

**BJMHR**

British Journal of Medical and Health Research

Journal home page: www.bjmhr.com

Evaluation of Potentially Inappropriate Medications Use In Elderly Population And Their Impact On Quality Of Life Using Beers Criteria

Mrs. Merin Levy Philips¹, Durka Sri R¹, Aruna Palanisamy*¹, Bhoopalan Shanmugam¹*1.Department of Pharmacy Practice, Sri Ramakrishna Institute of Paramedical Sciences, College of Pharmacy, Coimbatore, Tamil Nadu, India*

ABSTRACT

The growing geriatric population in India presents significant healthcare challenges, particularly regarding the safe and effective use of medications. This prospective, observational study was conducted over 10 months at a tertiary care hospital in Coimbatore to evaluate the use of potentially inappropriate medications (PIMs) among elderly patients using the 2023 Beers Criteria and to assess their impact on quality of life (QoL). Seventy-six patients aged 65 years and above were screened. Over 47% of prescriptions contained at least one PIM, with pantoprazole being the most frequently identified. The presence of multiple comorbidities and polypharmacy were common, leading to a high incidence of drug-drug interactions, including several with major severity. QoL was measured using the FANLTC-FACIT scale and revealed moderate scores in physical, social, and functional domains but notably lower scores in emotional well-being, particularly among female patients. The findings emphasize the need for clinical vigilance, routine prescription audits, and interprofessional collaboration to minimize PIMs and optimize pharmacotherapy in elderly care. Implementation of rational medication review and withdrawal strategies, along with adherence to updated geriatric prescribing guidelines among elderly patients, could substantially enhance QoL outcomes and reduce healthcare burdens.

Keywords: Potentially Inappropriate Medications (PIMs), Beers Criteria, Quality of Life (QoL), Drug-Drug Interactions, Elderly, FANLTC-FACIT.

*Corresponding Author Name: Aruna Palanisamy

Received 01 September 2026, Accepted 27 September 2026

Please cite this article as: Palanisamy A *et al.*, Evaluation of Potentially Inappropriate Medications Use In Elderly Population And Their Impact On Quality Of Life Using Beers Criteria. British Journal of Medical and Health Research 2026.

INTRODUCTION

Worldwide, 8.5% of the population is aged 65 years and above, while in India, 8.6% (104 million) are over 60 years [1]. The elderly make up about 8% of India's population, projected to rise to 12.4% by 2026 [2]. This demographic shift, accompanied by increased acute and chronic illnesses, highlights the importance of appropriate prescribing in the elderly [3]. Population ageing is a growing global health concern. With advancing age, physical weakness becomes inevitable, and older adults are increasingly susceptible to multimorbidity, especially chronic diseases. Treatment often targeted single diseases, leading to polypharmacy when multiple conditions were managed simultaneously [6].

The use of potentially inappropriate medications (PIMs) in elderly care is associated with an increased risk of adverse drug events (ADEs), hospital admissions, higher healthcare costs, and reduced quality of life [4]. Physiological ageing causes organ changes in systems such as gastrointestinal, genitourinary, and central nervous system. Alterations in blood flow, protein binding, and body composition influence drug distribution [3]. Ageing is driven by oxidative stress, lipid peroxidation, telomere shortening, altered gene expression, and apoptosis, leading to mitochondrial and DNA damage, which affect drug pharmacokinetics and pharmacodynamics.

Absorption mainly occurs in the small intestine, but skin, muscle, subcutaneous tissue, and lungs can also be sites [8]. The bioavailability of a drug refers to the fraction of the administered dose that reaches the systemic circulation, which may be reduced by first-pass metabolism occurring mainly in the liver and gut through the enzyme CYP3A4. Age reduces first-pass metabolism due to decreased liver mass, blood flow, and enzyme activity. The volume of distribution depends on drug characteristics and patient body composition. In the elderly, decreased body water and increased body fat can alter drug distribution. Drug metabolism, which occurs primarily in the liver, may be slower and can consequently affect drug clearance. [8].

Polypharmacy is common in geriatrics due to multiple comorbidities and prolonged drug use, increasing the risk of drug-related problems [1]. Elderly patients are often excluded from randomized controlled trials, leaving prescribing decisions without robust trial-based evidence. Older adults over 65 experience a decline in physiologic, cognitive, and physical function with age [4]. Inappropriate use of sedatives and hypnotics increases their risk of falls, delirium, and hallucinations [5]. Many elderly patients are on polypharmacy (5-9 drugs) or high-level polypharmacy (>10 drugs), raising the likelihood of drug-drug interactions [4]. Medications may include prescription, over-the-counter, or herbal drugs. Reviewing appropriateness is essential to avoid suboptimal drug use, interactions, and ADEs [7].

Increasing drug numbers per patient also increases duplicate prescriptions and unnecessary interventions [3].

For every medication, therapeutic benefits must outweigh risks. If a drug's potential risk exceeds benefit and safer alternatives exist, it is considered a PIM [10]. PIMs are defined as drugs where the risk of ADE outweighs clinical benefit, particularly when safer or more effective alternatives are available [4]. Criteria have been developed to identify PIMs, with the Beers Criteria by the American Geriatrics Society (AGS) being the most widely used. Initially developed through expert consensus, the Beers Criteria have been regularly updated, now in their sixth edition [6]. They identify medications inappropriate for older adults in general or in specific conditions, mainly due to high adverse event risk [7].

The AGS Beers Criteria categorize PIMs into:

1. Medications potentially inappropriate for older adults.
2. Medications inappropriate in certain diseases/syndromes.
3. Medications to use with caution.
4. Potentially inappropriate drug-drug interactions.
5. Medications requiring dose adjustment based on renal function.

The 2023 update reviewed evidence since 2019 to revise recommendations, rationale, and evidence strength [9]. The aim is to reduce PIM exposure, improve prescribing, educate clinicians and patients, reduce ADEs, and evaluate care quality, costs, and drug use patterns. The criteria are also used by researchers, insurers, regulators, and policymakers [9].

Declining fertility and rising survival rates have expanded the elderly population, bringing challenges such as the rising burden of non-communicable diseases (NCDs) in older adults, particularly obesity, tobacco use, inactivity, and alcohol consumption. These factors worsen quality of life, especially among lower-income older Indians [2]. PIM use is linked to worse health-related quality of life, higher ADE incidence, emergency visits, outpatient costs, and hospitalization risk [5,6].

The WHO defines quality of life (QOL) as “An individual's perception of life in the context of culture and value system in which he or she lives and in relation to his or her goals, expectations, standards and concerns”. QOL encompasses physical health, mental state, independence, social relationships, spirituality, and environment [2].

For functional assessment of non-life-threatening conditions, the Functional Assessment of Chronic Illness Therapy (FANLTC-FACIT) a 26-item version of the FACT-G can be used. In QOL studies, version 4 of the QOL questionnaire is administered in about 20 minutes. Illiterate participants have the questions read aloud, with answers recorded. This assessment

helps to determine the relationship between QOL, PIM use, and factors affecting QOL in the elderly [1].

In summary, India's elderly population is growing rapidly, leading to increased chronic diseases, polypharmacy, and PIM-related risks. Age-related physiological changes alter drug handling, raising the likelihood of ADEs. The AGS Beers Criteria offer a structured approach to identifying and minimizing PIM use. Reducing inappropriate prescribing is critical for safeguarding elderly patients quality of life, optimizing therapy, and minimizing economic and health burdens.

Aim

The aim of the study was to evaluate potentially inappropriate medications use in elderly population and their impact on quality of life using Beers criteria. *OBJECTIVES* of the study were to identify the potentially inappropriate medication use and its impact on quality of life among elderly patients.

Plan of the Study

The study was conducted in four distinct phases. In Phase I, a comprehensive literature survey was carried out, followed by the preparation of the study protocol and obtaining approval from the hospitals ethical committee. Phase II involved the preparation of the patient consent form, designing a structured data entry format, collecting patient data, and documenting it using the designed format. During Phase III, the collected prescriptions were screened using Beers Criteria and the Micromedex drug database, followed by analysis and graphical representation of the data, leading to meaningful interpretation. Finally, Phase IV focused on compiling the findings into a detailed project report, which was submitted to the study department. Each phase was crucial to ensure the scientific accuracy and ethical integrity of the study.

Design of Forms

The Patient Information Form contains details about the study, including its title and procedure, and assures that the collected information will be used solely for research purposes and kept confidential; the Informed Consent Form, prepared in both English and Tamil, confirms the subjects willingness to participate in the study and is provided before the study begins, containing the title and purpose of the research; and a specially designed Data Entry Form is used to record demographic details (name, age, sex, date of admission, date of discharge, reason for admission, past medical and medication history, social history, vital signs such as temperature, blood pressure, and pulse), laboratory investigations (fasting blood sugar, postprandial blood sugar, HbA1c, liver function test, renal function test), and to monitor patients blood sugar levels and HbA1c.

MATERIALS AND METHOD

A prospective observational study was conducted for a period of 10 months in the inpatient department General Medicine of Sri Ramakrishna Hospital, Coimbatore, a 1000-bedded multi-specialty hospital, tertiary care teaching hospital. A total of 76 eligible patients were selected for the study based on the following criteria: patients of either sex admitted to the study site during the study period and above 65 years of age were included, while pregnant or lactating women, ICU patients, terminally ill patients, and those below 65 years of age were excluded.

The relevant data were collected on the day of admission in a specially designed data entry form, which includes patient demographics (age, sex and outcome of the patients), diagnosis, investigations, and drug details, duration of therapy and details of any concomitant medications. The laboratory data were be noted down on follow- up. For conducting quality of life FANLTC scale was used.

RESULTS AND DISCUSSION

76 patients were included in our study.

Classes of Drugs Prescribed

The most frequently prescribed drugs are those acting on the cardiovascular system, with 105 drugs, accounting for 19.4% of all prescribed medications. The second most common group includes drugs acting on the gastrointestinal system, with 102 drugs, making up 18.8% of the total. Corticosteroids are prescribed much less frequently, with 5 drugs, representing only 0.9% of all prescriptions. Anti-gout drugs are the least prescribed, with 4 drugs, contributing just 0.7% to the total.

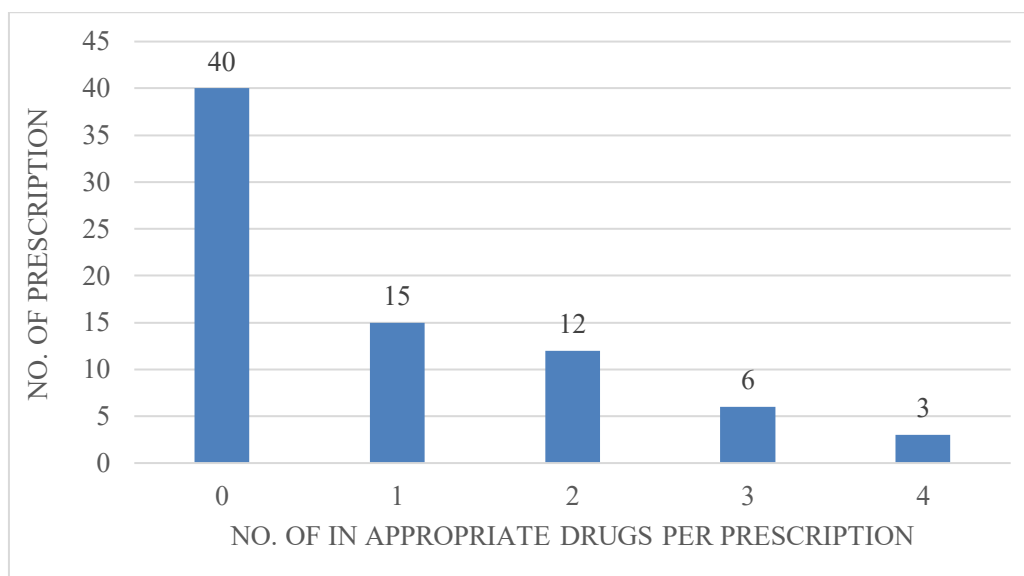


Figure 1: PIMs per prescription (n = 76)

Table 1: List of potentially inappropriate medications prescribed in the study population using updated Beers criteria 2023.

Name of the PIM As Per Beers Criteria and No. of Incidence	
1. Alprazolam - 6	18. Levetiracetam - 3
2. Amitriptyline - 1	19. Naproxen - 1
3. Aspirin - 7	20. Nifedipine - 2
4. Carbamazepine - 1	21. Nitrofurantoin - 1
5. Chlorpheniramine - 2	22. Pantoprazole - 20
6. Cilostazol - 2	23. Prasugrel - 1
7. Clonazepam - 3	24. Prazosin - 1
8. Clonidine - 2	25. Pregabalin - 3
9. Dapagliflozin - 1	26. Quetiapine - 1
10. Diclofenac - 1	27. Rabeprazole - 6
11. Diltiazem - 1	28. Rivaroxaban - 1
12. Esomeprazole - 1	29. Rivastigmine - 1
13. Gabapentin - 5	30. Theophylline - 1
14. Glibenclamide - 1	31. Ticagrelor - 8
15. Gliclazide - 3	32. Tramadol - 5
16. Glimepiride - 4	33. Trihexyphenidyl - 1
17. Ketorolac - 1	

Quality of Life

Quality of Life Domain Score (n = 67)

Quality of life determines the well-being of the patient. In this study, out of 76 patients 9 patients couldn't respond properly due to their illness. The average quality of life for participants (n = 67) was found to be 54.01. Male (63%) having more quality of life than female (37%). These results are in line with Jana et al. (2026), states that mean QOL score was higher in males (75.2) compared to females (67.4), indicating better overall QOL among men.

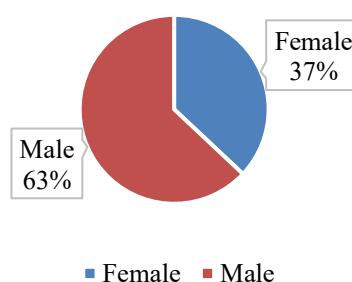


Figure 2: Average quality of life (n = 67)

Quality of life contains 4 major domains: physical, social, emotional and functional well-being. The total health domain is obtained by calculating the average of these 4 domains from our study, it is identified that social health domain is more (15.7) followed by physical health domain (14.97), functional health domain (13.83) and a low QOL is observed in emotional health domain (9.94).

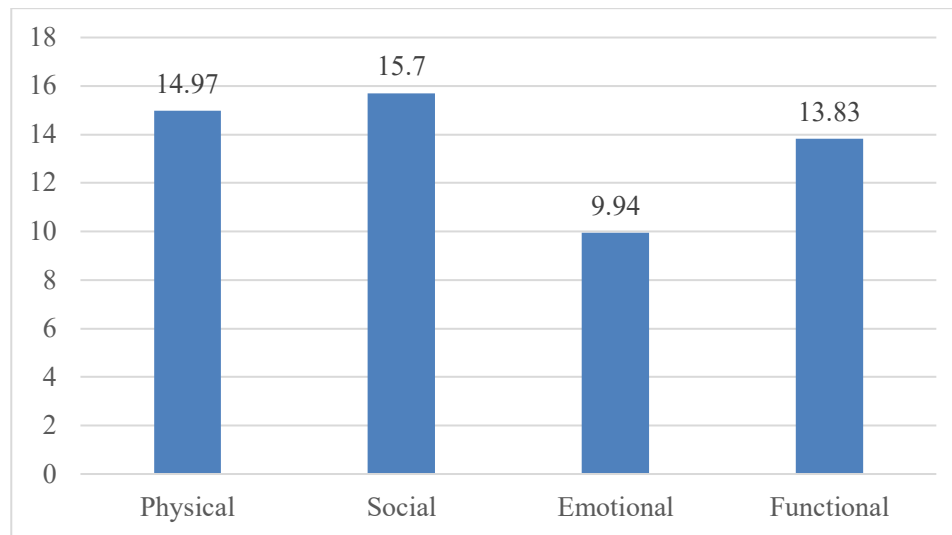


Figure 3: Average QOL of all patients (n = 67)

Quality of Life for Female

Female having more social well-being (15.7) and less emotional well-being (9) when comparing with all other health domain.

Quality of Life for Male

From this study, it is found that physical well-being (15.5) is more when compared with other health domains like social, emotional and functional wellbeing. Further, it is found that men having less emotional wellbeing.

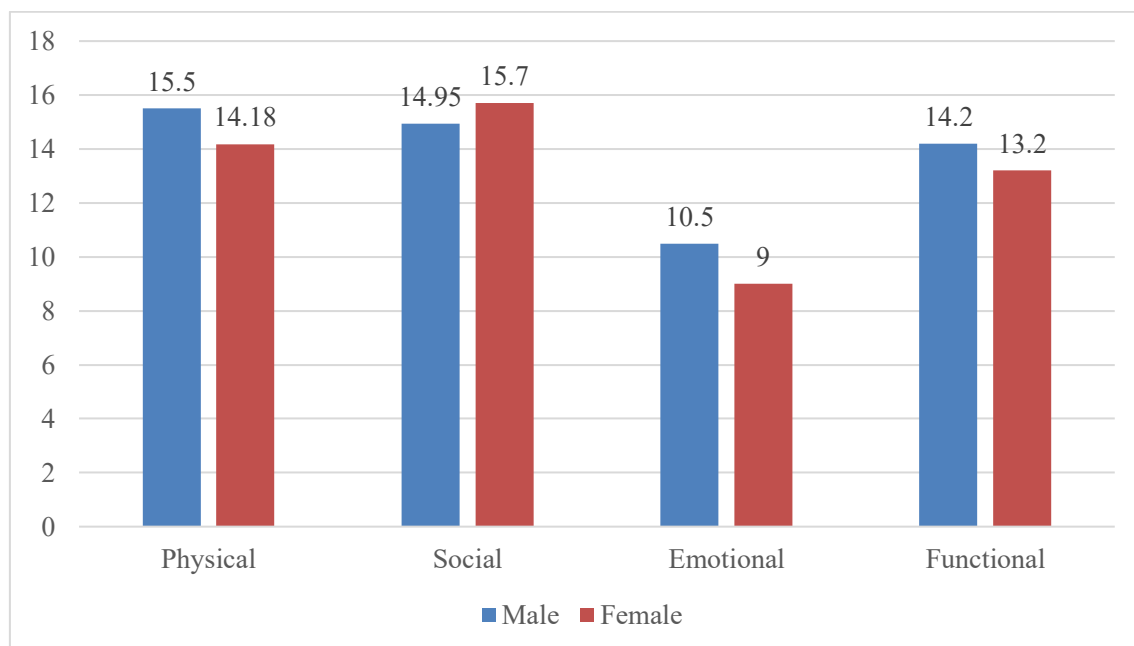


Figure 4: Average QOL of male and female (n = 67)

CONCLUSION

The present study assessed the potentially inappropriate medication use in the elderly population according to Beers criteria (2023) and identified drug-drug interactions using the Micromedex drug database. The higher rate of PIMs associated with the use of pantoprazole

in geriatric patients required close monitoring. The drugs included in the PIM category were analyzed considering potential risks and therapeutic benefits before prescribing.

A patient care-oriented interdisciplinary approach was very significant in reducing the PIMs. Apart from this, the healthcare authorities had taken initiatives in developing various guidelines and creating awareness among physicians for screening the risk factors in the elderly population.

The quality of life of older patients showed that people had moderate social, physical, and functional quality of life and poor emotional quality of life. Therefore, health and psychological policy development was recommended to improve the overall quality of life of the patients.

LIMITATIONS

While this study provides valuable insights, it is primarily constrained by a small sample size and a short observation period, which may limit the generalizability of the findings.

FUTURE RESEARCH

Future studies should be expanded to multi-centre studies across various states to allow a proper comparison of urban and rural prescribing patterns, with especial emphasis on the rural population. Since pantoprazole was the most commonly detected PIM in the present study, more emphasis needs to be put on its usage. Further studies should necessarily focus on the need for long-term PPI therapy and establishing strong deprescribing practices to ensure safer pharmacological practice in geriatric patients.

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