Chronic Kidney Disease (CKD): Knowledge of Risk Factors and Preventive Practices of CKD Among Students at a University in Rwanda

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Abstract

Background
Chronic Kidney Disease (CKD) is a global public health burden. Most people miss the early subtle signs that can develop at any age. CKD has severe complications, including End-stage Renal Disease.
Objective
To assess the knowledge level of CKD risk factors and preventive practices among university students in Rwanda.
Methods
A cross-sectional study design was used from April to May 2017. A stratified random sampling technique was used to recruit 260 university students. A 36-item questionnaire was self-administered. Data were analyzed using descriptive and inferential statistics.
Results
The mean age was 29 years and over half were female (53.4%). A great number (44%) had a low knowledge level of CKD and its risk factors, a third (34%) had moderate, and only (22%) had a high knowledge level of CKD risk factors. The majority (50.4%) had low level of preventive practices, nearly half (45%) had moderate and only (4.6%) had high level of preventive practice.
Conclusion
CKD knowledge and preventive practices in this study population were low. Knowledge gained and desire for healthy preventive practices may have been a benefit of the study. CKD educational programs should be further developed to prevent this significant problem affecting the Rwandese community.

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Keyswords: Chronic kidney disease, knowledge, preventive practices, university students

Background

Chronic Kidney Disease (CKD) is a major public health burden that affects about 10% of the global population. [1] CKD is defined as a decreased glomerular filtration rate, and increased excretion of urinary albumin, or both.[2] Every year, millions of people die as a result of inability to access adequate CKD treatment, particularly in resource limited countries.[1] CKD is prevalent in Africa and sub-Sahara Africa (SSA) with the prevalence of 15.8% and 17.7%, respectively in the general population.[3] The high risk populations such as patients suffer from diabetes mellitus, high blood pressure and HIV were highly vulnerable with the prevalence of 32.3% of CKD.[3] The prevalence of CKD in Rwanda ranged from 4% to 24%, based predominantly on proteinuria as a marker.[4]

Prevention and control programs include prevention, early detection and effective treatment programs.[1,3] However, population awareness of CKD remains low[1,3] due to lack of information about the risk factors and preventive practices,[2] which impede the effectiveness of these interventions.[1,3] Although, it is possible to slow or stop renal conditions progression when diagnosed and managed in an early stage,[1] according to the Centre for Disease Control and Prevention (CDC) estimate that around 30 million people in the US with kidney damage or reduced kidney function are not aware of their state[5] as the early signs of CKD are subtle, making it difficult to recognize.[1,3] This results in late diagnosis of kidney diseases at the end-stage of chronic kidney disease (ESCD) (stage 5), which requires renal replacement therapy.[6]

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Two of the most common risk factors that can lead to CKD are diabetes and hypertension ranging from 75% to 90 % in African countries.[5] Furthermore, it is not only NCDs that can be risk factors of CKD, but also some communicable diseases such as human immunodeficiency virus (HIV) and its related ARVs, schistosomiasis, leishmaniasis, and infectious glomerulonephritis can also increase the risk.[7,8] In addition, the use of herbal drugs, environmental toxins and repeated episodes of malaria infection are implicated in the development of CKD.[5,9] Strategies to reduce the burden of CKD include increasing public awareness of the gravity of the disease and its risk factors through health education, availing opportunities for early detection and screening, targeting prevention of obesity, diabetes and hypertension, and effective treatment.[1]

There appears to be limited studies in Africa on CKD knowledge. In Benin City, Nigeria, a study conducted in 2012 among non-medical university students in their 3rd and 4th year showed only 44.7% were aware that diabetes mellitus, and 25.1% were aware the hypertension were risk factors.[10] Furthermore, 48% believed that spiritual healing, herbal therapy and urine therapy were treatments.[10] That study showed that 25.1% had good knowledge, 35.2% had some knowledge, and 39% had poor knowledge.[10] A study conducted in South Africa in 2015, showed that 60.42% of university students had good knowledge of CKD risk factors,[11] and in Abia State, Nigeria, 81% of 4th-year nursing students had good knowledge of kidney function, 21% of CKD, though overall knowledge of risk factors was poor.[12] At university community in Nigeria in 2015, the prevalence of risk factors on CKD was high where in a sample of 259 young volunteers; the obesity was found in 12.2% of participants while proteinuria and glycosuria were found in 12.4% and 2.7% participants, respectively. Thus, indicated that young people like university students were also at high risk of developing CKD. [13] From our review, there has not been a study conducted on level of knowledge and preventive practices of risk factors of CKD in Rwanda. The aim of this study was to assess the knowledge of risk factors and preventive practices of CKD among university students at one selected University in Rwanda.

Specific objectives of the study

1. To determine the level of knowledge on CKD and its risk factors CKD among university students at one selected University in Rwanda.
2. To describe the level of preventive practices of CKD among university students at one selected University in Rwanda.
3. To establish demographic factors associated with knowledge of risk factors and preventive practice of CKD among university students at one selected University in Rwanda.
4. To examine the relationship between knowledge of risk factors and preventive practice of CKD among university students at one selected University in Rwanda.

Methods

Design

A descriptive cross-sectional design was conducted at one selected University in Rwanda from 1 April to 30 May 2017.

Participants' recruitment

The sampling frame consisted of 2,714 students; both full-time and special program evening and weekend students. A stratified random sampling technique was used to recruit 260 students from different classes within four departments to obtain an equal proportion from each strata among University students studying at University of Technology and Arts of Byumba (UTAB). The Yamena formula was used to determine the sample size, with a 0.05 margin of error and 95% confidence interval, which resulted in 252 students. Eight more students were added to make a rounded figure of 260 students.

Measures

A self-administered questionnaire with closed-ended questions was used to collect data. The questionnaire was developed from two validated questionnaires,[9,10] which had been previously used in similar studies testing the knowledge of CKD risk factors and preventive practices. The questionnaire was adapted to the Rwandan context, translated in Kinyarwanda, then back-translated to assure accuracy with interpretation. The instrument was in both Kinyarwanda and English. The instrument had three sections consisting of 36 items.

Section one had five questions related to sociodemographic data and included questions about age, gender, year of study, university department, and occupational status other than student (Table 1).
Section two consisted of 21 questions to determine the level of CKD knowledge of risk factors. A CKD knowledge questionnaire was adapted [13] after reviewing the literature and discussions with two nephrology experts. Participants had a choice of responses; Yes and No (table 2). Each correct answer was given one point while the wrong response was rewarded zero (0). Then after, the scores were summed up to obtain the overall score of the participants. There were 21 questions on the knowledge section meaning if the participants were to get all the questions right, the points will be 21. Therefore, the expected minimum score was zero (0%) while the expected maximum was 21 (100%). A low level of knowledge was defined as <11 (<50%), a moderate knowledge level as between 11-44 (50-69.99%) while those having score of 15-21 (70-100%) were considered as having high knowledge about CKD risk factors. The scale was adopted from the one developed by Adejumo et al. (2018) since the instruments used did not have the scale for knowledge.[14] The participants having knowledge below 12.6 (60%) are considered having poor

knowledge about CKD risk factors. The last two items on the questionnaire were added as attention checks, to see if respondents were actually reading the question properly or just checking any column.

Section three consisted of ten questions assessed engagement in CKD prevention practices. A questionnaire was adapted after reviewing the literature. [14] Participants had a choice of response: Yes or No (Table 3). Each correct practice answer was one point while the incorrect was zero (0). The possible maximum was 10 points (100%) while the possible minimum was 0 (0%). Then scores were then summed up to obtain overall practice score, which was later translated into percentage. A low level of preventive practice was defined as a score of <5 (<50%), moderate preventive practice as between 5-6.99 (50-69.99%) while high preventive practices was considered for those with 7-10 (70-100%). The same scale used for knowledge was used for practice levels for uniformity. In general, those with score below 5 (50%) are considered poor preventive practice.

The pilot study was conducted on 20 students to test the feasibility of the study. The participants involved in the pilot test were not included in the final study results. There were some adjustments to the questionnaire after the pilot study and further discussions with nephrology experts. The Cronbach's alpha was 0.73, indicating adequate internal consistency.

Data collection

The potential participants heard about the study while attending class at the university. The investigator explained the study and obtained written consent prior to data collection. Class monitors were present to help distribute the questionnaire. The questionnaire was in both Kinyarwanda and English, so participants could select a questionnaire depending on their language preference, even though class is taught in English language. The questionnaires were returned to the investigator within 24 hours. The returned filled questionnaires were screened for their completeness and coded.

Data analysis

The data were coded, entered into SPSS version 21, checked and cleaned. Data were analyzed using descriptive and inferential statistics. Knowledge of CKD and its risk factors as well preventive practices were reported as frequency and percentage. The mean and standard deviation were used to summarize the knowledge and practice level score, which were later categorized in categorical variable. The Pearson correlation coefficient was calculated to test correlation between the two numerical variables namely knowledge (independent variable) and practice (dependent variable). Also, chi-square test was used to establish an association between demographic characteristics (categorical variables) and knowledge/ practice (numerical variable). A p-value was set of .05 or below was considered statistically significant.

Ethical considerations

The Institutional Review Board at the College of Medicine and Health Sciences at the University of Rwanda approved the study prior to data collection. The participants were aware the study was voluntary and provided consent before data collection.

Results

The demographic characteristics were presented (table 1). Completed responses were received from 260 university students for a 100% response rate. The majority of respondents (64.6%) were aged between 18-30 years and female (53.5%). Students in the second year of study were more likely to participate (43.46%), and those in the management and development department (33.1%). The majority of students were unemployed (51.5%), though nearly half (48.5%) worked while attending university.

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Table 1. Sociodemographic Characteristics (n= 260)

Characteristics	n (%)
Age (years)	
18 - 30	168(64.6)
31 - 40	67(25.8)
41 - 50	23(8.8)
≥ 51	2(0.8)
Gender	
Female	139(53.5)
Male	121(46.5)
Year of study	
1st	62(23.8)
2nd	113(43.5)
3rd	41(15.8)
4th	44(16.9)
Department	
Management and Development	86(33.1)
Social Sciences	38(14.6)
Education in Sciences	73(28.1)
Arts and Humanities	63(24.2)
Students' work status	
Unemployed	134(51.5)
Farmer	31(11.9)
Government employed	48(18.5)
Self-employed	20(7.7)
Private sector /NGO	27(10.4)

Respondents' knowledge of CKD and risk factors are presented (table 2). The majority (64.6%) knew that CKD is a reduction in kidneys ability to remove wastes from the blood. The majority also knew that CKD is differed from stones of the kidney (76.9%), correctly indicated that patients with CKD manifest pain in the flank (60%), and correctly denied that CKD is the swelling of the kidneys (62.2%). More than a half (54.2%) agreed that CKD could be asymptomatic to an advanced stage.

However, nearly all (95.4%) were not aware that CKD patients may not experience difficulty with urination, and about half were not aware that changes in the odor (49.6%) and urine color (56.2%) were manifestations of CKD. Other knowledge deficits revealed that CKD patients urinate too little (86.5%), and untreated diabetes mellitus (40.5%) hypertension (61.9%), and smoking (61.2%) can increase their CKD risk. The two questions about being a driver or a tailor and increased CKD risk were placed there due to common misconceptions in the local area, with over half believing a driver (65.4%) and a tailor (61.5%) are risk factors for CKD.

Table 2. Knowledge of Chronic Kidney Disease and its Risk Factors (n = 260)

Knowledge questions	Yes n (%)	No n (%)
Knowledge of CKD		
CKD is a reduction in kidneys' ability to remove waste from the blood	168(64.6)*	92(35.4)
CKD is an infection of the kidneys	167(64.2)	93(35.8)*
CKD is damage to the kidneys	124(47.7)*	136(52.3)
CKD is a stone in the kidneys	60(23.1)	200(76.9)*
CKD is a swelling of the kidneys	98(37.8)	162(62.2)*
CKD is manifested by pain in the flank	156(60.0)*	104(40.0)
CKD is manifested by difficulty in urination	248(95.4)	12(4.6)*
CKD is manifested by change in urine odor	131(50.4)*	129(49.6)
CKD is manifested by change in urine color	114(43.8)*	146(56.2)
CKD can be asymptomatic to advanced stages	141(54.2)*	119(45.8)
CKD is manifested by urinating too little	35(13.5)*	225(86.5)
CKD is manifested by urinating too much	38(14.6)	222(85.4)*
Knowledge on risk factors of CKD		
Drinking too much water can result in CKD	55(21.2)	205(78.8)*
Drinking too little water can result in CKD	161(61.9)*	99(38.1)
Smoking can result in CKD	101(38.8)*	159(61.2)
Untreated diabetes can result in CKD	155(59.6)*	105(40.4)
Untreated hypertension can result in CKD	98(37.7)*	161(61.9)
Untreated HIV/AIDS can result in CKD	66(25.4)*	194(74.6)
Untreated Malaria can result in CKD	54(20.8)*	206(79.2)
Being a driver can result in CKD	170(65.4)	90(34.6)*
Being a tailor can result in CKD	160(61.5)	100(38.5)*

***Correct answer**

Ten questions helped determine the CKD preventive practices of participants (table 3). The findings show that only a third (32.7%) do regular physical exercise, and have a regular renal checkup (32.3%). Nearly half (44.2%) have a regular diabetes screening and over half (51.5%) have regular hypertension screening. Nearly all eat vegetables (93.8%) and fruit (74.6%) regularly. Some admit to eating too much salt (15.4%) or too many lipids and fats (9.6%). A few smoke (8.8%) and drink alcohol (19.2%).

Table 3. CKD Preventive Practices

Preventive practice questions	Yes n (%)	No n (%)
Do you have regular physical exercise?	85(32.7)	175(67.3)
Do you have regular renal check-up?	84(32.3)	175(67.3)
Do you have regular diabetes screen?	115(44.2)	145(55.8)
Do you have regular hypertension screen?	134(51.5)	126(48.5)
Do you regularly eat vegetables?	244(93.8)	16(6.2)
Do you regularly eat fruits?	194(74.6)	65(25.0)
Do you eat foods with too much salt?	40(15.4)	217(83.5)
Do you eat foods with high fat content?	103(39.6)	157(60.4)
Do you drink too much alcohol?	50(19.2)	210(80.8)
Do you smoke?	23(8.8)	237(91.2)

According to table 4, knowledge scores ranged from a minimum score of zero to a maximum score of 21. A great number (44%) indicated a low level of CKD knowledge, over a third (34%) had moderate level, and a limited number (22%) demonstrated a high level of knowledge. Scores for preventive practices related to CKD ranged from 0-10, with a mean of 5 (50%). Nearly half (45%) of those surveyed showed a low level of preventive practices (≤49%), over half (50.4%) showed a moderate level (50-70%), and a limited number (4.6%) showed a high level (≥71-100%).

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Table 4. Level of Knowledge and Preventive Practices on Chronic Kidney Disease and its Risk Factors among Participants (n = 260)

Level of knowledge Score out of 21	Knowledge score in percentage/F	Level of knowledge
0	0(1)	Low – 115 (44%)
2	9.5(2)	
3	9.4(12)	
6	14.3(18)	Moderate – 87(34%)
7	33.3(25)	
8	38.1(20)	
9	42.9(21)	
10	47.6(16)	High - 58(22%)
11	52.4(15)	
12	57.1(12)	
13	61.9(28)	
14	66.7(32)	
15	71.4(30)	
16	76.2(6)	
17	81.0(8)	
18	85.7(4)	
19	90.5(5)	
20	95.2(3)	
21	100(2)	
Preventive practices score out of 10	**Preventive Practice score in percentage**	**Level of preventive practice**
0	0	Low – 131
1	10	
2	20	
3	30	Moderate - 117
4	40	
5	50	
6	60	
7	70	High – 12
8	80	
9	90	
10	100	

According to table 5, there was a significant association between gender and knowledge of risk factors of CKD (p=.006), female gender and prevention practice (p=0.37), and occupation and preventive practice (p=.029). Age of participant, year of study and department did not have a significant relationship to the overall knowledge of risk factors for CKD. There was a weak significant positive relationship (r = .362, n = 260, p = .01) between knowledge of CKD and its risk factors and preventive practices. The more knowledge the university students have, the more likely to perform preventive practices. Since the results of the correlation matrix were significant, regression analysis was done to reveal the contribution of knowledge (independent variable) on the preventive practices (dependent variable). R^2 was 0.43, meaning knowledge accounted for 43% of the variance on CKD preventive practices among university students.

Table 5. Multivariate Analysis for Demographic Variables, Knowledge and Practice of Nurses

Factors associated with knowledge and preventive practices of CKD			
Variables	**P value**		
Gender and knowledge	.006		
Gender and preventive practice	.037		
Occupation and preventive practice	.029		
Simple linear regression analysis for knowledge and preventive practice of University students			
R = .426	R^2 = .181	Sig F change .00	P value = .01

p < 0.05 level (2-tailed).

Discussion

The findings indicated that the majority (55%) of participants had a low level of knowledge of CKD risk factors, a third (35%), had a moderate level, and a limited number (10%) a high level. Many respondents were not aware that diabetes, hypertension, and HIV could be significant risk factors for CKD in the local population.

Knowledge of CKD and its risk factors

Similarly, there were many studies indicating the populations had poor knowledge of CKD.[10, 12,15–18] A study in Nigeria showed that over a third (39.7%) had a low level of knowledge of kidney disease, another third (35.2%) of some knowledge, and a quarter (25.1%) had good knowledge. The sample involved 295 non-medical 3rd and 4th-year university students at a Government University in Nigeria.[10] A survey in Tanzania revealed a limited knowledge of CKD among 606 adults, and a common practice of using traditional healers and medicines, which lead to over exposure of irrelevant medications undermining renal health and considered worse than taking preventive measures.[16] In 2014, an Iranian community had limited knowledge of the main CKD risk factors with only 12.7% aware of unmanaged diabetes,and 14.4% untreated hypertension.[17] Not having the necessary CKD knowledge of the risk factors, signs and symptoms, disease stage and management are among the likely reasons why patients delay seeking care and treatment.[15]

Conversely, there were two studies indicating moderate to high knowledge levels.[11,19] A cross-sectional study in South Africa indicated more than half (60.4%) of the 144 university students surveyed had good knowledge of kidney disease.[11] A telephone survey of 516 in Hong Kong indicated a high knowledge level, with the majority (84.7%) aware of kidney function and identification of high dietary sodium as a risk factor (79.5%). Nearly half also knew that hypertension (43.8%) and diabetes (44.0%) were major risk factors, and frothy urine (52.7%) was a symptom of kidney disease; however, less (17.8%) knew that it could be asymptomatic until late stage. [19] Still, the author concluded the Hong Kong study population was poorly informed.

Prevention practices towards CKD

Prevention is better than cure, and these results indicate there is a need for more sensitization to improve CKD preventive practices. In the current study, half of the students (49.6%) had either a high level of participation in preventive practices, or a moderate level, as opposed to a low level (50.4%) of participation. However, our findings indicated that there was a weakly positive relationship (r = .426, n = 260, p= .01), as the level of knowledge increased, the level of preventive practices increased among the university students.

Similarly, there were two studies indicating low preventive practices concerning CKD. [15,20] A study in Malaysia revealed that even though the majority of respondents had poor knowledge (69.9%), they had a good attitude (68.9%,) and good practice (88.3%) to prevent risk of CKD.[20] A survey of 740 patients at outpatient clinics in Jordon discovered that even though they had adequate knowledge of the disease, half the sample had erroneous information about CKD signs and symptoms. Consequently, not having the correct information predisposed them to missing early warning signs, and adopting inappropriate preventives practices that were not promoting their health or improving their quality of life.[15]

The current study showed that gender and occupational status had a significant relationship with the level of knowledge and preventives practices towards risk factor. A study reported from Iran no significant relationship revealed between bio-demographic features and level of knowledge about CKD.[17] Interestingly, a study conducted in South Africa revealed that as participants moved from low level to high level in the year of study there was a decrease in their level of knowledge.[11]
Young people with CKD are more at risk of premature mortality from cardiovascular disease. [21] A Renal Registry in the United Kingdom indicated that a person aged 25-29 years had an average life expectancy of 18.5 years after beginning dialysis, as opposed to about 33 years at the same age without CKD.[21] Once diagnosed with CKD, adherence to hemodialysis treatment is necessary.

[22] Though some in Tanzania use traditional healers and traditional medicines for CKD treatment,[16] or believe CKD can be cured by herbal therapy or spiritual means and urine therapy for kidney disease treatment.[10,23] A systematic review of CKD emphasised the contributing factors to non-adherence in CKD patients.[24]

These findings indicate a need for widespread CKD awareness and educational programs at the national level. The CDC recommends the following interventions to help prevent or manage CKD.[5] Control modifiable factors such as high blood pressure and high glucose levels. People who are high risk for developing CKD should have regular testing, which has proven to be a cost-effective intervention. Manage CKD through appropriate medications, such as antihypertensive medications that lower high blood pressure, to slow the progression of disease. Prevent situations that could harm the kidneys or cause an abrupt drop in kidney function leading to further development of CKD. Treat kidney infections with antibiotics as needed, though certain medications are contraindicated. Avoid non-steroidal medications, such as ibuprofen and naproxen, and herbal supplements that may cause additional harm. In addition, exposure to x-ray or imaging dyes may pose a concern.[5]

Future research to assess CKD knowledge could include a larger sample comparing students in the health profession (nurses, midwives, physicians, pharmacists) with other students. A larger sample including other campuses, both urban and rural would be helpful.

Limitations

The study was conducted in a single university by the researcher, therefore cannot be generalized to other populations, such as other campuses and the general public. This may limit its generalizability of the findings. The baseline characteristics of students who declined to be in the study could not be compared to the participant's raises the possibility of response bias.

Conclusion

The knowledge of CKD risk factors and preventive practices in the study population was at a low level. CKD is a significant health burden in SSA with communicable and non-communicable diseases risk factors. Populations who have knowledge of the risk factors and aware of preventive measures would more likely seek earlier treatment. There is a need for enlightenment programs to improve knowledge to the Rwandese community so they can make lifestyle changes to prevent kidney damage. We recommend the development of a program that raises the awareness of CKD among University students. This will have a positive impact in CKD prevention in the younger age group and more chance of knowledge transferability.

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