International Journal of Basic & Clinical Pharmacology
Aidoo M et al. Int J Basic Clin Pharmacol. 2026 May;15(3):499-508
http://www.ijbcp.com
pISSN 2319-2003 | eISSN 2279-0780

DOI: https://dx.doi.org/10.18203/2319-2003.ijbcp20261115

Original Research Article

Assessment of drug prescribing pattern and quality indicators among chronic kidney disease patients in a tertiary hospital in Northern Ghana

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Received: 12 February 2026
Revised: 11 March 2026
Accepted: 15 March 2026

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ABSTRACT

Background: Drug utilization research in chronic kidney disease (CKD) patients is essential for identifying prescribing pattern, and evaluating prescribing quality against standard prescribing indicators and clinical guidelines. Evidence from Ghana on this research topic is limited. This study aimed to assess drug prescribing pattern and quality prescribing indicators among CKD patients in a tertiary hospital in Northern Ghana.
Methods: Retrospective cross-sectional study was conducted among CKD patients in the Tamale Teaching Hospital.
Results: Cardiovascular drugs were the commonly utilized across all CKD stages (n=790,31.7%). Potential appropriate prescribing of antihypertensive agents (93.5%), and renin-angiotensin system (RAS) inhibitors alone (66.1%) were higher compared to combined RAS inhibitor with diuretic (55.4%), phosphate binders (50.0%) and statins (35.6%). Patients with advance CKD stages received fewer RAS inhibitors but more statins compared to stag-3 CKD patients. There was optimal compliance with avoidance of inappropriate prescription including dual RAS inhibitors, erythropoietin stimulating agent (ESA) and digoxin. For contraindicated prescribing, metformin (57.9%) was higher than nonsteroidal anti-inflammatory drugs (NSAIDs) (1.2%) and the combination of NSAIDs + RAS inhibitor + diuretic (1.1%).
Conclusions: This study is the first the assessment of prescribing quality indicators among CKD patients in Ghana. It provides findings for clinical practice improvement and establishes baseline evidence for future research. Priority areas for improvement include prescribing RAS inhibitors alone or combined with diuretic, phosphate binders and statins when indicated. However, there is urgent need for intervention to reduce contraindicated prescribing of metformin in the setting.

Keywords: Chronic kidney disease, Drug utilization pattern, Prescribing quality indicators

INTRODUCTION

The increasing prevalence of CKD presents a significant public heath challenge, with patients facing heightened risks of kidney failure, complications and mortality.[1] Given that appropriate pharmacotherapy can mitigate these risks, ensuring quality and safety of medication treatment is critical to improving the clinical outcomes in CKD patients. In this context, drug utilization research in CKD patients serves as an essential tool for identifying gaps in pharmacotherapy and ensuring rational drug use.[2] Additionally, drug utilization research provides insights into drug prescribing including pattern, and quality of drug use.[2] Assessment of drug utilization pattern and applying prescribing quality indicators are essential tools to measure, monitor and ultimately improve appropriateness of drug therapy in CKD patients.[3,4] Systematic analysis of prescribing patterns and using prescribing quality

indicators, can help identify deviations from clinical guidelines, minimize nephrotoxic drug use, and reduce polypharmacy, thereby enhancing patient safety.[3-5]

Standard metrics, such as the World Health Organization (WHO) prescribing indicators assess rational drug utilization practices in the general patient population, and hence it is limited in identifying key aspects of drug utilization in specific patient population like CKD patients. Consequently, drug prescribing indicators specific to CKD patients are imperative to ensure rational drug use in CKD management.

The prescribing indicators specific to CKD patients are typically derived from evidence-based clinical guidelines and expert consensus.[4-9] These indicators serve as robust tools to guide clinical practice and assess the quality of care provided to patients with CKD. CKD specific prescribing quality indicators typically evaluates appropriateness of prescribing guideline-recommended therapies for specific CKD comorbidities such as hypertension, diabetes mellitus, anemia and mineral bone disorder as well as identifying potentially inappropriate prescribing of medications or combination of medications unsafe for CKD patients.[10,11]

Despite, the clinical relevance of drug utilization studies in CKD management, there is a notable paucity of published literature within the Ghanaian context. Hence, this study aimed to contribute to this knowledge gap by assessing drug prescribing pattern and prescribing quality indicators among CKD patients admitted to a tertiary hospital in northern Ghana. By identifying setting-specific trends, this research aims to provide evidence to help improve rational use of drugs and standard of renal care in the setting.

METHODS

Study site

The medical ward of Tamale Teaching Hospital in the northern region of Ghana was the study site. The medical ward is part of the internal medicine department and has a bed capacity of 216. At time of the study, 5 physician specialists, 6 medical officers, 2 Specialist pharmacists, and 6 pharmacists comprised the clinical team of the medical ward.

Study design

A hospital-based retrospective cross-sectional study from January 2021 to December 2021 was conducted.

Study population

This study population comprised of patients diagnosed with CKD who were admitted to the medical ward of Tamale Teaching Hospital between January 2021 to December 2021.

Inclusion criteria

We included patients with CKD based on the functional definition criteria by Kidney Disease: Improving Global Outcomes (KDIGO): (a) Glomerular filtration rate < 60 ml/min/1.73m^2 for ≥3 months with or without structural abnormalities.[12] The estimated glomerular filtration rate (eGFR) of the patients was calculated using the 2021 CKD-EPI creatinine equation online calculator.[13]

Exclusion criteria

Patients whose renal function tests were either not undertaken or missing or with incomplete medical records were excluded from the study.

Sampling

All patients who met the inclusion criteria comprised the study population. This resulted in a final sample size of 212 patients.

Data collection

Data was extracted from the hospital's electronic medical record system i.e. Light Wave Hospital Information Management System (LHIMS). The electronic medical records of all patients with kidney diseases admitted during the study period was obtained from the data management section of the Internal Medicine Department. Data collected from the electronic medical record of the eligible patients included age, sex, laboratory tests (renal function, urine protein, phosphate levels, calcium levels, and hemoglobin), blood pressure measurements, etiologies, complications and drug prescription data (generic name of drug and dose).

Data analysis

The collected data was initially screened for completeness and consistency before being coded and entered into Statistical Package for Social Sciences (SPSS) Version 29 (IBM, Illinois, USA) for analysis. Patients were classified into clinical stages of CKD according to estimated glomerular filtration criteria by KDIGO.[12] Clinical etiologies and complications were analyzed according to established diagnostic criteria. To standardized the evaluation of pharmacotherapy, drugs were classified using the first level of the WHO Anatomical Therapeutic Chemical (ATC) classification system which classifies drugs based on the main anatomical organ or system on which the drug acts.[14]

The distribution of the main anatomical drug classes were subsequently analyzed across the stages of CKD. The quality of drug utilization was evaluated using PQIs specific to CKD patients adapted from the validated framework by Smit et al.[4] The initial sixteen (16) PQIs were modified to twelve (12) PQIs (Table 2) that were appropriate for our study population based on the available

data. Four PQIs were excluded due to lack of eligible patients: appropriate prescribing of angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB). Combination of an ACEI or ARB and a diuretic in CKD patients with micro-albuminuria and diabetes, appropriate prescribing of non-calcium-containing phosphate binder in CKD patients with elevated calcium level and inappropriate prescribing of active vitamin D in CKD patients with elevated calcium level.

Descriptive statistics were conducted, and data were summarized into mean and standard deviation for numerical data and frequencies and percentages for categorical data.

RESULTS

Characteristics of the CKD patients

More than half of the patients were males (n=122, 57.5%), and the mean age was 45 years (44.90 years±17.738). The average eGFR was (14.14±20.193) (n=152, 71.7%). The common etiology was hypertension 144/212 (67.9%) and anemia was the most prevalent complication 170/212 (80.2%) among the patients (Table 1).

Drug utilization pattern

A total of 2494 drug prescriptions were recorded. The top-5 main anatomical drug classes included cardiovascular system (Group C): 790/2494 (31.7%), alimentary tract and metabolism (Group A): 20.9% (n=521), blood and blood forming organs (Group B): 403/2494 (16.2%), anti-infectives for systemic use (Group J): 15.6% (n=390), and nervous system in (Figure 1). Distribution of the top-5 main anatomical drug classes (n=2305) by CKD stages indicated that patients with CKD stage-5 received the highest number of drugs 1660/2305 (72.0%). Across all stages of CKD, group C drugs were the highest and group N were the lowest prescribed to CKD stage-3 (n=113/335, 33.7% vs n=30/335, 9.0%), CKD stage-4 (n=103/310, 33.2% vs n=28/310, 9.0%), and CKD stage-5 (n=574/1660, 34.6% vs n=143/1660, 8.6%) in (Figure 2).

Prescribing quality indicators

Potentially appropriate prescribing indicators showed that; 116/124 (93.5%) patients with hypertension received antihypertensive agents. More than fifty percent of CKD patients with proteinuria were prescribed ACEI or ARB 37/56 (66.1%) and ACEI or ARB in combination with diuretic 31/56 (55.4%). About one-third 16/45 (35.6%) of patients that needed statin therapy were appropriately prescribed. Phosphate binders were utilized in 5/10 (50.0%) of patients with elevated phosphate levels and all patients with elevated phosphate levels and low calcium levels received calcium-containing phosphate binders (Figure 3). Assessment of potentially inappropriate prescribing indicators, revealed that about one percent; 2/170 (1.2%) of patients with eGFR<30 ml/min/1.73m^2 received prescription of NSAID and 2/188 (1.1%) patients with CKD stages 3-5 were prescribed a combination of NSAID, RAS inhibitor and diuretic. Contraindicated prescription of metformin was observed in 57.9% (11/19) of patients with eGFR<30 ml/min/1.73 m^2 (Figure 3).

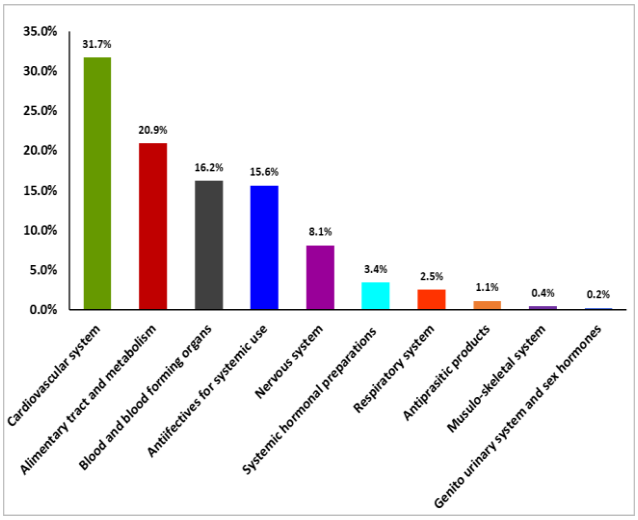

Figure 1: Top-10 therapeutic classes of drugs utilized among the CKD patients.

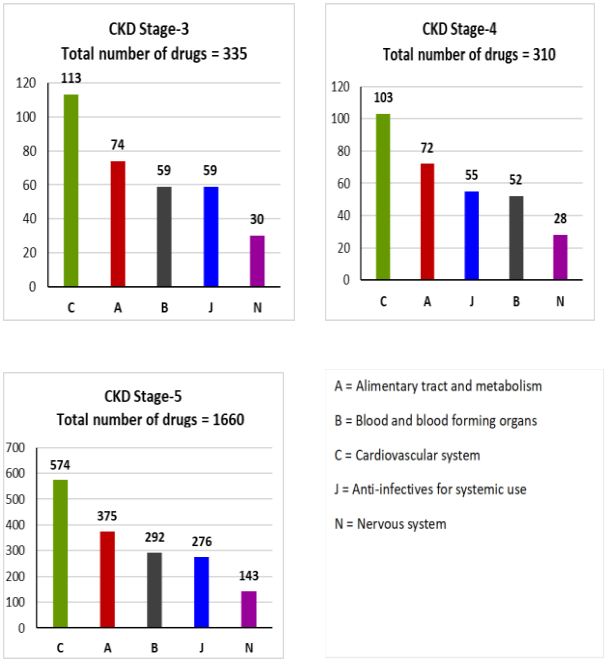

Figure 2: Top-5 main anatomical drug classes pattern by number of drugs utilized.

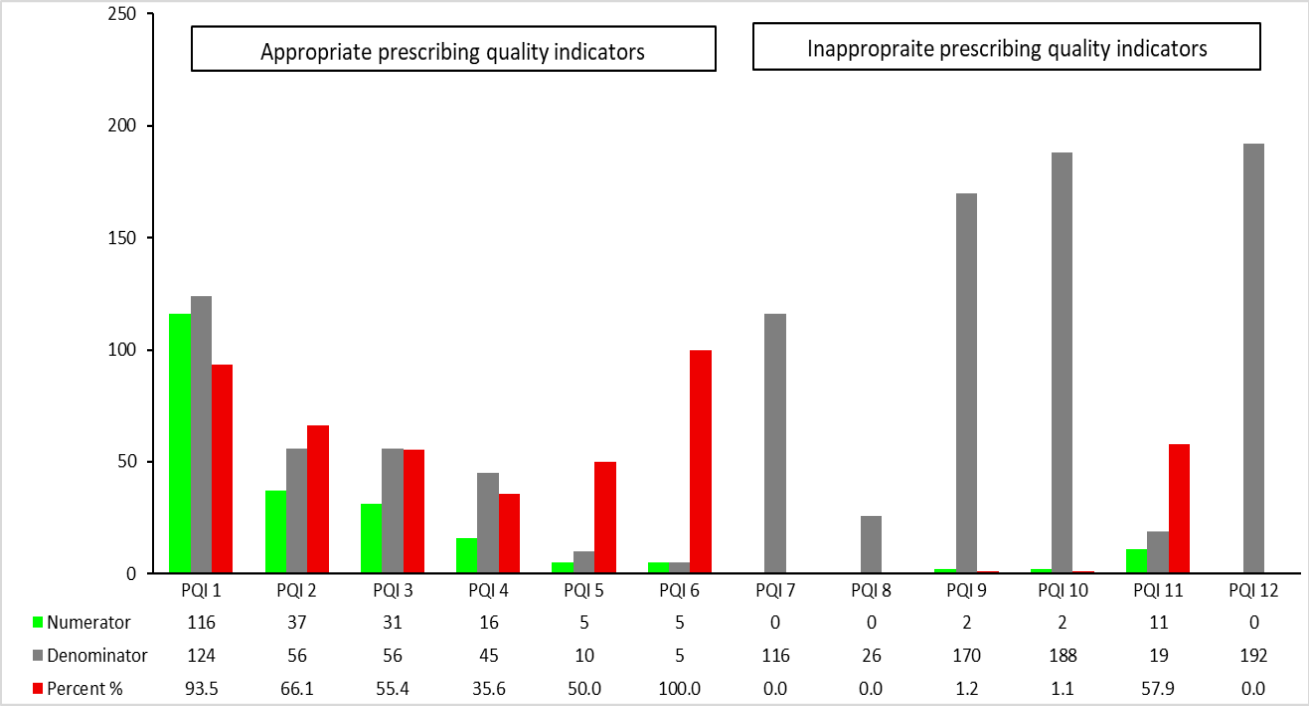

Figure 3: Overall prescribing quality indicators among the CKD patients.

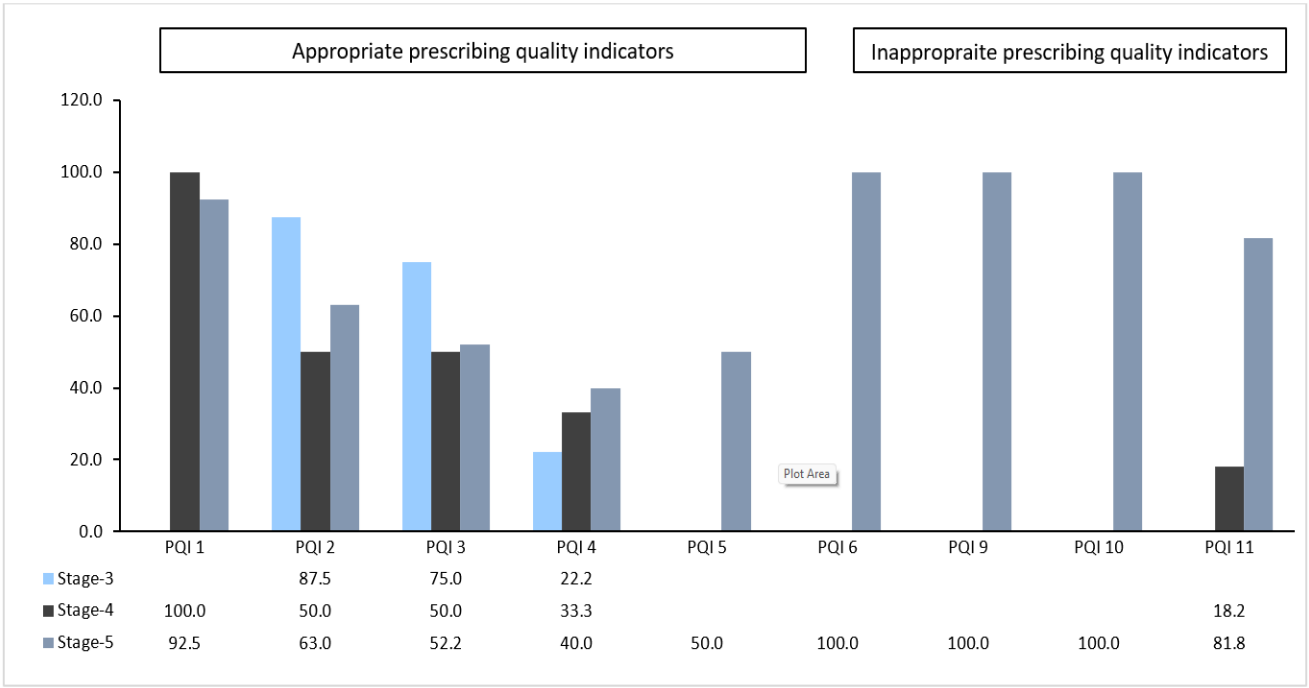

Figure 4: Prescribing quality indicators across the CKD stages.

Potential appropriate prescription of antihypertensive agents was higher in patients with CKD stage-4 (n=17/17, 100.0%) relative to CKD stage-5 (n=99/107, 92.5). Patients with stage-3 were the highest to have received RAS inhibitors (n=7/8, 87.5%), and combination of RAS inhibitors and diuretics (n=6/8, 75.0%) in (Figure 4). Statin therapy was potentially appropriately prescribed most to patients with CKD stage-5 (n=12/30, 40.0%), compared to patients with CKD stage-4 (n=2/6, 33.3%) and CKD stage-3 (n=2/9, 22.2%). Potential inappropriate prescription of metformin was predominant among patients with CKD satge-5 (n=9/11, 81.8%) compared to CKD stage-4 (n=2/11, 18.2%) in (Figure 4).

Table 1: Characteristics of the CKD patients (n=212).

Parameter	Number of patients (%)	Mean±Standard Deviation
Sex		
Male	122 (57.5)	
Female	90 (42.5)	
Age (years)	212 (100)	44.9±17.738
eGFR (ml/min/1.73m^2)	212 (100)	14.14±20.193
CKD Stage		
<60–30 ml/min/1.73m^2 (Stage–3)	32 (15.1)	48.81±13.376
<30–15 ml/min/1.73m^2 (Stage-4)	28 (13.2)	20.43±5.301
<15 ml/min/1.73m^2 (Stage-5)	152 (71.7)	5.38±3.124
Blood pressure (BP)		
Systolic BP (mmHg)	212 (100)	
High systolic BP >140 mmHg	105 (49.5)	154.5±10.248
Diastolic BP (mmHg)	212 (100)	
Low diastolic BP <70 mmHg	5 (2.4)	65.7±2.345
Urine protein test	65 (30.7)	2.02±1.097
Proteinuria; urine protein (≥1)	59 (27.0)	2.02±1.097
Phosphate (mmol/l)	13 (6.1)	2.11±0.789
High phosphate level (>1.49 mmol/l)	10 (4.7)	2.39±0.649
Calcium (mmol/l)	14 (6.6)	2.01±0.156
Low calcium level (<2.10 mmol/l)	14 (6.6)	2.01±0.156
Hemoglobin (mmol/l)	188 (88.7)	4.82±1.51
Normal hemoglobin level (≥7 mmol/l)	12 (5.7)	7.91±0.735
Etiologies		
Hypertension	144 (67.9)	
Diabetes mellitus	25 (11.8)	
Glomerulonephritis	16 (7.5)	
Obstructive uropathy	7 (3.3)	
Idiopathic	32 (15.1)	
Top-10 complications		
Anemia	170 (80.2)	
Fluid overload	135 (63.7)	
Leukocytosis	72 (34.0)	
Heart failure	61 (28.8)	
Uremic gastritis	61 (28.8)	
Proteinuria	59 (27.8)	
Hypoalbuminemia	54 (25.5)	
Hyperkalemia	52 (24.5)	
Urinary tract infection	45 (21.2)	
Emesis	35 (16.5)	

Table 2: Prescribing quality indicators utilized among the CKD patients (n=212).

#	Potential appropriate prescribing quality indicators
1	Percentage of patients between 18 and 80 years with CKD stages 4–5 and hypertension that is prescribed antihypertensives unless undesirable because of low diastolic blood pressure (< 70 mmhg)
2	Percentage of patients between 18 and 80 years with CKD stages 3–5 and proteinuria that is prescribed an ACE-I or ARB
3	Percentage of patients between 18 and 80 years with CKD stages 3–5 and proteinuria treated with multiple antihypertensives that is prescribed a combination of an ACE-I or ARB and a diuretic
4	Percentage of patients between 50 and 65 years with CKD stages 3–5 that is prescribed a statin
5	Percentage of patients between 18 and 80 years with CKD stages 3–5 and an elevated phosphate level (>1.49 mmol/l) that is prescribed a phosphate binder
6	Percentage of patients between 18 and 80 years with CKD stages 3–5 treated with phosphate binders and with low calcium level (< 2.10 mmol/l) that is prescribed a calcium-containing phosphate binder
#	Potential inappropriate prescribing quality indicators
7	Percentage of patients ≥ 18 years with CKD stages 3–5 treated with RAS inhibitors that is prescribed at least two RAS inhibitors (ACEI and ARB) simultaneously
8	Percentage of patients ≥ 18 years with CKD stages 3–5 and a normal hemoglobin level (≥7.5 mmol/l) that is prescribed an ESA
9	Patients ≥ 18 years with EGFR < 30 ml/min/1.73m^2 that is prescribed an NSAID
10	Patients ≥ 18 years with CKD stages 3–5 that is prescribed a combination of NSAIDS, RAS inhibitors and diuretics
11	Patients ≥ 18 years with EGFR < 30 ml/min/1.73m^2 and diabetes that is prescribed metformin
12	Patients ≥ 18 years with EGFR < 50 ml/min/1.73m^2 who are prescribed digoxin > 0.125 mg/day

DISCUSSION

Characteristics of the CKD patients

The demographic profile of the patients was characterized by a male predominance and the observation is comparable to other publications in Ghana, and Nigeria.[15,16] The observed mean age of 44.9 years was identical to the 43.9 years identified among CKD patients in another study in Ghana.[17] There was preponderance of CKD stage-5 which is consistent with the findings from other studies in developing countries including Gambia, and Libya.[18,19] The predominant patient presentation at end stage of renal disease in developing countries could be due to inadequate screening of patients with high risk factors for CKD, leading to delayed diagnosis. Hypertension was the prevalent etiology among the CKD patients which corresponds to the findings in other studies in Ghana.[15-20] Nevertheless, the finding is contrary to the global prevalent etiology which is diabetes mellitus.[21] Anemia was the most common complication among the CKD patients which is parallel to finding in an earlier study in Ghana.[17] This observation is akin to literature finding that anemia is the most common complication of CKD.[22]

Drug prescribing pattern

Analysis of prescribing pattern according to the first level ATC classification system revealed that drugs acting on the cardiovascular system (group C), alimentary tract and metabolism (group A), blood and blood forming organs (group B), anti-infectives for systemic use (group J) and nervous system (group N) were the most frequently prescribed. Prior studies among CKD patients have cited these classes of drugs as the commonly prescribed.[3-6]

Drug classes acting on the cardiovascular system were the highest utilized among the CKD patients. This finding is corroborated by studies in Asia and Europe.[7-9,23] This observation underscores the burden of cardiovascular comorbidities among CKD patients in the present study. The second most frequently prescribed drug class was agents for alimentary tract and metabolism accounting for 20.9% of the prescriptions. The rate is comparable to the findings in the United Kingdom (22.0%).[3] However, the proportion is significantly lower than the 44.86% reported in India.[24]

Blood and blood forming organs drug class represented 16.2% of the total drugs prescribed. Findings from other tertiary hospitals indicated lower (14.1%) and higher (21.38%) rates compared to the present result.[24,25]

Notably, the prescription of anti-infective agents (15.6%) in this setting exceeded the 1.04% - 10.11% range reported in previous literature.[24-26] Drugs acting on the nervous system consisted 8.1% of the total prescriptions. The rate is lower than the report in Europe; 13.5%.[3] However, the present finding is higher than the reported range in earlier publications in Asia; 1.46%–3.7%.[6,25]

Distribution of drug prescription according to CKD stage indicated that patients with CKD stage-5 received the highest drugs which was akin to an earlier report elsewhere in the United Kingdom.[3] Majority of CKD complications occur at advance stages of CKD especially in end stage renal disease, which usually require multiple drugs for treatment and thus may explain the observation.[27]

Drugs acting on the cardiovascular system were the most frequently utilized across all stages of CKD. Common cardiovascular risk factors including hypertension, diabetes mellitus and hypercholesterolemia are more common in CKD patients.[28] The relationship between cardiovascular disease and CKD is bidirectional, CKD can worsen cardiovascular disease, and cardiovascular diseases can further damage the kidneys.[29] The risk of cardiovascular diseases is a much higher in CKD patients particularly in end-stage renal disease compared to the general population.[30] CKD is one of the most potent risk factors for cardiovascular disease, and patients with advanced CKD have up to 10–20-fold greater risk of cardiovascular death.[29] Therefore, this makes management of cardiovascular diseases crucial for individuals with CKD and this may explain the prevalent prescription of drugs acting on the cardiovascular system across all stages of CKD.

Prescribing quality indicators

The present data shows a high rate (93.5%) of prescribing antihypertensive agents to patients who would benefit from them. The adherence rate compares positively to some other studies, higher than the 79.9% reported in Australia, though slightly lower than the 96.0% in Poland.[23-31] This near-optimal adherence is satisfactory because it aligns with the consensus in clinical guidelines that emphasize the importance of adequate blood pressure control in advanced CKD patients to mitigate cardiovascular risk and slow renal disease progression.[32] Interestingly, while prescription was optimal in CKD stage-4, a slight decline was noted in CKD stage-5. This observation may be attributed to clinical concerns regarding intradialytic hypotension, particularly with the use of beta-blockers due to their interference with normal cardiovascular reflexes during rapid volume removal and RAS inhibitors (i.e. ACEIs and ARBs) due to their reduction of vascular resistance.[33] Additionally, hypertension in patients with end stage renal disease is often caused by volume overload rather than sympathetic activity, making dialysis with ultrafiltration and dietary sodium restriction a principal strategy over aggressive management with anti-hypertensive agents over aggressive management with anti-hypertensive agents in this population.[34]

The use of ACEIs or ARBs (RAS inhibitors) are the mainstay therapy for CKD patients with proteinuria helping to decrease albuminuria and slow CKD progression. The present study shows that 66.1% of CKD patients with proteinuria who would likely benefit from RAS inhibitors received this therapy. The proportion was

comparatively higher than a report in the Netherlands where 56.5% of CKD stage 3–5 patients with proteinuria received RAS inhibitor.[35] Although, majority of the present study population were being prescribed RAS inhibitor therapy, a considerable therapeutic gap of 33.9% nonetheless exists among eligible patients. The existence of this substantial gap in the optimal nephroprotective prescribing often signals the presence of clinical inertia or apprehension. RAS inhibitors is often stopped or withheld in patients with advanced CKD due to concerns over potential adverse effects, primarily hyperkalemia and acute kidney injury, although increasing evidence suggest maintaining RAS inhibitors particularly in the presence of proteinuria often provides benefits that outweigh the risks.[36] Consistent with the aforementioned observation, the current study identified higher prescription of RAS inhibitors in patients with CKD stage-3 than in advanced CKD stages.

The indicator for combination therapy of ACEI or ARB and diuretic in patients with proteinuria taking multiple antihypertensives was achieved in 55.4% of eligible patients which is suboptimal. Compared to a previous published literature, lower rate of this indicator was recognized in 20.4% of similar CKD patients.[31] This suggests that the combined therapy of RAS inhibitors and diuretics which is often necessary to achieve challenging blood pressure reduction goals and maximize antiproteinuric effects may be underutilized in CKD population. Prescription of combination therapy of ACEI or ARB and a diuretic was more frequent in CKD stage-3 compared to advanced CKD stages which is consistent to an earlier observation in the Netherlands.[35] This observation may be attributed to the fact that thiazide and potassium-sparing diuretics are not recommended in advance CKD stages because thiazide diuretics become ineffective when eGFR falls below 30 ml/min/1.73m^2 and potassium-sparing diuretics increase risk of severe hyperkalemia.[37]

In our study, there was under prescribing of statin therapy for CKD patients for whom it is indicated. Only, 36.5% patients between 50 and 65 years with CKD stage 3–5 were prescribed statin therapy, which is more than twice lesser than the 74.3% rate identified in earlier publication.[4] In a primary care study in Singapore, the use of statins among CKD patients with dyslipidemia increased from 81.0% to 87.1%.[38] This implies that additional identification of cardiovascular disease or risk such as dyslipidemia contributes to increased prescription of statin therapy in CKD patients. Probably, unidentified cardiovascular disease or risk in the present CKD patients may have accounted for the lower prescription of statins. The prescription of statin therapy increased with higher stages of CKD which is comparable to an earlier report among CKD stage 3–5 patients.[35] Statin therapy was highest in patients with CKD stage-5, likely because this group have very high risk of cardiovascular death, myocardial infraction, and stroke often due accelerated atherosclerosis and vascular calcification and statin therapy is the primary pharmacological agent used to mitigate these risks.[39]

Phosphate binder therapy was prescribed to 50.0% of patients with hyperphosphatemia. The proportion was higher than prior documentation in Germany; 37.5%, but also lower than the 75.4% in the Netherlands.[23] The observation of half of the patients with hyperphosphatemia not prescribed phosphate binders may suggest a failure to recognized that dietary restriction of phosphates alone is insufficient and unreliable for maintaining phosphate levels with normal range.[36]

The study found excellent adherence in avoiding prescription of three critical unsafe therapies; dual RAS blockade (ACEI and ARB), ESA for patients with normal hemoglobin and high-dose of digoxin. The current observation to avoid prescription of dual RAS blockade is consistent to what was documented in Poland.[23] Nevertheless, dual therapy of RAS inhibitors were prescribed to seven (4.9%) and eight (2.0%) CKD patients in Germany and Italy respectively.[23] A combination of ACEI with ARB is known to be associated with an increased risk of hyperkalemia, kidney damage, and hypotension.[40] Therefore, dual therapy with RAS inhibitors is inappropriate in patients with CKD.[40]

The audit found out that only 1.2% patients with severe renal impairment were prescribed NSAIDs. This low rate is encouraging, NSAIDs are known to pose a significant risk of acute kidney injury and accelerated CKD progression especially when the eGFR is less than 30ml/min/1.73m^2. The present finding is comparable to the reported 1.4% prescription of NSAIDs in Germany.[23] However, extremely higher rate than current proportion was recognized in Australia;14.3%.[31] The combination of NSAID, RAS inhibitor, and diuretic known as the “Triple Whammy” was observed only 1.1% patients which is comparable to 1.4% and 1.0% recognized in Germany and United Kingdom respectively.[23] The observation is favorable because “Triple Whammy” combination is associated with increased risk of acute kidney injury. However, it was worrisome that the inappropriate prescription of NSAIDs and “Triple Whammy” solely occurred in patients with CKD stage-5 which are the most vulnerable group to experience the severe consequences of this drug-related problem.

A critical safety concern was identified metformin prescription; more than half; 57.9% of patients with eGFR<30 ml/min/1.73m^2 received contraindicated prescription of metformin. From literature a reference range of 14.1%–21.0% prescription of metformin for patients with eGFR < 30 ml/min/1.73 m^2 has been documented.[4-31] Thus, the current finding is more than twice higher than the literature range of contraindicated prescription of metformin in CKD patients. This finding constitutes a critical failure in patient safety protocol in the setting which requires urgent attention. Metformin is not recommended in patients with eGFR less than with

eGFR<30 ml/min/1.73 m^2 due to risk of accumulation leading to lactic acidosis. Moreover, it is particularly worrisome that patients with CKD stage-5 which are more riskier of this phenomenon were the predominant group to have received the inappropriate prescription.

CONCLUSION

The current study is the first to assess drug utilization pattern and prescribing indicators among CKD patients in Ghana and hence will serve as a background data for future drug utilization studies among CKD patients across hospitals in Ghana. CKD specific PQIs demonstrated optimal compliance with some safety related indicators including avoidance of dual RAS blockade, inappropriate ESA, and digoxin prescription. There was near optimal adherence to appropriate prescription of antihypertensive agents, and avoidance of inappropriate use of NSAIDs and Tripple Whammy. However, there were notable gaps in the appropriate use of mainstay CKD therapy (ACEIs or ARBs and statins) and high contraindicated prescription of metformin which underscores the need for targeted interventions to mitigate these challenges.

ACKNOWLEDGEMENTS

The authors are grateful to the management of Tamale Teaching Hospital, especially the Research Department and the Records Management Department for their guidance in obtaining permission to conduct the research in the hospital and for their support in the electronic data retrieval.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The Research Department of the Tamale Teaching Hospital reviewed and gave consent for the study to be conducted in the hospital. The Kwame Nkrumah University for Science and Technology Committee on Human Research Publication and Ethics gave ethical approval for the study [CHRPE/AP/885/25]

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Cite this article as: Aidoo M, Ansah C, Donkor AF. Assessment of drug prescribing pattern and quality indicators among chronic kidney disease patients in a tertiary hospital in Northern Ghana. Int J Basic Clin Pharmacol 2026;15:499-508.