

Chronic kidney disease of unknown origin in Northern Yobe, Nigeria: Experience from a regional tertiary hospital in northeastern Nigeria

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ABSTRACT

Background: Chronic kidney disease in the absence of traditional CKD risk factors has been found to contribute to the burden of kidney disease in communities all over the world. This hospital-based study is aimed at determining the prevalence of CKDu among CKD patients admitted into the renal unit of Federal Medical Centre, Nguru. **Methods:** Patients consisted of adults sequentially admitted into the renal unit of the medical ward of Federal Medical Centre Nguru. Clinical parameters such as age, sex, presence of risk factors for kidney disease were obtained from each patient. Laboratory parameters such as PCV, electrolytes, urea and creatinine, phosphate, calcium were also obtained. Glomerular filtration rate was calculated using the modification of diet in renal disease (MDRD) formula. **Results:** Two hundred and seventy-eight patients were admitted during the study period. Their ages ranged from 18 to 75 years with a mean±SD of 44.64±16.09 years. There were 138 (49.5%) males and 140 (50.5%) females; male:female ratio 1:1.02. Out of the study population, 83.6% were married. Mean blood pressures were 120.00±14.14 mmHg and 75.25±9.91 mmHg for systolic and diastolic respectively. Mean PCV was 20.25±7.05%, urea and creatinine were 27.46±8.95mmol/l and 1243.25±651.46µmol/l. Mean GFR was 7.44±9.80 ml/minute/1.73m² with 90.3% of patients presenting in stage 5. The prevalence of CKDu amongst them was 20.5%. **Conclusion:** This study showed that the prevalence of CKDu is high in Northern districts of Yobe State, North Eastern Nigeria. Further studies will be required to define environmental or cultural factors that contribute to the high prevalence in this region.

Key words: Chronic kidney disease of uncertain aetiology, CKDu, Northern Yobe, Nigeria

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Introduction

Since the advent of the 20th century, there has been a rising incidence of chronic kidney disease among patients who have no known risk factors.^{1,2} Male farm workers are predominantly affected in largely agrarian communities of Central America, Egypt, India, Sri Lanka and Central and Eastern Europe.³⁻⁷ This has led investigators to evaluate the role of environmental, socioeconomic as well as occupational factors in the development of kidney diseases.^{6,7} It was in 1956 that Tanchev *et al*^{8,9} published the initial description of what was to be known later as Balkan nephropathy; an endemic kidney disease affecting exclusively residents of communities along the banks of river Danube.



According to scientific committee supported by WHO, CKD of unknown origin (CKDu) is diagnosed in the absence of known risk factors of CKD such as diabetes mellitus, chronic glomerulonephritis, chronic or severe hypertension together with normal HbA_{1c} (<6.5%), blood pressure <160/100mmHg untreated or 140/90 mmHg on up to 2 antihypertensive medications.¹⁰

Exposure to heavy metals such as mercury, lead and cadmium in areas where there is high mining activity has also been implicated in the development of chronic kidney disease.¹¹⁻¹³ The high prevalence of chronic kidney disease of undetermined aetiology among farmers in Sri Lanka and Central parts of South America has recently led researchers to conclude that exposure to pesticides; glyphosate, phosphate fertilizer and drinking water contaminated by these chemicals in shallow wells were responsible.^{1,5} Male paddy farmers were found to be at higher risk than their non-farming counterparts in rural Sri Lanka. Also drinking from abandoned wells as well as use of glyphosate herbicides were found to confer significant risk of developing kidney diseases in Sri Lanka.¹⁴ In another study, Jayasumma *et al*¹¹ found that phosphate fertilizer used by farmers in Sri Lanka is the main source of contamination by Arsenic. The study found that triple phosphate fertilizer contains up to 31mg/Kg of Arsenic. It also contains several nephrotoxic metals such as lead, cadmium, cobalt and vanadium.

Affected patients have similar clinical presentations such as slowly progressive kidney disease, minimal or absent proteinuria, scarred kidneys and adults are exclusively affected.¹² Histopathologic findings in the kidneys of patients include tubulointerstitial nephritis associated with mononuclear cells infiltration, glomerular

sclerosis and tubular atrophy. This picture of tubulo-interstitial disease with negative immunofluorescence for IgG, IgM, and complement are in favour of toxic nephropathy.²¹⁻²⁴

Ummate *et al*¹⁹ has reported that majority of end stage kidney disease patients receiving haemodialysis in Maiduguri were residents of farming communities along the banks of river Komadugu-Yobe in North eastern Nigeria. And majority of these patients have a diagnosis of CKDu or CGN. This high prevalence of chronic kidney disease may suggest that some environmental factors may have a role in the causation of chronic kidney diseases in that environment. Several studies in the area have found high levels of cadmium and lead in the soil, water, goats and fish.^{17,26,27} Whether toxicity from these metals has a role in the causation of high burden of CKD in this environment has not yet been fully studied. This study intends to present the experience from a tertiary hospital in the affected communities.

Methodology

The study is a single centre cross sectional study carried out at the Federal Medical Centre Nguru, Yobe state, northeastern Nigeria. The Federal Medical centre is a regional hospital attending to patients from Nguru, Bade, Jakusko, Geidam and Karasuwa districts in northern Yobe state. The study population consisted of adults (>18 years) sequentially admitted into the renal unit of the department of Medicine between January 2015 to December 2016 (2-year period). Socio-demographic and clinical features were obtained and recorded in a well-structured questionnaire for each patient. Laboratory parameters including full blood counts, electrolytes, urea and creatinine, phosphate, total calcium as well as



viral screening for HBV, HCV and HIV were also obtained. Glomerular filtration rate (GFR) was calculated using the Modification of Diet in Renal Disease (MDRD) formula. Patients were evaluated for traditional risk factors of kidney disease such as hypertension defined as persistent office blood pressure >140/90 or history of long-standing diagnosis of hypertension; diabetes mellitus defined as fasting blood glucose >7mmol/l, herbal drug use, and prolonged NSAID use. Patients who have chronic kidney disease in the absence of known risk factors such as hypertension or blood pressure of <140/90 on <2 antihypertensive and/or diabetes mellitus are considered to have CKD of unknown origin. Chronic glomerulonephritis was diagnosed clinically based on the presence of proteinuria >1g/24

hours, hypertension, and shrunken kidneys on ultrasound in a patient < 30 years.

Statistical analysis. Data obtained were entered into a computer and analysed using SPSS version 20 (IBM Corp. Amonk, NY, USA). Continuous variables were presented as mean±SD whereas categorical variables were expressed as percentages.

Results

A total of 278 patients were admitted into the renal unit of Federal Medical Centre Nguru from January 2015 to December 2016 (2-year period). The mean ages of the study population ranged from 18 to 75 years with a mean of 44.64±16.09 years. There were 138 (49.5%) males and 140 (50.5%) females; male:female ratio 1:1.02. Out of the study population, 83.6% were married.

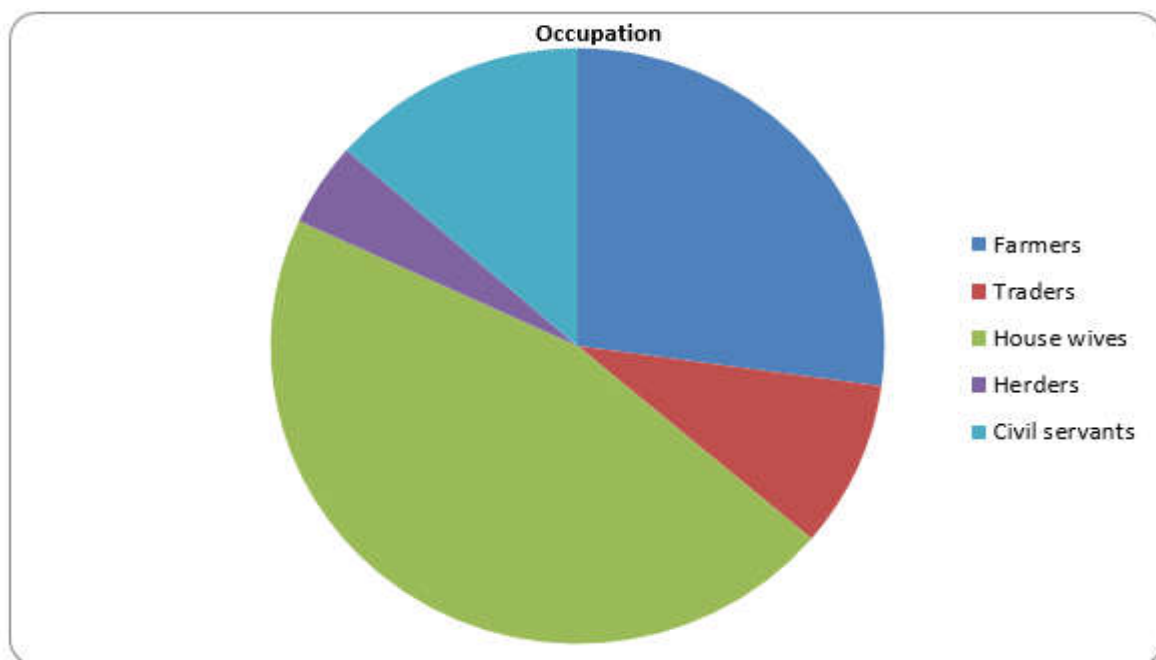


Figure 1: Distribution of occupation among patients

Majority of patients are long term residents of areas near the river Kumadugu; Gashua (29.5%), Nguru (21.3%) and Bursari (11.5%). Majority of patients (80.3%) had no formal

education, whereas 9.8% had secondary education and 3.3% had tertiary education. Mean GFR was 7.44±9.80 ml/minute/1.73m² with 90.3% of patients presenting in stage 5.



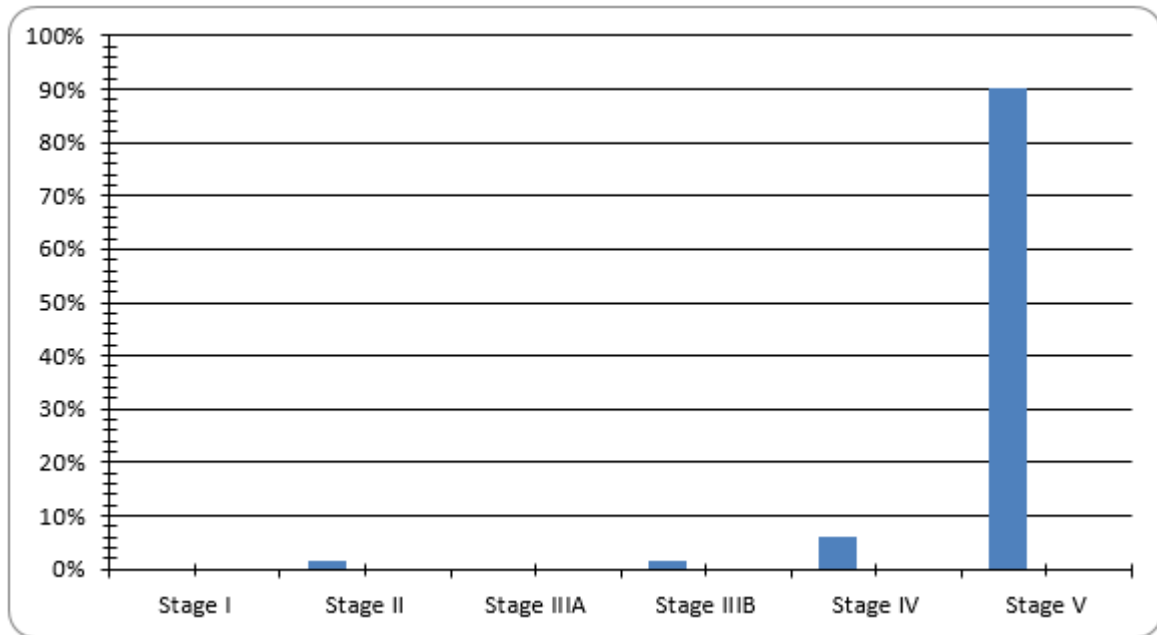


Figure 2: Distribution of patients in various GFR stages

The most common CKD risk factor identified is hypertension as shown in table 1.

Table 1: Patient reported risk factors of CKD

Risk factors	Yes n (%)	No n (%)
Hypertension	128(46.0)	150(54.7)
Diabetes	4(1.4)	274(98.6)
Herbal drugs	13(4.7)	265(95.3)
PIH	8(2.9)	270(97.1)

PIH; pregnancy induced hypertension

Table 2: Distribution of diagnoses of chronic kidney disease

Diagnosis	N (%)
Hypertensive nephrosclerosis	128(46.0)
CGN	75(27.0)
CKDu	57(20.5)
Diabetic nephropathy	4(1.4)
HIVAN	3(1.1)
Nephrotic syndrome	11(4.0)

CGN; chronic glomerulonephritis, CKDu; chronic kidney disease of uncertain aetiology, HIVAN; HIV associated nephropathy

Table 3: Comparing the characteristics of patients with hypertensive nephrosclerosis, chronic glomerulonephritis and CKDu

Characteristics	CGN n=75	Hypertension n=128	CKDu n=57
Age(yrs)±SD	26.94±7.03	55.16±10.19	50.00±15.75
Sex M	37(49.3)	68(53.1)	37(64.9)
F	38(50.7)	60(46.9)	20(35.1)
SBP(mmHg)	161.67±38.54	142.41±31.47	120.00±14.14
DBP(mmHg)	107.78±22.89	90.00±11.68	75.25±9.91
PCV(%)	22.79±4.46	23.65±5.91	20.25±7.05
Sodium(mmol/l)	140.27±5.39	140.56±11.00	142.13±9.91
Chloride(mmol/l)	101.00±0.64	99.37±10.64	92.88±16.44
Potassium(mmol/l)	4.43±0.64	4.62±1.03	4.41±1.68
Bicarbonate(mmol/l)	16.67±2.54	15.00±2.32	15.29±1.60
Calcium(mmol/l)	2.11±0.88	2.21±0.38	2.23±0.23
Albumin(g/dl)	30.22±7.51	30.20±5.20	30.40±9.58
Urea(mmol/l)	21.51±4.46	25.17±8.34	27.46±8.95
Creatinine(μmol/l)	1162.06±600.86	1092.50±527.91	1243.25±651.46
GFR(ml/min/1.73m)	7.61±8.40	5.90±5.54	4.38±2.33

PCV; packed cell volume, GFR; glomerular filtration rate, SBP; systolic blood pressure, DBP; diastolic blood pressure

Discussion

In our study, CKD in absence of traditional risk factors contributed to about a fifth of patients admitted into the renal unit of our hospital. This showed that CKDu contributes substantially to the burden of kidney disease in Yobe state. The study also showed that few districts in the northern drier parts of the State are affected more than others hence increasing the possibility that some environmental factor(s) may have a role. Gashua *et al*¹⁸ found high levels of cadmium and arsenic in the fish and sheep in the affected areas. The affected areas have high activity of irrigation rice farming and farmers commonly use pesticides, herbicides and fertilizers thus exposure to these chemicals may play a role. This is similar to findings by Athuralia *et al*²⁹ in Sri Lanka where CKDu occurs among residents of dry agrarian communities.

Although hypertensive nephrosclerosis and chronic glomerulonephritis are the leading causes of chronic kidney disease in Yobe state, CKDu has been found to contribute significantly. Patients with CKDu are farmers and herders who are residents of Gashua, Nguru, Bursari and Geidam. These communities are agrarian communities situated close to River Kumadugu. Patients are middle aged having similar mean ages as patients with hypertensive nephrosclerosis and older than patients with chronic glomerulonephritis. This may suggest that the plausible environmental toxin/factor requires a long incubation period before end stage kidney is reached. This finding is similar to that among patients with Balkan Nephropathy, Mesoamerican nephropathy and CKDu in Sri Lanka.



Anaemia was found to be common among patients with CKDu when compared with patients with CGN and hypertensive nephrosclerosis. Fernando *et al*³⁰ found that prevalence of anaemia was higher among female CKDu patients than males.

Late presentation was very common among our patients, 90% presented in end stage renal disease and their mean GFR was 4.38 ± 2.33 ml/minute. This may highlight the poor health seeking behaviour of our patients due to lack of education, access to health care facilities and poverty. It may also be due to the slow insidious nature of this illness.

Conclusion

This study has found that chronic kidney disease is common among patients with and without traditional risk factors in northern Yobe state. The contribution of CKDu to the burden of CKD in Northern Yobe state is substantial. Further studies will be required to define the factors that contribute to the development of CKD in that environment, define the histologic features of this disease and find biomarkers that detect the disease in its earliest stages.

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