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(RESEARCH ARTICLE)

Assessment of the Appropriateness of Prescribing Medication Among Geriatric Patients Using Beers Criteria: A Cross-sectional Study in a Government Tertiary Care Hospital, Mandya.

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Abstract

Background: Aging is the universal and biological process, with increase in life expectancy and reduction in fertility rates contributing to steep rise in the elderly population. This demographic transition has great implications for healthcare systems, as geriatric population are more susceptible to chronic diseases, reduced body function and medication related complications. Potentially Inappropriate Medications (PIMs) are a significant concern among geriatric patients due to age-related pharmacokinetic and pharmacodynamic changes. The Beers criteria, developed by the American Geriatric Society (AGS), serves as an essential tool to identify and reduce inappropriate prescribing.

Objective: The objective of this study is to assess the appropriateness of prescribing medication among the geriatric patients using 2023 AGS Beers Criteria and to identify factors associated with PIM use.

Methodology: A cross-sectional study was conducted among 310 geriatric inpatients (≥65 years) admitted at General Medicine Department of government tertiary care hospital in Mandya for period of 6 months. Medication appropriateness was evaluated using the 2023 AGS Beers Criteria. Data were analyzed using descriptive statistics, Chi-square tests, and binary logistic regression to assess associations between PIM use and predictors such as age, gender, number of diagnoses, and polypharmacy.

Results: Among 310 patients included in the study 50.6% were female and 49.4% were male patients. The mean age of the population was 73.4 ±7.27 years, with median age of 72 years. Out of 310 patients 122 patients were prescribed with at least one PIM, out of 2,129 total number of medications with an average of 6.87 drugs per patients, 5.73% drugs were found to be PIMs. The frequently prescribed PIMs were found to be Antihistamine drug Chlorpheniramine, rapid acting insulin, and aspirin accounting up to 33.2%, 16.5%, and 15.7% respectively. The most frequently prescribed PIM category was Category 1, accounting for 75.8% of PIMs. Polypharmacy showed a statistically significant association with PIM use ($p < 0.001$), while age group, gender, and number of diagnoses were not significantly associated. Binary logistic regression revealed that patients with polypharmacy had 12 times higher odds of receiving a PIM.

Conclusion: PIM use among geriatric inpatients was high, with polypharmacy being a significant predictor. Implementing regular medication reviews using Beers Criteria could improve prescribing quality and reduce adverse outcomes in this population. Educating and training healthcare professionals on geriatric pharmacotherapy, and involvement of clinical pharmacists on routine patient care is necessary.

Keywords: Beers Criteria; Potentially Inappropriate Medications; Geriatric Patients; Polypharmacy; Prescribing Appropriateness; Geriatric Pharmacotherapy

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1. Introduction

1.1. Global and national demographic shifts.

Aging is the universal and biological process, with increase in life expectancy and reduction in fertility rates contributing to a steep rise in the elderly population. The United Nations report shows that the number of people aged 65 years and older is growing rapidly compared to other age groups, which is estimated to be 1.5 billion globally by the year 2050, more than the twice the 703 million reported in 2019[1]. This demographic transition has great implications for the healthcare system, as geriatric population are more susceptible to chronic diseases, reduced body function and medication-related complications.

As per the **India Aging Report 2023**, the individuals aged 65 years and above constitutes a large segment of the population, and the 14% growth is expected by 2025[2]. Importantly the growth rate is faster in semi-urban and rural areas, where the healthcare infrastructure is limited. Southern states such as Kerala, Tamil Nadu, and Karnataka, including Mandya district, are witnessing a large proportion on geriatric age group compared to national average[2].

The growing geriatric population in semi-urban and rural areas like Mandya provides the unique healthcare challenges, risk of inappropriate prescribing due to polypharmacy, comorbidities, and less awareness among healthcare professionals. Hence, regional assessment of the prescribing practices in public hospitals are essential for identifying the gaps in improving the patient safety.

1.2. Geriatric pharmacotherapy: risks and challenges.

Aging is associated with physiological, pathological, and psychological changes which makes Geriatric Pharmacotherapy more complex. As individual age, there are progressive changes in body composition, organ function, metabolism, and excretion. Importantly aging is associated with reduced renal and hepatic function, decreased total body water, increase in fat content, and altered receptor sensitivity, all of which influence the pharmacokinetic and pharmacodynamic properties of the medications[3,4].

Polypharmacy — commonly defined as prescribing of the five or more drugs, which is highly prevalent in the elderly patient with multiple chronic conditions such as hypertension, diabetes mellites, cardiovascular diseases, chronic obstructive pulmonary diseases etc[4]. Polypharmacy might be necessary in some patients; it often ends in leading to inappropriate prescribing, drug-drug interactions, medication non-adherence, increased risk of hospitalizations and even result in mortality[5,6].

1.3. Definition of geriatric population.

The geriatric population is typically defined as individuals aged 65 years and above. The age of 65 is commonly used to define starting of geriatric stage in life. There is more to this number—it marks a stage where body begins to undergo natural changes that can affect how medicines work. It is at this age that physiological changes such as reduced hepatic and renal functions, reduced drug clearance, and altered pharmacodynamic response become clinically significant[7].

The inclusion of this age limit in the Beers Criteria strengthens and supports medical and pharmacological consensus that individuals aged 65 and above represents a population with distinct therapeutic needs and vulnerabilities. According to the American Geriatric Society (AGS) Beers criteria, the classification of 65 years and older is specifically used to assess the appropriateness of medication prescribing in older adults[8].

In this study, all patients aged 65 years and above are considered part of geriatric population in accordance with internationally accepted standards[7,8].

1.4. Beers criteria as screening tool.

Developed by Dr. Mark H. Beers in 1991 and been subsequently updated by **American Geriatric Society (AGS),** is most widely accepted and used evidence-based tools for identifying potentially inappropriate medications (PIMs) in geriatric patients. The objective of the criteria is to improve the safety of the prescribing in the elderly by providing the explicit list of medications which might be risky, less effective, or have safer alternatives for geriatric patients[7]. Beers criteria are updated regularly by American Geriatric society (AGS), most recent update was in 2023, the Beers criteria has now become an important component of geriatric treatment and clinical decision-making.

The criteria are organized into different key categories:

- Medications that are potentially inappropriate in most older adults
- Medications that should be avoided in older adults with certain conditions
- Drugs to be used with caution in older adults
- Potential drug-drug interactions to avoid
- Drugs that should be avoided or require dosage adjustment based on renal function[8].

These organized categories help clinicians to critically examine the prescriptions and identify the medication that may have higher risk than benefit. For example, medication that falls under the class **first-generation antihistamines, benzodiazepines,** and **certain anticholinergic drugs** are listed in the criteria as they have tendency to increase the risk of causing sedation, confusion, falls and cognitive impairment in geriatric patients[9].

Beers criteria are different to the other tools because it serves as the guiding tool for the optimizing the pharmacotherapy. it helps in individualized patient assessment by considering patient's overall clinical condition, comorbidities and treatment.

Several studies have validated the reliance of the Beers criteria in clinical settings by demonstrating that adherence to its recommendations can help in reducing the incidence of adverse drug events, hospitalizations and healthcare costs in the geriatric population[10,11]. Majorly Beers criteria is used in research and audit practices to assess and evaluate prescribing trends in geriatric care.

Beers criteria are highly valued in developed countries with advanced health care system, the implementation of Beers criteria in resource limited settings like India there are certain challenges, such as lack of awareness among prescribers, geriatric care training and high patient load in the government hospitals. Despite all these barriers, the Beers criteria help in identifying potentially inappropriate prescribing of medications and servers for improving the medication safety in the geriatric patients.

1.5. Inappropriate prescribing in India.

Inappropriate prescribing is a growing concern in Indian health care system, especially in geriatric population. It includes various prescribing errors such as potentially inappropriate medications (PIMs), over prescribing, under prescribing and incorrect dosing.

Studies conducted across India shows high prevalence of PIMs among geriatric patients in hospital settings. A study conducted in tertiary care hospital in South India reported nearly 30-40% geriatric patients were prescribed with one PIM[12]. Comparable trends are seen in research studies conducted in North Indian teaching hospitals, raising concerns about rational prescribing[13].

Multiple factors contributing to inappropriate prescribing in India:

- Lack of geriatric pharmacotherapy training among healthcare professionals.
- Lack of time and high patient load in the government healthcare settings.
- Limited use of screening tools like Beers criteria and START-STOP criteria in clinical practices.
- Patient driven pressure to continue medications without review, when multiple doctors are involved[14].

Another contributing factor for inappropriate prescribing in India is frequent use of Over the Counter (OTC) medications by the geriatric patients. Which leads to the poly pharmacy and increases the risk of adverse drug events[15].

1.6. Rationale for the study.

The tertiary care government hospitals in India serves as the referral centers for the large population, such as economically vulnerable people. In semi-urban and rural districts there is limited data regarding medication appropriateness in geriatric inpatients. With the rising numbers of the geriatric patients in the region, assessing the prescribing practice using evidence-based tool like Beers criteria are very crucial.

There are many studies which have assessed the prevalence of PIMs in the hospitals that are in the metropolitan cities, but there is less data from the hospitals that are present in the secondary towns and districts such as Mandya, where healthcare system differs significantly.

This study aims to fill that gap by systematically assessing the appropriateness of prescribed medications among the geriatric patients (individuals aged 65 years and above) using AGS Beers criteria 2023.

Objectives

- **Primary objective.**

To assess the appropriateness of the prescribing medication among geriatric patients by using AGS Beers criteria 2023.

- **Secondary objective.**

To find out the proportion of Potentially Inappropriate Medication (PIMs).

2. Materials and methods

2.1. Study design

Cross-sectional study

2.2. Study site

The present study was conducted in General Medicine Department of MIMS Teaching hospital. It is a 500 bedded tertiary care teaching hospital having different specialties like medicine, surgery, orthopedics, pediatrics, obstetrics and gynecology. This hospital provides specialized healthcare services to people in and around Mandya city and nearby villages.

2.3. Study period

6 months after getting approval (4months for data collection and 2 months for data analysis and write up).

2.4. Sampling method

Consecutive sampling.

2.5. Source of the data

Data were collected from the patients case records and treatment chart.

2.6. Sample size

The sample size is 310 patients in this study, it based on the PIMs prevalence of 28% as reported on the study "Prevalence of Polypharmacy, Hyperpolypharmacy, and potentially inappropriate medication use in older adults in India: A systematic review and meta-analysis" conducted across India[16].

2.7. Study approval

The study has approved by Institutional Ethics Committee, MIMS teaching hospital, Mandya.

2.8. Criteria for sample collection

2.8.1. Inclusion criteria

Patients of either sex who had completed 65 years of age on 31st December 2024 or earlier, who are admitted in general medicine department of Mandya Institute of Medical Sciences and Teaching Hospital, Mandya.

2.8.2. Exclusion criteria

- Patients aged below 65 years.
- Patients with incomplete or missing medical records.
- Terminally ill patients admitted in ICUs.
- Patients discharged within 24 hours.

2.8.3. Study procedure

The study was conducted in Mandya Institute of Medical Sciences and Teaching Hospital, Mandya. As per the inclusion criteria patients were enrolled for the study. A suitably designed data collection form was used to collect necessary data. The collected information was documented and subjected for analysis using 2023 AGS Beers Criteria and other suitable statistical methods.

2.9. Analysis of results

For the analysis of the result, 2023 AGS Beers criteria is used to identify the PIMs and their prevalence. Microsoft Word and Microsoft Excel are used to generate graphs and tables wherever required. Statistical software, Jamovi is used to identify the association of patient related factors on the outcome.

3. Results and discussions

The cross-sectional study was conducted in General Medicine Department at MIMS tertiary care teaching hospital, Mandya. A total number of 310 patients were enrolled based on the inclusion criteria. The demographic details such as age, sex, etc. and treatment details from the patient's case file were documented in a suitably designed patient data collection form.

3.1. Distribution of patients based on gender

Among 310 patients included in the study, 153 (49.4%) were male patients and 157 (50.6%) were female patients.

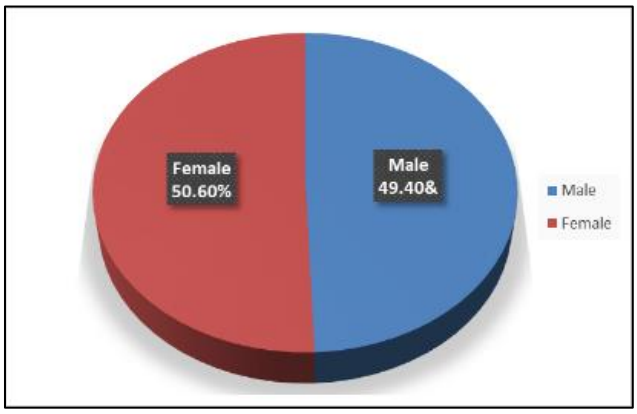

Figure 1 Distribution of patients based on Gender

3.2. Categorization of patients based on age

The study population was classified into the following age categories based on the standard geriatric age segmentation:

- **Young-old**: 65 to 74 years
- **Middle-old**: 75 to 84 years
- **Old-old**: 85 years and above

Table 1 Geriatric categorization of patients

Age category	Number of patients	Percentage (%)
Young-old (65-74 years)	176	56.8%
Middle-old (75-84 years)	102	32.9%
Old-old (85 years and above)	32	10.3%

3.3. Descriptive statistics of age

The age distribution of the study participants was analyzed using descriptive statistics. Total of 310 patients were included in the analysis. The mean age of the population was 73.4 years ±7.27 years, with median age of 72 years and a

mode of 65 years. The minimum age recorded was 65 years and maximum age was 100 years, indicating that the study captured data from wide range of elderly individuals.

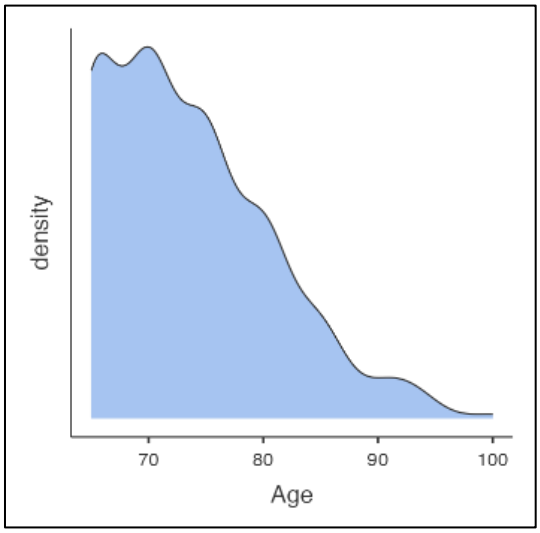

Figure 2 Density plot representing the Age Distribution of the study group

3.4. Distribution based on number of diagnoses

To better understand the disease burden among the study population, patients were categorized based on the number of coexisting diagnoses.

- **Single Morbidity:** Patients with single diagnosis.
- **Moderate Morbidity:** Patients with 2-3 diagnoses.
- **Multimorbidity:** Patients with 4 or more diagnoses.

Out of 310 patients, 192 patients (61.9%) had moderate morbidity, 66 patients (21.3%) were classified under multimorbidity, and 52 patients (16.8%) had single morbidity. Most of the study population had multiple chronic conditions with over 83% of patients having at least two or coexisting diseases.

Table 2 Patient classification based on Disease Burden

Diagnosis burden	Number of patients	Percentage (%)
Single Morbidity	52	16.8%
Moderate Morbidity	192	61.9%
Multimorbidity	66	21.3%

3.5. Prevalence of PIMs

In this study, the prevalence of the potentially inappropriate medication (PIM) use among the geriatric population was found to be 39.4% based on the AGS Beers criteria 2023. Out of the total 310 patients included in the study, 122 patients were prescribed with at least one PIM during their hospital stay. The number of medications prescribed per patient was also analyzed to understand the extent of medication burden and potential link to PIMs. The total number of prescriptions across the patients was 2,129 medications, with an average of 6.87 drugs per patients.

These findings reveal a high medication load, with most patients exposed to polypharmacy, commonly defined as the use of five or more medications. Higher number of medications is a known risk factor for Beers Criteria violations.

The most frequently prescribed PIMs were found to be, an antihistamine drug Chlorpheniramine (33.1%), rapid acting Insulin preparations (16.5%) and Aspirin (15.7%).

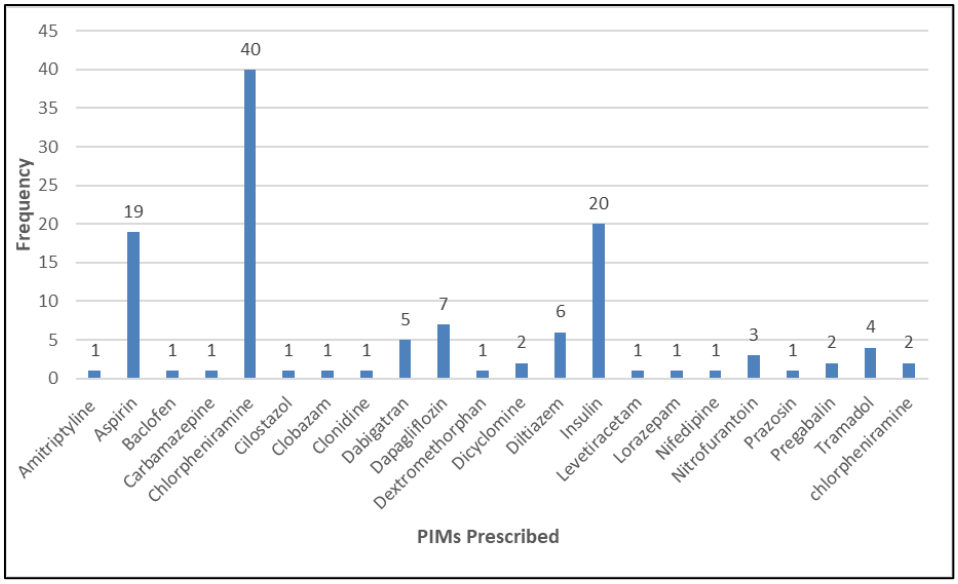

Figure 3 Distribution of PIMs prescribed among geriatric patients according to Beers Criteria

3.6. Age-wise distribution of PIMs

Among the 310 patients included in the study, the highest prevalence of PIM use was observed in the Young-old age group (65-74 years) at 20%, followed by the Middle-old age group (75-84 years) at 14.2%, and old-old age group (≥85 years) at 5.2%. This trend indicates that potentially inappropriate prescribing practices are more common in the relatively younger geriatric patients.

Table 3 Age-wise distribution of PIM use

Age Group (Years)	Total Patients(n)	Patients with PIM(n)	Percentage with PIM (%)
Young-old (65-74 years)	176	62	20.0%
Middle-old (75-84 years)	102	44	14.2%
Old-old (≥85 years)	32	16	5.2%
Total	310	122	39.4%

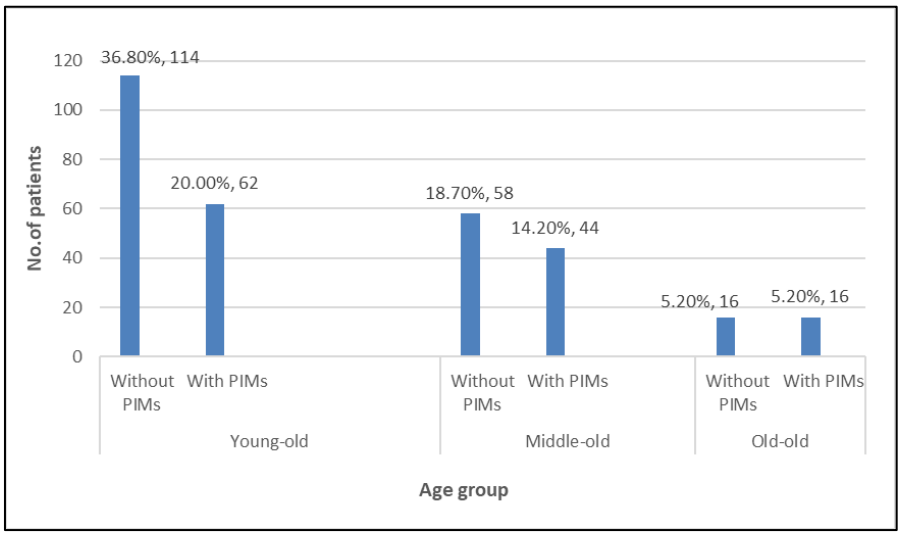

Figure 4 Age-Wise distribution of PIM uses among study population

3.7. Prevalence of PIMs based on beers criteria categories

Potentially inappropriate medications (PIMs) prescribed to the geriatric population were further classified according to the categories defined in the AGS Beers Criteria 2023. This classification helps in understanding the nature and type of inappropriate prescribing patterns commonly observed in geriatric patients.

Among 122 patients identified with at least one PIM, the most prevalent category was Medications that are potentially inappropriate in older adults (Category 1), accounting for n = 91 (75.8%) of all PIMs, the next most prevalent category was Drugs to be used with caution in older adults (Category 3) n = 18 (15.0%), Medications that should be avoided in older adults with certain conditions (Category 2) n = 7 (5.8%), followed by Potential drug-drug interactions to avoid and Drugs that require dosage adjustment based on renal functions with n = 2 (1.7%) each.

Table 4 Prevalence of PIMs based on Beers Criteria classification

Beers Criteria category	Number of Drugs Prescribed (n)	Percentage (%)
Category 1	91	75.8%
Category 2	07	5.8%
Category 3	18	15.5%
Category 4	02	1.7%
Category 5	02	1.7%

The study finds that there is predominant use PIMs that comes under Category 1 of Beers criteria classification, which are said to be high risk medications in the geriatric patients

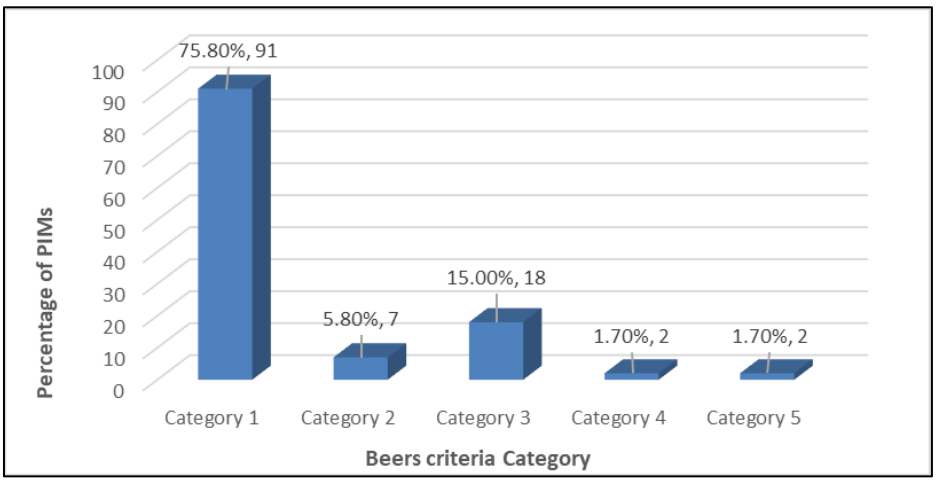

Figure 5 Distribution of PIMs among study participants, categorized according to the AGS Beers Criteria 2023

3.8. Association between PIM use and patient characteristics (chi-square test)

To assess the association between the use of PIMs and selected patient-related variables, Independence Chi-square (X^2) tests were employed. The variables, considered for this analysis included age group, gender, polypharmacy, and number of diagnoses. These variables were chosen based on clinical significance and their assumed relationship with inappropriate prescribing. The analysis was conducted using Jamovi software.

A series of Chi-square tests were performed to determine the association between several categorical variables, as detailed in Table 11. The results indicated a highly significant association for polypharmacy status ($X^2 = 54.5$, df = 2, $p < 0.001$). In contract the test did not demonstrate significant associations for the other variables examined, including age group ($X^2 = 3.39$, df = 2, $p = 0.184$), gender ($X^2 = 0.420$, df = 1, $p = 0.517$), and whether patient had single or multiple diagnoses ($X^2 = 2.64$, df = 2, $p = 0.267$).

Table 5 Summary table for the Chi-square table showing the association between various variables**.**

Summary of the Chi-square tests					
Variable	**Categories compared**	**X^2 Value**	**df**	***p*-value**	**Interpretation**
Age Group	65-74 vs 75-84 vs ≥85	3.39	2	0.184	Not statistically significant
Gender	Male vs Female	0.420	1	0.517	No significant association
Polypharmacy status	Polypharmacy vs Hyperpolypharmacy vs No polypharmacy	54.5	2	<0.001	Strong significant association
Number of Diagnoses	Single vs Multiple	2.64	2	0.267	No significant association

3.9. Binary logistic regression analysis

To further explore the factors influencing the use of PIMs among the geriatric patients, a binary logistic regression analysis was conducted. This statistical method is appropriate when the dependent variable is binary—in this case, whether a patient did or did not receive a PIM as per Beers Criteria. The primary objective of this analysis was to evaluate how various patient characteristics, such as age group, gender, polypharmacy, and number of diagnoses affect the likelihood of PIM use.

Among the four predictors, only polypharmacy was found to be a statistically significant predictor of PIM use, patients with polypharmacy had approximately 12 times higher odds of experiencing a PIM use compared to patients without polypharmacy (OR = 12.05, p = <0.001).

In contrast, gender, age group, and number of diagnoses did not show a statistically significant association with PIM use ($p > 0.05$). This suggests that, in this study population, inappropriate prescribing was not influenced by whether the patient is male or female, within younger-old or older-old age categories or had single vs. multiple diagnoses.

These findings highlight polypharmacy as a key independent risk factor for PIM use in the geriatric population.

Table 6 Binary logistic regression coefficients and odds ratios for PIM Use

Predictor	**Estimate**	**SE**	**Z**	***P* - value**	**Odds ratio**
Intercept	-2.253	0.423	-5.325	<.001	0.105
Gender:					
Male – Female	0.173	0.260	0.666	0.505	1.189
Age group:					
Old-old – Middle-old	0.120	0.448	0.268	0.789	1.127
Young-old – Middle-old	-0.230	0.285	-0.806	0.420	0.795
Polypharmacy:					
Yes – No	2.489	0.378	6.592	<.001	**12.053**
Diagnoses category:					
Multimorbidity – Moderate Morbidity	-0.215	0.310	-0.695	0.487	0.806
Single Morbidity – Moderate Morbidity	0.229	0.402	0.570	0.569	1.258
Estimates represent the log odds of "PIM Use = Yes" vs. "PIM Use = No"					

4. Discussions

Major healthcare concern in geriatric patients is inappropriate prescribing due to their age-related physiological changes, polypharmacy, and increased susceptibility of older adults to adverse drug events (ADEs). This study aimed to assess the appropriateness of prescribing medications among geriatric patients aged ≥65 years using 2023 AGS Beers Criteria in General medicine Department of tertiary care government hospital MIMS, Mandya.

The prevalence of PIMs in our study population was 39.4%, which is comparable with previously conducted systemic review and meta-analysis for prevalence of PIMs which reported prevalence of PIM use in South India 32% and national average of 28%[16]. These findings indicate a continuing trend of inappropriate medication practices in geriatric care despite the availability of clinical guidelines such as the Beers criteria. the high prevalence may be attributed to lack of awareness or limited implementation of these criteria among prescribers.

When stratified by the age group, the prevalence of PIM use is significantly high (20.0%) in Young-old (65-74 years) age group of geriatric patients compared to Middle-old (75-84 years) and Old-old (≥85 years) groups. The prevalence of PIM use is Higher in the Young-old group patients compared to other groups because of high number of patients in this group and a smaller number of patients in other two groups.

The study also classified PIMs based on the Beers Criteria categories, revealing that most of the inappropriate prescribing (75.8%) fell under Category 1: PIMs to avoid in most older adults. A significant proportion (15.5%) belonged to Category 3: Drugs to be used with caution, suggesting the need for individualized risk-benefit analysis. Meanwhile, Category 2 (Drug-disease/syndrome interactions) and Category 4 (Drug-drug interactions) contributed to 5.8% and 1.7% of the PIMs respectively, while category 5 (adjustment based on renal function) accounted for 1.7%. which is comparable to study conducted by Francis SP, Nashiya F et al., and Chinthalapudi SS, Cheeti S et al.,[17,18].

When evaluating the types of PIMs, the most prescribed inappropriate medication was found to be Chlorpheniramine (Antihistamines), Insulin preparations followed by Aspirin accounting to 33.1%, 16.5%, and 15.7% respectively. These finding are similar to the studies conducted by Chinthalapudi SS, Cheeti S et al., Bhatt, Arun N et al., and Riester MR, Goyal P et al.,[18,19,20]. These medications are known to pose increased risks such as falls, cognitive decline, or bleeding among the geriatric patients. This underscores the need for regular medication reviews and deprescribing practices in routine clinical care.

The Chi-square analysis revealed a statistically significant association between polypharmacy and PIM Use ($p < .001$). patients on five or more medications were significantly more likely to be prescribed with PIMs. This finding is consistent with literature showing that the risk of PIMs increases with the number of medications due to complex regimens and potential drug-drug interactions[19]. However, no significant association was observed between PIM use and age group, gender, or number of diagnoses, indicating that inappropriate prescribing is problem for all the geriatric patients regardless their characteristics.

To further evaluate risk factors for PIM use, a binary logistic regression analysis was conducted. The model identified polypharmacy as the only significant predictor of PIM use with odds ratio (OR) of 0.0830 indicating that patients exposed to polypharmacy were more likely to be prescribed with PIMs than those not on polypharmacy[19]. Other variables such as gender, age category, and multimorbidity did not show a statistically significant influence on PIM risk after adjusting for confounders.

These findings agree with Indian and international studies that polypharmacy as the most prominent and consistent predictor of inappropriate prescribing in the geriatric patients[19,21].

The study had several limitations. First, it was conducted in a single government tertiary care hospital, which may limit the generalizability of the results to other healthcare settings. Second, the cross-sectional design captures prescribing practices at one point in time, making it difficult to assess long-term trends or outcomes such as adverse drug events (ADEs). Lastly, clinical judgement, patients preferences, and therapeutic necessity — which are sometimes reasons for justified PIM use — were not assessed in this study.

5. Conclusion

The present study highlights the prevalence and patterns of potentially inappropriate medications (PIM) use among geriatric patients in a government tertiary care hospital setting in Mandya. Total of 310 geriatric patients were included in the study based on the inclusion criteria, 50.6% females and 49.4% were male patients.

The prevalence of potentially inappropriate medications use among geriatric patients is 39.4% as assessed using 2023 AGS Beers Criteria. The most frequently prescribed PIMs are Chlorpheniramine, Insulin and Aspirin accounting up to 33.1%, 16.5%, and 15.7% respectively. And most prescribed PIMs are from drugs Category 1 (Medications that are potentially inappropriate in older adults) of Beers Criteria. This finding indicates that inappropriate prescribing remains a significant issue in tertiary care hospital settings.

Among the various factors studied, polypharmacy emerged as the only statistically significant predictor of PIM use. No significant associations were observed with age group, gender, or number or diagnoses.

The results underscore the importance of integrating geriatric prescribing principles into clinical practice, especially in tertiary care settings where elderly patients often present with multiple chronic conditions requiring complex medication regimens. The application of tools like Beers Criteria can serve as a valuable aid in identifying and reducing inappropriate prescriptions, thereby improving medication safety and clinical outcomes in the geriatric population.

Efforts to optimize prescribing practices should include periodic medication reviews, healthcare professional training on geriatric pharmacotherapy, and the involvement of clinical pharmacists in routine patients care. Implementing these strategies can help minimize drug-related risks and enhance therapeutic effectiveness.

While this study provides valuable insights into prevalence and predictors of PIM use among geriatric patients, future studies should involve larger, multi-center populations and incorporate additional clinical, functional, and laboratory parameters to identify a broader range of predictors for PIM use.

Compliance with ethical standards

Acknowledgments

The assistance from the Mandya Institute of Medical Sciences, Mandya, Karnataka, India is gratefully acknowledged.

Disclosure of conflict of interest

No conflict of interest

Statement of ethical approval

Ethical clearance is obtained from Institutional Ethics Committee, Mandya Institute of Medical Sciences and Teaching Hospital, Mandya.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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