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# Prevalence of Chronic Kidney Disease and Awareness Levels Among Young Adults in Imo and Anambra States, Nigeria

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2024

Abstract

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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## Abstract

Chronic kidney disease (CKD) presents a significant public health concern, particularly in developing countries such as Nigeria, where health care resources are limited and awareness remains low. This quantitative study evaluated the prevalence of CKD and awareness levels among young adults in Imo and Anambra States, Nigeria. The relationship between health care access, medication adherence, and CKD diagnosis was also examined. The health belief model and the social ecological model provided the framework for the study. A sample of 800 participants was recruited from in- and outpatient facilities in Imo State and Anambra State, and sociodemographic information, awareness levels, and medication adherence were assessed. The prevalence of CKD in the two states was 30.02%. Imo State had a significantly higher prevalence (42.7%) than Anambra State (23.2%). The study revealed that most young adults with early CKD diagnoses faced challenges in accessing health care, and poor medication adherence was widespread. Additionally, a significant lack of awareness regarding CKD was observed among participants. These findings emphasize the pressing need for improved CKD awareness and prevention strategies in Nigeria to address this growing public health issue. Understanding factors contributing to the high CKD prevalence and limited awareness is crucial for formulating effective interventions and reducing the economic and health burdens associated with this condition.

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# Dedication

This project is dedicated to God Almighty, the author and progenitor of wisdom and knowledge.

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# Chapter 1: Introduction to the Study

Chronic kidney disease (CKD) affects 5%–15% of the adult population in the developed world (Amoako et al., 2014). Caring for patients with kidney failure, also called end-stage renal disease (ESRD), is expensive, leading to a financial burden on families, individuals, and the government due to the high cost of resources (Okwuonu et al., 2017). Worldwide, the annual fee for maintenance of an ESRD therapy in the absence of kidney transplantation is between US$ 70–75 billion (Ranasinghe et al., 2011). The cost of renal replacement therapy is also considerable, even in developed countries. It costs the United States about 40 billion dollars in public and private funds to treat patients with ESRD (Okaka & Unuigbe, 2014). The treatment modality and annual hemodialysis cost per patient is estimated to be about US$80,000. In 2016, the United States government spent more than 114 billion dollars on Medicare fee-for-service, treatment, and care for CKD/ESRD patients (Saran et al., 2019). In the United Kingdom and Italy, 0.02%–0.06% of the ESRD population accounts for an estimated 0.7%–1.8% of the health service budget (Okaka & Unuigbe, 2014). Developing countries like Nigeria have limited resources to care for the ESRD population.

In Africa, CKD is estimated to affect about 10.4% of the population and remains a public health burden. It is estimated that 8−10% of medical admissions in Nigeria are related to CKD (Ovwasa et al., 2023). Caring for the ESRD population is burdensome due to the high cost of economic resources (Okwuonu et al., 2017). In Nigeria, patients with ESRD rarely obtain treatment for the condition due to the high cost of treatment and lack of government support (Okaka & Unuigbe, 2014). The National Health Insurance

Scheme in Nigeria does not cover the cost of hemodialysis and other renal replacement therapies. As a result, most patients pay out of pocket, which attracts an enormous burden for these patients in a country where 70% of the population lives below the poverty line (Okaka & Unuigbe, 2014).

Early detection of CKD may reduce the costs of needed resources. Chukwuonye et al. (2018) reported on the prevalence and predictors of CKD in developing countries. They suggested that the main preventive strategies should start by identifying those at risk of developing CKD, educating the population on preventing kidney disease, and promoting awareness among health care and the community. CKD screening and intervention can prevent the disease because, according to Jha et al. (2013), information and understanding of the disorder remain low in many communities and among many physicians. On the other hand, Akpan et al. (2016) reported that risk factors for CKD were increasing. O. A. Adejumo et al. (2018) indicated a need for adequate knowledge of CKD among health workers, which impacts their role in reducing the burden of CKD. In their study, Kumela Goro et al. (2019) revealed that there was a high prevalence of CKD among patients with hypertension and diabetes mellitus. The high prevalence was attributed to a low level of patient awareness of CKD and its risk factors in this population. Raji et al. (2017) noted the challenges that developing countries such as Nigeria face concerning kidney transplants. Koala and Unuigbe (2014) also found that the cost of renal replacement therapy in developing countries is relatively high. As a result, most individuals with CKD obtain help from herbalists and spiritual houses (Okwuonu et al., 2017).

In developing countries, most individuals with CKD present late for treatment in hospitals. The delay contributes to increased morbidity and mortality associated with CKD. Perico and Remuzzi (2016) emphasized the importance of early recognition and screening programs for CKD and comorbid conditions in their research. A gap exists regarding CKD awareness and prevalence among young adults in Nigeria. Conducting the current study was significant because its outcome may assist health care stakeholders in creating CKD awareness strategies in their communities, thereby ensuring prevention, early detection, and treatment of this disease condition.

## Problem Statement

Globally, CKD prevalence is a significant public health problem. Past research indicates that CKD prevalence is increasing, leaving the affected with ESRD (Odenigbo et al., 2014; Raji et al., 2017; I. I. Ulasi & Ijeoma, 2010). Kidney disease includes conditions that damage kidneys and reduce their ability to eliminate waste. Kidney disease can occur progressively or suddenly. Chronic kidney disease results from a progressive loss of kidney function, whereas acute kidney disease results from a sudden loss of kidney function. Kidney failure that results from CKD is usually irreversible, whereas the disease caused by acute kidney injuries can be reversible (Osakwe, 2018). Twenty-five million Nigerians (13.9% of the 180 million people) had kidney failure (Chukwuonye et al., 2018; Osakwe, 2018; Uzukwu & Ekwenna, 2018). In some developing countries, such as Nigeria, most people with chronic diseases live their daily lives not knowing that they have a chronic illness. They only seek medical attention when they cannot perform routine daily activities. Research reveals that most patients with

CKD usually present with ESRD, which indicates uncaptured CKD (Kalyesubula et al., 2017; Raji et al., 2017; I. I. Ulasi & Ijoma, 2010). Statistics by the Nigerian Association of Nephrology also revealed that most CKD patients are of working age. Therefore, the condition results in the loss of jobs and poverty (Chukwuonye et al., 2018; Franka Osakwe, 2018; Uzukwu & Ekwenna, 2018). The increasing prevalence of CKD in the adult population requires further evaluation of the level of CKD awareness among the population. The current study aimed to determine the level of CKD prevalence and awareness among adults with CKD in Imo and Anambra States, Nigeria. The results of this study could add to the wealth of knowledge in Nigeria regarding the prevention of CKD and its complications.

## Purpose of the Study

Several studies about CKD have been conducted in different parts of Nigeria; however, no studies have been conducted in Imo or Anambra States. Moreover, I found limited studies on awareness and adherence to medication. Therefore, I designed this study to investigate: (a) the increasing prevalence of CKD among young adults in Imo and Anambra States in Nigeria to determine the prevalence of CKD among young adults in Anambra and Imo States in Nigeria, (b) the association between prevalence of CKD and location, (c) the association between early diagnosis and access to health care, (d) the distribution of adherence to medication among young adults in Anambra and Imo States in Nigeria, (e) the association between demographic information and CKD, and (f) the distribution of CKD awareness among young adults in Anambra and Imo States in Nigeria.

## Research Questions and Hypotheses

**RQ1**

What is the prevalence of CKD among young adults in Imo State and Anambra State, Nigeria?

***Dependent Variable***

Prevalence of CKD

***Independent Variable***

Young adults in Anambra and Imo State

**RQ2**

What is the relationship between the prevalence of CKD among young adults in Anambra and Imo State, Nigeria?

***Dependent Variable***

Prevalence of CKD

***Independent Variable***

Young adults in Anambra and Imo State.

***$H_o2$***

There is no association between the prevalence of CKD among young adults in Anambra and Imo State, Nigeria.

***$H_a2$***

There is an association between the prevalence of CKD among young adults in Anambra and Imo State, Nigeria.

**RQ3**

What is the relationship between access to health care and early diagnosis of CKD among young adults in Anambra and Imo State, Nigeria?

***Dependent Variable***

Early diagnosis of CKD

***Independent Variable***

Access to health care

***$H_o3$***

There is no association between access to health care and early diagnosis of CKD among young adults in Anambra and Imo State, Nigeria.

***$H_a3$***

There is an association between access to health care and early diagnosis of CKD among young adults in Anambra and Imo State, Nigeria.

**RQ4**

What is the distribution of adherence to medication among young adults in Imo State and Anambra State, Nigeria?

***Dependent Variable***

Adherence to medication

***Independent Variable***

Young adults in Anambra and Imo State

**RQ5**

What is the relationship between selected variables and the prevalence of CKD among young adults in Anambra and Imo State, Nigeria?

***Dependent Variable***

Prevalence of CKD

***Independent Variables***

Age, marital status, education level

***$H_o5$***

There is no association between sociodemographic variables and the prevalence of CKD among young adults in Anambra and Imo State, Nigeria.

***$H_a5$***

There is an association between sociodemographic variables and the prevalence of CKD among young adults in Anambra and Imo State, Nigeria.

**RQ6**

What is the distribution of CKD awareness level among young adults in Imo State and Anambra State, Nigeria?

***Dependent Variable***

Prevalence of CKD

***Independent Variable***

Young adults in Anambra and Imo State

## Nature of the Study

I used a quantitative design to evaluate the level of CKD prevalence and awareness among adults in Nigeria. A quantitative design was appropriate for the study because I also wanted to analyze the relationship between access to care and early diagnosis, determine the difference in CKD prevalence between the two States, and determine the distribution of adherence to medication among participants. The main

variables under consideration were prevalence of CKD, early diagnosis of CKD, adherence to medication, awareness of CKD, young adults in Anambra and Imo State, access to health care, age, marital status, and education level. Quantitative studies allow researchers to measure concepts and experiences in mathematical and statistical terms (Lewin, 2005).

Qualitative studies involve using observations, interviews, and case studies to collect information about a phenomenon under study from selected individuals or groups of individuals (Barczak, 2015; Park & Park, 2016). Researchers who use the qualitative approach apply inductive reasoning to make sense of insights and explanations gathered from various sources of information, such as personal observations, interview transcripts, documents, and recordings (Barczak, 2015; Park & Park, 2016). Qualitative researchers aim to answer the "how" and "why" questions in research (Johnson & Christensen, 2012). In mixed-methods studies, quantitative and qualitative methods are combined (Halcomb & Hickman, 2015; Terrell, 2012). A mixed-methods study typically includes qualitative techniques to expound and contextualize the quantitative results. In this study, I collected data via surveys requiring numeric responses. No interviews, observations, or recordings were performed in this study. Therefore, the qualitative and mixed-methods approaches were not as appropriate as the quantitative method in addressing this study's research questions and hypotheses. The purpose of this study was to evaluate the level of CKD prevalence and awareness among young adults in Nigeria.

## Scope and Delimitations

The scope of this research encompassed a thorough investigation of the prevalence and awareness of CKD among young adult patients in Imo State and Anambra State, Nigeria. I targeted individuals aged 25 to 55 years residing in urban and rural areas of these States. I also collected data on demographic information, medication adherence, CKD awareness, CKD prevalence, and association between prevalence and sociodemographic variables. I used a cross-sectional design to provide a snapshot of CKD among young adults in these regions.

## Significance

CKD is traditionally associated with older individuals (Kovesdy, 2022), but a growing body of evidence suggests it increasingly affects younger populations (Kovesdy, 2022; Yoon et al., 2023; Zhang & Rothenbacher, 2008). The results of this study provide the needed insight to understand the level of CKD awareness among this population before diagnosis. The outcomes of this study may assist health care stakeholders in creating CKD awareness strategies in their communities, thereby ensuring prevention, early detection, and treatment of the disease condition. Prevention, early detection, and treatment of CKD are crucial in averting the progression of CKD to ESRD. CKD affects 5%–15% of the adult population in the developed world (Amoako et al., 2014). The high cost of resources needed to care for the ESRD population burdens individuals, families, and governments (Okwuonu et al., 2017).

# Chapter 2: Literature Review

In this study, I aimed to address the increasing prevalence of CKD among Nigerian adults (Chukwuonye et al., 2018; Franka Osakwe, 2018; Uzukwu & Ekwenna, 2018). Although evidence of increased CKD prevalence in Nigeria is apparent, differences in the prevalence and awareness of CKD in different regions are unclear. The purpose of this study was to evaluate and compare the level of CKD prevalence and awareness among adults in Imo and Anambra States in Nigeria. This chapter includes a review of existing literature related to the topic of the study.

## Theoretical Foundation

I used the health belief model (HBM) and the social-ecological model (SEM) to guide this study. The HBM is a value-expectancy theory that can be used to explain health behaviors based on an individual's values and expectations for the outcomes of health behaviors. In 1958, social psychologist Godfrey M. Hochbaum, employed by the U.S. Public Health Service, developed the theory to understand why public health programs such as tuberculosis screening were underutilized. Researchers have used this theory to explain why some individuals take advantage of health interventions or change their behavior to improve their health whereas others do not. HBM's constructs that influence health behaviors include perceived benefits, perceived barriers, perceived susceptibility, perceived severity, self-efficacy, and cues to act (Farnia et al., 2019). The HBM illustrates the influence of individuals' beliefs about health, treatment costs, and treatment benefits on health behaviors and behavioral changes.

Researchers have used the HBM in numerous contexts to explore and predict behavioral health changes and decisions and to describe the impact of knowledge, attitudes, beliefs, and perceptions on health behaviors (Azizi et al., 2018; Merzah, 2016). Farnia et al. (2019) used the HBM to inform the exploration of determinants of self-management following kidney transplant surgery. The analysis process yielded 264 primary codes and 20 subcategories that corresponded with the six dimensions of the HBM. In another study of models that predict health behaviors associated with kidney health, Chironda et al. (2019) examined models and theories of care that have been applied to examine CKD treatment adherence behaviors. Is found that the most applicable models presented in existing literature based on known predictors of CKD treatment adherence were the Orem self-care, common sense, and theory of planned behavior models. Other models that presented some degree of predictive power, though not as significant, were the theory of reasoned action, the transtheoretical model, and the social cognitive theory. In this study, I used HBM to explore the connection between CKD awareness and health behaviors that influenced CKD prevalence in Imo and Anambra States in Nigeria.

The SEM describes the interaction of various personal and environmental factors, resulting in different outcomes and phenomena (Gruenewald et al., 2014). The five levels of the SEM include individual, interpersonal, organizational, community, and public policy (McDaniel, 2018). The personal level describes an individual's knowledge and skills. The interpersonal level describes relationships and interactions among people. The organizational level illustrates individuals organizing to influence community-level

interactions and phenomena. Lastly, the public policy, or systems level, describes actions and decisions enacted at the government or public systems level that have a widespread impact (McDaniel et al., 2018). The SEM is a valuable theory that guides studies on health care, chronic disease, and health behaviors in diverse contexts (Baral et al., 2013; McDaniel et al., 2018). Some researchers have also used the SEM to gain insight into the experiences and outcomes of CKD patients. Wong et al. (2022) used qualitative methods to apply the SEM to examine factors that affected patients' kidney transplant decisions. Five primary themes emerged from their analysis: (a) fearing transplant outcomes, (b) faith in God, (c) the influence of family dynamics and familial involvement in transplant decisions, (d) the experiences of friends and other community or network members, and (e) worrying about the social and economic impact of organ transplants. In this study, I used SEM to explore the context and factors influencing CKD prevalence and awareness in Imo and Anambra States in Nigeria.

## Literature Review

### CKD

CKD represents a growing global health challenge, with significant implications for individual patients and health care systems. The definition and classification of CKD were initially put forth by the National Kidney Foundation Kidney Disease Outcomes Quality Initiative in 2002 and later endorsed by Kidney Disease: Improving Global Outcomes in 2004. CKD is characterized by either kidney damage or a glomerular filtration rate (GFR) persistently below 60 ml/min per 1.73 m2 for at least 3 months,

regardless of the underlying cause. This condition is categorized into five stages based on the degree of GFR (Levey et al., 2011).

CKD is characterized by a gradual decline in kidney function over several months or years. This aspect of the disease explains why the impending danger often goes unnoticed until a substantial reduction in kidney function has occurred. The disease is typically asymptomatic in its early stages, and symptoms usually manifest around Stage 3, signifying a considerable loss of kidney function before detection (US Preventive Services Task Force, 2012; National Institute of Diabetes and Digestive and Kidney Diseases, 2016). CKD is a progressive and irreversible ailment, culminating in conditions such as cardiovascular disease or ESRD, depending on the case.

**Classification of CKD**

1. Stage 1: Kidney damage with normal or high GFR (≥ 90 mL/min/1.73 $m^2$). There may be evidence of kidney damage, but the GFR is normal or high.
2. Stage 2: Kidney damage with mildly reduced GFR (60–89 mL/min/1.73 $m^2$). Kidney damage is present, and there is a slight decrease in GFR.
3. Stage 3: Moderate reduction in GF. (GFR 30–59 mL/min/1.73 $m^2$). This stage is divided into 3a (GFR 45–59) and 3b (GFR 30–44). There is a noticeable decrease in kidney function, and symptoms may start to appear.
4. Stage 4: Severe reduction in GFR (GFR 15–29 mL/min/1.73 $m^2$). Kidney function is significantly reduced, and patients are at high risk for complications.

5. Stage 5: Kidney failure (ESRD; GFR < 15 mL/min/1.73 $m^2$). Kidney function is critically low, and patients typically require dialysis or a kidney transplant for survival (National Kidney Foundation, 2012).

**Epidemiology and Prevalence**

CKD is a prevalent condition affecting millions of individuals around the world. According to the Global Burden of Disease Study, the global prevalence of CKD is consistently increasing, significantly impacting morbidity and mortality rates (Kovesdy, 2022). CKD is a significant global health issue because it was ranked 19$^{th}$ among the leading causes of morbidity and mortality in 2013 (Jager & Fraser, 2017). Globally, the age-standardized prevalence of CKD is 10.4% in men and 10% in women, with higher rates observed in low- and middle-income countries compared to high-income nations (Mills et al., 2015). Notably, a high CKD prevalence was reported in the sub-Saharan Africa region. Evidence from systematic reviews indicated rates of 13.9% (J. W. Stanifer et al., 2014) and 10.1% (Abd-ElHafeez et al., 2018). The rate of CKD in the younger African population is higher compared to the rest of the world, leading to a high morbidity and premature mortality rate. Approximately 90% of CKD patients do not survive beyond 90 days of initiating dialysis (Olanrewaju et al., 2020).

The knowledge about the epidemiology of CKD among Nigerians is limited. National data on CKD prevalence was lacking, with only a few community-based studies conducted in specific regions of the country. A recent systematic review revealed that the prevalence of CKD varied among different areas of Nigeria (Chukwuonye et al., 2018). This review included seven population-based studies, with five conducted in the southern

part of the country and two in the northern region. Notably, Etsako in Edo state had a relatively high prevalence of 24.3%, whereas Ilie in Olorunda, Osun State, had a rate of 12.3%. The reported prevalence rate in Enugu, including Ujodo Nike, Emene-Nike, and Mbulu-Ujodo areas was 11.4%. A high prevalence of 26% was reported in Kumbotso, Kano State. Conversely, a lower prevalence of 14.2% was reported in 10 communities in Ekiti North and Central senatorial districts, Ekiti State. In Jos, Plateau State, the rate was lower at 2.5%. A 13.4% prevalence rate was reported in Umuahia in Abia State, particularly in the Olokoro area. These findings indicated regional disparities in CKD rates within Nigeria, with some areas experiencing a higher burden of the condition compared to others.

Research findings from a 2013 study indicated an 18% prevalence of CKD in a rural community in Osun State, South-Western Nigeria (R. Oluyombo et al., 2013). In another study, I. I. Ulasi, Ijoma, Onodugo et al. (2013) reported a prevalence of 11.4% in rural and 11.7% in semiurban populations in Emene-Nike and Mbulu-Ujodo of Enugu State in South-East Nigeria. Other researchers reported CKD prevalence figures ranging from 10.7% (M. Afolabi et al., 2009), 26.8% (I. Ulasi, Ijoma, Arodiwe et al., 2009), 7.8% (Egbi et al., 2014), and 19%–30% (Asemoh, 2014). Limited or no existing literature was available regarding the prevalence and awareness of CKD in Imo and Anambra States. These findings emphasized the overall high prevalence of CKD in Nigeria, emphasizing the need for further research to understand the actual burden of CKD in the Nigerian population (Omeire et al., 2019).

## Risk Factors and Etiology of CKD

### *Genetic Component*

CKD has heritable components. Köttgen et al. (2009) conducted genome-wide association studies aimed at identifying susceptibility loci for GFR, estimated through serum creatinine, cystatin C, and CKD (serum creatinine <60 ml/min per 1.73 $m^2$) in individuals of European ancestry from four population-based cohorts, which included 2,388 CKD cases. Köttgen et al. then sought to replicate these findings in 21,466 participants, of which 1,932 had CKD. Mutations responsible for encoding Tamm–Horsfall protein in the urine were identified in the Uromodulin gene and were associated with variations in renal function.

The APOL1 mutation is associated with CKD. According to Pollak et al. (2012), the mutation follows an autosomal recessive inheritance pattern linked to a substantially elevated risk of ESRD. Individuals carrying this mutation have a tenfold higher risk of ESRD compared to those without due to focal glomerulosclerosis and a sevenfold higher risk of ESRD due to hypertension. APOL1 mutations are exclusively found in individuals of African descent, rendering them more susceptible to CKD.

Genes related to the renin-angiotensin system appear to contribute significantly to CKD risk. Su et al. (2012) conducted a study involving 135 CKD patients and 270 healthy controls from the Han Chinese population in Taiwan. This study involved genotyping for polymorphisms in genes associated with the renin-angiotensin system, including angiotensinogen (AGT-M235T, T174M, A-20C), angiotensin-I-converting enzyme (ACE-A2350G), and angiotensin II Type 1 receptor (AGTR1-A1166C, C573T,

C-521T) through polymerase chain reaction-restriction fragment length polymorphism analysis. Su et al. observed significant associations between the ACE-A2350G and AGTR1-C573T polymorphisms in CKD patients.

***Family History***

The prevalence of CKD and its associated risk factors is high among family members of CKD patients. Song et al. (2009) conducted a study in the United States, where they screened incident dialysis patients who began treatment between January 1, 1995, and December 31, 2003. In their study, Song et al. asked participants to complete a questionnaire regarding their family history of ESRD voluntarily. After excluding patients with ESRD resulting from hereditary disorders and urologic causes, nearly 23% of incident dialysis patients had close relatives with ESRD. This finding underscored the importance of screening high-risk family members of individuals with CKD. Early screening and intervention in these family members may prove beneficial in preventing the onset or progression of kidney disease.

***Gender***

Various registries, including the Japanese Society for Dialysis Therapy, have provided valuable insights into the prevalence of ESRD, particularly about gender. For instance, research conducted by Iseki (2005) and Takamatsu et al. (2009) revealed that ESRD is more commonly observed in men. Iseki's study involved a large cohort of 107,192 participants aged 18 and above from Okinawa, Japan. After following the sample over a 10-year period, the odds ratio for developing ESRD was found to be 1.41 among male participants, indicating a higher risk for men. However, variations in the

prevalence of CKD exist between genders in different regions. For example, the findings of the CREDIT study conducted by Süleymanlar et al. (2011) in Turkey indicated a different pattern from Iseki's study. In their research, Süleymanlar et al. found that CKD was more prevalent in women compared to men, with a prevalence of 18.4% as compared to 12.8% in men. These findings highlighted the importance of considering regional and population-specific factors when assessing the prevalence of gender-related differences in kidney disease.

***Ethnicity***

Numerous studies conducted in the United States have consistently demonstrated a heightened risk of ESRD among African Americans when compared to Whites, indicating significant racial disparities in kidney health (Nzerue et al., 2002). Additionally, the risk of developing hypertensive ESRD is approximately 5 times higher in African Americans than in Whites (Lackland et al., 2001).

An investigation conducted by McClellan and Flanders (2003) revealed striking statistics regarding the lifetime risk of ESRD in different demographic groups. For 20-year-old individuals, the lifetime risk of ESRD was higher in Black women at 7.8%, closely followed by Black men at 7.3%. In contrast, the risk was substantially lower in White women at 1.8% and White men at 2.5%. These findings indicated the significant racial disparities in the risk of ESRD and highlighted the importance of addressing these differences in health care policies and interventions.

### *Age*

The decline in renal function is a common phenomenon associated with aging. In their research, Iseki (2005) demonstrated these effects on people, stating that more than half of the older individuals screened had CKD Stages 3–5. The National Kidney Foundation Kidney Disease Outcomes Quality Initiative guidelines define these stages by a GFR of less than 60 ml/min per 1.73 m2 (Iseki, 2005). Iseki's study findings suggested that the older population is particularly susceptible to developing CKD following various renal insults, as Falodia and Singla (2012) reported.

Findings from the CREDIT study done in Turkey by Süleymanlar et al. (2011) indicated the impact of age on CKD risk. Their analysis revealed that the odds ratios for CKD increased significantly, ranging from 1.45 to 2.18, with every 10-year increase in age for subjects older than 30. These observations underscored the importance of recognizing age as a significant factor in CKD development, particularly in the elderly population.

### *Low Birth Weight*

In the 1980s, Brenner et al. (1988)) proposed the hypothesis that intrauterine growth restriction could result in a decreased number of nephrons, increasing susceptibility to hypertension and renal disease. This concept is often called the Barker hypothesis (MacKenzie et al., 1996). Research conducted by Luyckx and Brenner (2010) supported this hypothesis: their findings indicated that for each kilogram increase in birth weight, there was a corresponding increase of 257,426 glomeruli in the nephron count. According to the findings of a prospective study by Vikse et al. (2008), low nephron

counts led to intraglomerular hypertension and hyperfiltration within the available nephrons, resulting in an overall lower GFR and a higher urine albumin-to-creatinine ratio. After following the cohort for 38 years, Vikse et al. observed that low birth weight and intrauterine growth restriction were significantly associated with an elevated risk of ESRD among the Norwegian population.

***Obesity***

One of the most significant yet modifiable risk factors for ESRD in the modern era is obesity. Obesity can exacerbate kidney injury by causing glomerular hypertrophy and hyperfiltration, leading to increased capillary wall tension in the glomeruli and decreased podocyte density (Chang & Kramer, 2012).

A large-scale epidemiological study conducted in Sweden provided insights into the relationship between obesity and CKD (Ejerblad et al., 2006). Ejerblad et al. studied native Swedes aged 18 to 74 with CKD, defined as having serum creatinine levels exceeding 3.4 mg/dl for men or 2.8 mg/dl for women during the study period. The findings indicated that being overweight (having a body mass index (BMI) of 25 $kg/m^2$ or higher) at the age of 20 was associated with a substantial threefold increase in the risk of CKD compared to individuals with a BMI under 25 $kg/m^2$. Furthermore, obesity (BMI of 30 $kg/m^2$ or higher) in men and morbid obesity (BMI of 35 $kg/m^2$ or higher) in women at any point during their lifetime were linked to three- to fourfold increases in the risk of CKD.

Obesity can contribute to the development of kidney damage through various mechanisms, including inflammation, oxidative stress, endothelial dysfunction, a

prothrombotic state, hypervolemia, and disturbances in adipokines (Mirrakhimov, 2012). In addition to a high BMI, carrying excess weight around the abdominal area is associated with an elevated risk of CKD. In multivariate analyses, Kwakernaak et al. (2013) found that a higher waist-to-hip ratio was linked to lower GFR, reduced adequate renal plasma flow, and a higher filtration fraction. These associations remained significant even after adjusting for sex, age, mean arterial pressure, and BMI.

***Socioeconomic Status***

Socioeconomic status (SES) encompasses a range of factors, including income, occupation, education, wealth, and housing situation, that collectively define an individual's or family's economic and social standing (Plantinga, 2013). Various studies have highlighted the significant impact of SES on the prevalence and risk of CKD. In their research, Krop et al. (1999) found a substantial association between income levels and CKD. Specifically, individuals with an income of less than $16,000 had a 2.4-fold higher risk of CKD compared to those with an income exceeding $35,000. The findings suggested that lower income was a significant risk factor for CKD. Additionally, Krop et al. found that individuals with CKD were more likely to come from families with unskilled workers. This employment-related aspect of SES further underscored its role in CKD risk. The National Health and Nutrition Examination Survey (NHANES) results revealed that unemployed individuals from non-Hispanic Black and Mexican American populations in the United States had twice the prevalence of CKD compared to their employed counterparts. This finding highlights the influence of employment status within specific demographic groups (Krop et al., 1999). Furthermore, the Atherosclerosis Risk

in Communities (ARIC) study revealed that individuals with less than a high school education had a 1.7-fold increased risk of CKD compared to those with a college education. Therefore, education level is a crucial SES determinant affecting CKD risk (Krop et al., 1999; Plantinga, 2013).

***Smoking***

Smoking is a significant risk factor for the development of CKD due to its role in promoting various detrimental effects on the renal system. Smoking contributes to CKD risk through mechanisms such as creating a pro-inflammatory state, inducing oxidative stress, causing a prothrombotic shift, impairing endothelial function, promoting glomerulosclerosis, and leading to tubular atrophy (Mirrakhimov, 2012). Several studies have indicated the relationship between smoking and CKD risk. In a study involving 7,476 nondiabetic participants, it was found that individuals who smoked more than 20 cigarettes per day had an increased risk of CKD (Bleyer et al., 2000). This finding suggested that heavy smoking is associated with a higher likelihood of developing CKD.

Findings from Orth et al. (2005) study demonstrated a dose-response relationship between smoking intensity and renal function. Specifically, there was a 31% increase in serum creatinine levels exceeding 0.3 mg/dl for each additional five cigarettes smoked daily. This finding emphasized that even relatively small increments in smoking intensity can have a substantial impact on kidney function. Bleyer et al. (2000) and Orth et al. (2005) studies collectively underlined the harmful consequences of smoking on kidney health. They emphasized the importance of smoking cessation as a preventive measure against CKD.

### *Nephrotoxins*

The progression of CKD has been associated with various factors, including the consumption of alcohol and recreational drugs, excessive use of analgesic medications, and exposure to heavy metals (Falodia & Singla, 2012). Additionally, the overuse of acetaminophen, a common analgesic drug, has been linked to CKD progression. A study conducted by Perneger et al. (1994) investigated the use of acetaminophen-containing pills and their potential impact on CKD. In Perneger et al. study, individuals who had consumed fewer than 1,000 pills containing acetaminophen in their lifetime were used as a reference group. The results indicated that those who had taken 1,000 to 4,999 pills had an odds ratio for ESRD of 2.0, indicating a doubled risk. Furthermore, individuals who had consumed 5,000 or more pills containing acetaminophen had an odds ratio of 2.4 for ESRD, signifying an even higher risk. These findings suggested that excessive and prolonged use of acetaminophen-containing medications may be associated with an increased risk of ESRD. Therefore, such medications should be carefully monitored and regulated to reduce the potential risk to kidney health.

### *Acute Kidney Injury*

The role of acute kidney injury (AKI) episodes in the development of CKD has been widely acknowledged by researchers. According to data from the United States Renal Data System (USRDS) in 2009, adults with a history of AKI during hospitalization faced a significantly increased risk (Goldstein & Devarajan, 2011). In their study, Goldstein and Devarajan found that people with a history of AKI episodes had a 10-fold higher risk of developing ESRD in the subsequent 12 months when compared to those

without. Notably, the impact of AKI on kidney health can extend beyond the acute phase. These researchers found that even after a single episode of experimental AKI, the histologic repair of the kidneys may be impaired, leading to the development of focal tubulointerstitial fibrosis. This observation suggests that the consequences of AKI may have long-term implications for the development of CKD. These findings underscored the importance of preventing and managing AKI to mitigate the risk of CKD and its progression to more advanced stages.

***Diabetes Mellitus***

Diabetes mellitus (DM) is the primary cause of CKD and ESRD in both developed and developing countries (McClellan & Flanders, 2003). DM has a significant impact on CKD because data from the Turkish Society of Nephrology's registry indicated that diabetic patients accounted for 37.3% of the hemodialysis population in Turkey (Süleymanlar et al., 2011). Similarly, statistics from the USRDS revealed that half of the new ESRD patients in the United States had diabetic nephropathy (Lea & Nicholas, 2002).

The mechanisms underlying kidney disease in diabetes involve several factors, including hyperfiltration injury, advanced glycosylation end products, and reactive oxygen species (Lea & Nicholas, 2002). At the molecular level, numerous cytokines, growth factors, and hormones, such as transforming growth factor-beta and angiotensin II, contribute to the pathological changes associated with diabetic nephropathy. Lea and Nicholas reported that about 8% of new patients diagnosed with Type 2 DM already had proteinuria at the time of diagnosis. McClellan and Flanders (2003) found that among

Type 2 DM patients who initially did not exhibit proteinuria, there was a substantial 20-year risk of developing diabetic nephropathy, which stood at 41%. McClellan and Flanders reported that after the onset of proteinuria, the subsequent 10-year risk of progressive CKD was 11%. Therefore, approximately half of individuals with Type 2 DM eventually developed nephropathy, and 10% of them experienced a progressive loss of renal function. These statistics underscored the critical link between diabetes and the development of CKD, emphasizing the need for effective diabetes management to prevent kidney complications.

***Hypertension***

Hypertension has long been established as a significant risk factor for CKD and ESRD. It plays a substantial role, contributing to 27% of all ESRD patients in the United States (Lea & Nicholas, 2002) and 28% of hemodialysis patients in Turkey (Süleymanlar et al., 2011). The impact of systemic hypertension on the kidneys is evident in the transmission of elevated pressure to the intraglomerular capillaries, which subsequently leads to glomerulosclerosis and a loss of kidney function. As a result, there is variability in the risk of impaired renal function among hypertensive individuals (Lea & Nicholas, 2002). Notably, primary (essential) hypertension, a common form of high blood pressure, is typically diagnosed between the ages of 25 and 45. However, overt kidney dysfunction does not usually manifest unless the patient sustains at least 10 years of uncontrolled hypertension (Lea & Nicholas, 2002).

Changes in serum creatinine are associated with CKD. According to the findings of a clinical trial conducted by Shulman et al. (1989) an increase in serum creatinine level

was attributed to renal function loss. At the beginning of the study, 5.9% of participants had a serum creatinine level of 1.5 mg/dl or higher. However, among the 8,683 participants, 2.3% of those with serial serum creatinine measurements exceeding 1.5 mg/dl experienced clinically significant loss of renal function over 5 years.

The severity of hypertension also influences the risk of developing CKD and ESRD. According to the Multiple Risk Factor Intervention Trial (MRFIT) study, the adjusted relative risk of reaching ESRD increased with the severity of hypertension. Klag et al. (1996) reported that the risk increased by 1.9 for high-normal blood pressure, 3.1 for stage I, 6.0 for stage II, 11.2 for stage III, and 22.1 for stage IV hypertension. Several other factors, including a history of cardiovascular disease, hyperlipidemia, metabolic syndrome, hepatitis C virus, human immunodeficiency virus infection, and malignancy, have also been identified as risk factors for CKD (Lea & Nicholas, 2002).

***Newly Defined Risk Factors***

Obstructive sleep apnea is a condition characterized by recurrent complete and partial breathing disturbances during sleep, occurring at least five events per hour (Mirrakhimov, 2012). Research has revealed a strong association between obstructive sleep apnea and CKD. In their study, Mirrakhimov reported that 30.1% of patients with obstructive sleep apnea were had CKD. Importantly, obstructive sleep apnea not only shares common risk factors with CKD but also exerts an independent effect on the risk and progression of CKD.

Heart rate has also been identified as a potential risk factor for CKD. In a study involving Japanese participants aged 20 to 84 years, Inoue et al. (2009) divided 6,759

subjects into quartiles based on their baseline heart rate and followed them for an average of 47 ± 16 months. Among the subjects, 734 developed CKD over the 5-year follow-up period. Individuals with higher heart rates were found to exhibit a greater decrease in estimated GFR and had a higher odds ratio of developing proteinuria. Each increment in the heart rate category led to approximately 1.1 times an increased risk of developing CKD and 1.2 times an increased risk of developing proteinuria, particularly in middle-aged or older subjects.

Periodontal diseases, which are initiated by gram-negative tooth-associated microbial biofilms, have also been identified as a risk factor for CKD (Pradeep et al., 2012). The inflammatory response associated with periodontal diseases has been linked to CKD risk.

Another risk factor for CKD is uric acid levels. Data from the Vienna Health Screening Project, which followed 21,475 healthy volunteers for a median of 7 years, indicated an association between uric acid levels and CKD (Obermayr et al., 2008). Individuals with slightly elevated uric acid levels (7.0–8.9 mg/dl) were found to have twice the risk of developing CKD, while those with elevated uric acid levels (≥9.0 mg/dl) had a threefold risk. These risk factors highlighted the multifactorial nature of CKD. The findings of Obermayr et al. research suggest the importance of managing and mitigating these risks to prevent the development and progression of CKD.

**Symptoms and Complications of CKD**

Webster et al. (2017) reported various symptoms of CKD in their research. They included anemia, cognitive changes, hypertension, gastrointestinal disturbances,

shortness of breath, changes in kidney function, itch and cramps, damage to the glomerular capillary wall and tubules, and peripheral edema due to sodium retention. The complications of CKD primarily involve anemia, bone diseases, cardiovascular disease (CVD), and cancer.

**Detection**

The early detection of CKD is challenging because the affected individuals may not be aware of the disease (Nishanth & Thiruvaran, 2018). Various medical tests are used to identify CKD, such as common spatial patterns and linear discriminant analysis. Factors like hemoglobin, albumin, specific gravity, hypertension, DM, blood glucose, blood pressure, and serum creatinine have been found to be crucial in the early detection of CKD. Additionally, several methods of assessment and dialysis types, including GFR, ACR, Cys C, MDRD, and CKD-EPI, are used in different regions. Skin texture analysis is particularly relevant in South India, where the population has unique characteristics. Udhayarasu et al. (2017) introduced skin texture as a parameter for CKD analysis and developed an equation that considers individual skin texture for GFR evaluation. Hladunewich et al. (2016) discussed the challenges of managing CKD in pregnant women, highlighting the importance of pre pregnancy counseling and risk stratification.

**Management**

CKD management involves monitoring the disease's stage, cardiovascular risk, metabolic bone disease, anemia, and drug safety. Quality of care should be maintained in these areas. The four interventions often used to reduce CKD progression include blood pressure control, diabetes management, the use of angiotensin-converting enzyme (ACE)

inhibitors or angiotensin receptor blockers, and correction of metabolic acidosis. Careful consideration of the patient's estimated GFR is necessary when prescribing medications. Moreover, patients should avoid nephrotoxic drugs. The goal is to prevent CKD progression, minimize complications, and enhance the patient's quality of life (Allen et al., 2011; Hladunewich et al., 2016).

**Prevention by Using Modern Techniques**

Preventing CKD involves managing blood pressure, using lipid-lowering therapy, maintaining good glycemic control, and correcting acidosis. Additionally, self-management and support groups play a crucial role in improving the lifestyle and dietary habits of CKD patients. Using advanced technical tools, such as machine learning and artificial intelligence is promising for early prediction of CKD. Some researchers have explored the use of decision trees, logistic regression, naive Bayes, artificial neural networks, and data mining to create automated diagnostic systems that can provide more precise results compared to traditional diagnostic methods (Allen et al., 2011; Murshid et al., 2019).

# Chapter 3: Research Method

The purpose of this quantitative study was to evaluate the level of CKD prevalence, adherence to medication, and awareness among young adults in Nigeria. I aimed to determine whether there was a difference in CKD prevalence between Imo and Anambra States in Nigeria. In addition, I examined the association between demographics (age, marital status, and education level) and CKD prevalence. Finally, I examined the relationship between access to health care and early CKD diagnosis among Nigerians living in Imo and Anambra States. This chapter describes the methodology of the research. Included in the chapter is a description of the research design, research questions and hypotheses, sampling, instrumentation, analysis plan, procedures, and ethical considerations. Selecting the appropriate methodology was crucial because it influenced the quality of research outcomes, ethical considerations, resource allocation, and the ability to address research goals and questions. Appropriate methodology ensures that the research process is effective and valid, leading to valuable and reliable results. A summary of the important details of the methodology concludes the chapter.

## Research Design and Rationale

I employed a cross-sectional design to investigate the prevalence of CKD among young adults in Anambra and Imo State. The research questions included the following: What is the prevalence of CKD among young adults in Imo State and Anambra State, Nigeria? What is the relationship between prevalence of CKD among young adults in Anambra and Imo State, Nigeria? What is the relationship between access to health care and early diagnosis of CKD among young adults in Anambra and Imo State, Nigeria?

What is the distribution of adherence to medication among young adults in Imo State and Anambra State, Nigeria? What is the relationship between selected demographic variables and the prevalence of CKD among young adults in Anambra and Imo State, Nigeria? What is the distribution of CKD awareness level among young adults in Imo State and Anambra State, Nigeria? A cross-sectional questionnaire-based design was the suitable choice for assessing the prevalence of CKD among young adults in Anambra and Imo State due to its efficiency, standardization, cost-effectiveness, privacy, ability to obtain a large sample size, and practicality in addressing ethical and logistical considerations.

## Methodology

### Study Population and Sampling

The study population comprised young adults aged 25 to 55 years residing in Anambra and Imo State. I used a purposive sampling technique to select at least 800 participants from both states. Inclusion criteria included individuals within the specified age range who provided informed consent for participation and visited in- and outpatient facilities in Imo State and Anambra State. Using at least 800 participants from the two types of hospitals was justifiable because it enhanced the study's statistical power, representativeness, and validity. It also allowed for more comprehensive analyses and provided more robust and reliable results, which were essential in addressing a complex and important health issue such as CKD.

## Data Collection Instruments

The study was a cross-sectional survey of young adults in Imo and Anambra States in Nigeria. The questionnaires administered to participants were adapted and modified and had two sections: sociodemographic details and medical reports. The questionnaires were designed to collect data on CKD prevalence, awareness, access to health care, diagnostic reports, adherence to medication, and demographic information. Data for everyone who responded were included from gathered surveys and detailed in a data set. Based on the feedback from the expert review, available literature, pilot testing, and cognitive interviews, necessary revisions to the questionnaire were done to validate the instrument. This involved rephrasing questions, adding, or deleting items, or clarifying instructions.

## Data Collection Procedures

I used a referral recruitment method. A colleague administered the questionnaires through face-to-face interviews with the participants. I collected data from the target population using pen and pencil. Questionnaires were distributed to the participants during clinic visits. Data were collected over 3 weeks. Informed consent was obtained from each participant before any data collection.

## Study Variables

The study variables were chosen based on the current research gathered through reliable sources and a literature review.

### *Dependent Variables*

- Adherence to medication

- Awareness of CKD
- Early diagnosis of CKD
- Prevalence of CKD

***Independent Variables***

- Access to health care
- Age, marital status, education level
- Young adults in Anambra and Imo State

**Operational Definitions of Variables**

***Adherence to Medication, Access to Health Care, and Awareness of CKD***

Medication adherence, access to health care, and awareness of CKD were established based on a few questions: 70% and above was coded as good, 40%–69% was coded as moderate, and 39% and lower was coded as poor.

***Age***

The age of each participant was established based on the age group everyone provided; 25–30 years was coded as 1, 31–40 years was coded as 2, 41–50 years was coded as 3, and 51–55 years was coded as 4.

***Early Diagnosis***

The early diagnosis of CKD referred to whether the illness was diagnosed at an early stage, which was a dichotomous or binary variable (yes/no). The early diagnosis of CKD was measured by asking the question, “Are you able to diagnose the illness at an early stage?”

### *Education Level*

Participants were asked about their education statuses: “What is the highest grade or year of school you completed?” None was coded as 1, primary was coded as 2, secondary was coded as 3, and tertiary was coded as 4.

### *Marital Status*

The marital status of each participant was established based on single (coded as 1), married (coded as 2), and separated (coded as 3).

### *Prevalence of CKD*

CKD prevalence referred to the number of people with gradual loss of kidney function in each population at a given time, which was measured in nominal form. The question “Are you an acute chronic kidney disease patient?” included a dichotomous or binary response (yes/no).

## Data Analysis

All data were entered and analyzed using Statistical Package for Social Science (SPSS) Version 25. Results were expressed in frequencies and percentages. Descriptive statistics was used to analyze sociodemographic data, awareness level distribution, and medication adherence. A chi-square test was used to test the strength of association between variables, and $p$ values $\leq .05$ were considered statistically significant. The selected analysis style, which included using the SPSS for data entry and analysis, expressing results in frequency and percentage, utilizing descriptive statistics, conducting the chi-square test, and setting a significance level at $\leq .05$, was justified for several reasons:

### *Appropriate Tool Selection*

SPSS is widely accepted and trusted software for statistical analysis, especially in social science research. Its capabilities made it suitable for handling and analyzing data in this context, which was important for ensuring accuracy and reliability.

### *Data Presentation*

Expressing results in frequency and percentage is a common practice in public health and social science research. It provides a clear and straightforward way to present data, making it accessible and understandable to a wide audience, including non statisticians and policymakers.

### *Descriptive Statistics*

Descriptive statistics are used to summarize and describe the main features of a data set, such as the characteristics of the sample and the distribution of variables. This is essential for gaining an initial understanding of the data and providing context for the subsequent inferential statistical tests.

### *Chi-square Test*

The chi-square test is appropriate when analyzing the association or independence between categorical variables. In this study, I was interested in understanding the strength of the association between different variables, such as awareness levels and medication adherence. The chi-square test was well suited for this purpose.

### *Significance Level*

Setting the significance level at $p \leq .05$ is common in statistical analysis. It helps researchers determine whether the observed relationships or differences in the data are statistically significant, which is essential for drawing valid conclusions from the study.

### *Standardization*

The selected analysis style aligned with standard social science and public health research practices. This enhanced the comparability of the study with existing literature and allowed for the incorporation of results into the broader body of knowledge.

### *Transparency and Replicability*

By following established analysis methods and specifying the software, statistical tests, and significance level used, I ensured transparency and replicability. Other researchers can understand and replicate the study's methodology, contributing to the reliability of the findings.

## Ethical Assurances

Ethical approvals for this study were obtained from Walden University (IRB No) and ethics committees in Imo State and Anambra State clinics. The American Psychological Association research ethics guidelines were followed to protect research participants. Informed consent was obtained from all participants, and their personal information was kept confidential. Any identifying details in medical records were de-identified to ensure privacy.

## Summary

Chapter 3 provided a detailed description of the methods used in the study, including the chi-square test to understand how results either supported or rejected the hypothesis. Results from the quantitative study analysis and evaluations of research questions are presented in Chapter 4.

# Chapter 4: Results

## Results and Analysis

A total of 816 people were recruited for this study: 65% resided in Anambra, 35% resided in Imo State, 60.3% were female, 39.7% were male, 50% were 41–50 years of age, 40.1% had attained a secondary level of education, 70.1% were married, and 35.2% were traders (see Table 1).

**Table 1**

*Sociodemographic Information*

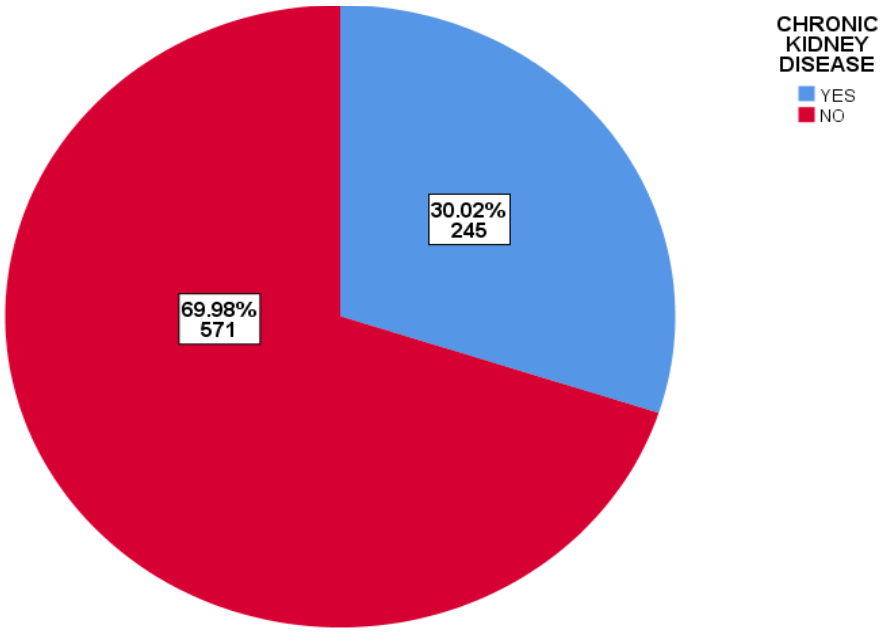
| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 324 | 39.7% |
| | Female | 492 | 60.3% |
| Age (years) | 25–30 | 82 | 10% |
| | 31–40 | 286 | 35% |
| | 41–50 | 408 | 50% |
| | 51–55 | 40 | 4.9% |
| Education level | None | 122 | 15% |
| | Primary school | 82 | 10% |
| | Secondary school | 327 | 40.1% |
| | Tertiary | 285 | 34.9% |
| Marital status | Single | 163 | 20% |
| | Married | 572 | 70.1% |
| | Separated | 81 | 9.9% |
| Occupation | Student | 123 | 15.1% |
| | Trader | 287 | 35.2% |
| | Civil servant | 122 | 15% |
| | Skilled laborer | 284 | 34.8% |
| Location | Anambra | 530 | 65% |
| | Imo | 286 | 35% |
| | Total | 816 | 100% |

**Research Question 1**

What is the prevalence of CKD among young adults in Imo State and Anambra State, Nigeria? SPSS Version 25 was used to analyze data collected from asking this question. Descriptive statistics (frequency and percentage) illustrated by a pie chart were used to answer this research question. The dependent variable was the prevalence of CKD and the independent variable was young adults in Anambra and Imo State. Figure 1 shows that the prevalence of CKD among young adults in Anambra and Imo state was 30.02%.

**Figure 1**

*Prevalence of CKD Among Young Adults in Anambra and Imo State*




**Research Question 2**

What is the relationship between prevalence of CKD among young adults in Anambra and Imo State, Nigeria? SPSS Version 25 was used to analyze data collected

from asking this question. A chi-square test was conducted and the results presented in a table. The dependent variable was the prevalence of CKD and the independent variable was young adults in Anambra and Imo State. Table 2 shows that the results of the analysis. The prevalence rate for CKD was higher (42.7%) in Imo State than in Anambra State (23.2%). The chi-square test revealed a significant association between the two variables ($X^2 = 33.447$, $p < .01$, $df = 1$).

**Table 2**

*Association Between Prevalence of CKD and Young Adults in Anambra and Imo State*

| Prevalence | Anambra State | Imo State | Total | $X^2$ | $p$ |
|---|---|---|---|---|---|
| Yes | 123 (23.2%) | 122 (42.7%) | 245 (30%) | | |
| No | 407 (76.8%) | 164 (57.3%) | 571 (70%) | 33.447 | < .01 |
| Total | 530 (100%) | 286 (100%) | 816 (100%) | | |

*Note*. $df = 1$.

**Research Question 3**

What is the relationship between access to health care and early diagnosis of CKD among young adults in Anambra and Imo State, Nigeria? SPSS Version 25 was used to analyze data collected from asking this question. A chi-square test was conducted and the results presented in a table. The dependent variable was early diagnosis of CKD and the independent variable was access to health care. Table 3 shows that 81 (66.4%) young adults in Anambra and Imo State with early diagnosis had poor access to health care, followed by 41 (33.6%) with good access to health care. Table 3 also shows that 408 (58.8%) people with late diagnosis had poor access to health care, followed by 245

(35.3%) with good access and 41 (5.9%) with moderate access. The chi-square test revealed a significant association between the two variables ($X^2 = 8.29$, $p = .02$, $df = 2$).

**Table 3**

*Association Between Early Diagnosis and Access to Health Care*

| Early diagnosis | Good | Moderate | Poor | Total | $X^2$ | $p$ |
|---|---|---|---|---|---|---|
| Yes | 41 (33.6%) | 0 (00.0%) | 81 (66.4%) | 122 (100%) | | |
| No | 407 245 (35.3%) | 41 (5.9%) | 408 (58.8%) | 694 (100%) | 8.29 | .02 |
| Total | 286 (35%) | 41 (5.9%) | 489 (59.9%) | 816 (100%) | | |

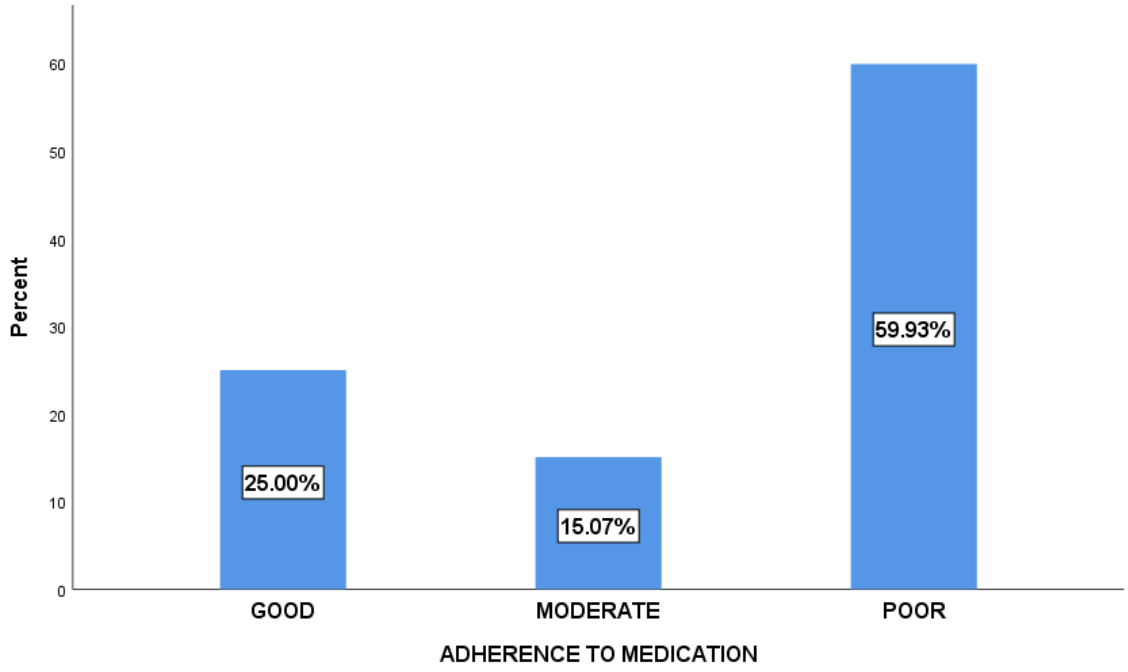
*Note*. $df = 2$.

**Research Question 4**

What is the distribution of adherence to medication among young adults in Imo State and Anambra State, Nigeria? SPSS Version 25 was used to analyze data collected from asking this question. Descriptive statistics (frequency and percentage) were presented in a bar chart. The dependent variable was adherence to medication and the independent variable was young adults in Anambra and Imo State. Figure 2 shows that 489 (59.93%) young adults in Anambra and Imo State had poor adherence to medication, followed by 204 (25%) for good and 123 (15.07%) for moderate.

**Figure 2**

*Distribution of Adherence to Medication Among Young Adults of Anambra and Imo State*




**Research Question 5**

What is the relationship between selected variables and prevalence of CKD among young adults in Anambra and Imo State, Nigeria? SPSS Version 25 was used to analyze data collected from asking this question. A chi-square test was conducted and results presented in a table. The dependent variable was prevalence of CKD and the independent variables were age, marital status, and education level. Table 4 shows a higher (50%) prevalence rate among those aged 18 and 30 years, a higher (49.7%) prevalence rate among singles, and a higher (42.8%) prevalence rate among participants with tertiary education compared to others groups.

**Table 4**

*Association Between Variables and Prevalence of CKD*

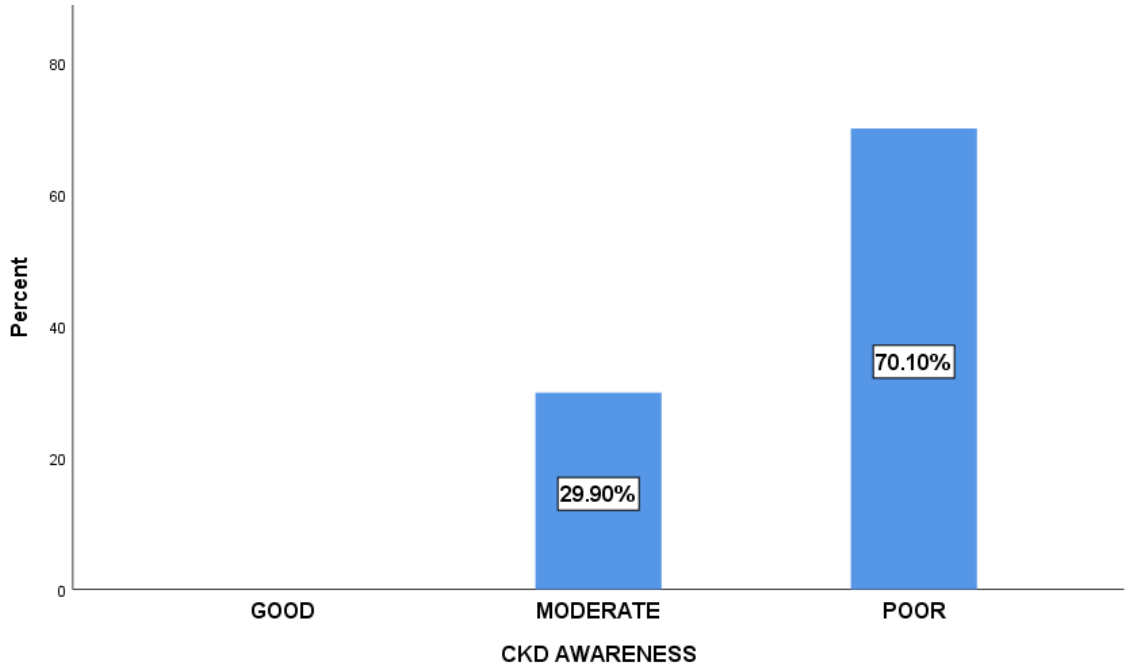
| Variable | Category | Yes *n* (%) | No *n* (%) | $X^2$ | *df* | *p* |
|---|---|---|---|---|---|---|
| Age (years) | 18–30<br>31–40<br>41–50<br>51–54 | 41 (50.0%)<br>81 (28.3%)<br>123 (30.1%)<br>0 | 41 (50.0%)<br>205 (71.7%)<br>285 (69.9%)<br>40 (100%) | 33.134 | 3 | < .01 |
| Marital status | Single<br>Married<br>Separated | 81 (49.7%)<br>164 (28.7%)<br>0 | 82 (50.3%)<br>408 (71.3%)<br>81 (100%) | 65.267 | 2 | < .01 |
| Education level | None<br>Primary<br>Secondary<br>Tertiary | 41 (33.6%)<br>0<br>82 (25.1%)<br>122 (42.8%) | 81 (66.4%)<br>82 (100%)<br>245 (74.9%)<br>163 (57.2%) | 61.904 | 3 | < .01 |

**Research Question 6**

What is the distribution of CKD awareness level among young adults in Imo State and Anambra State, Nigeria? I used SPSS Version 25 to analyze data collected from asking this question. I presented descriptive statistics (frequency and percentage) in a bar chart. The dependent variable was prevalence of CKD and the independent variable was young adults in Anambra and Imo State. Figure 3 shows that 572 (70.10%) young adults in Anambra and Imo State had poor awareness of CKD, followed by 244 (29.90%) for moderate awareness.

**Figure 3**

*Distribution of CKD Among Young Adults of Anambra and Imo State*



# Chapter 5: Discussion, Conclusions, and Recommendations

This chapter summarizes the study's findings based on the objectives of the study. In addition, I draw conclusions concerning the study's results and give recommendations. I also highlight areas of further study based on the limitations and strengths of the study.

## Interpretation of the Findings

### Prevalence of CKD Among Young Adults in Anambra and Imo State

The variable CKD prevalence is of paramount relevance in epidemiological and public health research because it serves as a critical indicator of the burden of CKD in a population. Understanding the prevalence of CKD is essential for health care planning, resource allocation, and policy development because it helps identify at-risk groups and prioritize interventions. The prevalence of CKD informs health care stakeholders about the need for specialized services, such as dialysis centers and kidney transplant programs, thereby improving patient care and outcomes. Additionally, CKD prevalence data are instrumental in identifying the risk factors and sociodemographic characteristics associated with the disease, enabling targeted prevention and early intervention strategies. By monitoring CKD prevalence, health care authorities can work toward reducing the economic burden of CKD, enhancing the quality of life for affected individuals, and advancing the collective understanding of this global health issue.

My study revealed a prevalence of CKD among young adults in Anambra and Imo States, with the prevalence rate recorded at 30.02%. This finding is consistent with, although slightly higher than, the prevalence rates reported in previous studies conducted in the same South-Eastern region of Nigeria. For instance, Olanrewaju et al. (2020)

reported a CKD prevalence of 12%, I. I. Ulasi, Ijoma, Onodugo et al. (2013) established a 11.4% prevalence rate, and Okwuonu et al. (2017) reported a 7.6% prevalence rate. The differences in reported prevalence rate may be attributed to methodological variations, such as sample size and adjustments for age and sex. Both Olanrewaju et al. and I. I. Ulasi, Ijoma, Onodugo et al. adjusted their prevalence estimates for age and sex. In contrast, Okwuonu et al. study featured a smaller sample size, which could explain the lower prevalence reported. My findings are also consistent with the unadjusted prevalence of 12.3% CKD reported by R. Oluyombo et al. (2013) in South-West Nigeria, although their study had a smaller sample size. Furthermore, my results align with those of O. Afolabi et al. (2023), who explored the prevalence and risk factors for CKD among health workers in a tertiary institution in South-East Nigeria and reported a similar prevalence rate of 31%. These findings indicated the significant burden of CKD in Nigeria and reinforced the need for further research to better understand the contributing factors and develop targeted interventions to mitigate this public health concern.

**Association Between Prevalence of CKD and Young Adults in Anambra and Imo State**

The association between the prevalence of CKD and young adults in Anambra and Imo States is of profound relevance in the field of public health research. Understanding this association provides critical insights into the epidemiology of CKD in a specific demographic group, revealing the unique risk factors and challenges faced by young adults. Being aware of this association can help health care authorities identify areas where CKD prevalence is highest, allowing for more targeted interventions and

health care resource allocation. Furthermore, this association can inform the development of preventive strategies tailored to the needs of young adults, with the goal of reducing the burden of CKD in this population. The research on the association between CKD prevalence and young adults in Anambra and Imo States has the potential to drive policy changes, improve health care access, and enhance the well-being of a vulnerable group, making it a critical and relevant area of study in public health.

My findings revealed a noteworthy disparity in the prevalence of CKD between Imo State and Anambra State, with Imo State recording a considerably higher prevalence rate of 42.7% compared to Anambra State's 23.2%. Although limited literature was available addressing this regional variation, Chukwuonye et al. (2018) conducted a systematic review of population-based studies on CKD prevalence in Nigeria. Their comprehensive review yielded a range of CKD prevalence rates across various regions, such as Etsako/Edo (24.3%), Ilie/Olorunda/Osun (12.3%), Enugu (Ujodo Nike, Emene-Nike, and Mbulu-Ujodo)/Enugu (11.4%), Kumbotso/Kano (26%), 10 communities from Ekiti North and Central senatorial districts/Ekiti (14.2%), Jos/Plateau (2.5%), and Umuahia (Olokoro)/Abia (13.4%). The CKD prevalence (23.2%) reported in Anambra State in my study appears to align with some of these figures, suggesting a similarity, whereas the higher prevalence observed in Imo State (42.7%) surpasses the rates in all the locations reviewed by Chukwuonye et al. These findings underscored the importance of further investigation to clarify the contributing factors behind the regional CKD prevalence disparities and to formulate region-specific interventions to address this health concern.

**Association Between Early Diagnosis and Access to Health Care**

The association between early diagnosis and access to health care is a relevant and crucial aspect of health care research because it impacts patient outcomes and health care system efficiency. Understanding this association could help uncover the intricate dynamics between timely diagnosis and the ability to access health care services. For individuals with chronic conditions such as CKD, early diagnosis is often the key to effective management and improved quality of life. However, if these patients do not have adequate access to health care facilities, early diagnosis can be rendered ineffective. My research was essential in identifying barriers to accessing health care for those with early diagnoses, whether due to geographic, economic, or systemic factors. The findings may guide policymakers and health care providers in developing strategies to enhance access, thereby ensuring that early diagnosis translates into better health outcomes for patients, reduced health care costs, and an overall more efficient health care system.

My study highlighted a concerning trend in health care access and early diagnosis among young adults in Anambra and Imo States, Nigeria. Results revealed that a substantial number of individuals with early CKD diagnosis faced poor access to health care, with 66.4% of them falling into this category, whereas only 33.6% reported good access. Similarly, among those with late CKD diagnosis, 58.8% had poor access, with 35.3% having good access and 5.9% reporting moderate access to health care facilities.

These findings resonate with prior research by O. A. Adejumo et al. (2016) which indicated that many CKD patients were already in CKD Stage 5 at the time of their initial presentation. My research findings also align with the observations made by I. I. Ulasi

and Ijoma (2010) and Amoako et al. (2014) who found that a significant proportion of patients presented with uremic symptoms and required emergency renal replacement therapy, highlighting the advanced stage of the disease at diagnosis.

Adejomu et al. (2016) also pointed out that a considerable percentage of CKD patients in their study had been referred from private hospitals and secondary health facilities lacking nephrologists, emphasizing the importance of early detection at the primary care level. In addition, the study suggested that primary and secondary care medical officers often missed opportunities for CKD screening and early intervention.

The convergence of these findings with my study's findings underscores the critical issue of poor access to health care facilities, which affects those with early and late CKD diagnoses. The failure to diagnose CKD at an early stage represents a missed opportunity to enhance patient outcomes. Primary care physicians must play a more proactive role in ensuring the early detection of CKD, thereby facilitating timely intervention and prevention of CKD progression to ESRD. These insights suggested the urgent need for health care infrastructure improvements and increased awareness among health care professionals to address the challenges posed by CKD diagnosis and management in the study region.

**Distribution of Adherence to Medication Among Young Adults of Anambra and Imo State**

The variable adherence to medication is critically relevant in the realm of health care and medical research, particularly in the context of chronic conditions such as CKD. Adherence refers to the extent to which patients follow prescribed medication regimens,

and it holds significant implications for treatment effectiveness and patient outcomes. In the case of CKD, proper adherence to medication is crucial for slowing disease progression, managing symptoms, and preventing complications. Poor adherence can lead to the worsening of the condition, increased health care costs, and reduced quality of life. Studying medication adherence can help researchers identify barriers and facilitators to treatment compliance. Research findings can help guide health care providers and policymakers in designing targeted interventions, educational programs, and support systems to enhance patient adherence, thereby improving the management and overall well-being of individuals with CKD.

My study highlighted a critical issue regarding medication adherence among young adults in Anambra and Imo States, Nigeria. Results demonstrated that a substantial majority (59.93%) exhibited poor adherence to medication, only 25% demonstrated good adherence, and 15.07% moderate adherence. Okafor et al. (2022) reported similar results, with 14% of participants reporting good adherence to medication, suggesting that this issue may extend to different populations. Additionally, Beerendrakumar et al. (2018) reported a 5% adherence rate, which further underscores the challenge of medication adherence in various settings. Although the findings of the two studies aligned with my findings, their attributes, in terms of the age, sample size, and educational backgrounds of participants differed, emphasizing that medication adherence is a complex issue influenced by various factors.

My findings regarding adherence rate differed from those reported by Cedillo-Couvert et al. (2018), who reported a higher adherence rate of 68% v. 25%. This variance

may stem from differences in the studied populations, health care systems, or the methods employed to assess adherence. Likewise, Hsu et al. (2015) found a lower medication adherence rate in 50% of participants, suggesting that medication adherence can vary widely across different populations.

The disparities in medication adherence rates highlighted in these studies emphasized the multifaceted nature of the issue, influenced by cultural, socioeconomic, and health care system factors. The disparities underscore the importance of tailored interventions to improve medication adherence among young adults with chronic conditions such as CKD because nonadherence can adversely impact disease progression and overall health outcomes. This area warrants further research to develop effective strategies for promoting medication adherence, particularly in regions with high prevalence rates of CKD.

**Association Between Variables and Prevalence of CKD**

The association between variables, such as age, marital status, and education level with the prevalence of CKD is of significant relevance in health care and epidemiological research. Understanding how these demographic factors relate to CKD prevalence provides insights into the disease's distribution within different population subgroups. Age is a critical determinant because the risk of CKD often increases with age. Therefore, understanding the age-related prevalence may guide health care planning for older people. Marital status may offer insights into lifestyle factors and social support, which can impact CKD risk and management. Education level may reveal the role of health literacy and access to health care in CKD prevalence. This association may inform

targeted prevention strategies, early diagnosis efforts, and health care resource allocation, thereby improving CKD management and reducing its impact on vulnerable population segments.

My study revealed significant disparities in the prevalence of CKD among various demographic groups. My findings indicated a higher prevalence rate of 50% among individuals aged 18–30 years, suggesting that young adults in this age bracket are disproportionately affected by CKD. Furthermore, singles had a prevalence rate of 49.7%, indicating a substantial burden of CKD among unmarried individuals. Additionally, participants with tertiary education revealed a higher prevalence rate of 42.8%, suggesting that higher educational attainment does not necessarily offer protection against CKD.

My findings are not comparable to those reported by Chukwuonye et al. (2018), who identified a prevalence rate of 42.9% among participants aged 61–90 years, highlighting a different age group as being more susceptible to CKD. Similarly, Olanrewaju et al. (2020) reported the highest prevalence rate among those aged 40–49 years age, which contrasts with my results. Moreover, Huda et al. (2012) discovered the highest CKD prevalence among individuals above 40 years, those with low educational attainment, and married individuals. Their findings differed from my findings. However, my study findings are comparable to those of Chen et al. (2020) because they also reported the highest CKD prevalence rate among singles.

The disparities in CKD prevalence across demographic groups underscore the complex nature of the disease and its multifaceted risk factors. The differences between

my findings and those of previous studies suggest that CKD's epidemiology can vary substantially across populations, regions, and cultural contexts. Further research is warranted to explore the underlying causes of these variations and to develop targeted interventions to address the unique CKD risk factors within specific demographic groups. This variability emphasizes the need for tailored public health initiatives to effectively address CKD on a global scale.

**Distribution of Awareness Level of CKD Among Young Adults of Anambra and Imo State**

The variable awareness is highly relevant in the context of health care and public health research because it reflects the extent to which individuals or communities possess knowledge about a particular health condition or issue. In the case of CKD, assessing awareness is crucial because it influences preventive actions, early diagnosis, and management. Low awareness of CKD can lead to delayed diagnosis, hindering timely intervention and potentially worsening the condition. It also has implications for health care utilization and compliance with treatment plans. By studying awareness, researchers and policymakers can identify gaps in public knowledge and implement targeted awareness campaigns to improve early detection, reduce the burden of CKD, and enhance overall health outcomes within a population.

My study underscore a critical issue in health care awareness among young adults in Anambra and Imo States, Nigeria. A significant 70.10% of participants exhibited poor awareness of CKD, with an additional 29.90% having only moderate awareness. These findings are consistent with Ibitoba et al. (2022) research that indicated that 35.5% had

poor knowledge of CKD, and 49.2% had only fair knowledge. O. A. Adejumo et al. (2018) made a similar observation whereby only 6% of respondents demonstrated good knowledge of CKD, whereas 55% and 37% had fair and poor knowledge, respectively. Moreover, R. Oluyombo et al. (2016) found that 32.3% had poor knowledge, 42.2% had fair knowledge, and only 25.5% had good knowledge of CKD. This persistent lack of awareness regarding CKD and its risk factors has critical implications resulting in poor preventive practices and diminished health-seeking behaviors. As a result, CKD incidences continue to rise, exerting significant economic and public health burdens, as emphasized by Asmelash et al. (2020).

My findings vary from those reported by Tegegne et al. (2020), who found that 47.9% had good knowledge about CKD. Additionally, studies conducted in Tanzania (J. W. Stanifer et al., 2016), Nigeria (R. Oluyombo et al., 2016), and Malaysia (Ng et al., 2016) reported varying levels of knowledge, with the prevalence of good knowledge ranging from 26.6% to 38.5%. These variations among countries may arise from differences in study design and the tools employed. For instance, researchers in Tanzania and Nigeria used a community-based cross-sectional approach, while those in Nigeria and Malaysia used open-ended and self-administered questionnaires. Furthermore, my findings contrast with a study in Jordan (Khalil & Abdalrahim, 2014), in which more than half of the participants correctly answered 80% of knowledge questions.

## Recommendations

### Practice Recommendations

- Invest in health care infrastructure and facilities in Imo State to improve health care access.
- Develop and implement educational programs to increase awareness of CKD, its risk factors, and preventive measures.
- Design interventions to support better medication adherence, potentially through patient education and counseling.

### Suggestions for Further Study

- Investigate the underlying factors contributing to the higher CKD prevalence in Imo State and how these factors can be addressed.
- Explore the effectiveness of public health education campaigns and adherence support programs in improving CKD outcomes among young adults.
- Examine the economic and social determinants of health care access and adherence in CKD patients.

## Implications

Health care planners and policymakers should focus on addressing the high CKD prevalence in Imo State and improving health care access, especially for early CKD diagnosis. Public health campaigns should target young adults to increase awareness of CKD and its risk factors. Interventions should be developed to enhance medication adherence among young CKD patients.

This study provides valuable insights into the increasing prevalence of CKD among young adults in Imo and Anambra States, revealing the regional disparity, health care access issues, low awareness, and medication adherence challenges. The findings serve as a foundation for developing targeted interventions and policies to mitigate the impact of CKD in this vulnerable population and contribute to the broader understanding of CKD epidemiology in Nigeria.

## Summary

The study examined the increasing prevalence of CKD among young adults in Imo and Anambra States, Nigeria. The prevalence of CKD in the two states was found to be 30.02%, with Imo State having a significantly higher prevalence (42.7%) compared to Anambra State (23.2%). The study also revealed that most young adults with early CKD diagnosis had poor access to health care. Furthermore, poor medication adherence and low awareness of CKD were prevalent among participants, with 59.93% reporting poor adherence and 70.10% having poor awareness.

## Conclusions

According to my research findings, there is substantial prevalence of CKD among young adults in Imo and Anambra States, signaling a concerning public health issue. CKD prevalence was significantly higher in Imo State compared to Anambra State, emphasizing the need for targeted interventions in this region. The findings underscore the importance of improving access to health care, especially for those with early CKD diagnosis, because poor access was predominant. The study highlighted the urgent need for interventions that could improve medication adherence among young adults with

CKD because a significant portion reported poor adherence. The low awareness of CKD among young adults in both states calls for extensive public health education and awareness campaigns.

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