Prevalence and risk factors of chronic kidney disease among non-clinical Healthcare Providers at the Rivers State University Teaching Hospital Port-Harcourt, Nigeria

ABSTRACT

Background: Chronic kidney disease (CKD) oftentimes remains undiagnosed until it progresses to end-stage renal disease. To tackle this silent killer, awareness and screening are essential. Limited information is available regarding the prevalence of CKD among non-clinical healthcare providers (HCPs) who work in healthcare settings.
Aim: To determine the prevalence and associated CKD risk factors among non-clinical HCPs working at the Rivers State University Teaching Hospital Port Harcourt, Nigeria.

Study design: This was a cross-sectional study

Place and Duration of Study: Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria March 10th2022.

Methods: 165 non-clinical HCPs were screened for CKD. A self-administered questionnaire was used to obtain data including; past medical history, blood pressure and BMI. Blood and urine samples were obtained to determine estimated Glomerular filtration rate (eGFR) and proteinuria. Associations of risk factors for CKD were determined by multivariate logistic regression and p-value significance <0.05.

Results: The prevalence of CKD was 12.7%. Most non-clinical HCPs were in stages 1-3. CKD was not significantly associated with any sociodemographic variable. Of all the participants, 20.6% were hypertensive, 7.3% were diabetic, 53.3% were either overweight or obese and 8.5% were proteinuric. CKD prevalence increased with age; <45 years (9.2%); >45 years (16.7%). The risk factors associated with CKD were diabetes (OR:5.9; CI:2.2-15.9), previously screened for kidney disease (OR:4.3; CI:1.6-13.4), pre-existing kidney disease (OR:8.2; CI:1.8-35.9) and on anti-hypertensives (OR:4.6; CI:1.8-12).

Conclusion: The prevalence of CKD among non-clinical HCPs in Rivers State is high. Diabetes, Hypertension and having a pre-existing kidney disease were the identified predictors for CKD. This study underscores the need for regular CKD screening and increased awareness among non-clinical healthcare providers.

Keywords: [Chronic Kidney Disease, Diabetes, Hypertension, Health Care Providers, Risk factors, Rivers State]

1. INTRODUCTION

Chronic kidney disease (CKD) is defined as kidney damage or glomerular filtration rate ≤60ml/min/1.73m2 for ≥3 months is a significant global health problem and affects people at an alarming rate [1]. Globally, it is estimated that the prevalence of CKD ranges between 8 – 16% and is the 16th leading cause of 'years of life lost' among those affected [2–4]. CKD disproportionately affects people residing in low-and-middle-income regions of the world, where screening and diagnosis rates are still low and is quickly emerging as a serious public health concern.

The prevalence of CKD in the African continent from two population-based systematic reviews were reported to range between 10.1% and 15.8% [5,6]. However, the pooled CKD prevalence in West Africa from both reviews revealed a range of 16.5% to 19.8%, which was the highest in the continent. There is no national data on the prevalence of CKD in Nigeria but community-based studies report prevalence ranging from 2.5 – 26% [7,8] and have been documented to become an increasing cause of morbidity and death.

Diabetes mellitus and hypertension are the two major causes of CKD worldwide [4]. Risk factors for CKD in Nigeria include hypertension, diabetes, and a family history of kidney disease. Other identified risk factors include advanced age, smoking, excessive alcohol consumption, obesity, use of herbal concoctions and prolonged use of non-steroidal anti-inflammatory medications [9–11]. Replete in the existing literature is the evidence that the main causes of CKD – asymptomatic hypertension and diabetes are highly prevalent,[9–12] yet are often undiagnosed due to lack of screening for risk factors and associated with a low level of awareness in certain populations in Nigeria [13,14].

Non-clinical healthcare providers in this study are defined as patient navigators, and other personalities such as ward maids, technical assistants, nurse assistants and admin staffers, who interact with patients but do not dispense medical advice or carry out procedures [15]. Their importance in resource-constrained settings for patient and community engagement is increasingly being recognized, as they contribute a significant workforce in the healthcare system in Nigeria [16]. Even so, they represent a group that could be at high risk and whose health risks frequently receive less attention. Because of their consistent work schedules in hospital care settings, it is sometimes thought that they are familiar with the fundamentals of health and illness states. This is because it may be assumed that their presence in hospitals might have afforded them, by proxy, considerable knowledge about diseases. Non-clinical staffers must be given adequate health education as they carry out their duties so they can be full beneficiaries of the health resources their work institutions provide [17].

Therefore, it is needful that these unintentionally often-ignored non-clinical healthcare providers be screened for CKD for them to be abreast of their CKD risks and were necessary be adequately educated and promptly managed to limit the progression to ESRD.

Whereas studies have been particularly conducted among clinical healthcare providers,[12,18] there are no studies on the prevalence of asymptomatic CKD in this silent yet vulnerable sector of the healthcare population in our setting. Since literature is scarce as regards the CKD prevalence and risk factors in them, we hypothesized that asymptomatic CKD may be higher in them. We, therefore, decided to study the prevalence of a positive CKD screening and identify its risk factors among non-clinical healthcare Providers in Rivers State University Teaching Hospital, Rivers State, South-South Nigeria.

2. MATERIAL AND METHODS

This was a cross-sectional study carried out at the Rivers State University Teaching Hospital, Port Harcourt, Rivers State, South-South Nigeria. The study was conducted by the RSUTH Renal Study Group (RRSG) which comprises adult and paediatric nephrologists, nephrologists-in-training and nephrology nurses. Members of the RRSG were responsible for administering the questionnaires, physical measurements and urine and blood collection for laboratory tests. The renal unit House Officers in both the paediatric and adult nephrology teams were also involved in the registration of all consenting participants. The study was conducted on the 10th of March, 2022. During this, all members of the RRSG went on a sensitization tour around the hospital educating all patients, relatives and non-clinical health workers about chronic kidney disease.

Participants were consenting non-clinical healthcare providers drawn from all the departments of the hospital and included cleaners, casual workers, nurse assistants, administrative staff and all workers besides nurses and doctors who worked within the hospital community.

Sample size: A sample size calculation using the Cochran formula and a prevalence of 12% from a previous study[19] was 162. All non-clinical healthcare providers who gave consent and made themselves available for the CKD screening exercise were enrolled. A total of 190 participants were screened, however, complete data were obtained from 165 of the non-clinical-HCPs.

Operational definition: As previously defined in earlier studies,[9,14] we defined the following: Hypertension as systolic BP >140 mmHg and/or diastolic BP >90 mmHg, Diabetes Mellitus as random blood glucose >200 mg (> 11.1mmol/L), Overweight as BMI of 25 to 29.9 and Obesity as BMI ≥30. A known hypertensive is one with a previous diagnosis of hypertension, and a known diabetic is one with a previous diagnosis of DM. A family history of DM, hypertension or kidney disease means a history of DM, hypertension or kidney disease in a relative. The definition of chronic kidney disease (CKD) was taken as an estimated glomerular filtration rate (eGFR) <60 ml/min/1.73m2 (according to the CKD-EPI equation) ± proteinuria, the definition of hypertension was taken as a history of hypertension or new hypertension and definition of DM was taken as a history of DM + newly diagnosed DM. Proteinuria and glycosuria were defined as the presence of at least 1+ of protein and 1+ of glucose on a dipstick respectively.

Proteinuria and glycosuria were assessed using participants urine using Combi-9 dipstick. Random blood sugar was measured using the Accucheck Glucometer, and results were expressed in mmol/l. A sample of five millimetres (5mls) of venous blood was taken from each subject for assessment of serum creatinine. The samples were placed in lithium heparin bottles (gently mixed) and transported immediately to the chemical pathology laboratory. Serum creatinine was estimated by Jaffe's method.

Data analysis: Completed questionnaires were automatically imported to an Excel spreadsheet and analysed using SPSS v 26 (SPSS Inc., Chicago, Illinois, USA). Simple frequencies and cross tables were performed and relevant tables were developed. Bivariate analysis was used to assess a relationship between participants' sociodemographic and identified risk factor variables and the presence of CKD. Logistic regression analysis was conducted using the significant dichotomized risk factors (independent variables - being on hypertensive medications, having diabetes mellitus, being on diabetic medications, previous history of kidney disease, previously being screened for kidney disease - to demonstrate the

strength of association with the presence of CKD. P-value < 0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

Socio-demographic characteristics of respondents

A total of 165 respondents were studied, 52 (31.5%) were males and 113 (68.5%) were females. The mean age was 46.48 ± 14.01 years, with an M: F ratio of 1:2.2. Almost half, 82 (49.7%) were between 25 and 44 years. Most 121 (73.3%) of the respondents live in urban communities, were married 102 (61.8%), earn a monthly stipend of <N30,000, 69 (41.8%) and have a tertiary level of education 109 (66.1%), as seen in table 1.

Table 1. Sociodemographic characteristics of respondents

	Frequency (n=165)	Percent
Sex		
Male	52	31.5
Female	113	68.5
Age (years)		
< 45	87	52.7
45-65	78	47.3
Type of community		
Rural	9	5.5
Semi-urban	35	21.2
Urban	121	73.3
Marital status		
Single	42	25.5
Married	102	61.8
Divorced/Separated	4	2.4
Widowed	17	10.3
Monthly income		
Not applicable	3	1.8
<N30,000	69	41.8
N30,000-N74,999	57	34.5

N75,000-N149,999	29	17.6
N150,000-N200,000	4	2.4
>N200,000	3	1.8
Highest level of education		
None	2	1.2
Primary	17	10.3
Secondary	37	22.4
Tertiary	109	66.1

Medical history of respondents

A review of the medical history of the respondents revealed that 56 (33.9%) had a history of hypertension, 44 (26.7%) take hypertension medications, 29 (17.6%) had diabetes mellitus, 21 (12.7%) are on diabetes medication, 7 (4.2%) smoke tobacco, 44 (26.7%) take alcohol, 20 (12.1%) use skin lightening cream or soap, 23(13.9%) take herbal concoctions, 80(48.5%) take pain killers, 52 (31.5%) have been screened for kidney disease before, 8 (4.8%) have been told they have kidney diseases before, 7 (4.2%) have relative with kidney disease, while 43 (26.1%) have other medical conditions (Table 2).

Table II. Medical history of respondents

	Frequency (n=165)	**Percent**
Have hypertension		
No	109	66.1
Yes	56	33.9
Take hypertension medication regularly		
No	121	73.3
Yes	44	26.7
Have diabetes mellitus		
No	136	82.4
Yes	29	17.6
Take diabetes mellitus medication regularly		
No	144	87.3

Yes	21	12.7
Smoke tobacco		
No	158	95.8
Yes	7	4.2
Take alcohol		
No	121	73.3
Yes	44	26.7
Use skin-lightening cream or soap		
No	145	87.9
Yes	20	12.1
Take herbal concoctions		
No	142	86.1
Yes	23	13.9
Take pain killers		
No	85	51.5
Yes	80	48.5
Have been screened for kidney disease		
No	113	68.5
Yes	52	31.5
Ever been told you have kidney disease		
No	157	95.2
Yes	8	4.8
Have any relative with kidney disease		
No	158	95.8
Yes	7	4.2
Have any other medical condition		

No	122	73.9
Yes	43	26.1

Respondents' Physical/biochemical parameters/ prevalence of CKD

The BMI status of respondents was measured and 71 (43.0%) of the respondents had normal BMI. The mean BMI and standard deviation were 26.37 (5.1%), 34 (20.6%) of respondents were classified as having hypertension, and 12 (7.3%) were classified as having diabetes mellitus.

The mean eGFR among the participants was 93.91 ± 32.73ml/min/1.73m^2. However, twenty-one participants had estimated eGFR <60ml/min/1.73m^2, giving a CKD prevalence of 12.7% and 14(8.5%) of them had proteinuria as seen in Table III.

Table III. Physical/biochemical parameters/Prevalence of CKD

	Frequency (n=165)	**Percent**
BMI Status		
Underweight	6	3.6
Normal weight	71	43.0
Overweight	54	32.7
Obese	34	20.6
Mean BMI (SD)	*26.37 (5.14)*	
Hypertension Status		
Hypertension absent	131	79.4
Hypertension present	34	20.6
Diabetes Mellitus Status		
No diabetes mellitus	153	92.7
Diabetes mellitus present	12	7.3
Mean RBS (SD)	*6.72 (3.08)*	
CKD Status		
No CKD	144	87.3
CKD present	21	12.7
Proteinuria		

Absent	151	91.5
Present	14	8.5

Prevalence of CKD and association with sociodemographic characteristics

Table IV showed the comparison between the prevalence of CKD and some socio-demographic variables. There was no statistically significant difference found across the various socio-demographic variables assessed. The prevalence of CKD among males was 17.3%, while among females, was 10.6%, but was not statistically significantly different (X^2=1.434, p=0.231). Similarly, the prevalence of CKD was 9.2% among those below 45 years, and 16.7% among those above 45 years, but these differences in prevalence were not significant (X^2=2.067, p=0.151). Similar insignificant findings were noted for community type, marital status, monthly income and level of education.

Table IV: Relationship between the prevalence of CKD and sociodemographic characteristics

	CKD Status (n=165)					
	No CKD (n=144)		**CKD present (n=21)**			
	freq	**%**	**freq**	**%**	**X^2**	**p-value**
Sex						
Male	43	82.7%	9	17.3%	1.434	0.231
Female	101	89.4%	12	10.6%		
Age (years)						
<45	79	90.8%	8	9.2%	2.067	0.151
45-65	65	83.3%	13	16.7%		
Type of community						
Rural	7	77.8%	2	22.2%	2.675#	0.255
Semi-urban	33	94.3%	2	5.7%		
Urban	104	86.0%	17	14.0%		
Marital status						
Single	35	83.3%	7	16.7%	2.188#	0.418
Married	91	89.2%	11	10.8%		

Divorced/Separated	3	75.0%	1	25.0%		
Widowed	15	88.2%	2	11.8%		
Monthly income						
Not applicable	3	100.0%	0	0.0%	1.638[#]	0.836
<N30,000	59	85.5%	10	14.5%		
N30,000-N74,999	50	87.7%	7	12.3%		
N75,000-N149,999	26	89.7%	3	10.3%		
N150,000-N200,000	3	75.0%	1	25.0%		
>N200,000	3	100.0%	0	0.0%		
Highest level of education						
None	1	50.0%	1	50.0%	3.336[#]	0.382
Primary	15	88.2%	2	11.8%		
Secondary	34	91.9%	3	8.1%		
Tertiary	94	86.2%	15	13.8%		

*=Statistically significant at p<0.05; [#]=Fishers Exact Test used

Risk Factors of CKD

Table V displays the identified risk factors associated with the presence of CKD. It was shown that the prevalence of CKD was significantly higher among those who take anti-hypertensive medications regularly (27.3%) than among those who do not take hypertension medications (7.4%); X^2=11.429, p<0.001. CKD prevalence was also shown to be significantly higher among diabetics (34.5%) compared to those who were non-diabetics (8.1%); X^2=14.992, p=0.001, and also significantly higher among diabetics who take their medication regularly (33.3%) than among those who do not (9.7%); X^2=9.198, p=0.002. CKD prevalence was higher among respondents who had been screened for kidney disease before compared to those who had no previous screening (25.0% Vs 7.1%; X^2=10.296, p=0.001), and also higher among those who had ever been told they have kidney disease compared to those who had not (50.0% Vs 10.8%; X^2=10.516, p=0.001).

Table V: Risk Factors of CKD

	CKD Status (n=165)					
	No CKD (n=144)		**CKD present (n=21)**			
Risk factors	**Freq**	**%**	**Freq**	**%**	**X^2**	**p-value**

Have hypertension						
No	98	89.9%	11	10.1%	2.008	0.156
Yes	46	82.1%	10	17.9%		
Take hypertension medication						
No	112	92.6%	9	7.4%	11.429	**0.001***
Yes	32	72.7%	12	27.3%		
Have diabetes mellitus						
No	125	91.9%	11	8.1%	14.992	**0.001***
Yes	19	65.5%	10	34.5%		
Take diabetes mellitus medication regularly						
No	130	90.3%	14	9.7%	9.198	**0.002***
Yes	14	66.7%	7	33.3%		
Smoke tobacco						
No	138	87.3%	20	12.7%	0.016	0.899
Yes	6	85.7%	1	14.3%		
Take alcohol						
No	106	87.6%	15	12.4%	0.045	0.883
Yes	38	86.4%	6	13.6%		
Use skin-lightening cream or soap						
No	127	87.6%	18	12.4%	0.106	0.745
Yes	17	85.0%	3	15.0%		
Take herbal concoctions						
No	125	88.0%	17	12.0%	0.523	0.469
Yes	19	82.6%	4	17.4%		

Take pain killers						
No	73	85.9%	12	14.1%	0.305	0.581
Yes	71	88.8%	9	11.3%		
Have been screened for kidney disease						
No	105	92.9%	8	7.1%	10.296	**0.001***
Yes	39	75.0%	13	25.0%		
Ever been told you have kidney disease						
No	140	89.2%	17	10.8%	10.516	**0.001***
Yes	4	50.0%	4	50.0%		
Have any relative with kidney disease						
No	138	87.3%	20	12.7%	0.016	0.899
Yes	6	85.7%	1	14.3%		
Have any other medical condition						
No	107	87.7%	15	12.3%	0.079	0.779
Yes	37	86.0%	6	14.0%		
BMI Status						
Underweight	6	100.0%	0	0.0%	1.794	0.616
Normal weight	63	88.7%	8	11.3%		
Overweight	45	83.3%	9	16.7%		
Obese	30	88.2%	4	11.8%		
Hypertension Status						
No hypertension	114	87.0%	17	13.0%	0.036	0.850
Hypertension present	30	88.2%	4	11.8%		
Diabetes Mellitus Status						

No diabetes mellitus	134	87.6%	19	12.4%	1.181	0.671
Diabetes mellitus present	10	83.3%	2	16.7%		

*=Statistically significant at p<0.05; #=Fishers Exact Test used

Table VI: Logistic regression showing the strength of the association of risk factors to CKD prevalence

			95% CI for OR		
	B	OR	Lower Limit	Upper Limit	p-value
Take hypertension medication					
No	1.540	4.667	1.806	12.059	0.001*
Yes	0[b]				
Have diabetes mellitus					
No	1.789	5.981	2.238	15.984	<0.001*
Yes	0[b]				
Take diabetes mellitus medication regularly					
No	1.535	4.643	1.606	13.423	0.005*
Yes	0[b]				
Have been screened for kidney disease					
No	1.476	4.374	1.685	11.362	0.002*
Yes	0[b]				
Ever been told you have kidney disease					
No	2.108	8.235	1.885	35.979	0.005*
Yes	0[b]				

OR=Odds Ratio; Reference category=CKD Present; b=Parameter set at 0 because it is redundant; *=Statistically significant at p<0.05

This study estimated the prevalence of CKD and associated risk factors among non-clinical HCPs working at the Rivers State University Teaching Hospital in Port Harcourt, Nigeria. The CKD risk factors and some markers of chronic kidney disease were prevalent among non-clinical HCPs and appeared to occur in the older population. CKD affected more men than women; advancing age, hypertension, diabetes and obesity were the most noticeable risk factors for CKD.

We found that the prevalence of CKD to be 12.7% among our study population to be higher than various reports similar from studies ranging from 1.9% to 12.0% in Southern and Northern Nigeria [11,19–22] but lower than the 16% to 43.5% in other studies also conducted in Southern and Northern Nigeria [7,23–26]. Dissimilarities in reported CKD prevalence could be due to variances in the methodological approaches used in estimating the estimated glomerular filtration rates, study settings, heterogeneity in populations and point versus timed eGFR screening. Overall, our reported CKD prevalence reveals a similar prevalence between non-clinical healthcare providers and the general population as evidenced by being comparable to the pooled estimate of 15.8% (12.1% -19.9%) found in a recent systematic review and meta-analysis of CKD in Africa among the general population.[6] Our study brings to the fore the need for creating awareness and screening for risk factors for CKD as was made apparent from the findings in this study.

The study identified CKD risk factors like hypertension, diabetes, overweight or obesity, proteinuria was prevalent among the non-clinical healthcare providers. This was similar to findings from other studies in Nigeria which identified hypertension, diabetes, proteinuria, and obesity to be the most common risk factors.[14,19,20,24] About one-fifth of them were already hypertensive which was high. The high prevalence of hypertension corroborates findings in previous studies in Nigeria and the African continent.[27,28] Hypertension remains an increasing public health issue in Nigeria. In this study, self-reported hypertension is high compared with the figure we measured, indicating some awareness of the disease among those affected. The rather low measured hypertension and no association of hypertension with CKD was an uncommon finding and may be a reason for the rather significant association of the use of anti-hypertensives with CKD. In other words, having to be on anti-hypertensives may be a predictor for developing CKD especially in the light of probable poor treatment adherence, this study however did not explore treatment adherence.

In this study, the prevalence of diabetes was two-fold lower than self–reported, and had the highest odds for CKD risk. We also could attribute this lower figure to a possible higher awareness of diabetes among the non-clinical healthcare providers and, perhaps the underscoring reason why a significant proportion who were on diabetic medications was noted to have a high CKD burden. A recent Systematic Review and Meta-analysis of 19 Nigerian studies showed that the pooled prevalence of diabetic kidney disease was 28% (95% CI 3-58) [29]. Similar to the findings in this present study, diabetes was the main predictor of CKD in an earlier study in Nigeria [7] and remains the most common cause of CKD globally, especially in resource-rich climes. With an increasing Nigerian populace and westernization of staple diets and increasingly sedentary lifestyles, it is plausible that more persons will be affected by diabetes kidney disease. Hence, a corresponding increase in the prevalence of CKD will be expected. Health authorities, therefore, need to implement prevention programs such as community awareness and screening of the general population and at-risk groups to reduce the impact of diabetes on kidney health.

This study also found that besides the leading predictor for CKD being diabetes mellitus, being previously screened for kidney disease or having a pre-existing kidney disease were also predictors of CKD. These were consistent with what is documented in the literature that other risk factors for CKD include a family history of CKD, inherited kidney disorders and past damage to the kidneys. This study, therefore, highlights the need for follow-up among non-clinical healthcare providers who have been screened in the past or informed about having a kidney disease. Inconsistent monitoring of renal parameters can result in undetected progression of kidney disease which may have been avoidable and progression slowed or halted if risk factors were identified early and lifestyle changes, such as maintaining a healthy diet, regular physical activity and blood pressure and blood glucose control commenced.

In this study, we found that CKD was not significantly associated with any sociodemographic variable like age, gender, body mass index, BP or hyperglycemia. This was similar to findings from other studies by Egbi et al,[9] However, unlike what was previously observed in other studies among the general populace that females were predominantly affected with CKD than males,[19,25] we observed a non-statistically significant slight male preponderance. The variation could be because of the small sample size and the study sampling technique. Nonetheless, we observed a higher prevalence of CKD in the older non-clinical HCPs. This was in keeping with findings from other studies that reported an association between advancing age and CKD. Also, smoking, use of alcohol, lightening skin creams, ingestion of herbal concoctions, prolonged use of NSAIDs, high BMI, elevated blood pressure or abnormal glucose profile, were not significant predictors of CKD in our study. Albeit, all these risk factors had higher occurrence among those who had CKD. Our finding of no significance may be due to methodological reasons. The duration and quality of control of diabetes and duration and quantum of smoking and duration of NSAID usage are known associated with the risks of CKD.

Although we had met our objectives, there are only few studies that have looked at CKD and risk factors among non-clinical healthcare providers. Our sample size was considerably small and the fact that the participants who were found to have CKD had their estimated GFR only evaluated once is a significant flaw in this study. The assessment should have been conducted again three months later to determine whether the estimated GFR values in the participants with CKD were still less than 60 mL/min/1.73 m^2, as a single measurement of eGFR may overestimate CKD prevalence.

4. CONCLUSION

Conclusion: The prevalence of CKD among non-clinical HCPs in Rivers State is high. Diabetes, hypertension and having a pre-existing kidney disease were the identified predictors for CKD. This study underscores the need for regular CKD screening for risk factors and increasing awareness among non-clinical healthcare providers. Lifestyle modifications like weight reduction exercises, dietary managementand other modifiable risk factors such as prolonged use of NSAIDs,smoking, alcohol ingestion and herbal concoctions are strongly recommended.

CONSENT

All authors declare that informed consent was obtained from the participants and other approved parties)for publication.

ETHICAL APPROVAL

All authors hereby declare that the study protocol had been examined and approved by the appropriate ethics review committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki."

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