

EVALUATION OF PRESCRIBING PATTERN AND IMPACT OF POLYPHARMACY IN GERIATRIC PATIENTS WITH CHRONIC KIDNEY DISEASE

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ABSTRACT

Background: Chronic kidney disease (CKD) is a progressive and irreversible condition commonly affecting elderly patients and is frequently associated with multiple comorbidities such as hypertension, diabetes mellitus, and cardiovascular diseases. Management of CKD often requires multiple medications, leading to polypharmacy, which increases the risk of adverse drug reactions, drug interactions, and medication-related problems. Evaluating prescribing patterns and identifying potentially inappropriate medications are essential to improve therapeutic outcomes and ensure patient safety in geriatric populations. **Objective:** To evaluate prescribing patterns and assess the impact of polypharmacy among geriatric patients with chronic kidney disease and to identify potentially inappropriate medications using Beers Criteria 2023. **Methods:** A prospective observational study was conducted in the nephrology department of a tertiary care hospital. A total of 80 geriatric patients with chronic kidney disease were enrolled

based on inclusion and exclusion criteria. Data including demographic characteristics, comorbidities, prescribed medications, and laboratory findings were collected using structured data collection forms. Prescriptions were evaluated for polypharmacy, drug interactions, and potentially inappropriate medications using Beers Criteria 2023, and data were analyzed using appropriate statistical methods. **Results:** Most patients were males aged 65–74 years. Hypertension and diabetes mellitus were common comorbidities. Polypharmacy was prevalent, with many patients receiving 11–15 medications. Antihypertensive drugs were

most frequently prescribed, and potentially inappropriate medications were identified in several prescriptions. **Conclusion:** Polypharmacy and inappropriate prescribing were common, highlighting the need for regular prescription review and improved medication safety.

KEYWORDS: Chronic kidney disease, Polypharmacy, Geriatric patients, Prescribing pattern, Beers Criteria, Potentially inappropriate medications.

1. INTRODUCTION

Chronic kidney disease (CKD) is a condition caused by a damage to the structure or functions of the kidneys and lasting for more than 3 months. It is based on a fall in kidney function with an estimated glomerular filtration rate (eGFR) of less than 60 mL/min/1.73 m or presence of kidney damage markers such as albuminuria or hematuria. Diabetes and high blood pressure are the main causes of CKD worldwide, and many times the patients do not show symptoms till the disease is progressed.^[1,2] CKD is categorized in five phases depending on kidney function, from mild kidney damage to stage 5 or end-stage renal disease (ESRD) when the patient needs dialysis or transplant.^[1-5]

At present CKD is causing morbidity in about 10% of global population and it is especially more common in the elderly people, usually it is associated with other diseases such as diabetes, hypertension and cardiovascular diseases outcomes.^[3,4,6] Patients with CKD are often on multiple medications at the same time, which leads to polypharmacy. Polypharmacy increases the likelihood of the side effects of medications, drug-drug interactions and even hospitalization and death, especially in elderly patients.^[7,8,9]

The Beers Criteria which is a list of drugs created by the American Geriatrics Society is a tool that recognizes medications that should be avoided in the elderly.^[12,13,14] The study is designed to assess the pattern of prescriptions and the effect of polypharmacy in geriatric patients with chronic kidney disease with an intention to enhance medication safety and therapeutic outcomes.^[10,11]

2. AIM

To evaluate prescribing patterns and determine the impact of polypharmacy among geriatric patients with chronic kidney disease (CKD).

3. OBJECTIVE

To assess the appropriateness of prescribed medications in geriatric CKD patients using the AGS Beers Criteria 2023.

To identify and evaluate drug-related problems associated with polypharmacy, including adverse drug reactions and drug-drug interactions.

To analyze the effect of polypharmacy on clinical outcomes and promote safer, more effective medication use in geriatric CKD patients.

To support rational prescribing practices and enhance the quality of patient care in elderly individuals with CKD.

4. METHODOLOGY

This prospective observational study will be done at the Department of General Medicine, Sri Ramakrishna Hospital, Coimbatore. First, patients who qualify as per the inclusion and exclusion criteria were recruited after obtaining their consent. Data collection forms which are well designed and structured were prepared and used. This form mainly includes demographic details, educational qualifications, social habits, current medication, past medical and medication history, laboratory data, and other relevant information. Relevant additional information was obtained from the patient's progress notes, treatment chart, laboratory reports, and patient interviews.

The medication regimen of study subjects was closely supervised and reviewed regularly. In case of necessity, patients were interviewed and discussions with doctors regarding identified Medication-Related Problems (MRPs) took place during ward rounds and outpatient visits. Patient data was collected through interviews with nursing staff and caregivers to obtain detailed information. From the gathered data, the pattern of drug utilization for the treatment of uncontrolled diabetes will be analyzed. Various drug-related problems (DRPs) such as incorrect medication noncompliance adverse drug reactions, and drug interactions, were the major focuses while evaluating the gathered data. This evaluation method relied on primary (standard literature), secondary (Micromedex), and tertiary resources (e.g. BNF AHFS, and Martindale), which were all accessible in the clinical pharmacy department.

Clinical pharmacy services that offered patient education, exploring drug interactions, and delivering drug information were given whenever the patient or the healthcare professionals

required it. The captured data was recorded and evaluated using the appropriate statistical methods.

5. RESULTS

This research work was set in nephrology department of a tertiary care teaching hospital. Inclusion and exclusion criteria were considered 80 patients for our study. As per the planned methodology, the research is presently at phase II, up to now 80 cases have been collected and the following results given.

Gender –Wise Categorization

In this study out of 80 patients, (57) 71.25% of the patients were males and (23) 28.75% were Females.

Table 1: Gender Wise Distribution Of Study Participants.

(n= 80)

GENDER	NO OF PARTICIPANTS	PERCENTAGE
MALE	46	60.52%
FEMALE	30	39.47%

Table 2: Age –Wise Distribution: (n= 80)

Patients age distributions were analysed, and of the 80 patients, it was revealed that 62.5% were aged 65-74 years (50), next 32.5% were 75-84 years (26), and only 5% were 85-94 years (4).

AGE IN YEARS	NO OF PATIENTS	PERCENTAGE
65-74 YEARS	50	62.5%
75-84 YEARS	26	32.5%
85-94 YEARS	4	5%

Table 3: Number of days patients stayed in hospital

Most of the participants in the study 53 (66.25%) had a total hospitalization of 2-4 days. A smaller number of patients 22 (27.5%) stayed for 5-7 days, whereas only 5 patients (6.25%) were hospitalized for 8-10 days.

Total hospital stay	No. of patients (n=20)	Percentage (%)
2-4	53	66.25%
5-7	22	27.5%
8-10	5	6.25%

Table 4: Details of number of drugs prescribed per prescription

Among the study subjects, 30 of the patients were taking (5-10) drugs while 39 of the patients were receiving (11-15) drugs, which was the most typical range. Besides, 11 patients were on (16-20) drugs showing that there was a high level of polypharmacy in the sample.

S.no	No. of medications	No of patients
1.	5-10	30
2.	11-15	39
3.	16-20	11

Table 5: Number of comorbidities (n= 80)

Hypertension 60 (75%) and diabetes mellitus 55 (68.75%) accounted for the most common comorbidities, with coronary artery disease 21 (26.25%) and Anemia 13 (16.25%) coming next. Stroke, hypothyroidism, and dyslipidemia were hardly seen, on the other hand respiratory musculoskeletal, renal, and other conditions were present in very small proportions, thus pointing out cardiovascular and metabolic disorders as main trouble players among patients.

Comorbidity	No. of Patients	Percentage (%)
Hypertension	60	75%
Diabetes Mellitus	55	68.75%
Coronary Artery Disease	21	26.25%
Anemia	13	16.25%
CVA	9	11.25%
Hypothyroidism	7	8.75%
Dyslipidemia	4	5%
IHD	3	3.75%
Pulmonary edema	3	3.75%
Bronchitis	3	3.75%
Osteoarthritis	2	2.5%
COPD	2	2.5%
UTI	2	2.5%
Renal stone disease	2	2.5%
CCF	2	2.5%
Asthma	1	1.25%
Renal Failure	1	1.25%
Rheumatoid arthritis	1	1.25%

Table 6: Classification of drugs

Out of the 562 total drugs, 112 (19.92%) were antihypertensive which is the largest share, then 78 (13.87%) were anti diabetic agents and 57 (10.14%) drugs acting on gastrointestinal system. Besides, antimicrobial drugs 60 (10.67%) and cardiovascular agents 56 (9.96%) were also to a large extent.

Such a breakdown clearly reflects the main role of drugs used for the treatment of chronic diseases such as hypertension, diabetes and cardiovascular disorders among the people under study.

S.no	Classes of drugs	No. Of drug (n=562)	Percentage
1	Drugs acting on Cardiovascular system	56	9.96%
2	Drugs acting on Gastrointestinal system	57	10.14%
3	Antihypertensive drugs	112	19.92%
4	Anti-diabetic drugs	78	13.87%
5	Drugs acting on central nervous system	30	5.33%
6	Drugs acting on blood and blood forming agents	21	3.73%
7	Antimicrobial drugs	60	10.67%
8	Drugs acting on respiratory system	35	6.22%
9	Drugs acting on CVA	25	4.44%
10	Analgesics	28	4.98%
11	Anti emetic drugs	20	3.55%
12	Drugs for Anemia	10	1.77%
13	Drugs for Osteoarthritis	5	0.88%
14	Antacids	9	1.60%
15	Corticosteroids	8	1.42%
16	Anti gout drugs	8	1.42%

EVALUATION OF PRESCRIPTION USING BEERS CRITERIA

Eighty geriatric patients admitted to the nephrology department were included. They were split by age and gender. Using BEER'S CRITERIA, common meds got checked - some were solid, others weren't. At least in theory, this helps flag risky prescriptions. The system works for now but may not catch every issue.

Table 7: Categorization of Prescription using Beers Criteria.

Category of prescription	No. of prescription	Percentage
Inappropriate prescription	41	51.25%
Appropriate prescription	39	48.75%

Table 8: List of Potentially Inappropriate Medications (PIMs) prescribed in the study Population using Updated Beers Criteria 2023 (n=41)

According to Beers Criteria, a total of 54 potentially inappropriate medications (PIMs) were Identified. The most common were Aspirin (16 cases), followed by Clonidine and Prazosin (7

Each), Enoxaparin (6), Hydroxyzine (3), Clobazam and Clonazepam (2 each), and several others with single incidences.

Beers Criteria has identified 54 potentially inappropriate medications (PIMs) in total. The highest number of cases were related to Aspirin (16 cases) followed by Clonidine and Prazosin (7 each)

S.NO	Name of the PIM as per Beer's Criteria	No of Incidence
1	Aspirin	16
2	Clonidine	7
3	Prazosin	7
4	Enoxaparin	6
5	Hydroxyzine	3
6	Clobazam	2
7	Clonazepam	2
8	Glimepiride	2
9	Gliclazide	2
10	Nifedipine	1
11	Alprazolam	1
12	Tolterodine	1
13	Colchicine	1
14	Phenobarbital	1
15	Diclofenac	1
16	Chlorzaxazone	1

Table 9: Potentially Inappropriate Medications (PIMs) According to Beers Criteria: Classification and Rationale

According to the classification in Beers Criteria, the majority of drugs found in this study e.g. Aspirin Nifedipine Clonidine, Gliclazide Alprazolam Glimepiride, Clonazepam Phenobarbital Diclofenac, Chlorzoxazone, and Clobazam are part of Class 1 meaning they are potentially inappropriate medications. Prazosin is categorized as Class 2 and considered inappropriate with certain diseases whereas Enoxaparin Tolterodine Colchicine, and Hydroxyzine in Class 5 are subjected to dosage modification depending on the level of renal function.

S.no	Name of the pim as per beer's Criteria	Classification Categories in Beer's criteria	Rationale
1	Aspirin Nifedipine Clonidine Gliclazide Alprozolam Glimepiride Clonazepam Phenobartital Diclofenac Chlorzaxazone Clobazam	CLASS 1	Medications considered as potentially inappropriate
2	Prazosin	CLASS 2	Medications Potentially inappropriate in patients

			with certain diseases or syndromes
3	Enoxaparin Tolterodine Colchicine Hydroxyzine	CLASS 5	Medications whose dosages should be adjusted based on renal function

Table 10: Errors identified in prescriptions using beers criteria (n=41)

Potentially wrong medicines show up in older patient's scripts when checked against Beers rules. Watchful choices, along with lower doses, help keep seniors safe from harmful reactions.

S.no	Drugs under beers criteria	Observation	Recommendations
1	Aspirin	Increased risk of GI bleeding/peptic ulcer	Avoid chronic use
2	Clonidine	CNS effects; bradycardia; orthostatic hypotension	Avoid clonidine as first line treatment for hypertension
3	Prazosin	Orthostatic hypotension risk	Avoid use as an antihypertensive
4	Enoxaparin	Increased bleeding risk	Reduce dose
5	Clobazam	Increased sensitivity; dependence risk	Avoid
6	Clonazepam	Increased sensitivity; dependence risk	Avoid
7	Glimepiride	Prolonged hypoglycemia risk	Use short-acting agent (glipizide)
8	Gliclazide	CV events; hypoglycemia risk	Avoid if possible
9	Nifedipine	Hypotension; myocardial ischemia risk	Avoid
10	Alprazolam	Risk of sedation, addiction, respiratory depression, death	Avoid
11	Phenobarbital	High dependence; overdose risk	Avoid
12	Diclofenac	Increased GI bleeding risk	Avoid chronic use
13	Tolterodine	Cognitive impairment risk	Avoid
14	Colchicine	Toxicity in renal impairment	Reduce dose
15	Hydroxyzine	Strong anticholinergic effects	Avoid
16	Chlorzoxazone	Sedation and fall risk in elderly.	Avoid

Table 11: Drug interactions.

S.NO	Drugs	Severity	Interaction effect
1	Aspirin + Ranitidine	Minor	Reduced salicylate plasma levels and decreased antiplatelet effect of aspirin
2	Aspirin + Metoprolol	Moderate	Reduced anti-hypertensive effect.
3	Atorvastatin + Clopidogrel	Moderate	Decreased active metabolite formation → reduced antiplatelet effect
4	Amlodipine + Metformin	Moderate	Increased risk of hyperglycemia and potential loss of glycemic control.
5	Aspirin + Nebivolol	Moderate	Reduced anti-hypertensive effect
6	Doxycycline + Glimepiride	Moderate	Increased blood glucose lowering effect and increased risk of hypoglycemia.
7	Aspirin + Bisoprolol	Moderate	Reduced antihypertensive effect.
8	Aspirin + Sodium Bicarbonate	Moderate	Decreased salicylate effectiveness
9	Dapagliflozin + Metoprolol	Moderate	Hypoglycemia or hyperglycemia; decreased symptoms of hypoglycaemia.
10	Glimepiride + Metoprolol	Moderate	Hypoglycemia or hyperglycemia; decreased symptoms of hypoglycaemia.
11	Clonidine + Metformin	Moderate	Increased risk of hyperglycemia and potential loss of glycemic control
12	Aspirin + Vitamin D3	Moderate	Decreased salicylate effectiveness
13	Dexamethasone + Human Insulin	Moderate	May result in reduced blood glucose
14	Amlodipine + Clopidogrel	Major	Decreased antiplatelet effect and increased risk of thrombotic events
15	Clopidogrel + Esomeprazole	Major	Reduced plasma concentrations of clopidogrel active metabolite and reduced antiplatelet activity
16	Aspirin + Torsemide	Major	Reduced diuretic effectiveness and possible nephrotoxicity.
17	Aspirin + Heparin	Major	Increased risk of bleeding
18	Aspirin + Metformin	Major	Increased risk of hypoglycemia
19	Doxycycline + Piperacillin / Tazobactam	Major	Decreased antibacterial effectiveness
20	Hydroxychloroquine + Ondansetron	Major	Increased risk of QT- interval prolongation.
21	Aspirin + Glimepiride	Major	Increased risk of hypoglycemia
22	Clopidogrel + Heparin	Major	Increased risk of bleeding
23	Aspirin + Enoxaparin	Major	Increased risk of bleeding
24	Aspirin + Clopidogrel	Major	Increased risk of bleeding
25	Glimepiride + Sitagliptin	Major	Increased risk of hypoglycemia
26	Aspirin + Hydrochlorothiazide	Major	Decreases diuretic effect & possible nephrotoxicity
27	Azithromycin + Ondansetron	Major	Increases risk of QT interval prolongation
28	Fluconazole + Torsemide	Major	May result in increased torsemide exposure and increased risk of Torsemide toxicity

29	Doxycycline + Piperacillin	Major	May result in decreased antibacterial effectiveness
30	Dexamethasone + Tramadol	Major	Concurrent use of tramadol & CYP3A4 inducers may result in reduced tramadol exposure.
31	Aspirin + Multivitamins	Moderate	May enhance the antiplatelet effect of therapeutic antiplatelet

6. DISCUSSION

Most geriatric CKD patients continued very likely to polypharmacy and were exposed to use of potentially inappropriate medication. majority of patients were males aged 65-74 years, hypertension and diabetes as common comorbidities. Almost half of them were receiving drugs in the range of 11-15 medication, so the risk of drug-drug interaction and adverse drug reactions would be high. PIM's were present in more than 50% of the cases, whereas aspirin, clonidine, and prazosin were the most common ones. It is reflective of difficulties in geriatric pharmacotherapy and renal dose adjustments. Apart from regular prescription review, pharmacist involvement, and clinical decision support systems are important steps towards ensuring patients' safety.

7. CONCLUSION

This study highlighted that geriatric CKD patients are often on a large number of medications (polypharmacy), and a considerable number of them are also receiving potentially inappropriate medications. In addition to hypertension, the common comorbidities in these patients are diabetes. The majority of patients are males, aged 65-74 years. Many patients were administered 11-15 different medications, which could lead to more adverse drug reactions and interactions.

Most of the prescriptions were found to contain at least one drug that is potentially inappropriate as per the Beers Criteria 2023. Several major drug interactions, particularly with aspirin, clopidogrel, metformin, and enoxaparin, were noted. To enhance safe prescribing habits of elderly CKD patients, it is necessary to have a regular review of prescriptions, involve pharmacists, and employ the use of screening tools.

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