respondents in this study had high knowledge levels (72.4%).

Majorly, respondents reported media as one of their sources of information on KD [Figure 2].

Table 2 shows the proportion of respondents with low and high knowledge in relation to different sociodemographic variables. Place of residence (p = 0.048), age (p = 0.044), educational level (p < 0.001), and marital status (p < 0.001) were all found to have a significant association with knowledge scores.

The predictors of risk-inducing lifestyles of KDs included significant consumption of herbal supplements (adjusted odds ratio (AOR) = 0.668, 95% CI: 0.51–0.88; p = 0.004), significant alcohol consumption (AOR = 0.751, 95% CI: 0.57–0.99; p = 0.044) and diabetes (AOR = 0.583, 95% CI: 0.44–0.77; p < 0.001) [Table 3].

Table 4 shows the binary logistic regression analysis of the adjusted independent predictors of knowledge scores of KD. The results revealed that respondents with primary (OR = 0.367, p = 0.102) or secondary (OR = 0.296, p < 0.001) education had significantly negative increased odds of KD knowledge compared with their counterparts with no education. While those with tertiary level education (OR = 0.650, p = 0.003) have lower negative odds KD knowledge compared to respondents with no education (not significant). Conversely, respondents from Hausa ethnic group (OR = 1.549, p = 0.074) have significant decreased odds of KD knowledge compared with those from the Yoruba ethnic groups. While respondents from Igbo (OR = 1.471, p = 0.047) and other ethnic groups (OR = 0.897, p = 0.744) have decreased odds of KD knowledge compared with those from Yoruba ethnic groups. In addition, respondents from semi-urban areas (OR = 1.332, p = 0.048) have decreased odds of KD knowledge compared with those from urban areas [Table 4].

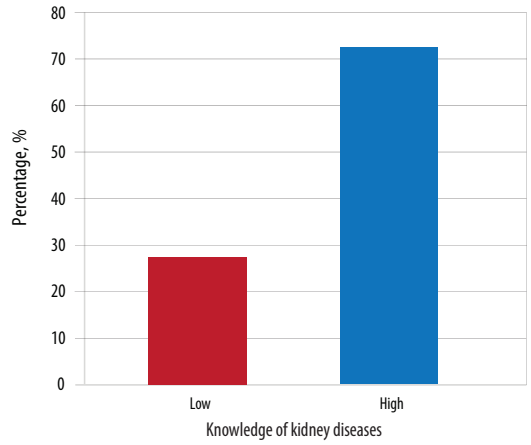

Figure 1: Percentage of respondents with low and high levels of knowledge of kidney diseases.

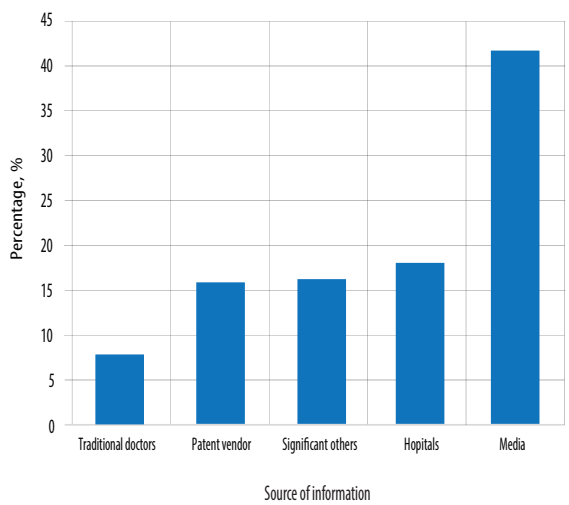

Figure 2: Respondents' sources of information on kidney diseases.

Table 1: Respondents' sociodemographic characteristics by location who have knowledge of kidney diseases (n = 1171).

Variables	Urban, n (%)	Semi-urban, n (%)	Total, n (%)	χ^2
Age, mean ± SD, years	32.4 ± 10.9	36.5 ± 11.0	33.5 ± 11.1	
Age, years				
< 20	139 (16.1)	13 (4.2)	152 (13.0)	62.037*
20–29	216 (25.0)	80 (26.1)	296 (25.3)	
30–39	260 (30.1)	139 (45.3)	399 (34.1)	
40–49	126 (14.6)	61 (19.9)	187 (16.0)	
50 +	123 (14.2)	14 (4.6)	137 (11.7)	
Sex				
Male	455 (52.7)	172 (56.0)	627 (53.0)	1.031
Female	409 (47.3)	135 (44.0)	544 (46.5)	
Educational level				
No schooling	11 (1.3)	0 (0.0)	11 (0.9)	39.021*
Primary	55 (6.4)	4 (1.3)	59 (5.0)	
Secondary	286 (33.1)	64 (20.8)	350 (29.9)	
Tertiary	512 (59.3)	239 (77.9)	751 (64.1)	
Ethnic group				
Yoruba	483 (55.9)	180 (58.6)	663 (56.6)	13.555*
Igbo	219 (25.3)	96 (31.3)	315 (26.9)	
Hausa	45 (5.2)	9 (2.9)	54 (4.6)	
Others	117 (13.5)	22 (7.2)	139 (11.9)	
Marital status				
Single	537 (55.9)	157 (51.1)	694 (59.3)	13.346*
Married	292 (33.8)	139 (45.3)	431 (36.8)	
Separated/divorced	18 (2.1)	7 (2.3)	25 (2.1)	
Widowed	17 (2.0)	4 (1.3)	21 (1.8)	
Religion				
Christianity	669 (77.4)	223 (72.6)	892 (76.2)	33.221*
Islam	184 (21.3)	66 (21.5)	250 (21.3)	
Traditionalist	10 (1.2)	5 (1.6)	15 (1.3)	
Others	1 (0.1)	13 (4.2)	14 (1.2)	
Employment status				
Working	627 (72.6)	248 (80.8)	875 (74.7)	8.088*
Not working	237 (27.4)	59 (19.2)	296 (25.3)	
Monthly income				
Low	197 (22.8)	119 (38.8)	316 (27.0)	39.569*
Middle	229 (26.5)	40 (13.0)	269 (23.0)	
High	438 (50.7)	148 (48.2)	586 (50.0)	

**Significant at p < 0.050. SD: standard deviation.*

Other variables such as socioeconomic status, age (20–29 and 30–39 years), sex (female), and marital status (married and separated/divorced) were negatively associated with decreased odds of KD knowledge among the respondents (not significant). While age (40–50+ years) were positively associated with decreased odds of KD knowledge among respondents (not significant) [Table 4].

DISCUSSION

The results of this study showed a high level of knowledge of KD among Nigerian communities. The prevalence of high knowledge in our cohort was 72.4%. This is similar to reports of other studies.[2,3,31] In this study, the prevalence of KD knowledge was higher than the 9.5% knowledge and 10.0% awareness level reported by Tamura et al.[32]

Table 2: Knowledge scores of kidney diseases by sociodemographic variables (n = 1171).

Sociodemographic variables	Knowledge status of kidney diseases				Total n (%)	*p*-value
	Low		High			
	(n = 323)	%	(n = 848)	%		
Sex						
Male	185	29.5	442	70.5	627 (100)	0.114
Female	138	25.4	406	74.6	544 (100)	
Age, years						
< 20	53	34.9	99	65.1	152 (100)	0.044*
20–29	53	31.4	203	68.6	296 (100)	
30–39	96	24.1	303	75.9	399 (100)	
40–49	46	24.6	141	75.4	187 (100)	
50 +	35	25.5	102	74.5	137 (100)	
Educational level						
None	5	45.5	6	54.5	11 (100)	0.000*
Primary	30	50.8	29	49.2	59 (100)	
Secondary	112	32.0	238	68.0	350 (100)	
Tertiary	176	23.4	575	76.6	751 (100)	
Ethnic group						
Yoruba	175	26.4	488	73.6	663 (100)	0.072
Igbo	80	25.4	235	74.6	315 (100)	
Hausa	20	37.0	34	63.0	54 (100)	
Others	48	34.5	91	65.5	139 (100)	
Marital status						
Single	224	32.3	470	67.7	694 (100)	0.000*
Married	94	21.8	337	78.2	431 (100)	
Separated/divorced	1	4.0	24	96.0	25 (100)	
Widowed	4	19.0	17	81.0	21 (100)	
Religion						
Christianity	257	28.8	635	71.2	892 (100)	0.181
Islam	61	24.4	189	75.6	250 (100)	
Traditional	4	26.7	11	73.3	15 (100)	
Others	1	7.1	13	92.9	14 (100)	
Employment status						
Working	234	26.7	641	73.3	875 (100)	0.269
Not working	89	30.1	207	69.9	296 (100)	
Socioeconomic status						
Low	89	28.2	227	71.8	316 (100)	0.223
Middle	84	31.2	185	68.8	269 (100)	
High	150	25.6	436	74.4	586 (100)	
Place of residence						
Urban	225	26.0	639	74.0	864 (100)	0.048*
Semi-urban	98	31.9	209	68.1	307 (100)	

**Significant at p < 0.050.*

Similarly, Shah et al,[33] reported a lower prevalence of KD knowledge and awareness (49.4% and 23.0%, respectively). A study in the Iranian community indicated a relative lower limited knowledge of KD.[34] However, studies in developing countries revealed lack of KD knowledge among patients before they reported to a hospital with symptoms of CKD.[2,35] In developed countries, such as America, only one-third of CKD diagnosed American patients were aware of CKD and its possible treatment modalities.[36,37] Thus, educational programs should incorporate healthy practices towards prevention and early

Table 3: Univariate analysis to determine the risk-inducing lifestyles for kidney disease among the study respondents (n = 1171).

Modifiable risk factors	Urban (n = 864), n (%)	Semi-urban (n = 307), n (%)	Total, n (%)	Odds ratio (OR)	95% CI	*p*-value
Habitual medicine intake without medical prescription						
Yes	226 (71.3)	91 (28.7)	317 (100)	0.841	0.63–1.12	0.238
No	638 (74.7)	216 (25.3)	854 (100)			
Habitual analgesic intake						
Yes	166 (82.2)	36 (17.8)	202 (100)	0.864	0.54–1.88	0.358
No	4 (100)	0 (0.0%)	4 (100)			
Habitual use of herbal supplements						
Yes	230 (68.0)	108 (32.0%)	338 (100)	0.668	0.51–0.88	0.004*
No	634 (76.1)	199 (23.9)	833 (100)			
Excessive use of herbal remedies (agbo)						
Yes	370 (72.1)	143 (27.9)	513 (100)	0.859	0.66–1.12	0.255
No	494 (75.1)	164 (24.9)	658 (100)			
Significant alcohol consumption						
Yes	240 (69.8)	104 (30.2)	344 (100)	0.751	0.57–0.99	0.044*
No	624 (75.5)	203 (24.5)	827 (100)			
Excessive cigarette smoking						
Yes	65 (72.2)	25 (27.8)	90 (100)	0.918	0.57–1.48	0.726
No	799 (73.9)	282 (26.1)	1081 (100)			
Lack of moderate/vigorous exercise						
Yes	687 (74.3)	238 (25.7)	925 (100)	1.125	0.82–1.54	0.462
No	177 (72.0)	69 (28.0)	246 (100)			
Sedentary behaviors						
Yes	250 (71.6)	99 (28.4)	349 (100)	0.855	0.65–1.13	0.276
No	614 (74.7)	208 (25.3)	822 (100)			
Biomedical risk factors						
Hypertension						
Yes	425 (76.4)	131 (23.6)	536 (100)	1.210	0.92–1.59	0.179
No	362 (72.8)	135 (27.2)	497 (100)			
Diabetes						
Yes	308 (70.6)	128 (29.4)	436 (100)	0.583	0.44–0.77	0.000*
No	483 (80.5)	117 (19.5)	600 (100)			
Overweight						
Yes	68 (78.2)	19 (21.8)	87 (100)	1.351	0.80–2.29	0.261
No	747 (72.6)	282 (27.4)	1029 (100)			
Obesity						
Yes	41 (83.7)	8 (16.3)	49 (100)	1.971	0.91–4.25	0.079
No	762 (72.2)	293 (27.8)	1055 (100)			
Heart problems						
Yes	15 (93.8)	1 (6.3)	16 (100)	5.405	0.71–41.1	0.067
No	849 (73.5)	306 (26.5)	1155 (100)			

**Significant at p < 0.050. CI: confidence interval.*

detection of KD and disseminating such information to the general population, as especially at the grassroots level.

We found that the main source of KD information was media (41.6%), and this may explain the relatively high level of knowledge. The

Table 4: Predictors of knowledge of kidney disease.

Variables	Coefficient (β)	Standard error	Odds ratio (OR)	*p*-value	95% CI
Sex					
Male	-	-	-	-	-
Female	-0.208	0.132	0.812	0.114	0.63–1.05
Age, years					
< 20	-	-	-	-	-
20–29	-0.445	0.260	0.385	0.087	0.39–1.07
30–39	-0.289	0.232	0.749	0.214	0.48–1.18
40–49	0.080	0.228	1.083	0.727	0.69–1.69
50 +	0.050	0.259	1.052	0.846	0.63–1.75
Educational level					
None	-	-	-	-	-
Primary	-1.002	0.612	0.367	0.102	0.11–1.22
Secondary	-1.218	0.274	0.296	0.000*	0.17–0.51
Tertiary	-0.430	0.143	0.650	0.003*	0.49–0.86
Marital status					
Single					
Married	-0.706	0.562	0.494	0.209	0.16–1.48
Separated/divorced	-0.170	0.568	0.844	0.764	0.28–2.57
Widowed	1.447	1.162	5.250	0.136	0.58–5.08
Ethnic group					
Yoruba	-	-	-	-	-
Igbo	0.386	0.199	1.471	0.047	0.99–2.17
Hausa	0.438	0.220	1.549	0.074*	1.14–2.39
Others	-0.109	0.334	0.897	0.744	0.78–1.72
Religion					
Christianity	-	-	-	-	-
Islam	-1.660	1.040	0.190	0.110	0.03–1.46
Traditional	-1.434	1.048	0.238	0.171	0.03–1.86
Others	-1.553	1.191	0.212	0.192	0.02–2.18
Employment status					
Working					
Not working	0.164	0.148	1.178	0.269	0.88–1.57
Socioeconomic status					
Low	-	-	-	-	-
Middle	-0.131	0.157	0.877	0.405	0.65–1.19
High	-0.556	0.417	1.518	0.404	1.01–2.29
Place of residence					
Urban	-	-	-	-	-
Semi-urban	0.286	0.145	1.332	0.048*	1.00–1.77

**Significant at p < 0.050. CI: confidence interval.*

use of technology-based platforms may be effective in implementing health-related kidney programs in Nigerian communities where mobile health (mhealth) technologies have been adopted and used successfully in public health efforts related to maternal-child health, tuberculosis, and HIV.[38,39] Although the use of technology-based platforms for improving non-communicable diseases care in sub-Saharan African countries is not well established, our assessment of healthcare practices related to KD suggested that mobile phones would be a prospective and well-received means of facilitating such public health efforts. Emails may also be useful for health communication and education among certain

populations in local urban settings where internet facilities can be found.[40,41]

In our study population, education and marital status had the strongest associations with the mean knowledge score for KD. In developed countries, the level of education is directly associated with better health outcomes in patients with KD, and education can moderate the effectiveness of interventions.[42,43] Thus, health knowledge is a key in aiding in the understanding of basic health information so that the right healthcare decisions can be made leading to better health outcomes. In developed countries, targeting high-risk populations with low levels of health knowledge has been proven to be effective in improving KD care as well as in adopting preventive modalities to reduce its risk factors.[44,45] In Nigerian rural communities, it is important to target high-risk individuals with low education and health literacy towards non-communicable diseases, including KD, which may allow for more efficient educational health programs and health interventions that may better account for disparities of health outcomes in urban and rural settings.

High level of education facilitates good discussion for preventive measures between health workers and persons that are most likely to be predisposed to kidney ailments.[1,45] Older respondents living in urban/semi-urban settings were associated with high knowledge levels of KD. Age and setting were characterized by a strong interest in learning about KD, as respondents were concerned about their socioeconomic status, health, and the social impact of being diagnosed with KD. Public health efforts aimed at improving knowledge of KD and reducing these concerns have been effective in other low-resource settings outside of developing nations of Africa, and our findings suggest that such efforts would also be well-received and implemented in health policy programs in Nigeria.[36,46,47]

The findings of this study showed a strong association between KD and habitual use of herbal supplements. Various authors have cited the habitual intake of herbal supplements and as a contributing factor to the increasing prevalence of CKD in Nigerian communities.[48,49] However, the association in this study may be explained by the likelihood of biomedical risk factors, which may act concurrently with herbal supplement abuse to cause nephrotoxicity from aristolochic acid resulting in adverse kidney effects and toxicity from contaminants within the extracts and has been implicated in the increasing prevalence of KD.[49,50] Similar reasons may explain the significant positive association found between KD and alcohol consumption in this study. This is in agreement with the findings of a previous study that found a significant association with alcohol consumption and renal impairment in the general population of South Korea.[51] On the contrary, some studies have reported no association between alcohol consumption and KD.[16,52]

Habitual analgesic and medicine intake (without a medical prescription) were not found to be a risk factor for KD in this study. This is in agreement with previous studies.[53,54] Similarly, analgesic use was not associated with KD.[55] In this study, excessive cigarette smoking was not associated with the development of KD, in contrast with findings that identified smoking as a major cardiovascular risk factor that promotes KD progression.[2] Cigarette smoking is perceived in Nigerian communities as an antisocial habit with which the subjects possibly may not want to be identified. This may explain the non-significant association of cigarette smoking on the development of KD among our cohort.

In addition, lack of moderate/vigorous physical exercise and sedentary lifestyles did not have a significant association with kidney ailments in this study. This does not agree with the findings of many studies, in which simple exercise can help improve the health of individuals at risk of KD. Thus, sedentary behavior is an important risk factor for diabetes, hypertension, and obesity and are predisposing factors for kidney damage if left untreated or unmanaged.[2,16,18,56] Unlike earlier studies from Nigeria that reported an association between KD and hypertension, overweight, obesity, and heart problems,[2,16,18] no such association was found in this study. This may be due to a high negative self-reported response rate arising from the respondents having inadequate health information about biomedical risk factors for the development of KD. This study also demonstrated that urgent attention needs to be paid to risk factors for KD and to bring about behavioral health modification interventions to address the rising prevalence of KD risk factors and its slow consequence on the progression of kidney challenges. This need is driven by the inadequate knowledge by the general population of the negative outcome of risk factors on the kidney.

Participants showed poor recognition of the underlying modifiable and biomedical risk factors (risk-inducing lifestyles). Based on that, negative attitudes towards risk-inducing lifestyles were mostly based on the fact that most respondents showed 'denial of medical reality' and a misconception about the interconnected kidney risk factors that affect people's health. Misconceptions and 'denial of medical reality' may influence individuals' predisposition not to engage in healthy lifestyles, and even to seek medical attention if signs or symptoms are not noticed. This finding was applicable in many health diseases and medical conditions such as cardiovascular disease, breast cancer, and heart disease.[2,16,57] Also, wrong assumptions about KD predisposing factors, signs and symptoms, disease stage, and related management plan may account for reasons why individuals with kidney challenges present late to medical facilities. Previous studies have shown positive development in health outcomes among populations who receive appropriate health knowledge.[36,47] Health interventions aimed at changing misconceptions and improving perceived susceptibility will enhance adoption of healthy practices towards dealing with chronic illnesses, KD inclusive. Therefore, health education about kidney functions, KD-related risk factors, and the benefits of early screening should be encouraged.

Ethnic group (Hausa) and place of residence (semi-urban) were independently associated with decreased odds of KD knowledge. Similarly, female sex, age (20–29 and 30–39 years), marital status (married and separated/divorced), other ethnic groups, and socioeconomic status were associated with negative non-significant decreased odds of KD knowledge. While religion and education (primary) have negative non-significant increased odds of KD knowledge. Hence, those with secondary education have negative significant increased odds of KD knowledge and negative significant decreased odds of KD knowledge with those that have tertiary education. Hence, the findings on the demographic factors with negative odds showed the absence of KD knowledge, which implied that those demographic factors do not predict KD knowledge. But their association with other risk factors are likely to incline an individual to seek adequate KD knowledge. Emphasis should, therefore, be placed on community health intervention programs tailored towards improving Nigerian populations' knowledge and awareness on the increased tendency to develop KD that are usually associated with risk-inducing lifestyles if left unmodified or unmanaged.

Our study was limited by its cross-sectional nature, where participants were visited only once to gather data. The knowledge of KD was self-reported, and so the concern of recall bias is of significance. Given the cross-sectional nature of our study, we suggest further prospective longitudinal studies about the association between the knowledge of KD and its sociodemographic determinants. We used a quantitative tool to assess knowledge and sociodemographic determinants in our survey. This approach may pose some methodological problems in obtaining the necessary information for this study. In addition, the study did not include a question as to whether or not the participating respondents with KD risk factors had routine medical care or not. This omission should be considered in future surveys.

The strength of our study, however, is the multi-stage systematic sampling method, and to a large extent a good coverage of the urban and semi-urban places of residence where the study was carried out. The sample of the respondents who participated in the survey is large, and allows robust analysis of the topic. Our community-based study found a relationship between knowledge of KD and its sociodemographic determinants. To the best of our knowledge, previous similar studies have been hospital-based. The study addressed a topical issue, considering its impact on the public health of Nigerian populations, and intended to attract the interest of not only investigators but also health policymakers.

CONCLUSION

The study achieved the aim of evaluating the Nigerian population's knowledge of KD and its relation to social determinants. Although the results indicated that most participants have knowledge of KD, the majority were found to engage in risk-inducing lifestyles as a result of poor recognition of linking their lifestyles to KD development. At-risk individuals (i.e., individuals with biomedical risk factors) are not adequately informed regarding their increased risk for developing KD. A concerted effort should be made to improve the level of knowledge and awareness among the population with a view to a better understanding of the burden of KD and

the solutions to reduce the burden of its related risk factors in their communities. KD should be discussed in public places with anyone with modifiable risk factors and health conditions of KD. Screening programs should incorporate more community awareness talks to raise people's understanding of the benefits of kidney organ routine check-up, and modification of unhealthy behaviors that will lead to desirable health outcomes. Using this approach will minimize kidney health problems. Health demographers and public health practitioners should assist in planning and designing community health interventional programs that help educate people on health issues such as KD. An important implication for policy development of this study is engaging in multidisciplinary intervention programs, including medical doctors and other non-health professionals. Health demographers and public health practitioners take cognizance of the interplay of culture and the role individuals' characteristics play, especially among high-risk individuals for KD. Another application for policy development is to provide financed improved health insurance services that will cover early detection and regular routine screening/check-ups for KD. This must be recognized as a priority area for Nigerian governments, given that an average Nigerian engages in self-management and treatment of health problems, acute or chronic (KD inclusive), with poverty standing as an obstacle for seeking medical attention.

Disclosure

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