Screening for chronic kidney disease and its risk factors in Oghara, Nigeria: a World Kidney Day 2014 report

Ogochukwu C. Okoye [1], Henry Ovwasa [1], Anthony G. Kweki [1], Isoken Idenigbe [1] Nyemike Awunor [2], Ayo B. Odonmeta[1], Nilum Rajora [3]

Abstract

Background: The risk factors associated with CKD such as hypertension, diabetes and obesity remain prevalent globally, resulting in a high prevalence of CKD especially in developing countries. Screening for CKD and its' risk factors is recommended for high-risk population. This study aimed to determine the prevalence and risk factors of CKD in a semi-urban community in Nigeria.

Methods: A cross-sectional survey was conducted in the teaching hospital premises at Oghara, after a world kidney day (WKD) health awareness campaign was undertaken in the community. A total of 135 subjects were interviewed and the following measurements were performed: blood pressure, body mass index, blood glucose, dipstick urinalysis, serum creatinine and estimation of glomerular filtration rate (GFR) using CKD-EPI.

Results: Mean age was 40 ± 13 years and 69.6% of participants were young. Male to female ratio was 1:4. The prevalence of proteinuria was 4.4% while 10.7% of all subjects had CKD (GFR <60ml/min). Although 11.1% of participants were known hypertensives only 6.7% had high blood pressure on screening. Other risk factors identified were Diabetes mellitus (10.3%), family of history of hypertension (14.1%), family of history of diabetes (9.6%), family of history CKD (1.5%) and obesity (11.9%). Proteinuria, diabetes and family history of hypertension were significantly associated with CKD.

Conclusions: CKD and its risk factors are common in the population. Dipstick proteinuria remains a useful and significant indicator of CKD**.** Community screening for the risk factors of CKD in developing countries is realistic and should be encouraged as a public health priority.

Key words: Chronic kidney disease, Diabetes mellitus, Hypertension, Proteinuria.

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Introduction

Chronic kidney disease is a global public health problem with great burden and extremely high cost of care in developing countries. The 2010 Global Burden of Disease study reports that chronic kidney disease has moved from the 27th to 18th cause of total number of global deaths from 1990-2010. [1] CKD and cardiovascular disease share similar risk factors such as hypertension, diabetes and obesity and these are significant determinants of morbidity and mortality in any given population. [2]

CKD is common in Sub-Saharan Africa where the overall prevalence is 13.9% [3], however prevalence rates vary from country to country, based on the population studied and methodology of the study. The risk factors of CKD are likewise common in the region. In Nigeria, community-based studies report a CKD prevalence of 7.8-30% . [4-10]

[1]Nephrology Unit, Department of Medicine, Delta State University Teaching Hospital. Oghara, Nigeria. [2]Community Health Department, Delta State University Teaching Hospital. Oghara. Nigeria. [3]Nephrology Division, UTSouthwestern Medical Centre, Dallas Texas. USA.

All correspondences to:
Dr Ogochukwu Okoye,
E-mail: ogonwosu2002@yahoo.com

Early CKD is asymptomatic but becomes symptomatic with initially non-specific, then severe symptoms at advanced, and irreversible stages of the disease; this phenomenon contributes to the difficulty with early diagnosis at the community level. Furthermore in developing countries, the practice of routine medical examination is yet to be embraced by all, and healthcare when available is paid for out-of-pocket; consequently early diagnosis is more difficult, while treatment and outcome of this disease is abysmal. The Kidney Disease Improving Global Outcomes (KDIGO) [11] and several practice guidelines [12] recommend that screening high-risk populations for CKD is cost-effective, but one might argue that the peculiar situation in some developing countries e.g. black race, poor access to health care, and poor health-seeking behaviours; underscore the need for regular whole population screening for risk factors of CKD.

The annual world kidney day (WKD) is an initiative of international Federation of Kidney Foundations (IFKF) and the International Society of Nephrology (ISN), observed annually since 2006, to emphasise through various media and activities that kidney disease is common, harmful and treatable. In many countries, it serves as an opportunity to screen high-risk populations for risk factors of CKD. The US Preventive Service Task Force recommends simple tests for detecting CKD including urine examination for protein, and serum

creatinine based eGFR. [13] WKD is observed annually in most countries and some data have originated from the screening exercises. This report is from the WKD 2014 screening exercise carried out in Oghara, to determine the prevalence and risk factors of CKD in the population.

Materials and Methods

This study was based on data obtained from a WKD community health screening organised at Oghara. Oghara is one of the oil producing towns in Ethiope West Local Government Area of Delta State in Nigeria, the major occupation in this region is small scale trading and farming. A health awareness campaign was undertaken on the 2014 WKD to educate the population about CKD and its' risk factors amongst others; and to inform them about a free health screening on same day. In order to get the usual cooperation of the members of the community, we obtained the assent of the traditional ruler. The health screening was conducted at 9am on March 12th 2014 within the teaching hospital premises, with volunteer nurses, laboratory technicians, health assistants and doctors rendering services and counseling as necessary. All participants gave verbal consent after they were pre-informed of the need for data collection, and that confidentiality will be ensured.

The Nigeria Association of Nephrology data entry sheet was used to obtain socio-demographic and other health information from respondents; the sheet captures the biodata, short medical history including history of hypertension, diabetes mellitus, and renal disease in participant and family; anthropometric measurements, blood pressure, and serum creatinine and dipstick urine tests. Body weight and height were measured to the nearest 0.1cm using a portable weighing scale and stadiometer. Blood pressure was measured using automated sphygmomanometers (Omron) and hypertension (HTN) was regarded as a reported history of HTN, HTN medication usage or repeated blood pressure reading of 140/90 mmHg according to JNC VII guidelines.[14]

Urine was collected and examined using conventional dipsticks (Medi-Test Combi 9), while blood was analysed for random blood sugar and serum creatinine was measured for the first 100 participants. Glomerular filtration rate was estimated using the CKD-EPI GFR equation. [15]

The following clinical definitions were applied: CKD was defined as GFR <60ml/min, Diabetes was defined as self report of diagnosis by a doctor or other health personnel, or random blood glucose > 11.1mol/1 or 200mg/dl. Obesity was regarded as BMI (weight/height^2) > 30kg/m^2 [16], and Urine sample with proteinuria, haematuria or pyuria of 1+ and greater was considered significant.

Data entry and management were performed using SPSS statistical software package version 22 (SPSS, inc., Chicago, IL). The main statistical analysis involved the estimation of the crude prevalence of proteinuria for the sample; the crude and specific prevalence rate of CKD according to age, sex and other known risk factors of CKD. P value < 0.05 was regarded as significant. Simple logistic regression analysis was used to determine the unadjusted odds ratio (OR) between the exposure variables and presence of CKD. The exposure variables included age, gender, obesity, systolic hypertension, diastolic hypertension, diabetes, family history of HTN, family history of DM and family history of CKD.

A waiver of ethical approval for this study was obtained from the Health, Ethics and Research Committee of DELSUTH. The quality of the data and its confidentiality was ensured. All participants in whom abnormalities were identified through the screening programme were counseled and referred for follow up at the outpatient clinic of the hospital.

Results

The Demographic Characteristics and Health Status of the Participants

Of the 135 participants screened, 80% were females and male to female ratio was 1:4. Majority of the participants (69.6%) were young (Table 1) and mean age 40±13 years. Mean BMI was 26.71±4.9 Kg/m^2, systolic blood pressure and diastolic blood pressure were 128±21mmHg and 76±12 mmHg respectively (Table 1).

Prevalence of CKD and Risk Factors.

Of the 135 participants, the first consecutive 100 had serum creatinine measurements, out of which complete results were available for 84. Prevalence of CKD was 10.7%, majority of participants had eGFR >60ml/min (Table 2).

The prevalence of proteinuria was 4.4% (6 out of 135), diabetes mellitus was 10.3%, hypertension was 11.1%, and obesity was 11.9% (See Table 3). Out of the 14 persons with diabetes mellitus, 28.6% had CKD compared to 7.1% among non-diabetics (p=0.038, OR=5.20); 66.7% of participants with proteinuria compared to 6.4% of those without proteinuria, had CKD (p= <0.001, OR=29.2). Six out of 17 persons (35.3%) with family history of hypertension had CKD, compared to 4.5% of those without a family history (p =0.002, OR=11.64), See Table 4.

Table 1: Demographic, Clinical, and Biochemical Parameters of Participants.

DEMOGRAPHICS	n (%) or Mean±SD
Age (years)	40±13
Young (18-44)	94 (69.6)
Middle Aged (45-64)	35 (25.9)
Elderly (≥ 65)	6 (5.5)
All	135 (100.0)
Sex	
Male	27 (20.0)
Female	108 (80.0)
All	135 (100.0)
HEALTH STATUS OF PARTICIPANTS	
Hypertension	15 (11.1)
Diabetes mellitus	14 (10.3)
Obesity	16 (11.9)
Family history DM	13 (9.6)
Family history HTN	19 (14.1)
Family history CKD	2 (1.5)
CLINICAL AND BIOCHEMICAL PARAMETERS	
Body Mass Index (Kg/m2)	26.7±4.9
Systolic Blood Pressure (mmHg)	128±21
Diastolic Blood Pressure (mmHg)	76±12
Random Blood Glucose (mg/dl)	103.0±23.4
Serum Creatinine (mg/dl)	0.9 (IQR:0.8-1.0)*
eGFR (ml/min) n=84	
≥90	56 (66.7)
60-89	19 (22.6)
30-59	3 (3.6)
15-29	0 (0.0)
<15	6 (7.1)
TOTAL	84 (100.0)

*Median (IQR: Q1-Q3), DM=diabetes mellitus, HTN=hypertension, CKD=chronic kidney disease, eGFR=estimated glomerular filtration rate.

Table 4: Association of CKD with Risk Factors. (n=84).

Characteristic	e GFR <60ml/min n (%)	e GFR ≥60ml/min n (%)	P-value (Fishers Exact)	OR (95% CI)
Age group (years)				
≥50	3(11.5)	23(88.5)	0.570	1.13(0.26-4.92)
<50	6(10.3)	52(99.7)		
Hypertension (mmHg)				
Yes (≥140/90)	2 (22.2)	7 (7.8)	0.246	2.78 (0.48-16.03)
No (<140/90)	7 (9.3)	68 (90.7)		
Obese				
Yes	2 (12.5)	14 (87.5)	0.544	1.24 (0.23-6.64)
No	7 (10.3)	61 (89.7)		
Proteinuria				
Yes	4 (66.7)	2 (33.3)	<0.001*	29.20 (4.26-199.98.)
No	5 (6.4)	73 (93.6)		
Diabetes mellitus				
Yes	4 (28.6)	10 (71.4)	0.038*	5.20 (1.19-22.70)
No	5 (7.1)	65 (92.9)		
FCKD				
Yes	0 (0.0)	1 (100.0)	0.893	0.00 (0.00-325.00)
No	9 (10.8)	74 (89.2)		
FHTN				
Yes	6 (35.3)	11 (64.7)	0.002*	11.64 (2.52-53.54)
No	3 (4.5)	64 (95.5)		
FDM				
Yes	2 (18.2)	9(81.8)	0.335	2.10 (0.37-11.69)
No	7 (9.6)	66 (90.4)		

*Significant, OR=odds ratio, FDM=family history of diabetes, FHTN=family history of hypertension, FCKD=family history of CKD.

Discussion

This study shows a high prevalence of CKD and its risk factors in the population studied. The 10.7% prevalence of CKD in this study is similar to 11.4% by Ulasi et al [4], though lower than 18.8% reported by Oluyombo et al [9], Abioye-kuti et al [10], and 24.3% by Okoye et al[8]; it was higher than a 7.8% prevalence reported amongst 179 Civil servants in the Bayelsa state Secretariat.[5] The disparity in these reports may be related to differences in the study populations (urban Vs rural), methodology (definition of CKD using different estimation formulae, assessment of proteinuria), and ethnic variations. The present study estimated GFR using the CKD-EPI, which performs better than some other equations. [15]

The prevalence of proteinuria in this study was 4.4%. This observation is consistent with earlier reports from Southern Nigeria [8,17,18]; Oviasu et al [17] studied asymptomatic adolescent Nigerians and detected proteinuria in 4.7% of respondents, while Okoye et al [8] found persistent proteinuria in 3.6% of a rural adult population in Edo State, while Ulasi et al [18] reported 4.3% among a market population in Southeast Nigeria. However rates were lower compared to 19.4% and 12.4% reported by Nalado et al[6] and Wachukwu et al [19] respectively. Proteinuria is an established risk factor for initiation and progression of CKD, although there are more reliable methods for quantifying protein in urine like albumin: creatinine ratio, these are more expensive tests compared to dipstick urinalysis especially when screening large population. However, persistent dipstick urinalysis remains a useful tool.

The prevalence of hypertension, diabetes mellitus and obesity in this study was 11.1%, 10.3% and 11.9% respectively. The prevalence of hypertension in Nigeria ranges from 5.9% to as high as 43% [4-8, 17,20,21], depending on the population studied and the definition used; earlier studies using the 160/90mmHg cut-off, tend to report lower rates compared to more recent studies. The prevalence of diabetes (RBS>200mg/dl) in this study was higher than 1.9%, 5.9% and 6.1% prevalence

reported by Okoye et al[8], Ulasi et al [4] and Umezurike et al [22] respectively. The disparity may be as a result of variation in population and case definition of diabetes (RBS and self-report of diagnosis or use of glucose lowering agents). The prevalence of diabetes mellitus is generally lower in Nigeria when compared to most western countries, however a there is a rising prevalence in Nigeria due to westernization in terms of changes in diet and lifestyle.

The prevalence of obesity in this study (11.9%) is comparable to 14.1% reported from a study in neighbouring Edo State[8], but lower than 27.2% and 22% documented by Umezurike et al [22] in South-South Nigeria and Amira et al in a South-West Nigerian respectively; [7] it is higher than 4.5% prevalence reported by Kolawole et al in Northern Nigerian .[23] The prevalence of obesity in this study may reflect the sex distribution of the sample (female preponderance), the staple diet, and occupation (trading) of the study population; however a combination of genetic, ethnic and environmental factors contribute to the amount of body fat of any individual, and so it is expected that the prevalence of obesity might vary from one population to another.

This study found a significant association between CKD on one hand, with DM, proteinuria, and family history of hypertension, on the other. This observation is consistent with an earlier community-based South-Western Nigerian study by Oluyombo et al.[9] While DM remains the commonest cause of CKD worldwide [24], and among the top 3 causes of CKD in developing countries like Nigeria [25], there have been reports of increasing importance of DM as an etiologic factor of CKD in developing countries. [25,26] Proteinuria is an established risk factor for progression of kidney disease, and this has been confirmed by landmark studies involving patients with diabetic, non-diabetic glomerular disease, and non-glomerular diseases. [27-29] In the Modification of Diet in Renal Disease (MDRD) study [27] involving 840 non-diabetic subjects, proteinuria was reported as the strongest independent predictor of CKD. This was also supported by the Ramipril Efficacy In Nephropathy (REIN) study. [28]

This study did not reveal any significant association between CKD on one hand and age and BMI on the other hand. The association of CKD and obesity is not consistent in the literature. A meta-analysis by Wang et al revealed a significantly higher risk of CKD among the overweight and obese compared to normal-weight individuals [30]; however, some researchers found no or indirect association between obesity and CKD [31,32]; while others have reported that obesity was commoner among normal population compared to CKD patients.[5,7,33] These contradictory observations may be as result of variations in population demographics such as age and sex distribution; methods of assessing obesity (e.g. BMI, waist circumference, Body fat percentage, Waist Hip-Ratio), and estimating CKD.

The mean age of participants in this study (40±13 years) is similar to 43±13 years reported in a Southeastern Nigerian population-based study [4], and only 5.5% of participants were elderly. This probably reflects the total life expectancy in the country of 54 years [34], but may also reflect the eagerness of younger people to participate in community screening program compared to older age groups; furthermore it may have been less feasible for the elderly to access the screening venue.

Finally, despite its strengths, the main limitations of this study are the small sample size, its cross-sectional design, and the single-point assessment of proteinuria and serum creatinine. However, findings from this study can inform local public health interventions, and serve as a basis for larger population cohort studies.

Conclusion

Chronic kidney disease and its risk factors are high in the study population. Dipstick proteinuria, diabetes mellitus and family history of hypertension increase the risk for CKD.

Screening for CKD and its risk factors should be encouraged at least once a year for general population and more frequently in high-risk patients; Primary health centres should be equipped with basic facilities to screen for CKD. Dipstick urinalysis, blood glucose and blood pressure measurement, should remain as mandatory components of preschool and pre-employment medical examination. Public enlightenment and advocacy aimed at reducing risk factors of CKD, improving health-seeking behaviors, and encouraging lifestyle modification will significantly decrease the burden of CKD in the population.

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