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Characterizing Chronic Kidney Disease in Rural Southern Nigeria: Socio-demographic, Clinical, and Referral Patterns.

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Abstract

Background: Chronic kidney disease (CKD) significantly contributes to mortality globally. Understanding the socio-demographic and clinical characteristics of CKD is vital for advocacy to alleviate its burden in Nigeria. This study assesses these attributes and referral patterns of CKD patients in a rural tertiary hospital in Nigeria. Method: This study utilizes a descriptive observational design with a non-randomized sampling method to select adult patients diagnosed with CKD at Irrua Specialist Teaching Hospital (ISTH) between June 1, 2023, and June 30, 2024. Patients' socio-demographic and clinical data were recorded electronically. Data analysis was performed using STATA v.17. Result: During the study, 339 patients with chronic kidney disease (CKD) were enrolled. The mean age was 54.3 ± 17.1 years, predominantly male (97.1%), with most engaged in trading or business (46.3%). The mean body mass index (BMI) was 27.6 ± 5.2, and the mean blood pressures were 143.6 ± 25.3mmHg systolic and 85.3 ± 15.6mmHg diastolic. The primary reason for referral was abnormal serum electrolytes, urea, and creatinine (79.9%), with 71.4% symptomatic at diagnosis. Main causes of CKD included diabetes mellitus (32.7%), systemic hypertension (22.1%), and chronic glomerulonephritis (15.3%). Most patients were in CKD stage 5 at diagnosis. Conclusion: Chronic kidney disease in our study cohort is prevalent among middle-aged males. Most patients had elevated body mass index and hypertension, with diabetes mellitus as the leading cause of CKD. The hospital General Outpatient Department was the primary referral source, and many patients were diagnosed at advanced stages of the disease. This highlights the need for increased awareness among healthcare professionals regarding early referrals for specialised care.

Keywords: CKD, diabetes mellitus, systemic hypertension, BMI, comorbidities.

Introduction

Chronic kidney disease (CKD) is a global public health problem. It has emerged as one of the most prominent causes of death and suffering in the world [1]. The prevalence of CKD has also been increasing, affecting an estimated 843.6 million individuals worldwide with a global prevalence of 10 % [2, 3]. This increase in the prevalence is attributed to the rise in risk factors, such as obesity, diabetes mellitus and systemic hypertension [1, 4].

The Global Burden of Disease (GBD) Chronic Kidney Disease Collaboration in The Lancet reported a comprehensive analysis of the global burden of CKD [4]. Individuals with even the earliest signs of CKD are at

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increased risk of arteriosclerosis and cardiovascular disease and may die long before they reach end-stage renal disease (ESRD) [5]. The global burden of CKD is enormous, and its effect is more in developing countries like Nigeria, where there is poor health insurance coverage, and most of the patients pay out-of-pocket; so, the burden is borne mainly by the patient and relatives.

In 2012, the National Health Insurance Scheme (NHIS) integrated partial coverage for haemodialysis meant to defray the cost of six haemodialysis sessions [6]. This is grossly inadequate for patients with ESRD on maintenance haemodialysis which requires three sessions per week. This patient suffers huge financial constraints and cannot sustain haemodialysis sessions. Sustenance of haemodialysis and kidney care is limited by poverty in developing countries; many patients in Africa cannot afford haemodialysis beyond the first 2 to 3 months [7].

Patients living in middle- and low-income countries present late (CKD stage 5) to the Nephrologists and consequently have bad outcomes as they cannot afford adequate renal replacement therapy (RRT) [4]. Kidney transplantation procedures, which are the best form of RRT, are underdeveloped in many countries [4]. There are studies in Nigeria conducted on the prevalence and risk factors for CKD with variations and non-uniformity due to the different equations used to estimate the glomerular filtration rate (eGFR), which poses a limitation in the knowledge of the true prevalence of CKD in Nigeria [8, 9, 10,11]. Beyond this limitation, data are scarce on the socio-demographic and clinical characteristics of CKD in the rural parts of South-South Nigeria specifically. The knowledge of the socio-demographic and clinical characteristics of CKD is crucial to drive advocacy for policies that will ameliorate the burden of CKD in Nigeria. This study therefore aims to evaluate the socio-demographic, and clinical characteristics as well as referral patterns of patients with CKD in a rural tertiary hospital in Nigeria as a prelude to subsequent studies to further characterize and determine predictors of outcomes in this population of patients.

Materials and Method

This descriptive observational study. A non-randomised sampling technique was employed to select all consenting adult patients (18 years and older) who were diagnosed with CKD at the Nephrology clinic of Irrua Specialist Teaching Hospital (ISTH), Irrua, between the period of 1st June 2023 and 30th June 2024. These included patients who had completed the electronic medical records (EMR). Chronic kidney disease (CKD) was diagnosed and staged based on KDIGO definitions.[12]

Socio-demographic details (age, sex, occupation, level of education, ethnic group), co-morbid conditions (systemic hypertension, diabetes mellitus, benign prostatic hyperplasia) and medication history were collected at enrollment. Referral documentation, reasons for referral, vital signs, physical examinations, diagnostic tests, and diagnosis were recorded in the hospital's electronic medical records (EMR) and subsequently extracted using a standardised proforma into a Microsoft Excel spreadsheet.

Irrua Specialist Teaching Hospital (ISTH), located in Irrua town, within the Esan central senatorial district along the Benin-Abuja highway in Edo State, South-South geopolitical zone of Nigeria, stands as a prominent referral Centre for adjacent regions and states. The Nephrology clinic, managed by Nephrologists, functions biweekly on Mondays and Fridays as a specialised outpatient facility.

Data Analysis

Data analysis was conducted using Stata 17(Stata Corp LLC, TX, USA). Continuous variables were summarised using means and standard deviations for normally distributed data, and medians with interquartile ranges for skewed distributions. Categorical variables were summarised as frequencies and percentages.

Ethical Consideration

This study protocol was approved by the ethics and research committee of ISTH; the assigned protocol number is ISTH/HREC/20241704606**.** Confidentiality of Data was assured using questionnaires with codes assigned to retrieve information and removing all personal identifiers from the questionnaires.

Results

There were 339 patients with chronic kidney disease (CKD) during the period under review. The mean age was 54.5 ± 17.1 years. Most of the patients (97.1%) were males, and most (69.0%) resided within the Edo Central Senatorial District. Business or trading was the most common occupation, and about two-thirds of the patients were of the Esan tribe (Table 1). Relevant clinical features and vital signs of the patients at diagnosis are shown in Table 2.

Table 1: Socio-demographic characteristics of patients with CKD.

Variable	Frequency n=339	Per cent (%)
Age (years)		
18 – 29	37	10.9
30 – 39	30	8.9
40 – 49	52	15.3
50 – 59	79	23.3
60 – 69	74	21.8
≥ 70	67	19.8
Mean age ± SD (years)	54.5 ± 17.1	
Sex		
Male	241	71.1
Female	98	28.9
Place of residence		
Edo Central	234	69.0
Edo North	78	23.0
Edo South	11	3.2
Outside Edo	16	4.7
Occupation		
Businessperson/trader	157	46.3
Retired	57	16.8
Civil servant	33	9.7
Student	23	6.8
Farmer	22	6.5
Dependant/unemployed	20	5.9
Artisan	10	2.9
Driver	7	2.1
Lecturer/teacher	6	1.8
Police officer	4	1.2
Ethnic group		
Esan	227	67.0
Etsako	48	14.2
Owan	23	6.8
Igbo	13	3.8
Akoko Edo	9	2.6
Bini	7	2.1
Ika	7	2.1
Others*	5	1.5
Religion		
Christianity	299	88.2
Islam	40	11.8
Level of education		
Primary	29	8.6
Secondary	90	26.5
Tertiary	220	64.9

*Others: Yoruba (2), Ibira (1), Kogi (1), Urhobo (1)

Table 2: Clinical features of patients with CKD

Variable	Frequency n=339	Per cent (%)
BMI (kg/m^2)		
< 18.5	6	1.8
18.5 – 24.9	98	29.8
25.0 – 29.9	124	37.7
≥ 30.0	101	30.7
Mean BMI ± SD (years)	27.6 ± 5.2	
Pulse rate (/min)		
< 60	7	2.1
60 – 100	295	87.0
> 100	37	10.9
Mean pulse rate ± SD (/min)	84.9 ± 14.4	
Systolic blood pressure (mmHg)		
< 120	51	15.0
120 – 139	95	28.0
140 – 159	101	29.8
≥ 160	92	27.1
Mean systolic blood pressure ± SD (mmHg)	143.6 ± 25.9	
Diastolic blood pressure (mmHg)		
< 80	104	30.7
80 – 89	95	28.0
90 – 99	71	20.9
≥ 100	69	20.4
Mean diastolic blood pressure ± SD (mmHg)	85.3 ± 15.6	
Respiratory rate (/min)		
18 – 20	193	56.9
> 20	146	43.1
Mean respiratory. rate ± SD (/min)	21.0 ± 2.0	
Temperature (^{0}C)		
35.6 – 36.5	281	82.9
36.6 – 37.2	56	16.5
> 37.2	2	0.6
Mean temperature ± SD (^{0}C)	36.3 ± 0.3	
Random blood glucose (mg/dl)		
60 – 69	10	3.0
70 – 139	265	79.6
140 – 199	35	10.5
≥ 200	23	6.9
Mean Random blood glucose ± SD (mg/dl)	119.0 ± 48.8	

SD = Standard deviation. BMI = Body mass index calculated by weight in kilogram (Kg) divided by square on height in metres (m).

The most common indication for referral was abnormal electrolyte, urea and creatinine (E/U/Cr) results. Most patients were referred from clinics within ISTH, with the

General Outpatient Department (GOPD) being the most common source of referral from within ISTH (Table 3).

Table 3: CKD patients referred to ISTH Nephrology Clinic.

Variable	Frequency n=339	Per cent (%)
Indication for referral*		
Abnormal E/U/Cr	271	79.9
Elevated blood pressure	19	5.6
Body swelling	17	5.0
Abnormal urinalysis	13	3.8
Abnormal ultrasound scan	11	3.2
Leg swelling	11	3.2
Others*	14	4.1
Source of referral		
ISTH clinics	233	68.7
Private hospital	102	30.1
Other government hospitals/PHC	4	1.2
Source of referral within ISTH (n=233)		
GOPD	105	45.1
Endocrine clinic	62	26.6
Cardiology Clinic	16	6.9
Urology Clinic	15	6.4
NHIS/Staff clinic	8	3.4
O&G clinic	5	2.2
Haematology clinic	5	2.2
Neurology Clinic	3	1.3
Others*	14	6.0

*Others: Dermatology clinic (2), Eye clinic (2), Orthopaedics clinic (2), Paediatric nephrology clinic (2), Surgical Outpatient Department (2), Gastroenterology clinic (1), Plastic clinic (1), Psychiatry clinic (1), Pulmonology clinic (1). GOPD = General Outpatient Department. O&G = Obstetrics and Gynaecology. E, U and Cr = Serum, electrolyte, urea and creatinine PHC = Primary health centre. NHIS =National Health Insurance Scheme.

A total of 242 (71.4%) were symptomatic on presentation, while 97 (28.6%) were asymptomatic. Among the symptomatic patients, the most prevalent symptom was leg swelling (54.5%), followed by weakness (26.4%) (Figure 1).

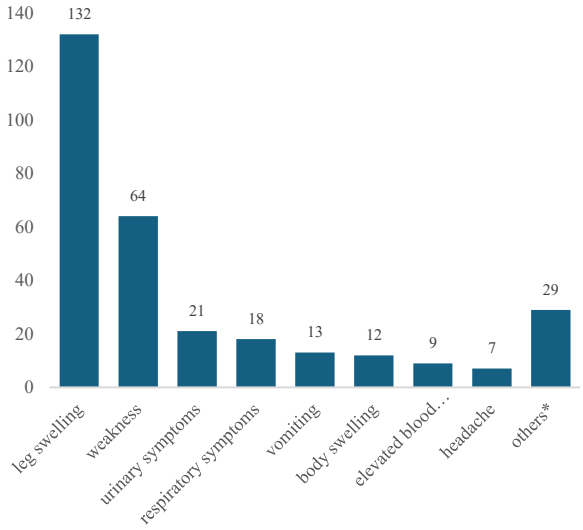

Figure 1: Proportion of symptomatic patients (n=242) (multiple responses).

*Others: facial swelling (5), abdominal swelling (3), leg pain (3), low back pain (3), abdominal pain (2), blurred vision (2), confusion (2), leg ulcer (2), chest pain (1), easy fatigability (1), joint pain (1), poor sleep (1), restlessness (1), toothache (1), tremor (1).

Out of the 339 patients, 257 (75.8%) had at least one comorbidity, while 82 (24.2%) had none. Among those with co-morbid conditions, systemic hypertension was the most prevalent, occurring in 63.8% of cases (Figure 2).

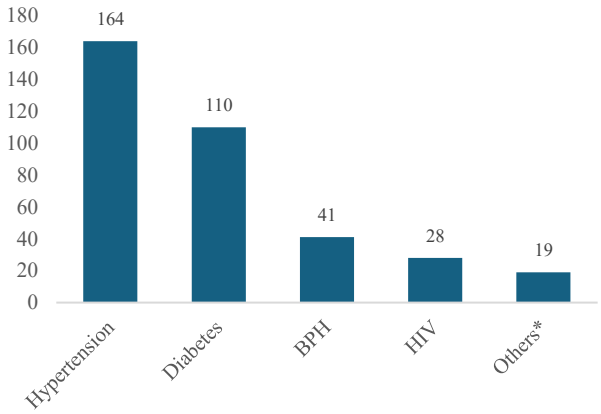

Fig 2: Proportion of patients with comorbidities (n=257) (multiple responses).

*Others: Sickle cell disease (6), Cancer of the prostate (5), Chronic Hepatitis B (2), Cancer of the cervix (3), Chronic hepatitis C (1), Parkinson's disease (2). BPH = Benign prostatic hyperplasia. HIV = Human immunodeficiency virus infection.

As shown in Table 7, the most identified causes of CKD were diabetes (32.7%), hypertension (22.1%), and chronic glomerulonephritis (15.3%). Other less common causes included HIV infection (8.3%), benign prostatic hyperplasia (7.4%), and nephrotic syndrome (5.0%). Nearly half of the patients (49.8%) presented at stage 5 CKD.

Table 7: Causes and Stages of CKD in patients with CKD

Variable	Frequency n=339	Per cent (%)
Causes		
Diabetes mellitus	111	32.7
Systemic hypertension	75	22.1
Chronic glomerulonephritis	52	15.3
HIV infection	28	8.3
Benign prostatic hyperplasia	25	7.4
Nephrotic syndrome	17	5.0
Others*	31	9.1
Stages		
Stage 1	12	3.6
Stage 2	22	6.5
Stage 3	75	22.3
Stage 4	60	17.8
Stage 5	168	49.8

*Others: Sickle cell disease (6), Unknown aetiology (6), Autosomal dominant polycystic kidney disease (3), Cancer of the prostate (2), Obstructive uropathy (2), Renal cell carcinoma (2), Renovascular disease (2), Uterine fibroid (2), Cancer of the cervix (1), Chronic myeloid leukaemia (1), Goodpasture disease (1), Chronic hepatitis B infection (1), Herbal concoction (1), Ovarian tumour (1)

Discussion

This study highlights the socio-demographic and clinical characteristics of patients with CKD in a rural tertiary hospital in South-South Nigeria. Most of the patients with CKD were in the middle age group with a mean age of 54.5 ± 17.1 years. This finding contrasts with a study done in Gambia to characterize patients with CKD where the mean age was found to be 37.82 years [13]. Beyond the difference in geographical location, the difference in the age pattern between the studies may be the effect of inclusion criteria as the Gambia study recruited patients from the age of 15 years unlike in our study that recruited patients who were 18 years and above [13]. Also, our study recruited 339 patients with CKD while the study in the Gambia had 52 patients; hence, the index study has more power for statistical inference. Our observation is, however, similar to the finding of *Chowdhury et al*, who reported a mean age of 53.31 ± 10.28 years for patients with CKD in Bangladesh [14], and *Dada et al*, who reported a mean age of 49.29 ± 15.92 years for patients with CKD in Ado-Ekiti, South-West Nigeria [15]. The structure and function of the kidney are affected by the ageing process, with the steepest decline beyond the age of 50 years [16,17].

An overwhelming majority of the patients with CKD in this study were male (97.1%). This may be explained by the fact that kidney function declines faster in men than women because of the unhealthier lifestyle in men, the protective effect of oestrogen, and the damaging effect of testosterone on the kidneys [18]. Also, more men than women start renal replacement [18]. Some earlier studies also reported male preponderance in the socio-demographic characteristics of patients with CKD [14, 15, 19]. This observation may also be a reflection of the impact of socioeconomic and cultural factors on the hospital presentation of these patients. However, *Garcia et al* stated that CKD was more prevalent in women globally, but the prevalence of end-stage kidney failure was higher in men [20]. Most of the patients in the index study were in KDIGO stage 5 (ESRD); hence, our finding is consistent with the report by *Garcia et al* [20].

We found that most patients with CKD in our study were traders or in business, Christians by religion, and had a tertiary level of education. The predominant religion in the South-South geopolitical zone of Nigeria is Christianity, based on anecdotal observation, which explains our observation on religion. While *Dada et al*, in the study of the demographic and clinical characteristics of patients with CKD in south-west Nigeria, did not analyze the religion and educational statuses of the patients, they reported that the predominant occupation of the patients was trading which is consistent with our observation in the index study [15]. Our finding of higher educational status in most patients with CKD is at variance with the observation by *Tripathy et al*, who explained the association between low educational attainment and incident CKD in young adults to be due to poor healthcare access, lifestyle, and co-morbid conditions [21]. However, the finding of *Barzegar et al* is consistent with our observation [22]. The difference in observations on the association between the level of education and the incidence of CKD in these studies may be attributed to differing study designs and cultural disparities in the study population. Our observation may also reflect unhealthy lifestyles in those with higher levels of education, or a selection bias due to better health-seeking behaviour in this group of patients. Those with low levels of education may not have the awareness or the financial resources to present to the tertiary hospital for care, rather, they would seek unorthodox care.

The mean BMI of the patients with CKD in this study was 27.6 ± 5.2, which is overweight, while the majority were overweight (37.7%) and obese (30.7%). Earlier study provided evidence that being overweight increased the risk of advanced CKD, and being obese further increased such risk independent of the presence of diabetes, systemic hypertension or cardiovascular disease [23]. Similar observations have also been reported in other studies [24,25]. Our observation is consistent with these earlier studies from other countries in the world. Some of the mechanisms that explain the impact of raised BMI on the risk of CKD include the haemodynamic effect through raised angiotensin II, activation of the sympathetic nervous system, inflammatory injury to the kidneys, and renal lipotoxicity [26].

We observed that most of the patients with CKD had elevated blood pressure. This observation is expected due to the bidirectional causative relationship between systemic hypertension and chronic kidney disease. *Lee et al* reported that systolic blood pressure ≥130mmHg and diastolic blood pressure ≥90mmHg are associated with the risk of CKD [27]. Other studies have also reported an association between elevated blood pressure and CKD [28,29]. CKD can be a cause of elevated blood pressure through multiple mechanisms, which include sodium dysregulation, increased activation of the sympathetic nervous system, and increased renin-angiotensin-aldosterone system activities [30,31].

The mean random blood glucose of the patients in this study was 119 ± 48.8mg/dl, which was within normal limits; only 6.9% of our patients had random hyperglycaemia. However, increased plasma glucose variability in patients with CKD has been reported in literature [32]. In CKD, postprandial hyperglycaemia can occur due to decreased kidney clearance of glucose; while fasting hypoglycaemia can occur because of decreased renal gluconeogenesis, prolonged half-life of endogenous insulin and glucose-lowering medications [32]. The index study did not investigate the fasting and postprandial blood glucose of the patients. Subsequent studies may investigate plasma glucose variability in patients with CKD.

We observed that most patients with CKD were symptomatic at presentation, with leg swelling being the most common presenting symptom. While patients with early CKD may not be symptomatic, symptoms are usually present in late CKD [33]. Since most of our patients were in the late stages of CKD, our observation was consistent.

The commonest comorbidities in patients with CKD in the index study were systemic hypertension and diabetes mellitus. This observation is consistent with the findings of *Fasipe et al,* in a tertiary hospital in Ondo State, South-West Nigeria, and that of *Odonmeta et al,* in a private health facility in Delta State, South-South Nigeria [34,35]. In another study in the United Kingdom, the two most prevalent comorbidities across all stages of CKD were systemic hypertension and musculoskeletal disorders [36]. In all these studies, systemic hypertension appeared to be the most prevalent comorbidity in patients with CKD. The observation is not unexpected considering the bidirectional causative relationship between CKD and systemic hypertension, as mentioned earlier in this manuscript.

The most prevalent cause of CKD in the index study was diabetes mellitus, followed by systemic hypertension and chronic glomerulonephritis. This same pattern had been reported in an earlier study from ISTH, Irrua, Edo State, South-South, Nigeria, by *Rafiu et al* [37]. *Ibitola et al* investigated the prevalence and risk factors of CKD among commercial motorcyclists in Ado-Ekiti, Ekiti State, South-West Nigeria, and found that diabetes mellitus and systemic hypertension were the only risk factors that significantly predicted CKD [38]. The latter observation agrees with the index study, and it reflects the increasing prevalence of diabetes mellitus in Nigeria. The progressive adoption of the Western lifestyle and diet by Nigerians can explain the latter. *Lucas et al*, also reported that the commonest cause of CKD was diabetes mellitus, and listed glomerulonephritis, genetic disorders, drugs, cardiovascular diseases, etc. as other causes [39].

Almost half of the patients with CKD were in KDIGO stage 5 at the time of diagnosis. This reflected late presentation or late referral for specialist care in the study population. This can impact on outcome and prognosis. This pattern was also reported by *Marie et al* in Cameroon, and it was attributed to physicians' practical attitudes, patients' socio-cultural behaviour, and economic conditions [40]. These attributions are hypothetically not different from the observations in our study population.

Late presentation or referral of patients with CKD to Nephrologists deprives them of timely expert diagnostic workup and treatment. Most of the patients with CKD in this study were referred to the Nephrology clinic on account of deranged serum electrolyte, urea and creatinine values (79.9%), mostly from the General Outpatient Department (GOPD) clinic of ISTH, Irrua. Since it was observed that most of these patients were

referred to in the late stage of the disease, it brings to the fore the need to further sensitise other healthcare professionals within and outside our health facilities on the importance of early detection and referral of patients with CKD. Beyond symptoms and signs referable to the kidneys, the indices of early CKD include abnormalities in the composition of blood and urine, and the detection of imaging abnormalities in the kidneys. There is also a need to work on increasing the awareness of the society to CKD through focused health education and community engagement, to promote early presentation of patients for Nephrology care. We also recommend routine renal function assessment, such as electrolyte, urea and creatinine assay, urinalysis, urine sediment microscopy, and renal imaging for apparently healthy individuals to detect any derangement early and promote early intervention.

Conclusion

The socio-demographic characteristics of our patients with CKD reflected that the majority were male, traders, in the middle age group and with a tertiary level of education. The clinical characteristics of the patients showed that the majority were either overweight or obese, with elevated systolic and diastolic blood pressure. Most of the patients were symptomatic at diagnosis, and leg swelling was the most prevalent symptom. The most common comorbidities in the patients were systemic hypertension and diabetes mellitus. The commonest causes of CKD in the study population were diabetes mellitus, systemic hypertension and chronic glomerulonephritis. The commonest source of referral of the patients was the ISTH GOPD clinic, and most of the patients were diagnosed with stage 5 disease (late). The latter brings to the fore the need to sensitize other healthcare professionals on the need for early referral to Nephrologists and to educate society on the for early presentation for expert care.

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