ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 15, Issue 7, 2022

Online - 2455-3891
Print - 0974-2441

Research Article

PRESCRIPTION ADHERENCE TO AGS BEERS CRITERIA AND MEDICATION ADHERENCE IN GERIATRIC PATIENTS

SUMMAIYYA AHMED[1]*, PAVITRA MAHESH[1], RUCHA DHAKNE[1], SONALI JAMDADE[1], MANASI WAGDARIKAR[2], SAYALEE KARVE[3]

[1]Doctor Of Pharmacy, SCES's Indira College of Pharmacy, Tathawade, Pune, Maharashtra, India. [2]Assistant Professor, Department of Pharmaceutical Chemistry, SCES's Indira College of Pharmacy, Tathawade, Pune, Maharashtra, India. [3]Assistant Professor, SCES's Indira College of Pharmacy, Tathawade, Pune,Maharashtra, India.
Email: ahmedsummaiyya55@gmail.com

Received: 12 April 2022, Revised and Accepted: 23 May 2022

ABSTRACT

Objective: The objective of the present study was to determine the prescription pattern and adherence to Beers Criteria 2019 and also evaluate the reasons for non-adherence and ways to promote adherence among geriatric patients.

Methods: Retrospective as well as prospective data were collected using a predesigned form. A total of 268 patients aged 60 years and above were involved in the study. The prescriptions were analyzed for appropriateness using AGS Beers Criteria 2019 and the 8-Item Morisky Medication Adherence Scale was used for the assessment of medication adherence.

Results: The majority of the patients were in the age group of 65–69 years with a mean age of 73.6 ± 5.05 years with a male preponderance (67%). Out of 268 sample sizes observed, the maximum number of prescriptions had at least one potential inappropriate medication (PIM) – during admission (40.67%) and discharge (48.50%). The most common PIMs observed were PPIs and insulin sliding scale. The use of NSAIDs (aspirin) in heart and renal failure patients was the generally recognized drug-disease and drug-drug interactions. This study confirms the presence of moderate adherence to the prescription among geriatric patients.

Conclusion: Even though Beers Criteria have been commonly used as a reference in many studies, it has not made its way into conventional clinical practice. The prescribers need to make themselves aware of the Beers Criteria and it should be followed for the geriatric population. Hence, this study will help physicians to deliver quality care to elderly patients.

Keywords: Geriatric, Beers Criteria, Inappropriate prescribing, Morisky Medication Adherence Scale, patient adherence.

 DOI: http://dx.doi.org/10.22159/ajpcr.2022v15i7.44921. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

In the developing countries like India, the demand for drug therapy for geriatric patients is increasing with an increase in the amount of the elderly. The population the age 60 years or above is termed the geriatric population [1,2]. In general, it is observed that these patients suffer from multiple comorbidities and have been hospitalized many times, thus increasing the incidence of drug-related problems that need to be resolved [3]. Higher life expectancy has translated into greater demand for medical services, comorbid conditions, and increasing prescribed medication consumption [4].

The geriatrics population has altered pharmacokinetics and pharmacodynamics parameters compared to that of young adults. Elderly patients often develop serious drug-related problems. Hence, it is important to identify the PIM use in this vulnerable group to minimize pharmacotherapy-related hazards [5,6]. The geriatric population are the largest group of drug consumer. Among the total population, 25–30% of the drugs are been consumed by elderly patients [3]. Optimizing medication is an important part of caring for the elderly. Moreover, different studies have found that more than 20% of the drugs prescribed for geriatric patients are potentially inappropriate prescriptions [4]. Therefore, elderly patients were considered a special population, and most patients were excluded from randomized controlled clinical trials. Therefore, the prescribing decisions made for elderly patients lack the scientific evidence generated by rigorous randomized controlled trials [7].

In 1991, Beer *et al*. initially developed criteria for determining inappropriate medication use among elderly patients in nursing homes using a literature review and consensus methodology. Inappropriate medications were defined as drugs that are either ineffective or pose unnecessary risk [8,9].

According to Beers Criteria 2019, medications that are prescribed inappropriately are classified into one of the following categories:

- Group I: Medications that are considered to be potentially inappropriate in geriatrics
- Group II: PIMs use in geriatrics due to drug-disease or drug-syndrome interactions that may exacerbate the disease condition
- Group III: PIMs: Drugs to be used with caution in geriatrics
- Group IV: Potentially clinically important drug-drug interactions that should be avoided in geriatrics
- Group V: Medications that should be avoided or the dosage reduced with varying levels of serum creatinine of kidney in geriatrics [4,9].

Adherence to medications has always been an issue among elderly patients. As they are vulnerable to multiple comorbidities, they are at higher risk of polypharmacy and thus may present with a higher risk of non-adherence to medications compared to the younger population. In chronic disease treatment, medication adherence plays a crucial component [10]. Medication non-adherence leads to decreased therapeutic benefits for the patient, frequent hospital visits, and increased health-care expenditure. This may be a growing concern to clinicians and health-care systems [5].

Therefore, the main objectives of this study are to observe the demographic details, assessing the prescription and adherence to AGS Beers Criteria 2019, and evaluating the reasons for non-adherence and ways to promote adherence among geriatric patients.

METHODS

An observational, single-centered cross-sectional study on prescription adherence to AGS Beers Criteria in geriatric patients was conducted in a tertiary hospital, Pune, India, over the past 6 months from February to August 2021. Ethical approval for this study was granted by the Hospital Ethics Committee with the proposal number of ABMH/3614.

During the study period, 268 geriatric patients were identified based on the inclusion criteria, and both retrospective and prospective data were collected. The inclusion criteria included: All OPD and inpatients of both genders above the age of 60 years and patients under cardiology, neurology, nephrology, and general medicine and exclusion criteria were as follows: Patient with severe illness and requiring intensive care unit admission, patient with cancer or undergoing chemotherapy, pregnant and lactating women, patient with a confirmed diagnosis with COVID-19 infection, and patients who are not willing to participate in the study.

Demographic data, medical and medication history, diagnosis, laboratory findings (serum creatinine levels), and medication prescribed during hospitalization and during discharge were collected from the self-designed patient profile form. Then collected information was analyzed according to their age, gender, and therapeutic category. Geriatric patients' prescriptions were assessed for the use of PIMs using updated American Geriatric Society (AGS) Beers Criteria, 2019. Drug disease or syndrome interactions, drug-drug interactions, drugs to be used with caution in geriatric patients, and medication that should be avoided or require dose reduction used were also assessed. They were then assessed for medication adherence using the Morisky 8-Item Medication Adherence questionnaire. Data were evaluated in terms of numbers, percentages, tables, figures, and graphical representation. Descriptive statistics were used to analyze the result which was then compared to those documented in the literature review.

RESULTS

A total of 268 geriatric patients were analyzed during the study period, out of the total number of cases collected, 218 cases were retrospective while 50 were prospective. Baseline characteristics of the subjects are summarized in Table 1.

Out of a total of 268 patients, 220 patients had comorbid conditions, as shown in Fig. 1.

Of all the prescriptions evaluated, 39.92% (n=107) were found to have 5–8 medications per prescription during admission and 58.95% (n=158) during discharge. Fig. 2 summarizes the number of medications prescribed per prescription during hospitalization and discharge.

Prescriptions were assessed to evaluate the PIMs, a sum of 17 PIMs exposed in the Beers Criteria 2019 had been used in this study and the most common PIMs recorded were pantoprazole, and insulin sliding scale, and alprazolam during hospitalization and during discharge, as shown in Fig. 3.

Medications that can aggravate the disease that results in drug-disease interaction were detected in 29 (10.8%) patients. The use of nonsteroidal anti-inflammatory drugs (NSAIDs) in heart and renal failure patients was the generally recognized drug-disease interaction (Table 2).

Totally 11 drugs which are to be used with caution in elderly patients were used; of which aspirin, 81 (30.2%) were the most frequently prescribed drug above 70 years of age which require cautious use in geriatric patients as per the Beers Criteria (Fig. 4).

According to the criteria, the drug-drug interactions found are represented in Table 2. The maximum interaction was noted with peripheral alpha-1 blocker, that is, prazosin, and loop diuretics, that is, torsemide. Medications that should be avoided with varying levels

Table 1: Baseline characteristics of the subjects

Characteristics	Number of subjects	Percentage
Gender		
Male	179	67
Female	89	33
Age groups (years)		
60–64	67	67
65–69	59	27.8
70–74	33	12.2
75–79	33	12.2
80 and above	23	8.5
Department		
Cardiology	90	33.5
Nephrology	62	23.1
Internal medicine	60	22.3
Neurology	48	17.9
Pulmonology	8	2.98

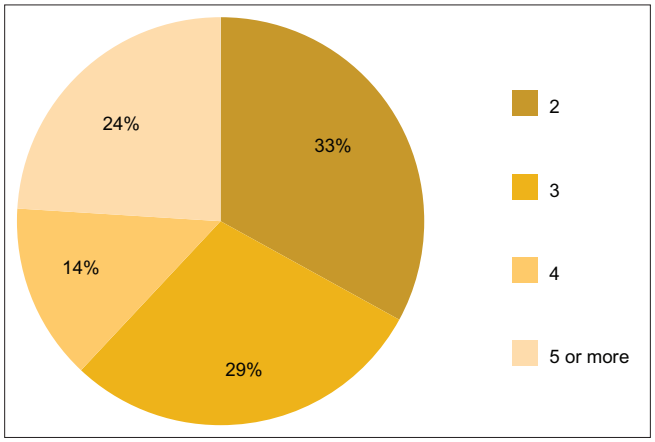

Fig. 1: Distribution based on patients with comorbid conditions (n=220)

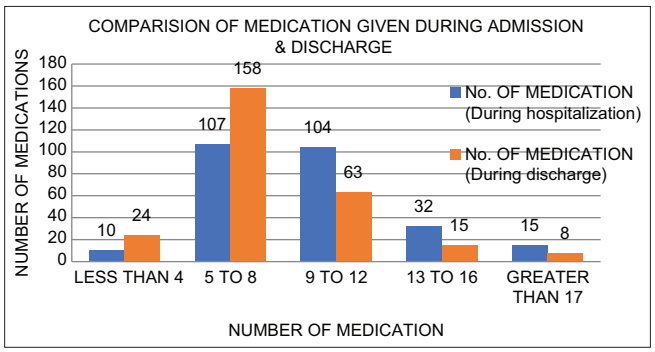

Fig. 2: Number of medications prescribed per prescription during hospitalization and discharge

of kidney function in older adults were levetiracetam 2.98% (n=8), tramadol 0.30% (n=1), pregabalin 0.30% (n=1), and ranitidine 0.30% (n=1) as recorded during the course of the study. Fig. 5 represents the number of PIMs prescribed per prescription during hospitalization and at discharge.

In the course of the study, 50 patients were interviewed for adherence study using the MMAS-8 Scale. Medication adherence was categorized into medium, low, and high adherence based on the number of "YES" or "NO." About 48% were reported to have medium adherence followed by low adherence (30%) and high adherence (22%). One of the reasons for medication non-adherence is the cost which was also studied and was found out that it was a major obstacle in prescription non-adherence,

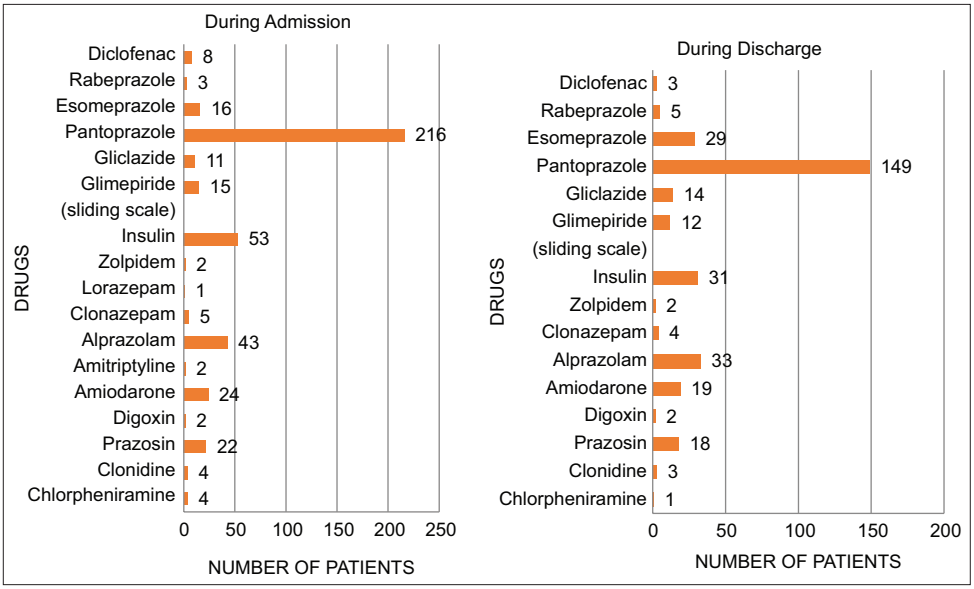

Fig. 3: PIMs used in geriatric patients according to AGS Beers Criteria during hospital admission and at discharge

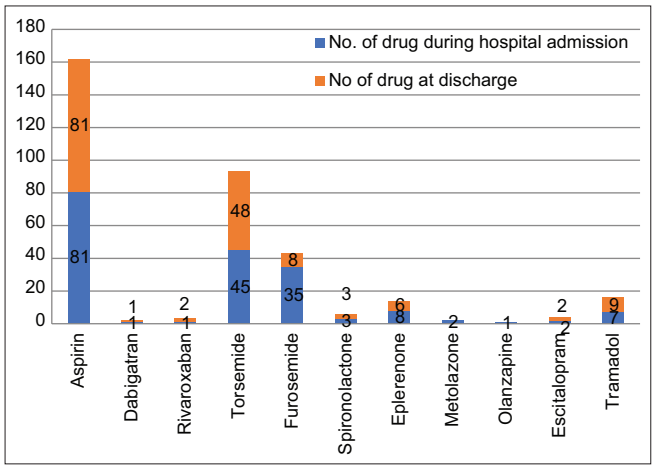

Fig. 4: Representation of the drug to be used with caution during hospital admission and discharge

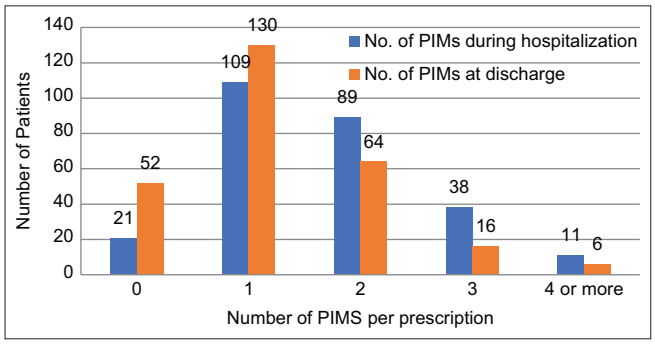

Fig. 5: Number of PIMs prescribed per prescription during hospitalization and at discharge

51% of population found to cost as a major concern while 49% were okay with the cost of the medication. Patients were also evaluated for non-adherence due to changing medication according to their convenience, it was found that 9.3% changed their medication dose and 90.6% did not. The ways to promote adherence in geriatric patients are tabulated in Table 3.

Table 2: Representation of drug-disease interaction according to 2019 AGS Beers Criteria

Disease	Therapeutic category	No. of patients (%)
Cardiovascular system: Heart failure	NSAIDs (aspirin)	5 (1.86)
	Non-dihydropyridine CCB (Diltiazem)	1 (0.3)
Central nervous system: Parkinson disease	All anti-psychotic	3 (1.11)
Kidney: Chronic kidney disease (creatinine clearance<30 ml/min)	NSAIDs (aspirin)	20 (7.46)

NSAID: Nonsteroidal anti-inflammatory drug, CCB: Calcium channel blocker

Table 3: Strategies to promote adherence in geriatric patients

- Evaluate patient understanding of the condition and treatment
- Avoid medication terms, emphasize layman's language
- Tailor medication regimens to the patient's daily routine
- Instruct with clarity and at the level of patient understanding
- On the exact treatment regimen, preferably in writing
- Educate the patient about the disease process, the necessity of conditions treatment or precaution, and consequences if not treated
- Identify combination medication that can be given to avoid two separate prescriptions, and minimize polypharmacy
- Educate the patient about the results, problems while treatment, and ADRs involved during treatment, including how the medication works, time to onset of effect, the goal of therapy, and how to measure for effectiveness
- Involve family members in the whole process for social and moral support
- Use of pictures, diagrams, or pictograms to ease the communication
- Assess medication for cost-effectiveness, focusing on generics; emphasis on lower-cost alternative

DISCUSSION

Pharmacists are frequently requested by numerous health system providers and primary care teams to refine outcomes and delivery of care to the patients. The utilization of the best available evidence by pharmacists in evaluating patterns of drug use and guideline utilization

from time to time in hospitals aids in achieving rational drug use in these settings. This study identified potentially inappropriate prescriptions by the AGS Beers Criteria 2019.

In the entire study population, male cases were predominant in comparison with female cases, similar sex distribution was seen in the study done by Anjum *et al*. (2017) [5]. Male predominance was justified because, in the developing countries like India, cardiovascular, diabetes mellitus, and chronic kidney diseases were more prevalent in male than in the female [2,5].

PPIs such as pantoprazole are the most commonly used and prescribed drug in hospitals and that should be avoided in the elderly. The main reason for this is that the use of PPI is associated with the risk of *Clostridium difficile* infection and the increased likelihood of bone loss and fractures [3,9,11]. The present study shows that a total of 216 (80.59%) patients out of 268 were reported to prescribe pantoprazole during admission whereas 149 patients (60%) were prescribed during discharge. In addition to PPI, studies have shown that the correlation between PIM and the insulin sliding scale is quite high. Insulin sliding scale (it contains only short- or rapid-acting insulin dosed according to the current blood glucose levels without concurrent use of basal or long-acting insulin) is a drug approved for use in diabetic patients. However, geriatric patients may have a higher risk of hypoglycemic events without an improvement in hyperglycemia management [3,9]. This study shows that 53 patients out of 248 patients (19.77%) were prescribed with insulin sliding scales during admission, whereas 31 patients (11.56%) were prescribed during discharge. This indicates negligence because instead of prescribing long-acting insulin, insulin sliding scales are routinely prescribed. Another important PIM is related to alprazolam, the restriction on the use of this drug is- it increases the risk of cognitive impairment, delirium, falls, and fractures [2,3,9]. This study shows that 43 patients (16.53%) were prescribed with alprazolam during admission, whereas 33 patients (12%) during discharge. A similar pattern in PIMs was observed in Sharma *et al*. (2020) [3], Alshehri *et al*. (2020) [11], as PPI, insulin sliding scale, and benzodiazepines were enlisted as the most frequent PIMs.

The most frequent interaction was loop diuretics (torsemide) along with prazosin, that is, 4% (n=11), while with furosemide was 1% (n=3). A similar pattern was observed in Castro-Rodríguez *et al*. (2019) [4] in Columbia.

Advanced age, multimorbidity, and polypharmacotherapy all were significantly associated with drug-disease interaction. Aspirin accounted for 7.5% in CKD and 2% in HF. Much the same as the trend was observed in Maheshkumar *et al*. (2015). [2] According to the American Heart Association, the use of aspirin is allowed in the prevention of the initial stroke provided eGRF<45 ml/min/1.73 m^2. As for CKD Stages 4 and 5, aspirin is not permissible by Pignone and associate (2018) [12]. Aspirin was the major drug responsible for drug-disease interaction in most of the patients as observed during the study. A study done by Silagy *et al*. [13] showed that the use of aspirin in people over 70 years of age is primary prevention and associated with a significant decrease in hemoglobin, whereas the American Diabetes Association does not recommend its use for this purpose in patients with diabetes mellitus [12]. Another study, contradictory, found an increase in the risk of ischemic stroke. However, it has been reported that aspirin use may blunt the beneficial effect of the renin-angiotensin-aldosterone system modifying therapy in patients with HF. Furthermore, older patients are at risk of adverse events related to aspirin use, especially gastrointestinal hemorrhage [14].

Medications to be used with caution, most commonly prescribed medications were aspirin with 30.2% (n=81) of patients above 70 years of age followed by torsemide in n=48 patients, similar result was seen in the study conducted by Chitra *et al*. [15] in India.

In this study, it has been observed that patients were prescribed a standard dose of levetiracetam, ranitidine, pregabalin, and tramadol, despite a decrease in their CrCl. If the CrCl level is 30 mL/min in a patient, there may be, CNS adverse effects possibly leading to a disturbed mental status [3,9]. In another study conducted by Sharma *et al*. (2020) [3], it was found that enoxaparin, ranitidine, and spironolactone were prescribed despite a decrease in their CrCl.

One PIM per prescription has the maximum number of occurrences both during administration (n=109) and during discharge (n=130) followed by two PIMs per prescription. Khamis *et al*. (2019) [16] in North Cyprus showed similar trend in PIMs. In this study, 7.83% (n=21) prescription had 0 PIM from the sample size n=268 during admission whereas 19.40% (n=52) prescription during discharge. The reduction in PIMs at discharge compared to hospitalization may be due to the ability to monitor patients during hospitalization [9,16].

In this study, out of 50 patients, 48% were reported to have medium adherence followed by low adherence (30%). This is because in the developing countries like India, elderly patients are uneducated and poses poor knowledge about their medications and the severity of diseases. Whereas, a study conducted by Anjum *et al*. (2017) [5] has discrete results, they reported that 51.1% has low adherence to medication followed by 35.5% with medium adherence. Cost-related non-adherence is one of the factors for non-adherence The issue of cost-related medication non-adherence can be possibly tackled by the assessment of medication for cost-effectiveness; focusing on generics; emphasis on lower-cost alternatives [2,10].

During the patient prescription adherence evaluation, certain reasons were put forth by the patients for non-adherence which include, forgetfulness, physical functions such as visual impairment, hearing impairment, cognitive impairment, and impaired mobility other reasons also included lack of disease and medication awareness, misinterpretation of verbal instructions, unaware of the consequences of non-adherence, and high perception of illness burden [17].

CONCLUSION

Based on the analysis performed in this study, it can be concluded that the prevalence of potentially inappropriate medication prescriptions in elderly patient in this study is lower than that reported in different studies. A total of 26 potentially inappropriate medications based on the Beers Criteria 2019 were reported in this study. Use of NSAIDs (aspirin) in heart and renal failure patients was the generally recognized drug-disease interaction and drug-drug interaction. However, the higher frequency of prescriptions of aspirin in geriatric patients should be taken into account as it is the sole drug that is causing the majority of drug-disease and drug-drug interactions.

Even though Beers Criteria have been commonly used as a reference in many studies, it has not made its way into conventional clinical practice. The prescribers need to make themselves aware of the Beers Criteria and it should be followed strictly for the geriatric population. Hence, this study will help physicians in taking the best clinical decisions, delivering quality care, and making for better pharmaceutical care for geriatric patients.

This study confirms the presence of poor adherence to the prescription among geriatric patients.

ACKNOWLEDGMENTS

We are grateful to all the hospital authorities of Aditya Birla Memorial Hospital and the Department of Pharmacy of Indira College of Pharmacy for encouragement and support for this study. We would like to express our deep gratitude to Dr. Manasi Wagdarikar and Dr. Sayalee Karve, our research guide, for their patient guidance, enthusiastic encouragement, and useful critiques of this research work.

AUTHORS' CONTRIBUTIONS

The authors confirm their contribution to the paper as follows: SA and PM designed and conceptualized the study whereas data collection was done by RD, SJ, SA, and PM. SA and PM analyzed and interpreted the data and wrote the manuscript, with the input from RD and SJ. All authors reviewed the results and approved the final version of the manuscript.

AUTHORS' FUNDING

The author(s) received no financial support for the research, authorship, and/or publication of this article.

COMPETING INTERESTS

All authors declare that they have no conflicts of interest.

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