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Chronic kidney disease screening: Results of the 2013 World Kidney Day activities conducted at the Jos University Teaching Hospital

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Abstract

Background: Chronic kidney disease (CKD) is on the rise globally due to the increase in prevalence of common risk factors. Screening for CKD risk factors is important for early detection and institution of measures to retard its progression. This study aimed to determine the markers of CKD and its risk factors in a selected population.

Methods: A cross sectional study of 510 individuals who were recruited during the 2013 world kidney day activities. History, clinical examination as well as the collection of urine and blood samples was performed on each participant to determine the presence of CKD and its risk factors. CKD markers were defined as the presence of proteinuria and or an estimated glomerular filtration rate (eGFR) of < 60ml/min.

Results: The mean age of the participants was 39±11 years with majority of them being females (64.7%). Hypertension was present in 256 (50.2%) while diabetes mellitus was seen in 27 (5.29%). Forty three individuals (8.4%) had proteinuria while the prevalence of CKD markers was 10.5%. Only age, (OR =1.03; 95% CI: 1.01-1.06) was found to be a factor independently associated with the development of CKD.

Conclusion: Though the prevalence of the traditional risk factors for CKD was high, only age was found to be independently associated with CKD markers. . Screening exercise is encouraged for the early detection of CKD markers with a view to mitigating their impact.

Key words: Chronic kidney disease, risk factors, screening, world kidney day

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Introduction

The burden of chronic kidney disease (CKD) with subsequent development of end stage renal disease (ESRD) in patients is on the increase globally. [1] Countries like Mexico, the U.S. and Japan showed rising ESRD incident rates of 527, 362 and 295 per million populations in 2011. [2] The situation is not different in Nigeria where CKD has a prevalence of 10.4% [3]and ESRD accounts for 8-10% of medical admissions. [4,5] This increase in CKD results from the rising prevalence of common aetiologic risk factors- the noncommunicable diseases like hypertension and diabetes mellitus particularly in developing countries like Nigeria. [6] Other risk factors for CKD in Nigeria include obesity, use of herbal medications and indiscriminate use of non-steroidal anti-inflammatory drugs. [4]

The increasing burden of ESRD worldwide has increased the demand for renal replacement therapy (RRT) with big economies of the world like the USA spending up to 34.3 billion USD amounting to 6.3% of the total Medicare budget in 2011 thus putting a lot of strain on the economy. [2] The situation in Nigeria is pathetic as patients entirely bear the cost of RRT resulting in high mortality among them due to inability to fund this venture. [7, 8] As a result of this, the need to screen for CKD and its markers with a view to instituting secondary preventive measures have become imperative. These measures have been proven to slow the progression to ESRD. [9] In a bid to address this need, this study was conducted during the activities of the World Kidney Day 2013 to screen for CKD markers and determine the commonly associated factors.

Materials and Methods

This was a cross sectional study conducted as part of activities marking the 2013 World Kidney Day at the Jos University Teaching Hospital. Screening posts at the hospital were opened to the public and members of staff of the hospital from 12 noon to 5:00 pm on the 14th and 15th of March 2013. The screening programme was advertised in the media for a week before the activities commenced.

Study population

We included staff members of the hospital and the general public in this study. All subjects above the age of

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18 years that presented for the activity were screened except pregnant women and menstruating women as they were excluded from the study.

Data collection

Data obtained from the subjects included age, sex, family histories of diabetes, hypertension and kidney disease in addition to prior diagnoses of diabetes, hypertension and kidney disease and herbal use using a case record form. Height and body weight were measured and used to calculate the body mass index (BMI) with a value ≥ 30kg/m² considered as obesity. Three blood pressure (BP) readings were measured after a rest period of five minutes with the average of the second and third readings used as the subject's BP. Hypertension was defined as a history of antihypertensive drug use and or ≥ BP 140/90 mmHg.

Urine and blood samples were collected from thereafter. All investigations were conducted at the Chemical Pathology laboratory of the hospital. Urine was tested for blood, protein and urinary tract infection using Combi-9 dipstix. The presence of 1+ blood and 1+ protein in urine were considered significant for haematuria and proteinuria respectively. Urinary protein was quantified using the immunoturbidimetric assay. Casual plasma glucose (CPG) was estimated using the glucose oxidase method. Diabetes mellitus was defined as use of anti-diabetic drugs and /or CPG ≥ 11.1 mmol/l. Serum creatinine was estimated using the kinetic enzymatic method. Glomerular function was estimated using the abbreviated MDRD equation as this had been validated in our environment. [10, 11] Estimated glomerular filtration rate (eGFR) less than 60 ml/min/1.73m^2 was considered to be reduced eGFR. In our study, CKD marker was defined as the presence of proteinuria or eGFR<60 ml/min/1.73m2.

Statistical analysis

Data obtained from the study was analysed using the EPI Info version 7.2.0.1 (CDC, Atlanta, GA). Results were expressed as Mean ± SD and proportions for quantitative and qualitative data respectively. Where quantitative data was skewed, median with IQR was used. The Student "t" test was used to compare group means while the Chi Squared test, the significance of observed differences between proportions. Where observations were less than 5, the Fisher exact test was used. Variables with P< 0.25 were entered into a multivariate equation to identify the independent correlates of CKD markers. P values less than 0.05 were considered significant.

Results

Characteristics of subjects

A total of 510 subjects (64.7% females) were screened for CKD as shown in Table 1. The mean age of the subjects was 39±11 years with the females being older than the males. The majority of the subjects had at least a secondary school education. Family history of hypertension, diabetes and kidney disease was present in 213 (41.8%), 82 (16.1%) and 11 (2.2%) of subjects respectively. Nearly a quarter of the subjects were known to be hypertensive. Only 5% of subjects had a prior diagnosis of diabetes mellitus. One tenth of the subjects used herbal medicines/ teas routinely.

Table 1: Characteristics of subjects at the chronic kidney disease screening exercise to mark the 2013 World Kidney Day at the Jos University Teaching Hospital

Variable	Total, n = 510	Females, n = 330	Males, n = 180	P value
Age, mean±SD; years	38±10	40±10	36±11	<0.001
Family history of DM, n (%)	82 (16.0)	56 (16.9)	26 (14.4)	0.45
Family history of HTN, n (%)	213 (41.7)	152 (46.0)	61 (33.8)	0.007
Family history of CKD, n (%)	11 (2.1)	9 (2.7)	2 (1.10)	0.34*
Prior history of DM, n (%)	25 (4.9)	21 (6.3)	4 (2.2)	0.05*
Prior history of HTN, n (%)	122 (23.9)	99 (30.0)	23 (12.7)	<0.001
Prior history of CKD, n (%)	3 (0.5)	3 (0.9)	0 (0.0)	0.05*
**Herbal drug use, n (%)	27 (11.7)	15 (9.6)	12 (16.2)	0.14
BMI, mean±SD	26.9 ± 4.9	28.3 ± 5.1	24.5 ± 3.4	<0.001
Obesity, n (%)	126 (24.7)	114 (34.5)	12 (6.6)	<0.001
SBP, mean±SD	127.8 ± 19.4	128.3 ± 5.1	126.8 ± 17.2	0.39
DBP, mean±SD	82.8 ± 13.5	83.7 ± 13.9	81.2 ± 12.3	0.04
Hypertension, n (%)	256 (50.2)	180 (54.5)	76 (42.2)	0.007
Diabetes, n (%)	27 (5.29)	23 (6.9)	4 (2.2)	0.02*
CPG, mean±SD	4.6 ± 2.3	4.8 ± 2.8	4.3 ± 0.7	0.5
Haematuria, n (%)	8 (1.5)	8 (2.4)	0 (0.0)	0.05*
Proteinuria, n (%)	43 (8.4)	33 (10.0)	10 (5.5)	0.08
Spot UPCR, median (IQR)	0.07 (0.04-0.12)	0.09 (0.05-0.72)	0.06 (0.04-0.60)	<0.001
Scr, mean±SD	85.3 ± 20.8	77.4 ± 15.2	99.8 ± 21.8	<0.001
eGFR, mean±SD	99.2 ± 26.3	98.2 ± 26.0	100 ± 26.9	0.29
eGFR< 60ml/min, n (%)	13 (2.5)	8 (2.4)	5 (2.7)	0.8
Proteinuria or eGFR <60, n (%)	54 (10.5)	39 (11.8)	15 (8.3)	0.22

N= number, SD= standard deviation; DM= diabetes mellitus; HTN= hypertension; CKD= chronic kidney disease; BMI= body mass Index; SBP= systolic blood pressure; DBP= diastolic blood pressure; CPG= casual plasma glucose; UPCR= urinary protein creatinine ratio; IQR= interquartile range; eGFR= estimated glomerular filtration rate; *= Fischer Exact; **: only 203 participants had data on herbal use

The mean BMI was 26.9±4.9 kg/m^2 with 126 (24.7%) of the participants being obese. The mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 127.8±19.4 mmHg and 82.8±3.4 mmHg respectively with the DBP being higher in females. Two hundred and fifty six (50.2%) had BP elevations in the hypertensive range. The CPG ranged from 2.1 mmol/l to 30.9 mmol/l with 27 (5.29%) having diabetes.

Table 2: Factors associated with CKD in the study population

VARIABLE	CKD present, n (%)	CKD absent, n (%)	P-value
Females, n (%)	39 (11.8)	291 (88.1)	0.22
Age; years, mean±SD	43 ± 11	38 ± 10	0.001
Obesity, n (%)	17 (13.4)	109 (86.1)	0.22
Family history of HTN, n (%)	23 (42.5)	190 (41.6)	0.89
Family history of DM, n (%)	10 (18.5)	72 (15.7)	0.6
Family history of CKD, n (%)	2 (3.7)	9 (1.9)	0.32
Herbal use, n (%)	23 (11.3)	180 (88.6)	0.32*
DM, n (%)	4 (14.8)	23 (85.1)	0.51*
HTN, n (%)	33 (12.8)	233 (87.1)	0.08

*= Fischer Exact; DM= diabetes mellitus; HTN= hypertension; CKD= chronic kidney disease

Prevalence of CKD markers

Proteinuria was present in 43 (8.4%) subjects while the spot UPCR ranged from 0.01 to 0.72 mg/mg with a median of 0.07 mg/mg. The mean serum creatinine was 85.3±20.8 µmol/l and was higher among males. Estimated GFR ranged from 37.4 ml/min/1.73m^2 to 165 ml/min/1.73m^2 with a mean of 99.2±26.3 ml/min/1.73m^2. Only 13 (2.5%) had eGFR< 60 ml/min/1.73m^2. Fifty four subjects (10.5%) had either proteinuria or reduced eGFR.

Subjects with proteinuria or reduced eGFR were older than those without; 43±11 vs. 38±10 years, p = 0.001.Only age was associated with CKD markers both on univariate and multivariate analyses as shown in Tables 2 and 3.

Table 3: Multiple logistic regression showing independent factors associated with CKD

Variable	Odds ratio	95% CI	P value
Age	1.03	1.01-1.06	0.003
Sex	0.80	0.41-1.56	0.52
Obesity	1.1952	0.62-2.29	0.59
Hypertension	1.0283	0.57-1.85	0.92

Discussion

World Kidney Day has become an established event marked every second Thursday of March every year to raise awareness of the importance of the kidneys to overall health and reducing the burden of kidney disease. In this paper, we report the prevalence of CKD markers and CKD risk factors among participants at activities to mark the 2013 World Kidney Day in a state in Nigeria. We found that CKD markers occurred commonly among the participants. We also demonstrated that older age was associated with the presence of CKD markers.

The overall prevalence of CKD markers of 10.5% reported in this study is similar to that earlier reported in southern Nigeria [12-14] Our finding was different from that reported by Odenigbo with his associates [15], who reported a CKD prevalence of 43.5% among elderly subjects and that of Amira and her colleagues who reported 23.9%.[16] The varying prevalence of CKD in these reports is directly influenced by various factors including population characteristics and the definitions used. The prevalence of hypertension in this study was 50.2% a picture almost similar to the study by Ulasi, with her colleagues[17] in an urban community where a prevalence of 42% was reported and the study by Onwubere and colleagues[18] where they reported a prevalence of 46.4% among rural dwellers in south eastern Nigeria. These high prevalence rates agree with earlier reports that the prevalence of non-communicable diseases is on the increase in developing countries. [6] The observed mean systolic and diastolic blood pressures in this study were fairly controlled and this may have accounted for the low prevalence of CKD.

The prevalence of diabetes mellitus in this study was 5.29% and this is similar to a prevalence of 5.9% reported by Ulasi with her colleague[12], 6.1% by Okafor associates[19] in a Niger Delta community of Nigeria and 5% reported by Wakoma and his associates[20] in South South Nigeria. However, lower prevalence rates of 2.8% and 3.6% were reported by Amira, et al [16] in a non-communicable disease survey and in the recent study conducted in North West Nigeria respectively. [21] These studies are in consonance with the national prevalence of 4.3% as stated by the World Health Organization's profile for Nigeria in 2016. [22] This shows that the prevalence of DM is on the increase and consequently CKD if preventive measures are not put in place.

Proteinuria which is both a marker of CKD and a risk factor for rapid acceleration to ESRD [23] had a prevalence of 8.4% in this study which is lower than 19.6% reported in Kano, [21] 29.7% reported in Rivers, [19] 19.9% in Lagos [16] and 16.2% in Enugu. [12] Our study found 24.7% of the population screened to be obese. This is higher than prevalence rates of 3.5% in Ilorin, [24] 14.9% in Enugu and 13.5% in Rivers. The notable reason for this disparity maybe the fact that these studies were conducted in rural communities where the dwellers are more actively engaged than the urban areas like Jos

where there is more sedentary lifestyle and hence the tendency to develop obesity. Obesity has been linked with faster progression of CKD [25] and so weight reduction programmes is important in slowing down the progression of CKD.

The use of herbal drugs and teas was found in 10% of the population screened. The report from Kano showed that 81.7% of the population screened used herbal medications. [21] These results are informative as it has been reported that use of such agents is an independent risk factor for CKD in China. [26] Reports also in Nigeria said such agents are nephrotoxic. [27,28]

Our study had certain limitations. We cannot exclude the effect of selection bias based on the recruitment method utilized in the study and as such our findings are not generalizable. Secondly, we did not repeat the evaluations for proteinuria and reduced eGFR after three months of the initial assessment. The diagnosis of CKD requires that the abnormality of urine, blood, imaging or function tests persist for a minimum of three months. These could have impacted on our findings. Despite the foregoing, our study provides an assessment of the CKD risk factors in the participants and identified those with possible CKD. This is the fulcrum in preventive nephrology.

In conclusion, our study identified only age as the factor associated with CKD markers. However, the known risk factors for CKD abound in the participants studied during the screening exercise. Many of these risk factors can be modified and as such CKD can be prevented or delayed. Health education with a view to adopting a healthy lifestyle, mobilising the community to present for periodic screening for markers of CKD and institution of secondary preventive measures will go a long way in reducing the burden of CKD/ESRD in a developing society like ours.

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