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Pattern of Anti-hypertensive Prescription and Adherence to Anti-Hypertensive Medications among Patients with Chronic Kidney Disease in A Tertiary Health Care Facility in Southern Nigeria

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ABSTRACT

Background: Patients with chronic kidney disease (CKD) often need pharmacological management for the rest of their lives. However, given the intricacy of specific regimens that call for the administration of various dosages, forms and frequency, sustaining continuous adherence is especially difficult. The aim of this study was to determine the level of medication adherence and factors associated with medical adherence among CKD patients in University of Port Harcourt Teaching Hospital (UPTH).

Methods: The study was a descriptive cross-sectional study conducted among 241 CKD patients in the renal outpatient clinic of UPTH who were selected by systematic sampling. The data on the variables were obtained using a semi-structured questionnaire. The data was analyzed using SPSS version 25. Categorical and numerical variables were summarized accordingly. Chi-square test was used to assess associations, with $p < 0.05$ considered statistically significant.

Results: The result showed that 184 (76.3%) of the respondents take diuretics while 164(68%) and 110(45.6%) were on calcium channel and beta-blockers respectively. 169 (70.1%), 57(23.7%) had low and moderate adherence respectively while 15(6.2%) had high medication adherence. The factors associated with medication adherence were partners level of education p=0.005, average monthly income p=0.028, relationship status p=0.013, duration of diagnosis p<0.001 and family history of CKD P=0.034.

Conclusion: Diuretics and calcium channel blockers were the most frequently used anti-hypertensives. Medication adherence was comparatively low. Patient oriented management that takes into consideration patients' socioeconomic status, educational level, relationship status, family history of CKD, and duration of illness may improve adherence and treatment outcomes.

Keywords: Chronic kidney disease, CKD, anti-hypertensive, medication adherence, UPTH

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INTRODUCTION

Chronic kidney disease (CKD) is a condition that is characterized by a chronic decrease in kidney function and can progress to kidney failure. Kidney failure can be life-limiting and disabling, and the most common treatment modality (hemodialysis) requires tri-weekly, hours-long sessions, which often have a severe impact on quality of life.[1,2] CKD is growing in prevalence all over the world.[3,4] The pooled prevalence for CKD was 16% in West Africa, the highest in the continent. CKD is characterized by the young age of patients in Africa, huge morbidity, and premature deaths. About 90% of patients with CKD die within 90 days of starting dialysis. [5] In Nigeria, which is one of the most populated countries on the continent, there is no substantive information on the prevalence of CKD in the country. In the southwest of Nigeria, a report showed that the prevalence of CKD was estimated to be 22.3%.[6] In the South-East of Nigeria, a study showed that the prevalence of CKD was 7.8%,[7] while an epidemiological trend in South-South Nigeria showed that CKD accounted for 9.7% of medical outpatient clinic attendance.[8]

There are established treatment options to delay CKD progression and associated complications which includes: controlling blood pressure and blood glucose, reducing proteinuria with prescribed medications (e.g., angiotensin-converting enzyme inhibitors), participating in physical activity and eating a low-sodium diet. These treatment recommendations come together to form a patient's treatment plan and require active patient engagement and adherence (i.e., following the treatment plan) to be successful.[9]

The various pharmacological treatments prescribed are aimed at mitigating symptoms and progression of the disease. Lifelong use of pharmacological management is common among CKD patients, and effectiveness is very much dependent on patients continuously taking their medication according to the prescribed doses in the implementation phase. However, maintaining continuous adherence is particularly challenging given the complexity of individual regimens that require administration of different doses, forms, and frequencies.[10,11]This infers a high burden of pill intake with sometimes more than 20 pills/day. Managing multiple medications and health care appointments, including, for some, dialysis several times a week, is a challenging task. This has led to patients skipping their medication intake.

Hypertension is both a cause and effect of CKD and contributes to its progression.[12,13] As eGFR declines, the incidence and severity of hypertension increase. [14] Additionally, hypertension and CKD are both independent risk factors for cardiovascular disease (CVD). Importantly, from a therapeutic perspective, lowering BP can slow eGFR decline, delay progression to ESRD, and reduce the incidence of CVD in this patient group.[15] Intensified blood pressure control is a key treatment strategy to slow chronic kidney disease progression.[16]

The global pattern has shown suboptimal medication adherence among CKD patients.[16,17] The problem of poor medication adherence among CKD patients also persists in Nigeria. Adherence to medication was 57% in Southwest Nigeria.[18] 48.6% in Northern Nigeria and about 27% in South-South Nigeria. [19] Poor adherence to medication has been associated with a decline in the quality of life of patients with end stage renal disease. [20] In Rivers State, Southern Nigeria, there is an estimated CKD prevalence of 27.3%.[21] However, there is a paucity of information about the treatment characteristics of these patients, including their adherence to anti-hypertensive medications. The aim of this study is therefore to assess the adherence to anti- hypertensive medication and its associated factors among CKD patients in a tertiary health facility in Southern Nigeria.

METHODS

Study Design: This study was a descriptive cross-sectional study.

Study Area: This study was conducted at the University of Port Harcourt Teaching Hospital (UPTH) located in Rivers State, Southern Nigeria. UPTH is a foremost treatment, research, and training hospital with over 800 beds. The hospital provides highly specialized health care services, including renal care and hemodialysis.

Study Population: The study population comprised all patients with CKD attending the renal clinic of the hospital. Patients with CKD in critical condition were excluded from this study.

Sample Size: The sample was calculated using Cochran's sample size formula for calculating the sample size of a single proportion,[22] Where n = Sample size to be obtained Z = the normal curve, 1.96 at 95% confidence intervale = margin of precision (5%) P is the proportion of CKD patients who adhered to their medication in previous studies = 57%[18]. q=1-p= 0.43. After adjusting for a non-response rate of 10, the

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minimum sample required to conduct the study was 213.

Sampling Technique: A systematic sampling technique was used to select 20 respondents on each clinic day for 13 clinic days at the renal unit of UPTH, where a semi structured questionnaire was consecutively given to every patient with CKD on anti-hypertensive medication.

Study Instrument: The study instrument was a semi-structured interviewer-administered questionnaire which consists of 4 sections:

Section A: Socio-demographic characteristics – This included information on age, sex, marital status, educational level, occupation, income level and place of residence. These variables were measured using self-reported responses and categorized appropriately for analysis.

Section B: Clinical history – This section obtained information on duration of CKD, stage of CKD, presence of comorbidities such as hypertension and diabetes mellitus, history of dialysis, classes of anti-hypertensives medications patients are taking and other relevant medical conditions. Clinical variables were obtained from patient medical records and self-reports.

Section C: Medication adherence – Medication adherence was assessed using the Morisky Medication Adherence Scale (MMAS-8), a widely used validated tool for measuring adherence to prescribed medications. Responses were scored according to the recommended scoring system and categorized as High adherence (8), Moderate adherence (6-7) and Low adherence (<6).

A pre-test will be conducted among a small sample of CKD patients in a health facility outside the selected study sites. Data from the pilot study will be used to assess the reliability of the instrument using Cronbach's alpha coefficient, with a value of 0.70 or higher considered acceptable for internal consistency.

Data Analysis: Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 25. Categorical variables were summarized using frequency and proportions. Numerical variables were summarized using means and standard deviation. Chi-square analysis was used to determine the relationship between the independent and dependent variables. A p-value of less than 0.05 was considered statistically significant.

Ethical Consideration: Ethical approval was obtained from the research ethics committee of UPTH with protocol number UPTH/ADM/90/S.11/VOL.XI/1820 approved on the 13th of January 2025. Written informed consent was obtained from the participants prior to the commencement of the study. The data obtained from this study will be treated with confidentiality. The names and personal information of the respondents were not included in the report.

RESULTS

Table 1: Social Demographic Characteristics

Variable	Frequency n=241	Percent
Age group		
≤20	12	5
21-30	15	6.2
31-40	36	14.9
41-50	73	30.3
51-60	66	27.4
>60	39	16.2
Sex		
Male	160	66.4
Female	81	33.6
Education		
None	6	2.5
Primary	15	6.2
Secondary	101	41.9
Tertiary	119	49.4
Religion		
Christian	223	92.5
Islam	12	5
Traditional	3	1.2
Others	3	1.2
Marital Status		
Married	166	68.9
Single	54	22.4
Divorced	9	3.7
Widowed	12	5
Partners level of education n=166		
None	6	3.6
Primary	17	10.2
Secondary	57	34.3
Tertiary	86	51.8
Employment status		
Employed	84	34.9
Self-employed	97	40.2
Unemployed	60	24.9
Monthly Income		
<50.000	69	28.6
50,001-100,000	59	24.5
100,001-150,000	24	10
150,001-200,000	33	13.7
>200,000	56	23.2
Partners monthly Income n=166		

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<50.000	44	26.5
50,001-100,000	66	39.8
100,001-150,000	11	6.6
150,001-200,000	15	9
>200,000	30	18.1
Residence		
Urban	182	75.5
Rural	59	24.5
Tribe		
Igbo	72	30
Ikwerre	42	17.5
Ogoni	21	8.8
Ijaw	18	7.5
Yoruba	15	6.3
Others	73	30.3
Number of Children		
<2	142	58.9
3-5	90	37.3
>5	9	3.7

Table 1 showed that 73 (30.3%) of the respondents were between the ages of 41 and 50 years, 160 (66.4%) were males, 119 (49.4%) attained a tertiary level of education, 223 (92.5%) were Christians, 166 (68.9%) were married, and 97 (40.2%) were self-employed. Also, 69 (28.6%) earn less than 50,000 naira, 66 (39.8%) of the respondents' partners earn between 50,001 and 100,000 naira, 182 (75.5%) reside in urban locations, 72 (30.0%) belong to the Igbo ethnic group, and 142 (58.9%) have less than two children.

Table 2: Treatment Characteristics

Variable	Frequency n=241 (%)
Duration of Diagnosis	
≥12 Months	152(63.1)
13-36 Months	39(16.2)
>36 Months	50(20.7)
Classes of Anti-hypertensive Medication	
Calcium Chain blockers	164(68)
Diuretics	184(76.3)
Angiotensin converting enzyme inhibitors	104(43.2)
Angiotensin receptor blockers	45(18.7)
Centrally acting agents	15(6.2)
Beta-blockers	110(45.6)
Alpha blockers	6(2.5)
Vasodilators	42(17.4)
Mineralocorticoid receptor blockers	30(12.4)
Have Comorbidity	
Yes	172(71.4)
No	69(28.6)
Type comorbidity n=172	
Hypertension	125(72.7)
Hepatitis B	3(1.7)
Ulcer	17(9.8)
Diabetes	60(34.9)
Asthma	6(3.5)
Cancer	12(7.0)
HIV	18(10.5)
CLD	3(1.7)
Family history of CKD	
Yes	53(22.0)
No	188(78.0)
Specify Family member n=53	
Father	29(54.7)
Mother	16(30.2)
Sibling	2(3.8)
Uncle	6(11.3)
Use alternative treatment	
Yes	30(12.4)
No	211(87.6)

The treatment characteristics in the table showed that 152 (63.1%) of the respondents had been diagnosed for 12 months or less, 184 (76.3%) take diuretics, 172 (71.4%) had comorbidity, of which 125 were hypertensive, 53 (22.0%) had a family history of CKD, and 30 (12.4%) use other methods of treatment. (Table 2)

Table 3: Medication Adherence

Variable	Frequency n=241	Percent
Sometimes forget to take medication		
Yes	152	63.1
No	89	36.9
Days did not take medication over the past two weeks		
Yes	104	43.2
No	137	56.8
Ever cut back of stopped taking medication without telling doctor, because you felt worse when you took it		
Yes	126	52.3
No	115	47.7

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Sometimes forget to bring along medication when you travel		
Yes	134	55.6
No	107	44.4
Took medication yesterday		
Yes	208	86.3
No	33	13.7
Sometimes stop taking medication when feel healthy		
Yes	131	54.4
No	110	45.6
Get hassled about sticking to your medication		
Yes	187	77.6
No	54	22.4
Have difficulty remembering to take all your medication		
Never	63	26.1
Sometimes	130	53.9
Often	39	16.2
Always	9	3.7

Table 3 showed that 152 (63.1%) of the respondents sometimes forget to take their medication, 104 (43.2%) did not take their medication for some days in the past two weeks, 126 (52.3%) had cut back or stopped taking their medication without telling their doctor because they felt worse when they did so, 134 (55.6%) sometimes forget to bring along their medication when they travel, 208 (86.3%) took their medication yesterday, 131 (54.4%) sometimes stop taking their medication when they feel healthy, 187 (77.7%) get hassled about sticking to their medication, and 130 (53.9%) sometimes have difficulty in remembering to take all their medication.

DISCUSSION

The study assessed the treatment characteristics and adherence to antihypertensive medications among chronic kidney disease (CKD) patients in the University of Port Harcourt Teaching Hospital (UPTH). The findings revealed that about two-thirds of the respondents were on diuretics and calcium channel blockers, while approximately half were on angiotensin-converting enzyme inhibitors. Furthermore, more than a quarter of the respondents were on beta-blockers, and less than a quarter were on angiotensin receptor blockers, vasodilators, alpha-blockers, mineralocorticoid receptor blockers, and centrally acting agents.

More than half of the respondents had low medication adherence, while only about 6% demonstrated high adherence. The level of adherence observed was lower than that reported among CKD patients in Northern Nigeria, Ethiopia, and other parts of the world. Poor adherence to medication may accelerate the progression of kidney disease and increase the risk of complications, hospitalization, and mortality among CKD patients.

The results also showed that over 12% of respondents used alternative forms of treatment. This finding is consistent with reports among CKD patients in Switzerland. However, the prevalence of alternative treatment use in this study was lower than that reported in Tanzania and Northern Nigeria. The relatively low use of alternative treatments may be attributed to the urban residence of most respondents, which may be associated with greater awareness of the risks of using unprescribed therapies. The use of alternative treatments may worsen kidney function and may interact with prescribed medications, thereby reducing their effectiveness. Additionally, reliance on alternative treatments may lead to catastrophic health expenditure, particularly as most healthcare costs are paid out-of-pocket.

The level of partner education was significantly associated with medication adherence, with adherence improving as the level of partner education increased. This may be explained by a better understanding of the disease and its treatment among individuals whose partners are more educated, thereby providing stronger social support for adherence to prescribed medications.

The average monthly income of respondents was also significantly associated with medication adherence. Adherence improved as income levels decreased. This may be due to a greater perceived severity of illness among lower-income patients and concern about the high costs of complications such as dialysis. In addition, individuals with lower income levels are more likely to rely on public healthcare facilities, which often provide structured follow-up systems and relatively lower treatment costs.

Relationship status was another factor significantly associated with medication adherence. Respondents without partners were found to have higher adherence compared with those with partners. This may be related to greater autonomy and fewer household responsibilities, allowing individuals without partners to maintain more consistent medication routines without disruptions associated with family obligations.

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The duration of diagnosis was also significantly associated with adherence. Medication adherence was higher among individuals with a shorter duration of diagnosis. Newly diagnosed patients may be more motivated to follow treatment recommendations closely in order to prevent disease progression. In addition, newly diagnosed patients tend to have more frequent clinical appointments, providing greater monitoring and counseling. In contrast, patients with longer disease duration may experience treatment fatigue due to prolonged therapy.

A family history of CKD was also significantly associated with medication adherence. Respondents without a family history of CKD demonstrated better adherence to prescribed medications. This may be related to a heightened perception of risk and urgency in managing the condition among individuals unfamiliar with the disease

Table 4: Factors associated with Medication adherence

Variable	Adherence		X^2(p-value)
	Low/Moderate n (%)	High n (%)	
Age group			
≤40	57(90.5)	6(9.5)	1.591(0.207)
>40	169(94.9)	9(5.1)	
Sex			
Male	148(92.5)	12(7.5)	1.328(0.249)
Female	78(96.3)	3(3.7)	
Education			
≤Secondary	113(92.6)	9(7.4)	0.563(0.453)
Tertiary	113(95.0)	6(5.0)	
Partner Education			
≤Secondary	80(100.0)	0(0.0)	7.948(0.005) *
Tertiary	146(90.7)	15(9.3)	
Average income			
≤200,000	170(91.9)	15(8.1)	4.842(0.028) *
>200,000	56(100.0)	0(0.0)	
Partners income			
≤200,000	130(95.6)	6(4.4)	1.757(0.185)
>200,000	96(91.4)	9(8.6)	
Religion			
Christian	208(93.3)	15(6.7)	1.291(0.256)
Others 2	18(100.0)	0(0.0)	
Relationship status			
Have Partner	160(96.4)	6(3.6)	6.224(0.013) *
No partner	66(88.0)	9(12.0)	
Employment status			
Employed	172(95.0)	9(5.0)	1.952(0.162)
Unemployed	54(90.0)	6(10.0)	
Duration of diagnoses			
≥12 Months	137(90.1)	5(9.9)	9.366(<0.001) *
13-36 Months	39(100.0)	0(0.0)	
>36 Months	50(100.0)1	0(0.0)	
Family History of CKD			
Yes	53(100.0)	0(0.0)	4.509(0.034) *
No	173(92.0)	15(8.0)	

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The factors associated with medication adherence were partner's level of education (p=0.005), relationship status (p=0.013), duration of diagnosis (p<0.001), and family history of CKD (p=0.034). (Table 4)

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Strengths of the Study

1. The study used the Morisky Medication Adherence Scale to assess medication adherence, which is a widely validated instrument and improves the reliability of adherence measurement.
2. The research targeted patients with chronic kidney disease, a population at high risk of complications from poor blood pressure control, making the findings clinically relevant.
3. Conducting the study in a tertiary health facility provided access to patients with confirmed CKD diagnoses and specialist care, improving the accuracy of clinical information.
4. The study examined not only adherence but also medication patterns, comorbidities, and use of alternative therapies, providing a broader understanding of treatment practices.

Limitations of the Study

1. Medication adherence was assessed using self-reported responses on the Morisky Medication Adherence Scale, which may be affected by recall bias or social desirability bias.
2. Only patients attending the renal clinic during the study period were included, potentially excluding individuals who do not regularly attend clinic visits.
3. Some factors that could influence adherence, such as psychological status, health literacy and healthcare system barriers, were not extensively explored.

Implications of the Study

1. Low medication adherence as shown in the study can result in more frequent hospital admissions, longer treatment durations and higher healthcare costs, placing additional strain on both patients and the healthcare system.
2. The findings highlight the importance of enhanced patient education, counseling on the importance of adherence and regular follow-up to improve treatment outcomes.
3. Since medication adherence was influenced by sociodemographic factors, interventions should incorporate family and community support systems to encourage consistent medication use.
4. The results of the study suggest a need for policy-level interventions, such as improved access to affordable medications, structured adherence programs and integration of adherence monitoring into routine CKD care.
5. The study underscores the necessity for further research on barriers to adherence, including psychological, cultural and health system factors, to develop targeted interventions for CKD patients.

Conclusion

CKD patients often have comorbidities such as hypertension, diabetes and HIV, making management complex and requiring multidisciplinary care. This study found that most patients used calcium channel blockers and diuretics, while some also used herbal medicines. Overall, medication adherence was poor, and factors such as family history of CKD, relationship status, education, income, and duration of diagnosis influenced adherence. Furthermore, the findings highlight the need for better patient education, improved clinician–patient communication, and adherence counselling to improve treatment outcomes. These results can guide patient-centered interventions to improve medication adherence and reduce CKD complications, especially in resource-limited settings.

Declarations

Conflict of Interest Declaration: No conflict of interest

Ethical Conformity Statement: The study was approved by the Research and Ethics Committee of University of Port Harcourt Teaching Hospital with Reference Number UPTH/ADM/90/S.11/VOL.XI/1820

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REFERENCES

1. Rivera E, Clark-Cutaia MN, Schrauben SJ, Townsend RR, Lash JP, Hannan M, et al. Treatment adherence in CKD and support from health care providers: a qualitative study. Kidney Med. 2022;4(11):100545.
2. Sood V, Braun M, Hogue S, Lieberman B, Copley-Merriman C. High burden and unmet patient needs in chronic kidney disease. Int J Nephrol Renov Dis. 2012;5:151-163.
3. Saran R, Robinson B, Abbott KC, Agodoa LYC, Bragg-Gresham J, Balkrishnan R, et al. US renal data system 2018 annual data report: epidemiology of kidney disease in the United States. Am J Kidney Dis. 2019;73(3):A7-A8.
4. Sundström J, Bodegard J, Bollmann A, Vervloet MG, Mark PB, Karasik A, et al. Prevalence, outcomes, and cost of chronic kidney disease in a contemporary population of 2.4 million patients

Print ISSN: 0189-9287 Online ISSN: 2992-345X

from 11 countries: the CaReMe CKD study. Lancet Reg Health Eur. 2022; 20:100438.
5. Olanrewaju TO, Aderibigbe A, Popoola AA, Braimoh KT, Buhari MO, Adedoyin OT, et al. Prevalence of chronic kidney disease and risk factors in North-Central Nigeria: a population-based survey. BMC Nephrol. 2020;21(1):467.
6. Ibitoba FA, Akpor OA, Akpor OB. Prevalence and risk factors of chronic kidney disease among commercial motorcyclists in Ado-Ekiti, Ekiti State, Nigeria. Sci Afr. 2022;16:e01136.
7. Okwuonu C, Chukwuonye I, Adejumo O, Agaba E, Ojogwu L. Prevalence of chronic kidney disease and its risk factors among adults in a semi-urban community of South-East Nigeria. Niger Postgrad Med J. 2017;24(2):81-87.
8. Ovwasa H, Aiwuyo HO, Okoye AO, Unuigbe E, Rajora N. Epidemiology trend of chronic kidney disease in a semi-urban tertiary hospital in Sub-Saharan Africa. Cureus. 2023;15(3):e36912.
9. Levin A, Stevens PE. Summary of KDIGO 2012 CKD guideline: behind the scenes, need for guidance, and a framework for moving forward. Kidney Int. 2014;85(1):49-61.
10. Molnar MZ, Gosmanova EO, Sumida K, Potukuchi PK, Lu JL, Jing J, et al. Predialysis cardiovascular disease medication adherence and mortality after transition to dialysis. Am J Kidney Dis. 2016;68(4):609-618.
11. Chang TI, Winkelmayer WC. Kidney disease and antihypertensive medication adherence: the need for improved measurement tools. Am J Kidney Dis. 2010;56(3):423-426.
12. Bidani AK, Griffin KA. Pathophysiology of hypertensive renal damage: implications for therapy. Hypertension. 2004;44(5):595-601.
13. Kestenbaum B, Rudser KD, de Boer IH, Peralta CA, Fried LF, Shlipak MG, et al. Differences in kidney function and incident hypertension: the multi-ethnic study of atherosclerosis. Ann Intern Med. 2008;148(7):501-508.
14. Muntner P, Anderson A, Charleston J, Chen Z, Ford V, Makos G, et al. Hypertension awareness, treatment, and control in adults with CKD: results from the chronic renal insufficiency cohort (CRIC) study. Am J Kidney Dis. 2010;55(3):441-451.
15. Pugh D, Gallacher PJ, Dhaun N. Management of hypertension in chronic kidney disease. Drugs. 2019;79(4):365-379.
16. Burnier M, Pruijm M, Wuerzner G, Santschi V. Drug adherence in chronic kidney diseases and dialysis. Nephrol Dial Transplant. 2015;30(1):39-44.
17. Mechta Nielsen T, Frøjk Juhl M, Feldt-Rasmussen B, Thomsen T. Adherence to medication in patients with chronic kidney disease: a systematic review of qualitative research. Clin Kidney J. 2018;11(4):513-527.
18. Braimoh R, Busari A, Akinyede A, Ogunsakin A, Olayemi S. Assessment of factors affecting treatment adherence in patients with chronic kidney disease in Nigeria: a survey from a tertiary health-care centre. Niger J Med. 2023;32(1):49-55.
19. Timothy E, Blessing A. Adherence to haemodialysis among chronic renal failure patients of a tertiary health facility, Benin City, Edo State. Borno Med J. 2021;18:1-10.
20. Tesfaye WH, McKercher C, Peterson GM, Castelino RL, Jose M, Zaidi STR, et al. Medication adherence, burden and health-related quality of life in adults with predialysis chronic kidney disease: a prospective cohort study. Int J Environ Res Public Health. 2020;17(1):371.
21. Briggs D, Eleki B, Wesley O, Ibifubara N, Ibinabo M, Michael P. Prevalence and risk factors of chronic kidney disease among nonclinical healthcare providers at Rivers State University Teaching Hospital, Port Harcourt, Nigeria. 2023; 6:20-30.
22. Cochran WG. Sampling techniques. 2nd ed. New York: John Wiley & Sons; 1977.
23. Rivera E, Clark-Cutaia MN, Schrauben SJ, Townsend RR, Lash JP, Hannan M, et al. Treatment adherence in CKD and support from health care providers: a qualitative study. Kidney Med. 2022;4(11):100545.
24. Clark-Cutaia MN, Rivera E, Iroegbu C, Squires A. Disparities in chronic kidney disease: the state of the evidence. Curr Opin Nephrol Hypertens. 2021;30(2):208-214.
25. Saran R, Robinson B, Abbott KC, Agodoa LYC, Bragg-Gresham J, Balkrishnan R, et al. US renal data system 2018 annual data report: epidemiology of kidney disease in the United States. Am J Kidney Dis. 2019;73(3): A7-A8.
26. Levin A, Stevens PE. Summary of KDIGO 2012 CKD guideline: behind the scenes, need for guidance, and a framework for moving forward. Kidney Int. 2014;85(1):49-61.
27. Okoro RN, Ummate I, Ohieku JD, Yakubu SI, Adibe MO, Okonta MJ. Evaluation of medication adherence and predictors of sub-optimal adherence among pre-dialysis patients with chronic kidney disease. Med Access Point Care. 2020; 4:2399202620954089.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

28. Legesse ES, Muhammed OS, Hamza L, Nasir BB, Nedi T. Medication-related problems among ambulatory patients with chronic kidney disease at St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia. PLoS One. 2022;17(12):e0278563.
29. Tesfaye WH, Erku D, Mekonnen A, Tefera YG, Castelino R, Sud K, et al. Medication non-adherence in chronic kidney disease: a mixed-methods review and synthesis using the theoretical domains framework and the behavioural change wheel. J Nephrol. 2021;34(4):1091-1125.
30. Hess S, De Geest S, Halter K, Dickenmann M, Denhaerynck K. Prevalence and correlates of selected alternative and complementary medicine in adult renal transplant patients. Clin Transplant. 2009;23(1):56-62.
31. Stanifer JW, Lunyera J, Boyd D, Karia F, Maro V, Omolo J, et al. Traditional medicine practices among community members with chronic kidney disease in northern Tanzania: an ethnomedical survey. BMC Nephrol. 2015;16(1):170.
32. Afolaranmi TO, Hassan ZI, Uwadiae EJ, Nwokolo UE, Nwaemelu IB, Ugwu KG, et al. Use of complementary and alternative medicine among patients on long-term treatment in a tertiary health institution in Jos, Nigeria. Int J Prev Med. 2022; 13:46.
33. Debelle FD, Vanherweghem JL, Nortier JL. Aristolochic acid nephropathy: a worldwide problem. Kidney Int. 2008;74(2):158-169.
34. Izzo AA, Ernst E. Interactions between herbal medicines and prescribed drugs: a systematic review. Drugs. 2009;69(13):1777-1798.
35. James PB, Taidy-Leigh L, Bah AJ, Kanu JS, Kangbai JB, Sevalie S. Prevalence and correlates of herbal medicine use among women seeking care for infertility in Freetown, Sierra Leone. Evid Based Complement Alternat Med. 2018; 2018:9493807.

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