

Aetiology and Demographic Pattern of Chronic Kidney Disease in a Tertiary Health Institution in South-East Nigeria: A Four-Year Review

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ABSTRACT

Background: In sub-Saharan Africa (SSA), chronic kidney disease (CKD) is considered to be more common in men, the young and middle aged; while hypertension and glomerular diseases are the main causes of CKD. However its causes, and demographic distribution differ regionally. This may be due to variations in exposure to communicable and non-communicable diseases, differences in prevalent behavioural practices like cigarette smoking, genetic factors. **Objectives:** This study sought to explore the demographic characteristics and causes of chronic kidney disease seen in a tertiary hospital in Anambra State, South-Eastern Nigeria. **Methodology:** Medical records of all adults with kidney disease, aged 18 years and above, seen at the nephrology clinics over a four year time span with a diagnosis of CKD were reviewed. **Results:** The median age of the study cohort was 57 years (range = 18 to 94 years). More than 60% of CKD patients were older than 50 years and the peak age ranged between 51 to 70 years. Females accounted for 51.7% of patients and the male:female was 0.9:1. The most frequent causes of CKD were hypertensive nephropathy (46.7%) followed by diabetic kidney disease (27.9%). Only 3.06% of patients had chronic glomerulonephritis. **Conclusion:** The CKD population in Anambra State, south-east Nigeria is older than what have been reported previously from most other parts of SSA; also the sex disparity seen in earlier studies has disappeared. Importantly, diabetes is becoming an important cause of CKD in this sub-region. Earlier recognition and better treatment of Diabetes mellitus are necessary to reduce the burden of CKD in Anambra State.

Keywords: Diabetic kidney disease, Renal disease, Anambra, Nigeria

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Article Metrics

Submitted: 8 Aug 2023

Accepted: 20 Nov 2023

Published: July-Dec 2024

Journal Metrics

p-ISSN: 1115-0521

e-ISSN: 3027-2890

Website: www.orientjom.org.ng

E-mail: editorojm@gmail.com

Publisher

cPrint, Nig. Ltd

E-mail:

cprintpublisher@gmail.com

How to cite this article

N N Jisieike-Onuigbo, C N Ndulue, F Oguejiofor, A Anyanor, B C Ozuemba, N Osakwe. Aetiology and Demographic Pattern of Chronic Kidney Disease in a Tertiary Health Institution in South-East Nigeria: A Four-Year Review. *Orient J Med*, 2024;36(3-4):47-54. DOI:10.5281/zenodo.13902542



Access to the article

Website: <http://www.orientjom.org.ng>

DOI: 10.5281/zenodo.13902542

INTRODUCTION

Globally, the prevalence of chronic kidney disease (CKD) is high, and its contribution to mortality is increasing.¹ Currently, about 850 million people have CKD and the CKD-related mortality rate has increased by more than 40% over the past two decades.^{2,3} It has been predicted that by 2040 CKD would become the 5th most common cause of death worldwide.⁴ However its causes, demographic distribution, and impact differ regionally, presumably due to differences in access to healthcare resources, prevalent behavioral practices like cigarette smoking, genetic factors (e.g. APOL1 alleles) and varying exposure to co-morbidities such as hypertension, diabetes and obesity.^{1,5}

Chronic Kidney Disease is more prevalent in Low/Middle-income countries relative to high-income countries.⁶ Most of the world's less developed countries are in sub-Saharan Africa (SSA). Earlier reports from sub-Saharan Africa indicate that CKD is more common in men, the young and middle aged, with hypertension and glomerular diseases constituting the main causes of CKD.^{7,8,9,10} This is different from the pattern observed in high income countries such as Europe⁵, Japan¹¹, Taiwan¹², and the United States¹³, where CKD is more common in the elderly with diabetes mellitus being the most common cause of CKD.

Recent reports have projected that the incidence of diabetic kidney disease (DKD) in SSA would increase dramatically in the future due to changes in dietary habits and widespread adoption of sedentary lifestyles.¹⁴ There is need for updated information on the causes of CKD in our society because of the recently increasing urbanization which has led to a rise in the prevalence of non-communicable diseases like obesity and diabetes mellitus; and also because of the impact of human immunodeficiency virus (HIV) in sub-Saharan Africa.

We carried out this study to describe the demographic characteristics and causes of chronic kidney disease seen in a tertiary hospital in Anambra State, South-Eastern Nigeria. To the best of our knowledge, there

is no published report in this area and study results will go a long way in helping to draft an effective public health response to the CKD epidemic.

METHODOLOGY

This was a descriptive retrospective study conducted at Nnamdi Azikiwe University Teaching Hospital (NAUTH). This is a tertiary hospital located in Nnewi, a major commercial city in Anambra State, South-East Nigeria. The renal unit runs two nephrology clinics weekly and serves an estimated population of > 4 million people. The hospital receives referrals from neighboring states (Abia, Imo, Enugu, Rivers, Cross River, Delta and Ebonyi States). During the study period, it was the main referral center for haemodialysis treatment in the state.

Aetiologies of CKD were defined as follows:^{15,16} Hypertensive nephropathy is present if the patient presented with the following - hypertension which predated the onset of kidney disease, presence of hypertensive target organ damage, absence of dipstick proteinuria and absence of other causes of CKD. Diabetic kidney disease implies presence of Type 1 or Type 2 diabetes mellitus, other microvascular complications of diabetes (diabetic neuropathy or retinopathy) and proteinuria. Sickle cell nephropathy is the presence of sickle cell disease, proteinuria, and eGFR <60ml/min/1.73m². Human Immunodeficiency Virus (HIV) associated kidney disease is the presence of confirmed HIV infection, low CD4 count, overt proteinuria and normal-sized or enlarged kidneys on ultrasound; Nephrotic syndrome: presence of nephrotic-range proteinuria, hypoalbuminemia, hypercholesterolemia with or without edema. Chronic glomerulonephritis implies the presence of haematuria and/or overt proteinuria and bilaterally shrunken kidneys on ultrasound scan (<9cm) in the absence of other causes of CKD. Autosomal dominant polycystic kidney disease is presence of enlarged kidneys and more than 4 cysts in either kidney. Obstructive nephropathy involves the unilateral or bilateral uretero-pelvic dilatation on ultrasound and impaired renal function. Chronic pyelonephritis involves past history of recurrent urinary tract

infections and focal cortical thinning on ultrasound imaging.

Medical records of all adults, aged 18 years and above, seen at the nephrology clinics over a four year time span (April 2011 to March 2015) with a diagnosis of CKD were included in the study. Medical records belonging to patients with incomplete information, acute kidney injury and patients aged less than 18 years were excluded. Data on age, sex, and aetiology of CKD were extracted from the medical records.

Patient confidentiality was maintained during the process of data collection as individual patient identifiers such as patients' names or hospital numbers were purposefully not extracted and each record was assigned a unique identification number. Institutional ethical approval was obtained from the Health Research Ethics committee of Nnamdi Azikiwe University Teaching Hospital.

Results were presented in figures using descriptive statistics. Continuous variables were expressed as median and inter-quartile range while categorical variables were expressed as frequencies and percentages.

RESULTS

During the period under review, a total of 5139 patients were seen at the specialty clinics of the Department of Internal Medicine, NAUTH, Nnewi. Of these, 832 patients with kidney diseases were attended to in the nephrology clinics. We excluded the records of 40 patients who were previously treated for acute kidney injury only (without underlying CKD) and were seen in clinic solely for follow up after discharge. The yearly distribution of CKD patients is shown in Table 1

Figure 2: Age distribution of chronic kidney disease patients

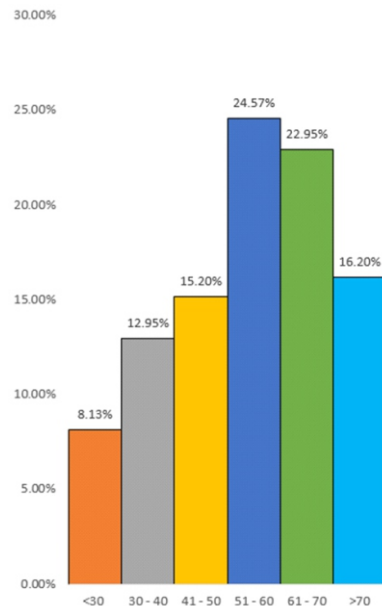


Table 1: The yearly distribution of patients with chronic kidney disease

Year	Frequency
April 2011 – March 2012	248
April 2012 – March 2013	229
April 2013 – March 2014	195
April 2014 – March 2015	160
Total	832

Figure 1 showed that even though there was a slight female preponderance (51.7%), the proportions of both sexes were almost equal (Male: Female = 0.9:1). The age of patients ranged from 18 – 94 years with a median of 57 years. As shown in Figure 2, more than 60% of the CKD patients were older than 50 years. Most of the study population were between 51 to 70 years old.

The most frequent causes of CKD were hypertensive nephropathy (46.7%) followed by diabetic kidney disease (27.9%). Less frequent causes of CKD include Human Immunodeficiency Virus (HIV) associated kidney disease (7.6%) and nephrotic syndrome (7.2%). In this study, sickle cell nephropathy and renal artery stenosis accounted for less than 1% of CKD cases seen during this period (Figure 3).

Figure 1: Sex distribution of chronic kidney disease patients

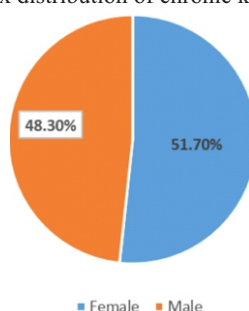
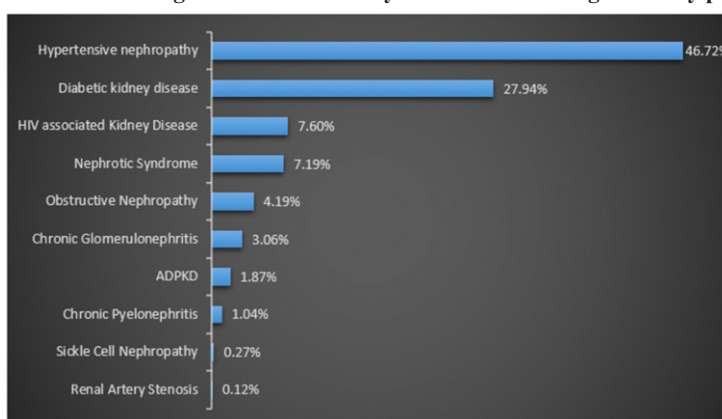


Figure 3: The aetiologies of chronic kidney disease seen during the study period



ADPKD – Autosomal Dominant Polycystic Kidney Disease; HIV – Human Immunodeficiency Virus

DISCUSSION

The prevalence of chronic kidney disease is on the increase worldwide. The situation in developing countries mirrors what is obtainable worldwide hence it is considered a public health challenge. The most common cause of CKD made in our study was hypertensive nephropathy followed by diabetic kidney disease, HIV associated kidney disease, nephrotic syndrome and obstructive nephropathy. Ulasi *et.al*, reported that hypertension was the leading cause of CKD in patients with primary renal disease of known aetiologies.¹⁷ Wachukwu *et al*. also reported hypertensive nephropathy as the most prevalent cause of CKD in their series.¹⁸ However, most previous studies in Nigeria have reported chronic glomerulonephritis (CGN) as the commonest cause of CKD in Nigeria.^{9,19} This has

been attributed to the background prevalence of infectious diseases which cause acute glomerulonephritis and subsequently chronic glomerulonephritis.

This study reported hypertension and diabetes above chronic glomerulonephritis. Hypertension and diabetes mellitus are said to be on the increase in black population together with its target organ consequence of which renal disease is one of them. In Africa, hypertension has been reported as one of the leading causes of renal disease.²⁰ It is important to note that most of the diagnosis of renal disease made in our study were based on clinical parameters which may have some variations when compared to other studies. Moreover most renal diseases present with hypertension which may have contributed to them

been labeled as hypertensive nephropathy. This may have caused the increased prevalence of hypertensive nephropathy compared to other etiologies.

We also found a high incidence of CKD secondary to diabetes mellitus (27.9%). This result differs from other reports on the causes of CKD in SSA, in which diabetes mellitus (DM) is not recorded as a significant etiology of CKD. In 1989, Akinsola *et al.* reported that 50% of CKD in a tertiary hospital in South-West Nigeria was caused by glomerular diseases followed by hypertensive nephropathy at 25%; only two patients in that cohort had diabetic kidney disease (DKD).⁹ Similar pattern has been affirmed by subsequent reports from SSA.^{16,21} The higher incidence of DKD in the present study reflects the ongoing epidemiologic transition in the burden of disease from communicable to non-communicable disease in SSA. Better treatment of infectious diseases in recent decades has probably led to a reduction in the incidence of chronic glomerulonephritis. The high incidence of CGN recorded in earlier studies was due to the high burden of chronic bacterial, parasitic and viral infections prevalent in the low income countries. Earlier and better treatment of these infections in recent times has led to a reduction in the incidence of acute glomerulonephritis and its sequelae - CGN.

Meanwhile there is a marked surge of diabetes mellitus due to a change in the population lifestyle. In 1989 the prevalence of DM in Nigerians was 1.43% but in 2019, this had increased to 21.7%.^{22,23} This 14-fold increase in the prevalence of DM in Nigerians matches the 15-fold increase in the incidence of DKD over the same time-frame. Also, in the intervening decades from the earlier studies, newer drugs and innovations in the management of diabetes mellitus have become affordable and available leading to better glycemic control and consequently less mortality from the acute complications of DM. Thus more diabetic patients are surviving long enough to develop DKD. This pattern may also be partly explained by the higher proportion of older people with CKD found in this

study population relative to those of earlier studies. In their study of CKD patients seen in LUTH over a 10 year period, Amira *et al.* noted that the incidence of DKD was highest in CKD patients older than 64 years (27.8%) compared to younger age groups (2.5%).²⁴ It is pertinent to note that the incidence of DKD in our study (27.9%) is comparable to the 27.8% that Amira *et al.* recorded among older CKD patients.²⁴ Just as reported in the current study, DKD was the second highest cause of CKD recorded in a Ghanaian tertiary hospital between 2011 and 2012.²⁵ Furthermore, the low incidence of CGN recorded in this study (3.06%) may be due to the low proportion of CKD patients less than 40 years in the study population (21.08%). As Amira *et al.* have demonstrated earlier, CGN is more common in younger CKD patients especially those less than 40 years old.²⁴

Human immunodeficiency virus associated kidney disease was the third commonest cause of renal disease in our study. Renal disease is a common complication of seen in HIV patients and the cause is multifactorial. This includes direct effect of the virus on the nephron, presence of co-morbidities and side effects of anti-retroviral medications. Emem *et al.* reported a high prevalence of nephropathy (38%) in patients living with HIV.²⁶ This suggests that HIV contributes significantly to the CKD burden in Nigeria.

A key finding of this study was the unexpectedly high proportion of older people with CKD. More than 60% of CKD patients were older than 50 years and the peak age ranged between 51 to 70 years. This represents a marked change from earlier studies on the age distribution of CKD patients in SSA. One of the earlier reports on the epidemiology of CKD in SSA by Akinsola *et al.* noted that CKD was predominant in the young and middle-aged; in fact only one CKD patient in that cohort was older than 60 years.⁹ Data from Senegal and Benin Republic document that the age of most CKD patients were below 46 years and 60 years respectively.^{21,27} Two retrospective studies from Sagamu and Lagos, Nigeria noted that the vast majority of CKD patients were between 20 to 55 years old.^{16,24} Similarly, in 2010, Ulasi *et al.* observed that

86.5% of CKD patients seen in Enugu, Eastern Nigeria, were younger than 60 years; however, a more recent report from the same hospital in 2020 documented an age distribution that was similar to our study results as 66.9% of their CKD patients were between 42 to 74 years old.^{17,28} This change from the younger age demographic pattern may reflect higher life expectancy among Nigerians in recent times compared to earlier decades from when the older studies were reported.²⁹ It also clearly showed the interplay between age dynamics and aetiology in the causes of CKD. The younger age group had CGN as the prevalent cause of CKD while the older age group had hypertension and diabetic kidney disease as the prevalent causes.

In addition to the findings discussed above, we also found that the sex distribution of CKD patients were almost equal (M:F = 0.9:1) though more females were seen than males. This contradicts other earlier reports from Nigeria. In past reports, the proportion of male CKD patients have been consistently higher than their female counterparts. Previously documented M:F ratio have ranged from 1.3:1 to 1.9:1.^{17,16,24} Researchers previously attributed this male predominance in the incidence of CKD to better health seeking behavior among the menfolk. However epidemiologic studies suggest that younger men are at higher risk of CKD due to the potentiating effect of testosterone on CKD progression whereas it is speculated that women in their reproductive age are protected by estrogens.³⁰ Considering the older age spectrum of the present study population, it is feasible that the disappearance of previously recorded sex disparity might be due to the loss of the putative protective factor in the older women of the study population.

CONCLUSION

Hypertension is the most common cause of CKD in Anambra State, Nigeria. However diabetic kidney disease is becoming an important cause of CKD in this sub-region. In order to blunt and, possibly reverse, the rising incidence of CKD, public health efforts should be targeted at earlier recognition and

better treatment of Diabetes mellitus. The general public should be made aware of lifestyle changes needed to reduce the risk of Type 2 Diabetes mellitus and the importance of good glycemic control among diabetics. Furthermore regular community screening for DKD using simple tools like glucometers and urine dipsticks should be implemented.

Author roles

Conceptualized and designed the study- NNJ, CNN, IIU

Supervised data acquisition- FO, BCO, NO, HE, CUO

Data interpretation- CNN, AA, HE, AOK

Manuscript preparation- NNJ, CNN, FO, AA

Critical review of manuscript for important

intellectual content- AOK, CUO, IIU

Conflict of interest: nil

Sponsorship: nil

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