

Assessment Of Polypharmacy and Drug Utilization Pattern in Geriatric Patients.

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ABSTRACT:

Polypharmacy is a major concern among geriatric patients due to multimorbidity and age-related physiological changes that can alter drug pharmacokinetics and pharmacodynamics. This study assessed polypharmacy and drug utilization patterns among geriatric patients, focusing on WHO Core Prescribing Indicators, potentially inappropriate medications (PIMs), and drug–drug interactions. A prospective observational study was conducted among 140 patients aged above 60 years attending a tertiary care teaching hospital. Of these, 86 (61.43%) were males and 54 (38.57%) were females. A total of 1,115 drugs were prescribed, with an average of 7.96 drugs per patient. Inappropriate polypharmacy was observed in 65 patients (46.43%), while excessive polypharmacy was identified in 39 patients (27.86%). PIMs were identified in 125 patients (89.29%), with proton pump inhibitors being the most common PIM class (34.4%), followed by NSAIDs (26.4%) and benzodiazepines (10.4%). Moderate drug–drug interactions were most common (82.9%). The findings highlight the need for regular medication review and rational prescribing in geriatric patients.

key words:

Polypharmacy; Geriatric patients; Drug utilization; Potentially inappropriate medications; Beers Criteria; Drug–drug interactions; WHO prescribing indicators; Essential medicines; Rational prescribing; Clinical pharmacist.

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I. INTRODUCTION:

Population ageing has become an important public health concern due to increased life expectancy resulting from advances in healthcare, nutrition, sanitation, and living conditions. Older adults commonly experience multiple chronic diseases such as hypertension, diabetes mellitus, cardiovascular diseases, chronic kidney disease, respiratory disorders, arthritis, osteoporosis, and neurological disorders. The coexistence of two or more chronic conditions, known as multimorbidity, frequently requires long-term treatment with multiple medications. Age-related physiological changes can also alter the pharmacokinetic and pharmacodynamic responses to drugs, making geriatric patients more vulnerable to medication-related problems.

Polypharmacy is commonly described as the concurrent use of multiple medications, with five or more medicines often used as a practical definition. However, the number of medicines alone does not determine whether polypharmacy is appropriate. Appropriate polypharmacy occurs when each medication has a valid indication and its benefits outweigh the potential risks, whereas inappropriate polypharmacy involves unnecessary or potentially harmful medication use. Excessive polypharmacy refers to the use of a very high number of medicines and may further increase treatment burden. Factors contributing to polypharmacy include multimorbidity, multiple prescribers, frequent hospitalizations, self-medication, use of over-the-counter medicines and supplements, therapeutic duplication, and inadequate communication during transitions of care.

Polypharmacy may increase the risk of adverse drug reactions, drug–drug interactions, medication errors, non-adherence, falls, cognitive impairment, functional decline, hospitalization, and increased healthcare expenditure. Age-related reductions in renal and hepatic function, changes in body composition, and altered receptor sensitivity may further increase drug exposure and toxicity in older adults. Therefore, regular medication review and individualized prescribing are essential in geriatric pharmacotherapy.

The WHO Core Prescribing Indicators provide standardized measures for evaluating prescribing practices, including the average number of drugs prescribed per encounter, percentage prescribed by generic name, percentage of encounters with antibiotics and injections, and percentage of medicines prescribed from the essential medicines list. These indicators help assess rational prescribing and identify areas requiring

improvement. In addition, potentially inappropriate medications (PIMs) are an important concern in older adults because certain medicines may have an unfavorable risk–benefit profile in this population. The American Geriatrics Society Beers Criteria is widely used to identify medications that should generally be avoided or used cautiously in older adults, including medications associated with specific diseases, clinically important drug interactions, and renal function-related concerns.

Drug–drug interactions are another important consequence of multiple medication use. Interactions may occur through pharmacokinetic or pharmacodynamic mechanisms and can lead to reduced therapeutic efficacy or increased toxicity. Drug utilization research helps evaluate prescribing patterns, medication burden, therapeutic categories, and the rational use of medicines in specific patient populations. Clinical pharmacists can contribute through medication review, identification of PIMs and drug interactions, prescription auditing, patient counselling, adverse drug reaction monitoring, and recommendations for rational therapy and deprescribing.

Therefore, a comprehensive assessment of polypharmacy, prescribing indicators, PIMs, and drug–drug interactions is essential for improving medication safety in geriatric patients. The present study was undertaken to assess polypharmacy and drug utilization patterns among geriatric patients, with particular emphasis on WHO Core Prescribing Indicators, potentially inappropriate medications based on the Beers Criteria, and drug–drug interactions.

AIM & OBJECTIVES:

AIM:

To assess polypharmacy and evaluate the drug utilization pattern among geriatric patients attending a hospital.

OBJECTIVES:

Primary Objectives :

- To determine the prevalence of polypharmacy among geriatric patients.
- To evaluate prescribing patterns in elderly patients.
- To identify commonly prescribed therapeutic classes.

Secondary Objectives:

- To assess the average number of drugs prescribed per prescription.
- To evaluate prescriptions using WHO prescribing indicators.
- To identify potential drug–drug interactions
- To identify factors associated with polypharmacy.

II. REVIEW OF LITERATURE:

Eltaher and Araby (2018) reported that polypharmacy is a major concern among elderly individuals and is associated with hospitalization, poor quality of life, and increased healthcare costs. Sex, income, residence, and multiple comorbidities were important predictors of polypharmacy.

Jyrkkä et al. (2009) found that poor health status, female sex, and age above 85 years were associated with polypharmacy and excessive polypharmacy. Diabetes, depression, pain, heart disease, and pulmonary diseases were also important contributing factors.

Hajjar et al. (2007) reported that polypharmacy is common among elderly patients and may result in unnecessary drug use and poor health outcomes. The authors recommended regular medication review to ensure appropriate drug therapy.

Allen (2005) highlighted that multiple chronic diseases in elderly patients often require several medications. The study emphasized the need to identify and discontinue medications that are not clinically indicated.

Eltaher and Araby (2019) found a high prevalence of polypharmacy among elderly individuals, with **85.3% taking five or more medications**. Sex, residence, income, and comorbidities were significant predictors of polypharmacy.

Golchin et al. (2015) reported that polypharmacy increases the risk of drug–drug interactions, adverse drug reactions, poor adherence, and cognitive problems. Medication review using tools such as the **Beers Criteria and STOPP/START criteria** was recommended

Charlesworth et al. (2015) observed that the prevalence of taking five or more medications among older adults increased from **12.8% to 39%** between 1988 and 2010. Multiple chronic diseases and increased life expectancy were important factors contributing to polypharmacy.

Linjakumpu et al. (2002) reported an increase in prescription drug use among elderly individuals from **78% to 88%**, while polypharmacy increased from **19% to 25%**. Medication use was particularly high among women and those aged over 85 years.

Golchin et al. (2015) found that **35.6% of elderly participants experienced polypharmacy**. Duplicate therapy, potentially inappropriate drug combinations, and visits to multiple pharmacies were identified as important medication-related concerns.

Walckiers et al. (2015) reported that excessive polypharmacy was associated with older age, poor health status, multiple chronic diseases, and greater healthcare utilization. The authors emphasized rational prescribing and regular medication assessment in elderly patients.

III. MATERIALS AND METHODOLOGY:

Study Design: Prospective observational study.

Study Site: Department of General Medicine, tertiary care teaching hospital.

Study Duration: Four months.

Study Population: Geriatric patients attending inpatient and/or outpatient departments.

Sample Size: Approximately 100–150 patients.

Inclusion Criteria:

- Patients aged 60 years and above.
- Patients receiving at least one prescribed medication.
- Patients willing to participate.

Exclusion Criteria:

- Patients younger than 60 years.
- Patients with incomplete medical records.
- Patients unwilling to provide informed consent.

SOURCE OF DATA:

Data will be collected from:

- Patient case sheets
- Medication charts
- Physician prescriptions
- Laboratory reports
- Patient interviews
- Hospital electronic medical records

METHOD OF DATA COLLECTION:

Patient data collected using a structured data collection form containing:

- Patient information
- Diagnosis
- Medication details
- Drug utilization parameters
- Polypharmacy classification
- WHO prescribing indicators.
- PIMs analysis.
- Drug – Drug interaction.

IV. RESULT AND DISSCUSSION:

In a month period of study, a total of 140 patients aged 60 years and above were included and analysed. Among the 140 patients showed that the majority of patients were in the 60–65 years age group, comprising 51 patients (36.43%). This was followed by the 66–70 years group with 33 patients (23.57%) and the 71–75 years group with 20 patients (14.29%). The 76–80 years age group included 17 patients (12.14%), while 14 patients (10.00%) belonged to the 81–85 years group. Only 4 patients (2.86%) were in the 86–90 years group, and 1 patient (0.71%) was aged above 90 years. Overall, the distribution indicates that the study population was predominantly concentrated in the 60–70 years age range.

S.NO	AGE CATEGORY	NO OF PATIENT	PERCENTAGE
1	60–65 years	51	36.43%
2	66–70 years	33	23.57%
3	71–75 years	20	14.29%
4	76–80 years	17	12.14%
5	81–85 years	14	10.00%
6	86–90 years	4	2.86%

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7	Above 90 years	1	0.71%
	Total	140	100%

GENDER WISE DISTRIBUTION:

Among the 140 geriatric patients included in the study, 86 (61.43%) were male and 54 (38.57%) were female. The findings showed a higher proportion of male patients compared with female patients. Males constituted the majority of the study population, accounting for nearly two-thirds of the participants, while females represented a comparatively smaller proportion. Overall, the study demonstrated a predominance of male patients (61.43%) among the geriatric population studied.

S.NO	GENDER	NUMBER OF PATIENTS (n)	PERCENTAGE (%)
1	Male	86	61.43%
2	Female	54	38.57%

ASSESSMENT OF POLYPHARMACY:

Among the 140 patients, 91 patients (65.00%) had polypharmacy, making it the most prevalent category. 39 patients (27.86%) had excessive polypharmacy, while only 10 patients (7.14%) had non-polypharmacy. Overall, 130 patients (92.86%) received five or more medications, indicating a high prevalence of polypharmacy among the geriatric study population.

S.NO	CATEGORY	NUMBER OF PATIENTS	PERCENTAGE (%)
1	Non-polypharmacy (<5 drugs)	10	7.14%
2	Polypharmacy (5–9 drugs)	91	65.00%
3	Excessive polypharmacy (≥10 drugs)	39	27.86%
	Total	140	100%

TOTAL NO OF DRUGS PRESCRIBED:

The total drug distribution among 140 patients showed that the number of drugs prescribed ranged from 3 to 16 drugs per patient. The highest proportion of patients received 6 drugs (27 patients, 19.29%), followed by 7 drugs (20 patients, 14.29%) and 8 drugs (19 patients, 13.57%). A total of 120 patients (85.71%) received five or more drugs, indicating a high prevalence of polypharmacy among the study population. The overall mean number of drugs prescribed was approximately 7.96 drugs per patient.

S.NO	TOTAL DRUGS PRESCRIBED	NO. OF PATIENTS	PERCENTAGE (%)
1	3	2	1.43%
2	4	8	5.71%
3	5	14	10.00%
4	6	27	19.29%
5	7	20	14.29%
6	8	19	13.57%
7	9	11	7.86%
8	10	16	11.43%
9	11	5	3.57%
10	12	7	5.00%
11	13	3	2.14%
12	14	6	4.29%
13	16	2	1.43%

WHO CORE PRESCRIBING INDICATOR:

A total of 140 prescriptions were analysed, comprising 1,115 drugs, with an average of 7.96 drugs per prescription. Among the prescribed drugs, 51 (36.40%) were prescribed by their generic names, while 627 (56.23%) were prescribed from the Essential Drug List. Antibiotics were prescribed in 103 (73.60%) encounters, indicating a high frequency of antibiotic use. Injections were prescribed in 71 (50.70%) encounters. Overall, the findings indicate a relatively high average number of drugs per prescription, with moderate use of generic prescribing and essential medicines, alongside a high prevalence of antibiotic and injection prescribing.

S.NO	PRESCRIBING INDICATORS ASSESSED	RESULTS	PERCENTAGE
1.	Total number of prescriptions analysed.	140	
2.	Total number of drugs prescribed.	1115	
3.	Average number of drugs per prescription.	7.96	
4.	Percentage of drugs prescribed by generic name.	51/1115	36.40%
5.	Percentage of drugs prescribed from essential drug list.	627/1115	56.23%
6.	Percentage of encounters in which antibiotic prescribed.	103/140	73.60%
7.	Percentage of encounters in which injection prescribed.	71/140	50.70%

CATEGORY WISE DISTRIBUTION OF DRUG:

The category-wise distribution of prescribed drugs revealed that antibiotics/antimicrobials were the most frequently prescribed drug category, comprising 153 drugs (16.02%), followed by gastrointestinal agents with 148 drugs (15.50%) and analgesics/anti-inflammatory agents with 127 drugs (13.30%). Nutritional supplements accounted for 114 drugs (11.94%), while respiratory agents constituted 83 drugs (8.69%). Antihypertensive agents and antidiabetic agents represented 56 (5.86%) and 50 (5.24%) drugs, respectively. Antiplatelet/anticoagulant agents accounted for 45 drugs (4.71%). Among the less frequently prescribed categories, antiemetic agents accounted for 28 drugs (2.93%), followed by diuretics, corticosteroids, and proteolytic enzymes with 25 drugs each (2.62%). Psychotropic agents constituted 20 drugs (2.09%), whereas lipid-lowering agents accounted for 17 drugs (1.78%). Antiepileptic agents and laxatives were each prescribed 8 times (0.84%), followed by antiallergic agents (5; 0.52%), antianginal agents (4; 0.42%), neuroprotective agents (3; 0.31%), and thyroid hormones (2; 0.21%). Overall, the prescribing pattern demonstrated a predominance of antimicrobial, gastrointestinal, analgesic/anti-inflammatory, nutritional, and respiratory medications.

S.NO	DRUG CATEGORY	NO. OF DRUGS	PERCENTAGE
1	Gastrointestinal agents	148	15.50%
2	Antibiotics/antimicrobials	153	16.02%
3	Analgesics/anti-inflammatory agents	127	13.30%
4	Respiratory agents	83	8.69%
5	Antihypertensive agents	56	5.86%
6	Antidiabetic agents	50	5.24%
7	Nutritional supplements	114	11.94%
8	Antiplatelet/anticoagulant agents	45	4.71%
9	Diuretics	25	2.62%
10	Corticosteroids	25	2.62%
11	Antiemetic agents	28	2.93%
12	Proteolytic enzymes	25	2.62%
13	Psychotropic agents	20	2.09%

14	Lipid-lowering agents	17	1.78%
15	Antiepileptic agents	8	0.84%
16	Laxatives	8	0.84%
17	Antiallergic agents	5	0.52%
18	Antianginal agents	4	0.42%
19	Neuroprotective agents	3	0.31%
20	Thyroid hormones	2	0.21%

DISTRIBUTION OF BEERS CRITERIA CATEGORIES PIMs:

Among the 125 patients identified with potentially inappropriate medications (PIMs) according to the Beers Criteria, Category 1 PIMs, defined as medications to avoid in most older adults, were the most frequently observed, accounting for 122 patients (97.6%). Category 2 PIMs, which include medications to avoid in older adults with specific diseases or conditions, were identified in 1 patient (0.8%). Category 3 medications, which are medications to be used with caution in older adults, were observed in 2 patients (1.6%). Overall, Category 1 constituted the predominant Beers Criteria category among the identified PIMs.

S.NO	BEERS CATEGORY	DESCRIPTION	NO. OF PATIENTS	PERCENTAGE (%)
1.	Category 1	PIMs to avoid in most older adults	122	97.6%
2.	Category 2	PIMs to avoid in older adults with specific diseases/conditions	1	0.8%
3.	Category 3	Medications to use with caution	2	1.6%
	Total		125	100%

PHARMACOLOGICAL CLASSES OF POTENTIALLY INAPPROPRIATE MEDICATIONS:

Among the 125 patients identified with potentially inappropriate medication (PIM) use, proton pump inhibitors (PPIs) were the most frequently prescribed pharmacological class, involving 43 patients (34.4%). This was followed by NSAIDs, identified in 33 patients (26.4%), while benzodiazepines were prescribed to 13 patients (10.4%). Antiemetic/prokinetic agents accounted for 12 patients (9.6%), and opioid analgesics were identified in 10 patients (8.0%). First-generation antihistamines were observed in 5 patients (4.0%). Antipsychotics and α_1 -adrenergic blockers were each identified in 4 patients (3.2%). Antidepressants were prescribed to 3 patients (2.4%), whereas corticosteroids were the least frequently identified PIM class, occurring in 2 patients (1.6%). Overall, PPIs and NSAIDs constituted the predominant pharmacological classes among the PIMs identified in the study population.

S.NO	PHARMACOLOGICAL CLASS	PIM DRUGS INCLUDED	NO. OF PATIENTS	PERCENTAGE (%)
1	Proton Pump Inhibitors (PPIs)	Pantoprazole, Esomeprazole, Omeprazole	43	34.4%
2	NSAIDs	Ketorolac, Aceclofenac, Diclofenac, Piroxicam, Meloxicam, Naproxen	33	26.4%
3	Benzodiazepines	Alprazolam, Clonazepam, Lorazepam	13	10.4%
4	Antiemetic/Prokinetic agents	Domperidone, Metoclopramide	12	9.6%
5	Opioid analgesics	Tramadol, Morphine	10	8%
6	First-generation antihistamines	Chlorpheniramine, Hydroxyzine, Pheniramine	5	4%
7	Antipsychotics	Haloperidol, Olanzapine, Quetiapine, Sulpiride	4	3.2%
8	α_1 -Adrenergic blockers	Tamsulosin, Prazosin	4	3.2%
9	Antidepressants	Amitriptyline, Nortriptyline, Duloxetine	3	2.4%
10	Corticosteroids	Dexamethasone, Deflazacort	2	1.6%

DISTRIBUTION OF DRUG - DRUG INTERACTION:

Among the 140 patients, moderate severity was the most frequently observed, occurring in 116 patients (82.9%), with a total of 253 events. Minor severity was observed in 96 patients (68.6%), accounting for 130 events. Major severity was identified in 26 patients (18.6%), with a total of 37 events. Overall, moderate drug-related problems were predominant, followed by minor problems, whereas major problems were comparatively less frequent.

CALCULATION:

PERCENTAGE

S.NO	Severity	No. of Patients	Percentage	Total Events
1.	Minor	96	68.6%	130
2.	Moderate	116	82.9%	253
3.	Major	26	18.6%	37
	Total patients	140	100%	420

V. DISCUSSION

The present study evaluated prescribing patterns, polypharmacy, potentially inappropriate medications (PIMs), and drug–drug interactions among 140 geriatric patients. A total of 1,115 drugs were prescribed, with an average of 7.96 drugs per patient. Polypharmacy was observed in 65.0% and excessive polypharmacy in 27.86% of patients, indicating a high medication burden. Males constituted 61.4% of the study population, with General Medicine being the most represented department (38.57%). Only 36.40% of drugs were prescribed by generic name, while 56.23% belonged to the NLEM. Antibiotics and injections were prescribed in 73.60% and 50.70% of encounters, respectively, suggesting the need for rational use. According to Beers Criteria, Category 1 PIMs were identified in 97.6% of patients. PPIs (34.4%) and NSAIDs (26.4%) were the most common PIMs. A total of 420 potential drug–drug interactions were identified. Regular medication review and clinical pharmacist involvement are essential to improve medication safety and rational prescribing in geriatric patients.

VI. CONCLUSION:

This current study has shown a significant problem of polypharmacy and medication-related risk in geriatric patients. Polypharmacy was found in 65.00% of patients whereas excessive polypharmacy in 27.86%, thus the considerable burden of medications in the studied population. Medication prescription evaluation showed the high mean number of medications in prescriptions, a high percentage of antibiotic and injection use. Potentially inappropriate medications were detected in 125 patients whereas the predominant number of those drugs were category 1 Beers criteria medications. Proton pump inhibitors and non-steroid anti-inflammatory drugs are the most frequent types of potentially inappropriate medications. Also, drug–drug interaction of moderate degree is often detected. The results show that the necessity of constant medication evaluation, rational medication prescription, monitoring and detection of potentially inappropriate medications and drug–drug interaction is important. The active participation of clinical pharmacists in prescription and medication counselling can help to decrease medication problems.

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