



## Assessing the Geriatric Medication safety under AGS Beer's criteria 2023 in Tertiary care Hospital

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### KEYWORDS

Beer's criteria, Potentially Inappropriate Medication, Geriatrics, PIMs, Poly pharmacy

### ABSTRACT

**Background:** The Beers Criteria, developed by the American Geriatrics Society (AGS), is a comprehensive strategy for reducing potentially inappropriate medicine (PIM) use in the elderly population. Using the Beers criteria, this study evaluates geriatric prescriptions in order to analyze the prevalence of possibly inappropriate drugs.

**Methodology:** Using a data collecting form, a six-month cross-sectional study will be conducted in the teaching hospital for tertiary care. The case record form will be used to record information such as age, gender, department, lab results, recommended medications, doses, and duration. Potentially inappropriate medicine will be recognized using the AGS 2023 modified Beer's criteria.

**Results:** Based on data from 255 patients, the results showed that 53.3 percent of the patients were male, 52.5 percent were in the 65–70 age range, and 43.5 percent were geriatric patients from general medicine. A minimum of one PIM was given for each of the 308 PIMs, 41.6% contain one PIM drugs, 27.8% were two PIMs respectively. With around 25.9% most frequently prescribed PIM was shown to be pantoprazole, followed by diuretics with 22% of patients given. IBM SPSS STATISTICS 29.0 VERSION was utilized for data analysis and interpretation. A relationship between the number of PIMs and the number of comorbidities by using chi-square test and the p value is 0.045 found significant.

**Conclusion:** Every prescription that was examined in the study had at least one PIM, according to the findings of the study on hospital prescribing practices. It was also observed that the number of comorbidities and the patients' age were associated to the prevalence of PIMs. The findings indicate that PIM prescription is frequently given to elderly Indian patients who are hospitalized.

### 1. Introduction

In order to reduce the use of potentially inappropriate medications (PIM) in older adults, the American Geriatrics Society (AGS) created the Beers Criteria, a comprehensive medicine utilisation method. Elderly people's prescription medication needs to be taken with extra care because of their unique physiological changes and increased susceptibility to dangerous drug reactions<sup>1,2</sup>. Critical risk factors include the existence of many chronic conditions, such as diabetes mellitus, heart failure, and hypertension. Research has shown that elderly people are more likely to be hospitalised for medication related reasons<sup>3</sup>. Taking many drugs raises the possibility of drug interactions or bad effects on coexisting morbidities, which in turn raises the risk of

hazardous drug reactions<sup>4,5</sup>. The criteria have the name of Dr. Mark H. Beers, who chaired the initial expert panel responsible for developing the Beers Criteria in 1991<sup>6</sup>. In 1997, the criteria were revised, adding more drugs to the list and improving the suggestions. The American Geriatrics Society took over stewardship of the Beers Criteria in 2010, after an interprofessional group updated them in 2003, AGS recently announced the Beers Criteria for 2023, which is the seventh modification overall and the fourth since the AGS assumed guardianship of the criteria<sup>7,8,9</sup>. In tertiary care hospital, the evaluation of geriatric medication is an important area of focus, particularly considering the difficulties involved in prescribing for elderly patients. The American Geriatrics Society's Beers Criteria is a generally recognized guideline that helps medical practitioners



identify potentially inappropriate medications (PIMs) for elderly patients (AGS)<sup>10</sup>. In 1997, the criteria were revised, adding more drugs to the list and improving the suggestions. The American Geriatrics Society took over stewardship of the Beers Criteria in 2010, after an interprofessional group updated them in 2003, AGS recently announced the Beers Criteria for 2023, which is the seventh modification overall and the fourth since the AGS assumed guardianship of the criteria<sup>7,8,9</sup>. In tertiary care hospital, the evaluation of geriatric medication is an important area of focus, particularly considering the difficulties involved in prescribing for elderly patients.. The American Geriatrics Society's Beers Criteria is a generally recognized guideline that helps medical practitioners identify potentially inappropriate medications (PIMs) for elderly patients (AGS)<sup>10</sup>

## 2. Methods

### 2.1. Study Setting

We conducted a prospective study to evaluate geriatric prescriptions at a tertiary hospital associated with the Karpagam Faculty of Medical Science and Research in Coimbatore. Prior to the start of the investigation, the Institutional Ethics Committee (IEC) IHEC/337/KAHE/03/2024 granted ethical approval for the study protocol.

### 2.2. Study tool and study sample

The period of data collection was six months. The medication chart review provided the diagnosis and drug data. Using the AGS Beers Criteria 2023, which identifies potentially inappropriate medications for older adults, we assessed the prescriptions to ensure they met safety and efficacy standards. The prescribed drugs and their dose schedules in relation to the patients' diagnoses were examined. After that, every drug was compared to the Beers list tables, and if any were listed, the quality of the evidence and recommendation strength for each medicine were documented. Six months was spent on the project and the data of 255 patients were collected which department of General Medicine, General Surgery, Orthopedics, Dermatology, Pulmonology, and Cardiology wards at the hospital. Both male and female patients were included, with their medication charts and inpatient/outpatient medical or case records being evaluated. Exclusion criteria for the study were geriatric patients admitted to ICU wards, those with incomplete medical data, and patients under the age of 65 years .

### 2.3. Statistics

The study employed descriptive statistical analysis to synthesize socio-demographic data, significant clinical parameters, and prescription habits of elderly patients. Frequency and percentage were utilized for categorical vectors. Data was lost. The statistical analysis and data input were performed using the Statistical Package for Social Science, Version 29.0. variables related to the PIM use (result) based on the five categories categorized using Beers' criteria. To determine a significant difference or relationship between categorical-dependent variables with regard to different groups, the chi-square test was employed. The nonparametric approach was strongly advised since the parameter data were not frequently distributed.

## 3. Results

A total of 255 in- and out-patient records, with ages ranging from 65 to 90 years, were examined. The research population's age was further divided into three categories: 65-70, 70-75, and  $\geq 75$  years old respectively, Whereas 52.5% of (134) patients belonged to 65-70years age group, 32.9% of 84 patients belonged to 71-75 Years and 14.5 % of 37 patients were belonged to >75 years.

Comparing the genders of the 255 people in the research population, the 53.3% of patients were males (136/255) and 46.7% of patients were females (119/255)

| Table 1 |          | FREQUENCY | PERCENTAGE |
|---------|----------|-----------|------------|
| AGE     | 65-70YRS | 134       | 52.5%      |
|         | 71-75YRS | 84        | 32.9%      |
|         | >75      | 37        | 14.5%      |
| GENDER  | Male     | 136       | 53.3%      |
|         | Female   | 119       | 46.7%      |

Table (1) shows Frequency And Percentage Of demographic details

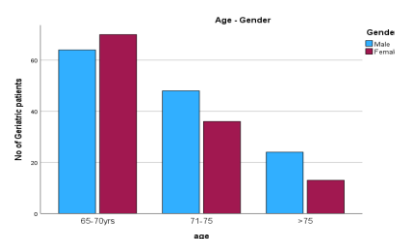


Figure 1 Bar diagram showing the distribution of age and gender in the study

High prevalence of geriatric patients from the Department of General Medicine was 43.5%, followed



by General Surgery was 18.8% , Dermatology was 11.4%, Orthopedics was 8.6% , other departments like cardiology, pulmonology and psychiatry.

| S/no. | DEPARTMENT  | FREQUENCY | PERCENTAGE |
|-------|-------------|-----------|------------|
| 1     | GM          | 111       | 43.5%      |
| 2     | GS          | 48        | 18.8%      |
| 3     | Dermatology | 29        | 11.4%      |
| 4     | Orthopedics | 22        | 8.6%       |
| 5     | Others      | 45        | 17.6%      |

Table (2) shows Frequency And Percentage Of Department

Type 2 Diabetes Mellitus, hypertension, and cardiovascular disease were shown to have a higher risk of producing PIMs in the research group, despite the fact that the majority of patients had two or more comorbidities.

| S/no | Comorbidities | Frequency | Percentage |
|------|---------------|-----------|------------|
| 1    | HTN           | 145       | 56.9%      |
| 2    | DM            | 101       | 39.6%      |
| 3    | CVD           | 49        | 19.2%      |
| 4    | CKD           | 20        | 7.8%       |
| 5.   | OTHERS        | 85        | 33.3%      |

Table 4 Frequency And Percentage Of Cormorbidities

The percentage of comorbidity pattern of hypertension was 56.9%, Diabetes Mellitus 39.6%, cardiovascular disease 19.2%, CKD 7.8% and other comorbidities like liver disease, neurological disorders, respiratory disorders and endocrine disorders were 33.3%.

### Potentially Inappropriate Medications

The updated AGS Beers Criteria for 2023 divided PIMs into five categories: medications to be avoided, medications that interact with diseases, medications to be taken cautiously, medications that interact with diseases, and medications to be used at lower doses in patients with renal illness.

A total of 19 PIMs included in the Beers Criteria 2023 were utilized in this investigation to evaluate the prescriptions. In our study, we found that the high prevalence of Pantoprazole (25.9%) and Benzodiazepines (15.7%) in the first category of avoid PIM (57.3%) during hospitalization and during discharge. Chi square test was used in the analysis, compare with the category and drugs whereas pantoprazole and anti diabetic drug showed significant p (<0.05) with the category 1 and benzodiazepines and anti histamine were p value is > 0.05 showed insignificant. . It was shown that type 2 diabetes mellitus was the second

most common comorbidity. Although long-acting sulphonylureas, which were often prescribed medications for type 2 diabetes mellitus, were thought to have a PIM, the majority of anti-diabetic treatments were not identified as PIMs.

Drugs that have the potential to worsen the illness and cause a drug-disease interaction have been identified in n=43 (16.9%) patients. The use of steroids was 19(7.5%) and antipsychotics were 23 (9%). Both drugs shown significant.

Table 5 Potentially Inappropriate Medications listed under AGS Beers Criteria 2023

|   | Drugs                                | n  | %     | P Value |
|---|--------------------------------------|----|-------|---------|
| Category 1<br>(Avoid PIM)                         | Pantoprazole                         | 66 | 25.9% | 0.003   |
|   | Benzodiazepines                      | 40 | 15.7% | 0.078   |
|   | Anti Diabetics                       | 26 | 10.2% | 0.017   |
|   | Anti Histamines                      | 22 | 8.6%  | 0.015   |
| Category 2<br>(Drug Disease Interaction)          | Corticosteroids                      | 19 | 7.5%  | <0.001  |
|   | Antipsychotic                        | 23 | 9%    | <0.001  |
| Category 3<br>(Drugs Used With Caution)           | Diuretics                            | 56 | 22%   | <0.001  |
|   | Tramadol                             | 23 | 9%    | <0.001  |
| Category 4<br>(Drug Drug Interaction)             | Anti hypertensive                    | 24 | 9.4%  | 0.105   |
| Category 5<br>(Dose Adjustment in Renal Patients) | spironolactone, Tramadol, Pregabalin | 30 | 11.8% | 0.690   |

Medication that should be used cautiously in old patients was utilized; the most often prescribed medications that ought to be used cautiously in elderly patients, according to the Beers Criteria, were diuretics (56, 22%) and tramadol (23, 22%). Both medications showed noteworthy results. The study revealed that pantoprazole was the most often given PIM, with around 25.9% of patients receiving a prescription for it. Diuretics were supplied to 22% of patients, with furosemide and spironolactone being the most commonly prescribed diuretics, this is similar to the the



research done by Pavani Golla et al., which found that furosemide was the second most commonly prescribed PIM after pantoprazole<sup>13</sup>

Diuretics were used as PIMs to treat hypertension; they were often administered in combination with one loop or thiazide diuretic, one potassium-sparing diuretic, and prazosin. medications that should be taken in combination with other medications in older individuals, with two or more prescriptions for RAS inhibitors increasing the risk of hyperkalemia. Antihypertensive drug is insignificant ( $p$  value > 0.05) with the category 4.

Drugs that, depending on the creatinine clearance level, should be avoided or whose dosages should be lowered in older persons with varied degrees of renal function listed in the category of spironolactone, Tramadol and Pregabalin which showed insignificant whereas the  $p$  value is > 0.05

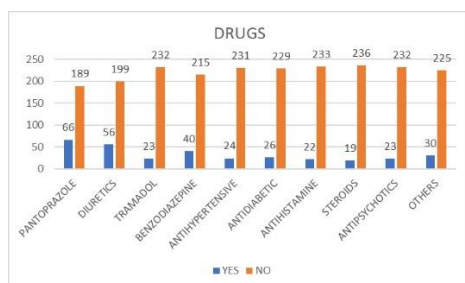


Figure 2 Frequency of each Potentially Inappropriate Medications

#### 4. Discussion

Elderly patients are becoming more and more prevalent, and they are more prone to negative health outcomes<sup>14</sup>. Compared to younger persons, the elderly people responds differently to drugs<sup>15,16</sup> this is a result of their gradual pharmacokinetic alterations. Growing older and having worsening health conditions raise the risk factors for chronic illnesses<sup>17</sup>, which over time function as comorbidities and necessitate the use of PIM is more prominent. Our study findings shows that maximum PIMs taken in the age of 65 to 70 years which is resemble with the study of Sultan et al., Patients older than 90 years old had the fewest PIMs, while those in the 65–70 age range received the most.<sup>18</sup>

In India, a major worry for the older population is polypharmacy, which is defined as taking five or more prescriptions at the same time. Research suggests that between 40 and 50 percent of India's elderly population may be exposed to polypharmacy. According to an urban survey, over 44% of senior citizens suffer from polypharmacy. This condition raises the likelihood of a and drug interactions and has potential hazards that

outweigh any therapeutic advantages. It can also result in a higher incidence of potentially unsuitable prescriptions.<sup>19</sup>

Tosato et al. noted that a deterioration in physical function or ADR was linked to the usage of PIM. According to south India analysis<sup>21</sup>, minor polypharmacy (two to four medicine) constituted 15.22% of the total prevalence, major polypharmacy (five or more medicines) for 81.35%, and hyper polypharmacy (ten or more medicines) for 3.46%. PPI, antipyretics, and H2 receptor blockers were the most often recommended medications. In that order, they made up 21.70%, 5.78%, 5.42%, and 4.94%. Polypharmacy is avoidable and treatable with an appropriate prescription. The study finding<sup>22</sup> shows interdisciplinary deprescribing strategy did not lower mortality, unplanned hospital visits, or rehospitalization within a year for older inpatients with polypharmacy. Even in elder inpatients with polypharmacy, the intervention was successful in lowering the amount of drugs used without having a statistically significant negative impact on clinical outcomes.

In the first category of avoiding PIM, Pantoprazole is one of the proton pump inhibitors (PPIs) that effectively treats GERD and peptic ulcers. However, long-term usage in elderly people might have detrimental effects including fractured bones. PPIs could reduce the absorption of calcium leads to osteoporosis<sup>23</sup> and fractures, particularly in the hip, wrist, and spine areas., which potentially increases the risk of renal impairment, including acute interstitial nephritis and chronic kidney disease. They may also increase susceptibility to *C. difficile* infections. The studies<sup>24</sup> shown guidelines deprescribing the proton pump inhibitors in the elderly patient. Choosing whether and how to discontinue using PPIs or lower their dosage is made easier by the helpful advice in the study guideline. The purpose of recommendations<sup>25</sup> is to help patients make decisions together, not to control them.

In cases of diabetes, hypertension, and osteoporosis, corticosteroids interact with the disease might exacerbate blood glucose levels, increase blood pressure due to fluid retention, and cause bone loss, which raises the risk of fracture. When administering corticosteroids to individuals with these diseases, cautious observation and treatment are necessary.

Antipsychotics pose significant risks in specific conditions: In dementia, they increase the likelihood of stroke and mortality. In Parkinson's disease, they can worsen symptoms. The sedative effects and orthostatic



hypotension associated with these medications heighten fractures and falls are risks.

In the third category of drug used with caution, Diuretics were substantially linked to an elderly persons are more likely to fall, according to research suggested that with the chance of falls in this population being 1.185 times greater than in the population not taking diuretics.<sup>26</sup>

Diuretics have been linked to electrolyte imbalance, according to another research<sup>27</sup>. Compared to patients under 65, individuals over 65 had a 10 times (and a 16 times) greater chance of developing hyponatraemia (OR 9.87, 95%, CI: 5.93–16.64). This increased risk applied to both sexes equally. A thiazide-based diuretic was taken by the majority of patients (74.5%), but only 10% utilized a modest dosage. It can be very difficult to (de)prescribe SGLT2 inhibitors and diuretics to elderly heart failure patients who have fallen, but this study<sup>28</sup> helps doctors make patient-centered, specific, and rational treatment decisions.

Adverse drug reactions in elderly inpatients are caused by the drugs interaction under the 4<sup>th</sup> category between diuretics and antihypertensive medications. The results of the study<sup>29</sup> revealed that electrolyte abnormalities occurred in 8 cases, hypotension or orthostatic hypotension in 6 cases, and renal dysfunction in 1 case of ADRs caused by diuretics. Heart failure was the most prevalent ailment in seven of the twenty-four cases where antihypertensive medications were believed to be ADRs, followed by hypertension in four of the cases. Heart failure (3 cases) and diabetes (3 cases) were the most prevalent conditions among the 15 cases where diuretics were thought to constitute ADRs.

Renal dose adjustments (category 5) are necessary for medications because individuals with impaired kidney function may be at risk. Pregabalin<sup>30</sup> is excreted by the kidneys, the dosage needs to be adjusted. Elevated levels and possible toxicity might result from impaired renal function. Tramadol possess renal dose adjustment, especially for formulations with prolonged release. Decreased kidney function can cause buildup, which raises the possibility of seizures and other negative consequences. Spironolactone<sup>31</sup> having the possibility of hyperkalemia, this medication should be taken carefully in older persons with reduced renal function. It might be required to closely monitor or change the dosage.

## Conclusion

With the use of Beer's criteria 2023, a tool for rational medication prescription for the aged, this study helped evaluate the prescribing habits for geriatric

patients. Every prescription that was examined in the study had at least one PIM, according to the findings of the study on hospital prescribing practices. It was also observed that the number of comorbidities and the patients' age were associated to the prevalence of PIMs. The findings indicate that PIM prescription is frequently given to elderly Indian patients who are hospitalized. Prescribers and clinical pharmacists, among other caregivers, should play a larger role in managing older patients by implementing the essential steps. It is crucial to improve quality of life and healthcare by reducing the usage of PIMs and the associated adverse effects.

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