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Study Of Medication Utilization Evaluation in Patients with Chronic Kidney Disease and Acute Renal Disease in Tertiary Care Hospital: An Cross- Sectional Study

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ABSTRACT

Background: Medication utilization evaluation involves the assessment of drug marketing, distribution, prescribing, and usage within a society, with particular focus on the associated medical, social, and economic outcomes. DUE is a continuous, authorized, and systematic process aimed at improving the quality of healthcare. AKI and CKD are interrelated syndromes, with AKD (7–90 days post-AKI) serving as a critical phase for intervention to prevent CKD progression. AKD is associated with high morbidity, especially in elderly and comorbid patients. Globally, AKI impacts 13.3 million people annually, with 1.7 million deaths. Management includes recurrence prevention, early nephrology referral, and targeted therapies such as RAS inhibitors. This study evaluates medication utilization patterns in chronic kidney disease using WHO core drug use indicators to identify and improve rational prescribing practices.

Methodology: Approval from the Institutional Ethics Committee, a descriptive cross-sectional study was conducted over a one-year period (March 2023 to February 2024) to evaluate the prescription patterns and drug utilization in patients with renal diseases. The study was carried out in the Nephrology Outpatient Department of a tertiary care hospital in Sangli, Maharashtra, India.

Results: In this study of 200 renal patients, CKD was more prevalent (79%) than AKI. The mean drugs per prescription were 6.5 ± 2.2, with 64% prescribed by brand name and 76% from the NLEM. Tablets were the most common dosage form (70%), and erythropoietin and nifedipine were the most frequently used supplement and antihypertensive, respectively.

Conclusions: This study highlights that CKD was the predominant diagnosis among renal patients, with frequent polypharmacy and high use of essential medicines. The findings underscore the need for rational prescribing practices and increased use of generics to optimize outcomes and reduce treatment costs.

Keywords: *Medication utilization evaluation, Chronic Kidney Disease, Acute Kidney Disease, Prescription Pattern.*

1. INTRODUCTION

Rational medication use is essential for achieving optimal therapeutic outcomes, yet in India factors such as illiteracy, poverty, fragmented healthcare systems, unchecked drug promotion, non-prescription sales, market competition and poor drug information access impede success. Irrational use drives up costs, fuels resistance, causes adverse reactions and increases mortality. Medication Utilization Evaluation (MUE) studies address these issues by systematically reviewing prescribing, dispensing, administration and patient use to enhance healthcare quality. [1] According to the WHO, Drug Utilization Evaluation (DUE) involves the assessment of drug marketing, distribution, prescribing, and usage within a society, with particular focus on the associated medical, social, and economic outcomes. DUE is a continuous, authorized, and systematic process aimed at improving the quality of healthcare. [2]

Drug utilization research is essential to promote rational prescribing, ensuring patients receive appropriate medications in correct doses, for the right duration, and at minimal cost, as emphasized by WHO. It identifies inappropriate drug use, which can lead to adverse outcomes, resistance, and increased healthcare burden. By analyzing prescribing trends, comparing them with guidelines, and providing feedback to prescribers, this research supports clinical decision-making. It also guides policy changes and optimizes healthcare resource use—especially crucial in countries like India, where the majority of healthcare expenses are paid out-of-pocket. The World Health Organization (WHO) has established key indicators to assess prescriber ability, patient satisfaction, and health worker performance. Studying these indicators helps improve prescribing patterns, reduce patient financial burdens, and improve patient outcomes.[2,3]

Chronic Kidney Disease(CKD) is a leading cause of global morbidity and mortality. Developed countries like the USA, UK, and China have seen a 5–13% rise in incidence over the past 20 years, while developing countries plateaued at ~14%. CKD-related deaths have more than doubled since 1990, reaching 1.4 million by 2019. In 2017, 697.5 million cases were reported globally, with India and China contributing one-third. In India, CKD prevalence ranges from <1% to 21% across regions. [4]

AKI and CKD are linked syndromes, with AKD defined as kidney dysfunction occurring 7–90 days after AKI, representing a critical window to prevent CKD progression. AKD is common in elderly and patients with chronic diseases, and is associated with high morbidity and mortality. Globally, AKI affects approximately 13.3 million people and causes around 1.7 million deaths annually. Key pathophysiological mechanisms include tubular cell-cycle arrest, inflammation, mitochondrial dysfunction, and RAS activation. Management involves preventing recurrent AKI, early nephrology follow-up, optimizing medications, blood pressure, nutrition, and exploring novel therapies like RAS inhibitors. [5, 6]

Assessment of drug utilization patterns under specific clinical conditions provides critical insights into prescribing behaviors and facilitates the identification of irrational medication use. Systematic evaluation methods are essential to promote rational pharmacotherapy. In this context, the World Health Organization (WHO) has established core drug use indicators as standardized tools for utilization studies. The present study aims to analyze the medication utilization patterns in patients with chronic renal disease by applying the WHO core drug use indicators.

2. MATERIALS AND METHODS

The study was conducted following ethical standards and received formal approval from the Institutional Ethics Committee, ensuring compliance with all relevant ethical guidelines and regulatory requirements for research involving human subjects.

A descriptive cross-sectional study was conducted over one year (March 2023 to February 2024) to evaluate medication utilization in patients with chronic kidney disease (CKD) and acute kidney injury (AKI). The study took place in the Outpatient Department of Nephrology, within the Department of General Medicine, at a tertiary teaching medical college and hospital in Islampur, sangli, maharshtra. A total of 200 patients diagnosed with renal diseases were identified from the nephrology OPD. After explaining the study objectives, written informed consent was obtained from all participants, and their data were collected using a pre-designed and ethically approved case record form.

Study Population:

Patients diagnosed with Acute Kidney Injury (AKI) and Chronic Kidney Disease (CKD).

Inclusion Criteria:

1. Patients diagnosed with acute or chronic kidney disease.
2. Patients aged over 18 years, of either gender, with available prescription records.
3. Patients who provide informed consent.

Exclusion Criteria:

1. Emergency and critically ill patients.
2. Patients exclusively on dialysis.

Data Analysis:

Data were entered and analyzed using Microsoft Excel 2007. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize the data.

3. RESULTS

Demographic Details of Patients:

Data from 200 patients diagnosed with renal disease were collected from the nephrology outpatient department.

- Age-wise Distribution:

The mean ± SD age for females was 45.20 ± 13.85 years, and for males, it was 49.10 ± 12.90 years.

- Gender-wise Distribution:

Among the 200 patients, 108 (54.00%) were male and 92 (46.00%) were female.

Table: 1: Demographic Details of Patients

Demographic Variable	Frequency (n = 200)	Percentage (%)	Mean Age (years) ± SD
Gender			
Male	108	54	49.10 ± 12.90
Female	92	46	45.20 ± 13.85

Clinical Parameters of the Patients

- **Diagnosis:**
  Kidney diseases were classified based on duration and clinical presentation. Chronic Kidney Disease (CKD) was the most prevalent diagnosis, seen in 158 patients (79.00%), while Acute Kidney Injury (AKI) was diagnosed in 42 patients (21.00%).
- Dosage Form:

Tablets were the most commonly prescribed dosage form, constituting 70.00% (approximately 910) of all prescriptions. Injections accounted for 25.00% (approximately 325) of prescriptions. Other forms included capsules at 3.00% and syrups at 2.00%.

Table 2: Clinical Parameters of the Patients

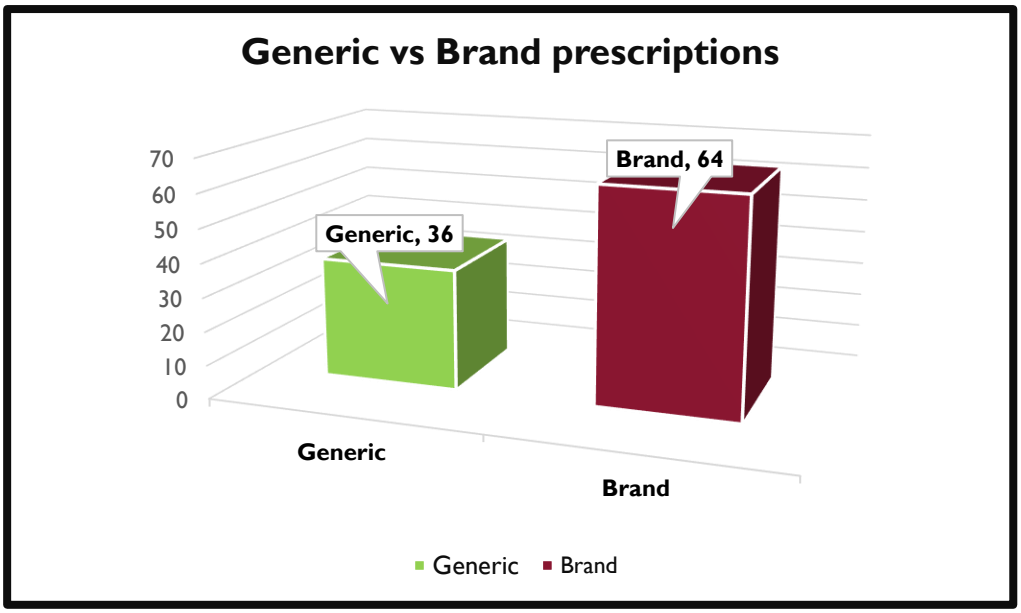
Clinical Parameter	Category	Frequency (n = 200)	Percentage (%)
Diagnosis	Chronic Kidney Disease (CKD)	158	79
	Acute Kidney Injury (AKI)	42	21
Dosage Form	Tablet	910	70
	Injection	325	25
	Capsule	39	3
	Syrup	26	2

WHO Core Prescribing Indicators:

1. **Drugs prescribed Brand vs. Generic Prescription Pattern:**

In the treatment of renal diseases, 64% of prescriptions were written by brand name and 36% by generic name, indicating a preference for brand prescribing in clinical practice. (Graph 1)

Graph no 1: Brand vs. Generic Prescription Pattern



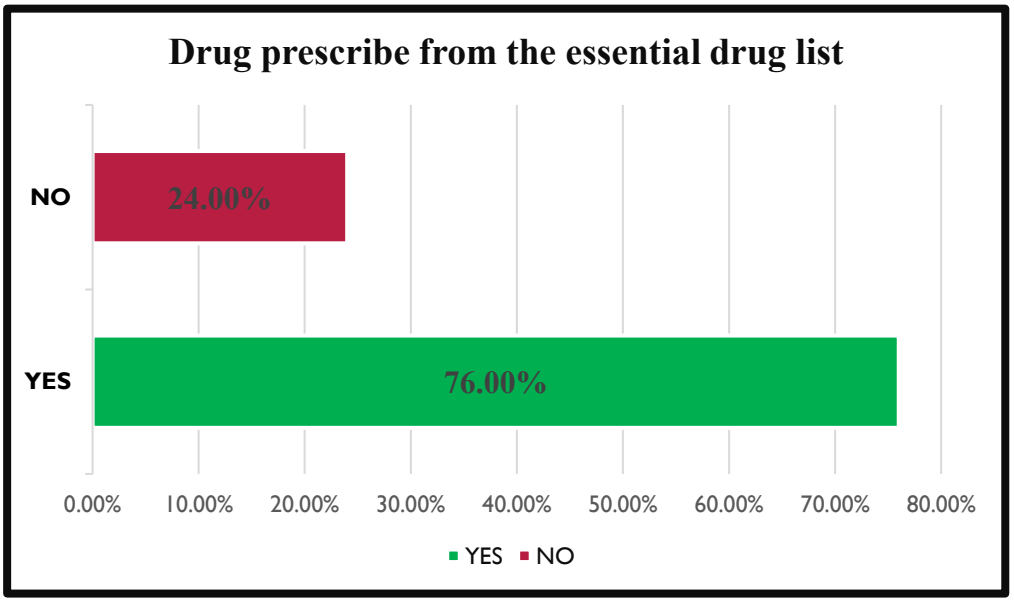
2. Average number of drugs per prescription (Polypharmacy Analysis)

A total of 200prescriptions, were evaluated to assess polypharmacy patterns in renal disease management. The mean number of drugs prescribed per prescription was 6.5 ± 2.2, reflecting a significant degree of polypharmacy. The most common drug count per prescription was seven (35%), followed by six (29%) and four (28%). A smaller proportion of prescriptions included eight or more medications. These findings underscore the complexity of pharmacotherapy in patients with renal disease and the importance of regular prescription review to minimize the risks associated with polypharmacy.

3. Percentage of drug prescribe from the essential drug list: -

A total of 97 distinct medications were prescribed for the treatment of renal diseases, with 76% of these drugs being from the National List of Essential Medicines (NLEM). The commonly prescribed NLEM medications included calcium carbonate, carvedilol, aspirin, cefuroxime, ciprofloxacin, erythropoietin, ethambutol, ferrous ascorbate, metformin, glimepiride, furosemide, amlodipine, telmisartan, atorvastatin, and pantoprazole, among others. This high proportion of essential medicines reflects adherence to standardized, cost-effective pharmacotherapy guidelines in managing renal conditions. (Graph 2)

Graph no. 2: Percentage of drug prescribe from the essential drug list



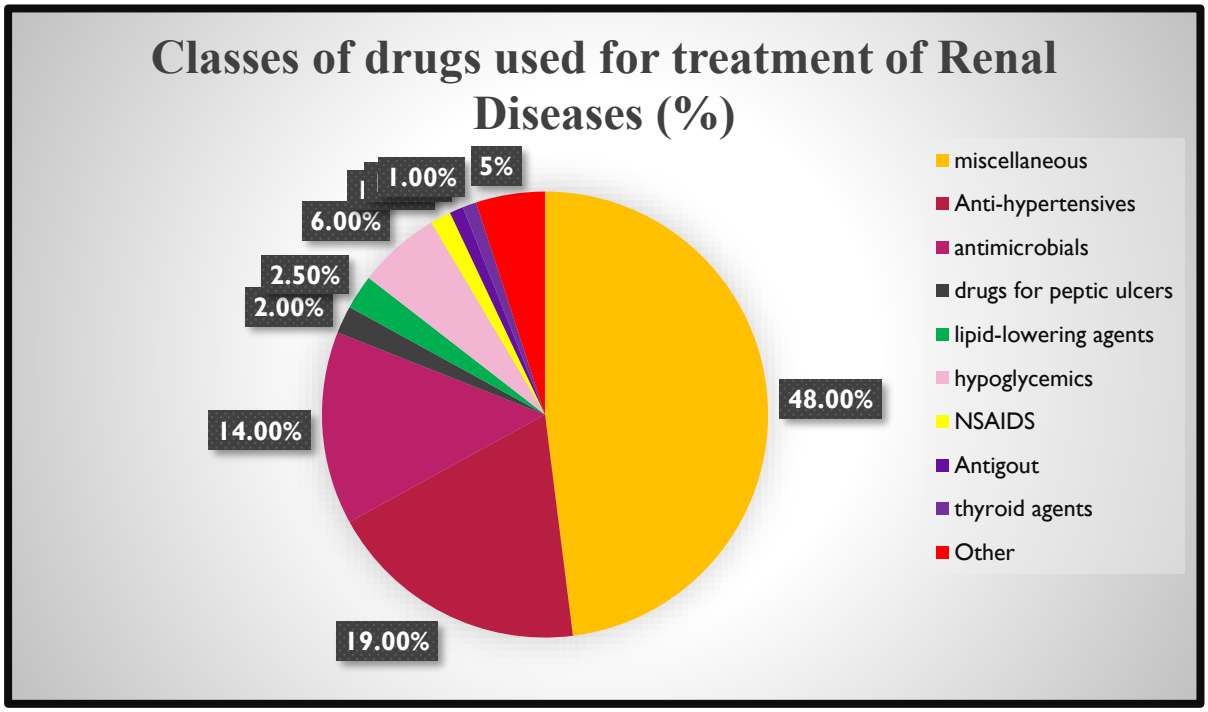
4. Percentage of antibiotic prescribed

Antibiotics accounted for 14% of all medications prescribed. Among these, amoxicillin was the most frequently prescribed, representing 17% of antibiotic use. Other commonly prescribed antibiotics included levofloxacin, ciprofloxacin, rifampicin, isoniazid, ethambutol, cotrimoxazole and others.

Classes of drugs:

A variety of drug classes were prescribed for renal disease management, including miscellaneous agents, antihypertensives, antimicrobials, drugs for peptic ulcers, lipid-lowering agents, hypoglycemics, NSAIDs, antigout medications, thyroid agents, and others. Among all medications prescribed, miscellaneous drugs constituted the largest proportion at 48%, followed by antihypertensives at 19%, and antibiotics at 14% (see Graph 3).

Graph no. 3: Classes of drugs used for treatment of renal diseases



Miscellaneous Drugs used in the treatment of renal diseases:

CKD and AKI were treated with a large number of Miscellaneous Drugs. There were 48 % Supplements which were prescribed. It consisted of both injection and oral preparations. erythropoietin was prescribed the most, it was prescribed 36% times. Followed by multi vitamin tablet and injections 17%, Calcium was 11%, iron sucrose was 8%, vitamin D was 7% and others (21%). (Table 3)

Drug Name	Number of Drugs (n)	Percentage of Supplements (%)	Percentage of Total Drugs (n = 1300) (%)
Erythropoietin	225	36.06	17.31
Multivitamin	106	16.99	8.15
Calcium	69	11.06	5.31
Iron Sucrose	50	8.01	3.85
Vitamin D	44	7.05	3.38
Others	130	20.83	10
Total	624	100	48

Antihypertensive Use in Renal Disease

Out of 247 antihypertensives prescribed, oral formulations predominated. Nifedipine was the most commonly used (43%), followed by carvedilol (26%), torsemide (13%), and amlodipine (11%). The remaining 8% included agents like prazosin, ramipril, and telmisartan. These choices reflect standard practice for managing hypertension and fluid overload in CKD and AKI patients. (Table 4)

Antihypertensive Drug	Number of Prescriptions (n)	Percentage (%)
Nifedipine	106	42.91
Carvedilol	64	25.91
Torsemide	32	12.96
Amlodipine	27	10.93
Others	18	7.29

4. DISCUSSION

Patients with chronic kidney disease (CKD) and acute kidney injury (AKI) frequently require complex and long-term pharmacotherapy due to multiple comorbid conditions such as hypertension, diabetes mellitus, cardiovascular disease, and anemia. The presence of polypharmacy and altered drug metabolism in renal dysfunction elevates the risk of adverse drug reactions and treatment-related complications. As prescribing patterns evolve in response to clinical guidelines and drug availability, evaluating drug utilization becomes essential to optimize therapeutic outcomes.

In our study, a total of 200 patients were enrolled, with a slight male predominance—54% (n = 108) were male and 46% (n = 92) were female. These findings are in line with the study conducted by Neeta J. et al., which included 302 patients, of whom 61.26% (n = 185) were male and 38.74% (n = 117) were female, resulting in a male-to-female ratio of 1.58:1. The observed male predominance in both studies may be attributed to a higher prevalence of renal risk factors in males and potentially greater access to healthcare services.[7]

In our study, kidney diseases were classified based on clinical presentation and duration, with Chronic Kidney Disease (CKD) being the predominant diagnosis in 79% of patients, and Acute Kidney Injury (AKI) observed in 21%. Tablets were the most frequently prescribed dosage form (70%), followed by injections (25%), capsules (3%), and syrups (2%), reflecting prescribing trends in renal care. Similarly, in the study by Neeta J. Kanani, tablets constituted 69.15% of all formulations, followed by injectables at 23.20%, which aligns with our observations.[7]

Regarding prescription patterns, 64% of drugs were prescribed by brand name and 36% by generic name, indicating a preference for brand prescribing in clinical settings. This contrasts with Neeta J. Kanani's findings, where 64.08% were prescribed generically. In the study by Dr. Luai Fahd Mohammad Alhetari, 54% of drugs were prescribed using generic names, and 80% were from the Essential Medicines List, highlighting greater adherence to WHO recommendations. [7,8]

Polypharmacy was a notable feature in our study, with the mean number of drugs per prescription being 6.5 ± 2.2. The most common drug count per prescription was seven (35%), followed by six (29%) and four (28%), indicating moderate to high levels of polypharmacy. These findings are in line with Janet Mary Oommen's study, where the mean number of drugs per prescription ranged between 7.51 ± 2.09 and 8.52 ± 1.35, and polypharmacy (≥5 drugs) was present in 86.75% of cases. In contrast, Dr. Alhetari's study reported a much higher average of 12 drugs per case, further emphasizing variability in prescribing practices across different settings. [9]

In the present study, a substantial proportion of prescriptions in CKD and AKI management included miscellaneous drugs, with supplements accounting for 48% of total prescriptions. Among these, erythropoietin was the most commonly used agent (36%), reflecting its central role in managing renal anemia. Other frequently used supplements included multivitamins (17%), calcium (11%), iron sucrose (8%), and vitamin D (7%). These findings align with the high prevalence of anemia and mineral-bone disorders in renal patients. Antihypertensive drugs also constituted a major component, with 247 prescriptions noted—primarily oral formulations. Nifedipine (43%), carvedilol (26%), torsemide (13%), and amlodipine (11%) were the most commonly prescribed agents. This prescribing trend reflects guideline-based approaches aimed at controlling blood pressure and managing fluid overload in renal populations.

A study conducted by Harshita et al. in Haryana demonstrated broader use of antihypertensive classes, with calcium channel blockers (CCBs) being the most frequently prescribed (59 patients), followed by diuretics (46 patients) and alpha-blockers (34 patients). The study also highlighted diverse combinations, including ARBs with diuretics and diuretics with CCBs, indicating an individualized treatment approach. For anemia management, injectable erythropoietin was the most used, consistent with our findings, while multivitamins, iron preparations, and folic acid combinations were also commonly

prescribed. Additionally, management of bone-mineral disorders involved calcium carbonate with vitamin D3, calcium gluconate, and cholecalciferol, similar to the supplementation trends observed in our study. In contrast, Insa M. Schmidt et al. reported simvastatin (38.4%), ramipril (31.7%), and aspirin (32.6%) as the most commonly prescribed agents in CKD patients, reflecting a stronger emphasis on cardiovascular risk management. Their study also noted significant use of vitamin D (31%), magnesium, iron (5%), and folic acid (2%), while the use of vitamin K antagonists and psychotropic medications remained lower. Notably, the inclusion of over-the-counter (OTC) and homeopathic agents in their cohort underscores the diversity of therapeutic practices across settings.[10]

These variations in drug use highlight regional differences in prescribing practices and underscore the importance of periodic drug utilization evaluations to ensure evidence-based, cost-effective, and rational pharmacotherapy in renal patients.

5. CONCLUSION

This study of 200 renal patients revealed CKD as the most common diagnosis. Tablets were the predominant dosage form, and polypharmacy was frequent with an average of 6.5 drugs per prescription. Most drugs (76%) were from the National Essential Medicines List, indicating adherence to standard treatment. Supplements, especially erythropoietin, and antihypertensives like nifedipine and carvedilol were commonly prescribed. These findings highlight the need for ongoing prescription review and rational drug use to improve patient outcomes. Understanding these prescribing patterns is crucial for optimizing therapeutic outcomes and healthcare resource utilization in this patient cohort. The study highlights the imperative to reinforce prescribing policies that encourage the use of generic medications to enhance treatment accessibility and cost-effectiveness.

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Conflict of interest: None declare

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