Burden and Risk factors of Kidney Injury in North-Central, Nigeria: A Cross-sectional Survey

Oladele CO[1], Bello OA[2], Olaosebikan OF[3], Ahmed G[2], Goro AA[4], Dashe R[4], Ajimuda SA[4], Olurode YA[5], Bello AH[6] andAiyedun OS[1]

1**:** Department of Internal Medicine, Federal Medical Centre, Bida, Niger State, Nigeria.
2: Department of Paediatrics, Federal Medical Centre, Bida, Niger State, Nigeria.
3: Department of Chemical Pathology, Federal Medical Centre, Bida, Niger State, Nigeria.
4: Department of Nursing Services, Federal Medical Centre, Bida, Niger State, Nigeria.
5: Department of Anaesthesia, Federal Medical Centre, Bida, Niger State, Nigeria.
6: Department of Internal Medicine, University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria.

INTRODUCTION

Kidney diseases are now more common globally. This encompasses acute kidney injury described as an abrupt decrease in kidney function encompassing both structural damage and impairment in function[1] as well as Chronic Kidney Disease (CKD) which is the precipice of most renal disorders[2-4]. Chronic Kidney Disease refers to bilateral (or single in case of a solitary kidney or transplanted kidney) structural and functional kidney damage occurring for 3 months or more with or without glomerular filtration rate of < 60 ml/min/1.73m^2[5]. The burden of kidney injury occurring in the community is grossly underestimated in resource poor settings despite studies suggesting increased prevalence in Sub-Saharan Africa[5]. The situation is made worse with poor health facilities, prevalence of poor socio-cultural practices and poor access to health care in this part of the world[6], therefore the need for preventive measures to reduce the burden and early intervention to mitigate complications of the disease.

While community based data abound in developed countries[8-11], studies in Nigeria are mainly hospital based with some recently reported prevalences ranging from 1.6% and 12.4%[12-14].Community based survey in South-Western and South-Eastern Nigeria reported prevalence of 14.2% and 11.2% respectively. The paucity of community based studies on the burden and risk factors of community acquired kidney injury in Nigeria makes it difficult to appreciate the magnitude of the problem. This serves as hindrance in regards to defining a policy direction or putting in place appropriate preventive protocols. Studying kidney injury acquired in the community in other localities in Nigeria, such as Northern Nigeria where lifestyle and culture differs from the South will assist in this regards.

This study therefore is aimed at examining the burden and risk factors for kidney injury in Mokwa, Niger state, North-Central Nigeria.

METHODS

This is a cross-sectional survey carried out to commemorate the 2017 World Kidney day. The study was carried out by the Kidney study team of Federal medical Centre, Bida. Niger state.The locality of the study was Mokwa Local Government area (LGA) in Niger State, Northern Nigeria. It is the most populated LGA in the state and the major language in the community is Nupe[15]. It serves as a popular transit town for heavy duty vehicles travelling to the

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Corresponding author: **Bello, OA,** Department of Paediatrics, Federal Medical Centre, Bida, Niger State, Nigeria. *E-Mail:* iabdulafeez@yahoo.com, 08033861311

Southern part of Nigeria. Prior sensitization and notification was carried out at Mokwa town and all the villages within the LGA. This process was facilitated by the Head of Department of Health at the LGA and the health representatives of all the villages. Ethical approval was obtained from the Research and Ethics department of Niger State Ministry of Health.

The study location wasat the Primary Health Care centre in Mokwa. A consent form was attested to by all participants following a health promotionexercise and explanation of what the study is about to the population.A convenient sampling method was adopted and a structured questionnaire which has been face validated was administered to each of the participants in an orderly fashion. Members of the team that could speak Nupe administered the questionnaires being the predominant language spoken by respondents.

Weight was measured using standardized bathroom scale in kilogram (a known weight material was used for standardization). Height was measured with a standiometer in metre. Bodymass index (BMI) was calculated with the formular weight (kg)/ height^2(M). Participants were classified as Normal BMI: $19 – 24.9 Kg/M^2$, Overweight: $25 – 29.9 Kg/M^2$, Obese: $\geq 30 kg/M^2$ in line with WHO classification[16]

Blood pressure was measured using a mercury sphygmomanometer of appropriate cuff. Participants were seated in a chair and machine placed at level of the heart. The blood pressure was measured on the left arm twice to ensure reliability. Participants with systolic blood pressure (SBP) $\geq$140mmhg and or diastolic blood pressure $\geq$90mmhg were labelled as hypertensive in line with the WHO / ISH guideline[17].

A universal bottle was provided for each participant for urine analysis. Test was performed on each urine sample. All urine strip reagent area was immersed in urine sample provided, strips are then placed horizontally and compared with standardized colour chart, changes are read at the time specified by the manufacturer of the strips[18]. The following findings were considered significant: Proteinuria$\geq$1+, Haemoglobinuria$\geq$1+, Luecocyte: $\geq$1+, Nitrite:$\geq$1+.

Estimated glomerular filtration rate (eGFR) was calculated from the serum creatinine using the CKD-EPI equation[19].
Chronic kidney disease was classified using the Kidney disease improving global outcomes definition and classification[4].

All obtained data was entered into a spread sheet and analysis was done using statistical package for social sciences version 21. Prevalences were expressed in proportion and percentage. Mean±SD of normal variables were calculated. Cross tabulation was used to calculate significance in relation to risk variables. Logistic regression, confidence interval and odds ratio was used to predict the significant of risk factors for CKD in the population. Significance was set at $p < 0.05$.

RESULTS

Of the 265 participants who consented only 246 completed the questionnaire and had all laboratory investigations done. The mean age of the population was 43.8±15.9, age range was 17-95years. Their mean weight was 67.5±17.3kilogrammes while the mean height was 1.6±0.1metres. There were 53 (21.2%) females among the subjects while 193 (78.8%) were males. The gender compared well with age with p = 0.142 (0.133-0.150).

Proteinuria ($\geq$1+) was seen in 26 (10.6%) while haemoglobinuria($\geq$ 1+)was seen in 33 (13.4%) of the subjects. Chronic kidney disease defined as estimated GFR of <60mls/min/1.73m^2 and or proteinuria of $\geq$ 1+ was seen in 36 (14.6%) of the subjects. Classification of CKD in accordance with KDOQI guideline based on the gender is as shown in Table 1.

Table 1: Classification of CKD in the population based on gender Estimated Glomerular Filtration Rate (eGFR)

Gender	$\geq$ 90	60 – 89	30– 59	15 - 29	< 15	Total
Male	116	68	2	1	0	53
Female	37	13	8	0	1	193
Total	153	81	10	1	1	246

Prevalence of risk factors of CKD in the populationis indicated in Table 2 showing known diabetic and hypertensive among the studied population was 17 (6.9%) and 76 (30.8%) while obesity and blood pressure e" 140/90mmhg occurred in 61 (25.3%) and 84 (34.4%) respectively.

UsingUnivarate analysis to examine how this risk factors predict CKD in the population, all the factors were not predictive of CKD in the population (Table 3).

Table 2: Prevalence of risk factors for kidney injury

Risk Factors	Yes (%)	No (%)	Total (%)
Known diabetic	17 (6.9%)	229 (93.1%)	246 (100%)
Known hypertensive	76 (30.8%)	170 (69.2%)	246 (100%)
Smokes cigarette	1 (0.4%)	245 (99.6%)	246 (100%)
Consumes concoction	123 (50.0%)	123 (50.0%)	246 (100%)
Drinks alcohol	1 (0.4%)	245 (99.6%)	246 (100%)
Obesity	61 (25.3%)	185 (74.7%)	246 (100%)
Blood pressuree"140/90mmhg 246 (100%)		84 (34.4%)	162 (65.6%)
Microalbuminuria	4 (1.6%)	242 (98.4%)	246 (100%)

Table 3: Univarateanalysis of risk factors of kidney injury

Risk factors	Odds ratio	95% CI	P
Male gender	1.415	0.616 – 3.252	0.414
Known hypertensive	5.625	0.699 – 45.277	0.105
Known Diabetic	1.296	0.292 – 5.657	0.740
Obesity	0.340	0.292 -5.657	0.322
Blood pressuree"140/90mmhg 0.443		0.750	0.360 – 1.563
Alcohol consumption	0.000	0.002 – 0.017	1.000
Smokes cigarette	0.000	0.002 – 0.017	1.000
Consume concoction	1.879	0.004 – 0.167	0.061
Microalbuminuria	2.059	0.208 – 20.371	0.573

DISCUSSIONS

The prevalence of kidney injury in Mokwa community from this study was 14.6%. This implies 1 of every 7 adult in this community suffer some form of kidney injury, inferring from this it implies that as at 2018 the adult population of Nigeria is estimated at 81 million[20], inferring from this study it implies 11.8million of the Nigerian population may have kidney injury. This is worrisome being that most Nigerians are unaware of this disease as substantiated in Oluyombo et al's KAP'S study on the subject[21].

This burden is higher than what was reported from communities in South-East and South-South Nigeria[22, 23]. Though Egbi et al's study was in an urban area and the subjects were civil servants in Bayelsa state[21]. Our prevalence is higher than that reported for hospital based studies in Nigeria[12-14] thereby substantiating the fact that patients presenting with kidney injury in our hospitals are just a tip of the iceberg of the magnitude of undiagnosed individuals suffering kidney injury in the community. Prevalence from continents globally range from 6.4 – 8.5% though most of this studies recruited a larger population than ours[8, 24 – 28]. The higher burden been reported in our study may be related to increased APOL 1 gene variants which has been adduced for higher risk of CKD among black population[29].

Proteinuria (e"1+) and haematuria (e"1+) was seen in 10.6% and 13.4% of participants in this study respectively. This has been reported to be equally high in previous community studies substantiating their validity as markers of community acquired kidney injury and as useful screening tools[22, 23 & 30]. Consumption of traditional concoction was common among the participants and was found in 50% of the subjects. Though no toxicology studies have been done on concoction commonly consumed in this community but there are documentations that have demonstrated vulnerability of the kidneys to exogenous toxins such as concoctions[31]. Kadiri *et al* reported that local concoction accounted for 37.5% of aetiology of acute tubular necrosis in a South-Western Nigeria study[30]. Hypertension was high among the participants with known hypertensive accounting for 30.8% and those detected during the study accounted for 34.4% of the participants. This may be an indication of high rate of undiagnosed hypertensive patients who have not been on treatment for hypertension and may present with complications such as kidney injury that may progress to CKD. A similar picture was seen in a community study in Ile-Ife with higher rate of newly diagnosed study participants with hypertension compared to known hypertensive patients among their study respondents[30].

On univariate analysis all risk factors studied did not predict CKD. This finding is similar to a Congolese study that reported no association between CKD and known risk factors such as diabetic mellitus, hypertension and obesity[32]. A similar finding was reported by Egbi et al in South-Southern, Nigeria[23]. This may be a pointer to the mixed picture in regards to aetiology of kidney injury in this community, contrary to earlier documentations that have adduced it mostly to diseases such as hypertension and diabetes[4].

Limitations of Study

This study is an observational study and no randomization of sampling was done making it difficult to generalize the findings. Though a community study, inability to obtain same data 3 months later makes this study fall short for description of CKD in the participants. However, the fact that this respondents had no acute symptoms make them appropriate to be labelled at risk of CKD. Blood sugar measurement was not done which could have afforded us opportunity to detect diabetes mellitus among the subjects. Diabetes mellitus has been documented as the most common cause of end stage renal disease in North America and Europe[34]. Dipstick protein detection was done in our study, it is however less sensitive compared to protein: creatinine ratio (PCR), likewise early morning urine is more reliable in order to reduce orthostatic proteinuria among participants. Finally, imaging studies of the kidney and urinary tract would have contributed to detecting chronic kidney disease among participants with GFR e"60mls/min/1.73m^2.

CONCLUSION AND RECOMMENDATIONS

This study is one of the few community studies on this subject in this part of Nigeria. The findings demonstrate a high burden of kidney injury within the community and compared to most other studies in Nigeria the burden found was higher.

Prevalence of risk factors of kidney injury such as proteinuria, high blood pressure, obesity and consumption of local concoction was high though this risk factors were not predictive of CKD in the population.

There is an urgent need to declare this condition as a public health problem. More community studies should be carried out especially in Northern Nigeria to further understand how risk factors lead to CKD. Continuous medical education on kidney diseases and its risk should be done in the community especiallyfor Primary Health care workers to increase early detection and prompt management.

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