Prevalence and Pattern of Risk Factors for Chronic Kidney Disease among Health Workers in a Tertiary Institution in South East Nigeria

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ABSTRACT

Background: Chronic kidney disease (CKD) is one of the leading causes of mortality globally. The prevalence of risk factors associated with CKD is on the increase in Nigeria. Early recognition and treatment of risk factors can prevent onset or slow down disease progression. **Objectives:**This study aimed to determine the prevalence of chronic kidney disease and some of its risk factors among health workers at Alex-Ekweueme Federal University Teaching Hospital, Abakaliki. **Methodology:** This was a cross-sectional study conducted as part of the activities to commensurate world kidney day. Consecutive volunteers were screened. Their bio-data, anthropometric data and blood pressures were obtained. Blood glucose was determined by glucometer, urine sample was collected for urinalysis and blood sample was taken for serum creatinine. Estimation of glomerular filtration rate (eGFR) was calculated using the modification of diet in renal disease (MDRD) formula. **Results:** 390 members of staff were screened. There were 152 (39%) males and 238 (61%) females. Mean age was 38.19 ± 10.24years. CKD risk factors were obesity (32.8%), hypertension (26.4%), proteinuria (11.0%) and diabetes mellitus (6.2%). 31.0% had CKD (eGFR<60 ml/min) and CKD was significantly associated with age, hypertension, obesity and proteinuria. **Conclusion:** Chronic kidney disease and its risk factors were prevalent among the participants. Healthy lifestyle and regular screening among health workers should be encouraged to curb CKD and its risk factors.

Keywords: Renal Function, Assessment, Risk Factors, Health Workers

INTRODUCTION

Chronic kidney disease (CKD) is defined as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m^2 for ≥3 months. [1] CKD is increasingly becoming a global health problem with adverse effects.[2,3] The rise in the burden of CKD in recent years is associated with increasing morbidity, mortality and huge financial burden especially in low and middle income countries.[4,5] In Nigeria, many studies have been conducted in different

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parts of the country to determine the prevalence of CKD and the associated risk factors.[6,7,8,9,10,11] Chronic kidney disease prevalences observed in the south-eastern part of Nigeria were 13.4% (Abia state) [6] and 11.4% (Enugu state). [7] Oluyombo et al. observed CKD prevalence of 12.3% in Osun state (south west, Nigeria))[8] while Nalado et al observed CKD prevalence of 26% in Kano state(north west, Nigeria) . [9]

The risk factors for CKD are diverse. Hypertension and diabetes are the two leading causes of CKD worldwide. Other documented risk factors for CKD in Nigeria include old age, obesity, family history of renal disease and use of traditional medicines.[3] The increasing burden of chronic non-communicable diseases like hypertension, diabetes mellitus and obesity that affect the kidneys has led to rising prevalence of CKD in the world. This adds to the burden of chronic glomerulonephritis and interstitial nephritis which are other causes of CKD prevalent in Africa.[12]

This study aimed at determining the prevalence of CKD and some selected CKD risk factors among health workers.

METHODOLOGY

The study was done at Alex-Ekweueme Federal University Teaching Hospital, Abakaliki(AEFUTHA), Nigeria. This was a cross sectional study conducted as part of the activities to marking the world kidney day (WKD) in March 2019. Prior to the screening activities, all categories of health workers in the hospital were informed and invited for the program. Initial health talks were delivered about CKD and its risk factors by the nephrology team. Members of staff were thereafter encouraged to participate in the screening exercise.

The minimum sample size for this study was calculated using CKD prevalence of 13.4% from a previous community-based study in south east, Nigeria.[6] Using the appropriate formula for study population > 10,000 with 95% confidence and 5% error margin, sample size was 200 . This number was increased to 400 to increase the scope of the study. Ethical clearance was obtained from AEFUTHA Health Ethics Research Committee and informed consent was obtained. Consecutive volunteers were screened.. The questionnaire used in this study was the one designed by Nigerian Association of Nephrology (NAN) for screenings during WKD. This was in keeping with the step wise approach to chronic disease surveillance recommended by World Health Organization.[13]The step wise approach involved the use of questionnaire, physical examination and biochemical measurements. Questionnaires were used to collect the bio-data and other necessary information. The participants were guided by trained research assistants to fill the questionnaires.

Thereafter, the anthropometric data and blood pressure were obtained. Anthropometric measurements were done using a digital bathroom weighing scale for weight measurement and a stadiometer to measure height to the nearest 0.1 m.The body mass index (BMI) was calculated as weight/(height)^2. Blood pressure (BP) was measured on the left arm with an Accoson® mercury sphygmomanometer (Accoson®, Britain), with the subjects relaxed and in sitting position. Blood glucose was determined using the ACUCHECK® glucometer(Roche Diagnostics, Germany). Urine sample was collected for urinalysis using dipstick and blood sample was taken for creatinine estimation using Jaffe fixed time kinetic method in the laboratory at AEFUTHA.

The glomerular filtration rate (GFR) was estimated from serum creatinine measurements using the modification of diet in renal disease formula (MDRD-4 parameter equation). The MDRD formula has been proven to be a reliable method of assessing renal function in Nigerian patients with CKD.[14]

Data analysis was carried out using Statistical Product and Service Solution (SPSS) IBM-SPSS for Windows version 25 (IBM Corp., Armonk, N. Y., USA). Relevant means and standard deviations were generated for continuous variables while categorical variables were presented in proportions and

percentages. *P* value <0.05 was considered significant. Findings were presented using frequency tables and chart.

Definition of terms

Hypertension was defined as systolic blood pressure of 140 mmHg and above or diastolic blood pressure of 90 mmHg according to JNC-7 criteria and also those presently taking antihypertensive therapy.[15]

Diabetes mellitus was defined as a fasting plasma glucose of 126 mg/ dL and above or a random blood glucose of 200 mg/dL or higher and also a history of previously known diabetes.[16]

Using the WHO classification body mass index (BMI) was classified as follows: underweight BMI below 18.5 kg/m^2, normal weight 18.5–24.9 kg/m^2, and overweight BMI 25–29.9 kg/m^2. BMI of 30 and above was classified as obesity. [17]

Chronic Kidney Disease was defined as creatinine clearance of GFR <60 mL/min/1.73 m^2.[1]Based on the GFR, participants were further classified into five stages as follows:

Stage 1 - GFR ≥90 ml/min/1.73 m^2
Stage 2 - GFR 60–89 ml/min/1.73 m^2
Stage 3 - GFR 30–59 ml/min/1.73 m^2
Stage 4 - GFR 15–29 ml/min/1.73 m^2
Stage 5 - GFR <15 ml/min/1.73 m^2

Those identified to have risk factors for CKD were counseled and referred for further evaluation.

RESULTS

Medical History of Participants

Three hundred and ninety members of staffs participated in the study. There were 152(39.00%) males and 238 (61.00%) females. Mean age of participants was 38.19 ± 10.24 years. Out of the 390 participants, 25(6.4%) had medical history of hypertension while 7(1.8%) had a medical history of diabetes mellitus. None of the participants was aware of having chronic kidney disease. Family history of hypertension was present in 8(2.1%) participants, 1(0.03%) participant had a family history of diabetes while none of the participants was aware of any family history of chronic kidney disease (Table 1).

Anthropometric and clinical parameters

Mean weight was 75.47± 15.36 kg while the mean height was 1.63± 0.17m. The mean BMI calculated was 27.82± 5.30 Kg/m^2. Mean systolic BP was 122.50±18.47mmHg and mean diastolic BP was 78.94±13.27mmHg. Mean FBS was 85.33±8.75mg/dl, mean creatinine value was 115.25±44.87umol/l and mean GFR was 70.39±25.80mls/min (Table 2).

Prevalence of CKD and Selected Risk Factors

Prevalence of CKD (GFR< 60%) was 31.0% (121 participants). According to CKD staging, 17.2% had stage 1, 51.2% of the participants had stage 2 CKD, 29% had stage 3 CKD, 2.4% had stage 4 CKD while 0.2% had stage 5 CKD (Figure 1). One hundred and three (26.4%) had hypertension, 24 (6.2%) diabetes mellitus, 128 (32.8%) obesity and 43 (11.0%) had proteinuria(figure 2).

The relationship of CKD with other variables was determined. Age, BP , BMI correlated significantly

Table 1: Clinical History of CKD Risk Factors

Parameter	Number N=390	Percentage (%)
Gender		
Male	152	39.0
Female	238	61.0
Clinical History		
Medical History of HTN	25	6.4
Medical History of DM	7	1.8
Medical History of CKD	–	–
Family History of HTN	8	2.1
Family History of DM	1	0.3
Family History of CKD	–	–

Table 2: Clinical Parameters of Participants

Clinical Parameter	Mean
Weight	75.47±15.36kg
Height	1.63±1.73m
BM1	27.82±5.30kg/m^2
BP(Systolic)	122.50±18.47mmHg
BP(Diastolic)	78.94±13.27mmHg
Fasting Blood Sugar	85.33±8.75mg/dl
Random Blood Sugar	99.05±27.96mgd/l
Serum Creatinine	115.25±44.87umol/l
Glomerular filtration rate	70.39±25.80mls/min

with eGFR (p value<0.05) (Table 3).

Table 3: Bivariate Analysis of Factors associated with CKD

CKD Risk Factors	Total N-390 (100%)	CKD N-121 (100%)	NON CKD N=269 (100%)	Chi –Square	P –Value
Age(Years)					
<30	95(24.3)	19(15.7)	76(28.1)	10.866	0.028
31 – 40	144(37.0)	44(36.2)	100(37.4)		
41 – 50	110(28.3)	37(30.9)	73(27.1)		
=50	41(10.4)	21(11.0)	20(7.4)		
Obesity	128(32.8)	57(43.2)	75(27.1)	4.868	0.031
Hypertension	103(26.4)	49(40.5)	54(20.1)	6.493	0.013
Protenuria	43(11.0)	21(17.0)	22(8.4)	4.204	0.040
Diabetes Mellitus	25(6.4)	7(5.7)	18(6.8)	1.095	0.433

Figure 1: Prevalence of CKD and Risk factors

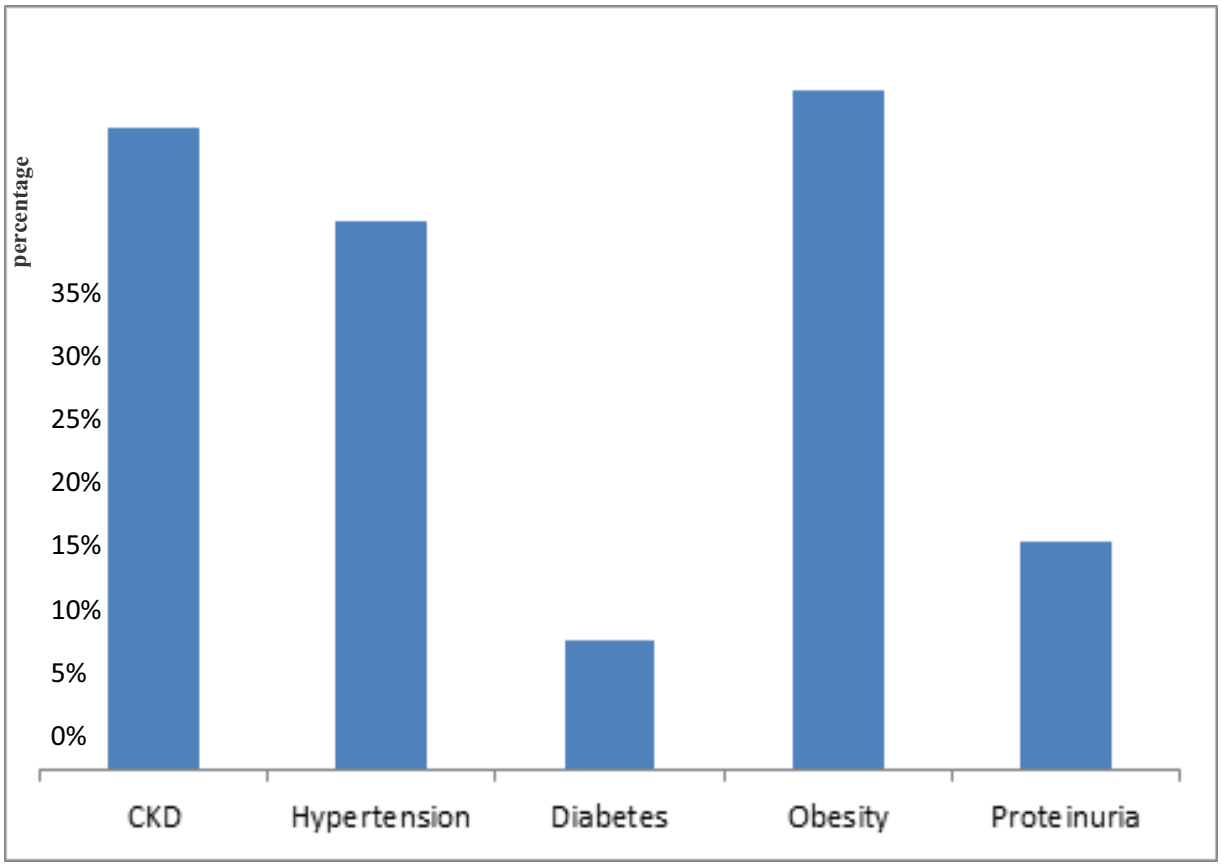
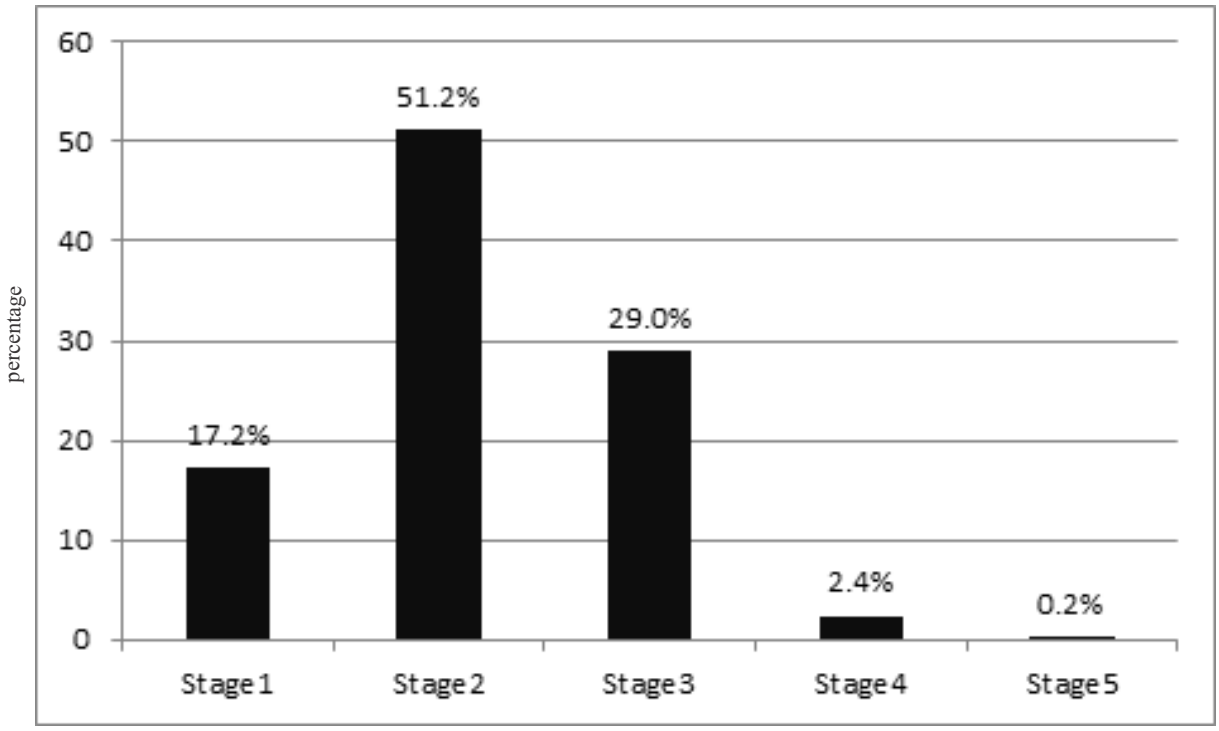


Figure2: Stages of CKD



DISCUSSION

In Nigeria, many studies have been conducted in the different parts of the country to determine the prevalence of CKD and the associated risk factors. Many of these studies were conducted among patients in the hospital or in the communities. This study was carried out in an urban setting while most of the community studies were carried out in the rural and semi urban settings. Prevalence of CKD in this study was high (31%). Some previous community studies in Nigeria also reported high prevalence rates. Naladoet *al*. observed CKD prevalence of 26% in Kano state while Okoye *et al*. observed CKD prevalence of 24% in Benin.[8,18] Prevalence of CKD observed in some other community based studies that used MDRD equation in Nigeria were 12.3% in Osun state,[10] 13.4% in Abia state[9] and 14.2% in Ekiti state.[19] Much lower prevalence rates were observed in few studies. Chukwuonye *et al.* reported CKD prevalence of 7.5% in a study conducted in Lagos[20] and Abene *et al.* observed CKD prevalence of 2.5% in Jos.[21] Reports of previous hospital based studies showed CKD prevalence of 3.6-10%. [22,23]

The increasing burden of hypertension, obesity, and chronic non-communicable diseases that affect the kidneys had led to rising prevalence of CKD in the world. A study in the USA among diverse ethnicity reported prevalence of 36.5%, 25.4% and 16.7% for obesity, hypertension and diabetes respectively. [24] Prevalence of hypertension among health workers in this study was 26.4%.This is similar to hypertension prevalence of 26% observed in a semi urban

community in Abakaliki by Eze *et al*.[25] However, this is lower than hypertension prevalence of 33% reported among traders by Ugwueze *et al.*[26] in a recent study in Abakiliki. Prevalence of hypertension in a study among local government civil servants in Oyo state was 40.4%.[27] The population in this study was relatively younger than those studied in Oyo state. Prevalence of hypertension of 42% was observed among market traders in Enugu by Ulasi *et al*.[28] Many of the traders studied were store owners who had sedentary lifestyle.

Prevalence of obesity was high (32.8%) in this study. This is comparable to obesity prevalence of 27.7% among health workers reported by Iwuala in south west Nigeria.[29] Obesity prevalence of 52.3% was observed among civil servants in Oyo state by Babatunde *et al*. [27] High prevalence of obesity was also noted among university lecturers in Oyo state by Akintunde *et al*.[30] This is higher than prevalence of obesity of 11% observed among semi urban dwellers who are mostly farmers in Abakaliki studied by Eze *et al*.[25] This study collaborates the fact that obesity is prevalent amongst civil servants.

The prevalence of DM in this study is 6.2%. Globally the prevalence of diabetes mellitus is 9.3%.[31] Ameta-analysis by Uloko*et al.*[32] shows the current prevalence of DM as 5.7% in Nigeria.[32] Some other studies in south east Nigeria observed varied prevalence of DM to be 5.9% by Ulasi *et al*.,[28] 7.9% by Okwuonu *et al.*[9] and 3.3% by Ezeani*et al*.[33] Eze *et al.*[25]observed DM prevalence of 9% in Abakaliki while Ugwueze *et al.*[26]observed a higher prevalence of 48.6% among traders in Abakaliki. The disparity in the prevalence studies could be as a result of variations in the different populations studied.
In recent times, due to the westernized culture, the prevalence of hypertension, obesity and DM have increased in the developing countries like Nigeria.[34] Westernization has led to lifestyle changes in the direction of a high energy diet and sedentary habits.[35]

In this study, there was an association between CKD and age. Age is an established risk factor of CKD.[36,37,38] This study also observed hypertension as a risk factor for CKD. Systolic blood pressure was observed as risk factor for CKD in the study by Oluyombo *et al*.[19] There was an association between obesity and CKD in this study. Association between CKD and obesity was also observed in previous studies.[8,9,18,40,41] In this study, there was a relationship between CKD and proteinuria. Proteinuria is a marker of CKD and previous studies also demonstrated similar relationship.[7,42] There was no association between DM and CKD in this study .This observation is similar to some previous prevalence studies which did not demonstrate any association between CKD and diabetes mellitus.[8,9,18]

The limitation of this study is that it was based on sampling of willing health workers. Convenient sampling has its potential bias. It is possible that those who had considered themselves at higher risk participated in the study since all the staff did not participate in the study. .Also, participants were not re-assessed at 3 months. Many of the participants with reduced eGFR may not have had persistently reduced eGFR at 3 months. Hence the prevalence of CKD could have dropped significantly. This was demonstrated in the study by Okwounu *et al.*[17] where 13.4% had GFR<60mls/min on initial evaluation while only 4.6% had persistently low GFR at 3 months later.

Conclusion and recommendations

The prevalence of CKD and its risk factors were high among health workers in this study. Since CKD is associated with much adverse effects and health implications, prevention and modification of its associated risk factors remain the most effective way of curbing its rising prevalence. Health workers should be encouraged to participate in routine screening exercises for early detection and treatment of CKD. Healthy lifestyle is advocated to reduce CKD risk factors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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