

Potentially Inappropriate Medication Use in Elderly Adults: A Prospective Study in Cardiology Outpatient Department of a Tertiary Care Teaching Hospital

Roy US¹, Khan MR², Rahman MA³, Ahmed T⁴, Majumder NK⁵

Abstract

Conflict of Interest: None

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Objective: This study was undertaken with the aim to detect extent of drugs use in elderly patients at Cardiology outpatient department of a tertiary care teaching hospital and to evaluate inappropriate prescribing with the help of Beers Criteria 2015.

Material and Methods: The study was carried out at Cardiology outpatient department of Shaheed Suhrawardy medical college hospital, Dhaka, Bangladesh from May 2018 to April 2019. Total 2351 Geriatric patients were included during the study period of 12 months. The data was collected in a prescribed data form which included the patient's details and the prescriptions.

Results: The result revealed that 11.96% of total drugs were prescribed inappropriate manner and 27.26% of total patients received at least one inappropriate drug prescription. Administration of a drug which should be avoided in elderly forms a common category of inappropriate drug use. Antihypertensive, Anti-platelets, Anti-diabetics, Antibiotics and Sedatives/ Hypnotics were the most common drug groups prescribed in inappropriate manner.

Conclusion: This study shows high prevalence of inappropriate use of drugs in geriatric patients which needs attention to improve the situation.

Key Words:

Beers criteria, Potentially Inappropriate Medications (PIMs), Geriatric.

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Introduction:

Elderly population is increasing day by day worldwide.¹ Safe and effective prescribing of medicine in elderly continues to present a major challenge.² With limited evidence available to guide prescribing for elderly, the prescribers tend to depend on data available for younger subjects. Elderly form a heterogeneous group due to various factors like co-morbidities, individual variability

in aging process and interindividual difference in age related pharmacokinetic and pharmacodynamics change.³ Obviously inappropriate use of drugs is expected to be high in this population.

Multiple drugs use and polypharmacy is highly prevalent in elderly, exposing them not only to adverse drug reactions but also to drug interactions, increased cost of therapy and compliance errors.^{4,5} The prevalence of adverse reactions are increased in elderly people and reactions are reported to be more severe.⁶ Studies on hospitalization due to adverse drug reactions reveal that elderly are several times more likely to be admitted due to adverse drug reactions and about half of these reactions are preventable.^{6,7}

In order to prevent adverse reactions in the elderly it is important to identify the pattern of inappropriate use of drugs in this population. To evaluate the appropriateness of drugs prescribed for elderly, Beers defined criteria for potentially inappropriate medications in 1997 which were updated in 2003, 2012 and 2015.⁸

The literature related to the use of potentially inappropriate medications in elderly from Bangladesh is scarce. Hence

1. Dr. Uday Shankar Roy, Associate Professor, Department of Cardiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
2. Dr. Murshidur Rahman Khan, Assistant Professor, Department of Cardiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
3. Dr. Mohammad Abdur Rahman, Assistant Professor, Department of Cardiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
4. Dr. Tanvir Ahmed, Registrar, Department of Surgery, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.
5. Dr. Nisith Kumar Majumder, Associate Professor, Department of Cardiology, Rajshahi Medical College, Dhaka, Bangladesh.

Correspondence to: Dr. Uday Shankar Roy, Associate Professor, Department of Cardiology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh. Phone:01819128105, E-mail: drudoyo@gmail.com

this study was undertaken at a tertiary care teaching hospital with the objectives of evaluating the prevalence and pattern of potentially inappropriate medications in elderly using Beers criteria 2015.

Material and Methods:

This study was carried out in Cardiology outpatient department (OPD) of Shaheed Suhrawardy medical college hospital, Dhaka, Bangladesh. The hospital caters to the health care needs of millions of patients from Dhaka city, many villages and towns around the city and from other parts of the country.

The data were collected prospectively. Patients reporting to Cardiology OPD for treatment who aged 65 years and above and consented for study were included and age below 65 years or patients needed admission were excluded from the study. Only new cases were included in the study and total 2351 consecutive patients were enrolled in the study during the study period May 2018 to April 2019. Data were collected in a preformed data sheet which included patient's demographic details, OPD registration number, diagnosis/provisional diagnosis and complete prescription.

Data Analysis:

About 92% drugs were prescribed by their brand names. After identification of the drugs by their generic name they were evaluated for potentially inappropriate use in elderly peoples with the help of Beers criteria 2003, updated in 2012 and 2015. Beers criteria are comprehensive set of explicit criteria for potentially inappropriate drug use in ambulatory elderly ages 65 years and above [8]. According to these criteria, drugs are prescribed inappropriately are classified into one of the following categories: Category A: Drugs that generally should be avoided in older adults.

Category B: Drugs that exceed maximum recommended daily dose.

Category C: Drugs to be avoided in combination with specific co-morbidity.

Statistical Analysis:

Data obtained were analyzed with the help of SPSS software version 15. The chi-square test was used and values with $p < 0.05$ were considered statistically significant.

Results:

A total 2351 patients were included during study period. Of these 1271 (54.06%) were males and 1080 (45.93%) were females. The ages of patients ranged from 65 to 90 years.

Morbidity Pattern:

During the study period disease conditions among elderly patients is shown in figure 1. The most common cause for attending the Cardiology OPD was Cardiovascular disorders 870 (37%) [Hypertension 503(57.81%)& IHD 367 (42.19%),] followed by Depression/ Insomnia 634 (26.96%), Diabetes mellitus 471 (20.03%), Urinary tract infection (UTI) 211 (8.97%), Peptic ulcer disease (PUD) 95 (4.04%) and Chronic obstructive pulmonary disease (COPD) 70 (2.97%).

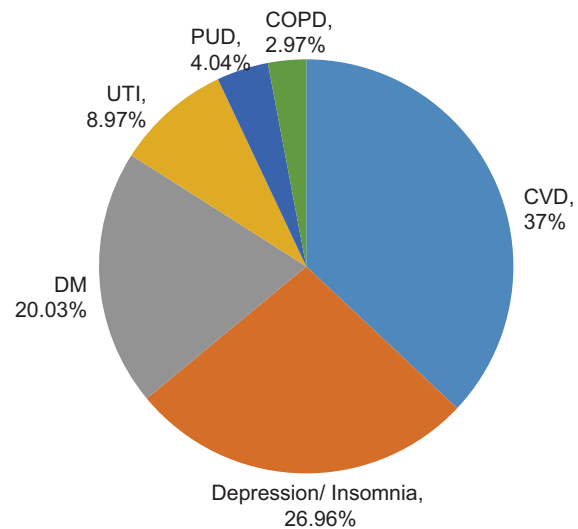


Fig-1: Morbidity Pattern in elderly attending Cardiology OPD, n=2351

Drug use Pattern:

During the study period 2351 patients received a total 9651 drugs. The average number of drugs per patient was 4.10 (range 1 to 15). Atenolol plus Amlodipine (Fixocard), was the most frequently used drug, being prescribed to 27.56% of patients. Other common prescribed drugs were Aspirin plus Clopidogrel (25.10%), Anti-lipid drugs (21.72%), Anti-diabetics (19.05%), Antibiotics (13.42%) and others (12.20%).

Use of Potentially Inappropriate Medicines (PIMs), (Beers criteria, 2015)

Out of 2351 patients, 641 patients (27.26%) received at least one drug which was potentially inappropriate and 1155 drugs (11.96%) out of 9651 drugs were prescribed inappropriately; drugs to be avoided in elderly patients (Category A) being the most common category of inappropriate use [Table-1]. According to Beers criteria 2015, 1155 drugs out of 9651 drugs prescribed inappropriately in this study, which carried a high degree of risk to the elderly patients. There was significant association between the number of drugs prescribed and frequency of use of PIMs ($P < 0.05$)

Table-I

*Frequency of use of Potentially Inappropriate Medicines (PIMs) in elderly **
Total=1155 (A+B+C)

Category A		
Generally should be avoided in older adults	Name of drugs	679
	Nifedipine (Immediate release)	197 (8.30%)
	Prazosin	101(4.20%)
	Methyldopa	80(3.40%)
	Indapamide	73(3.10%)
	Amiodarone	72 (3.00%)
	Nitrofurantoin	63 (2.60%)
	Terazosin	41(1.70%)
	Amitriptyline	32(1.30%)
	Theophylline	15 (0.63%)
	Clonidine	03 (0.27%)
Category B		
Drugs that exceed maximum recommended dose	Name of drugs	341
	Insulin/ Sulfonylurea	98 (4.10%)
	Digoxin	63(2.60%)
	Clonazepam	49(2.00%)
	Bromazepam	44 (1.80%)
	Alprazolam	35(1.40%)
	Phenobarbital	27(1.10%)
	Citalopram	16 (68.00%)
	Oxazepam	09 (0.38%)
Category C		
To be avoided in combination with specific co-morbidity	Name of drugs	135
	Aspirin	73 (3.1%)
	Proton pump inhibitors	27 (1.1%)
	NSAIDs/ Cox-2 inhibitor	25 (1.1%)
	Warfarin	10 (0.42%)

*According to Beers criteria 2015.

Table-II

Common conditions for use of PIMs in elderly

Conditions	Frequency (%), N= 641
Cardiovascular diseases (HTN, IHD)	219 (34.16%)
Depression/Insomnia	180 (28.08%)
Diabetes mellitus	137 (21.37%)
Urinary tract infection (UTI)	63 (9.82%)
Peptic ulcer disease (PUD)	27 (4.21%)
Chronic obstructive pulmonary disease (COPD)	15 (2.34%)

Common conditions for PIMs:

Inappropriate drug use was most frequently found in Cardiovascular diseases (Hypertension+ IHD) followed by Depression/Insomnia, Diabetes mellitus, Urinary tract infection (UTI), Peptic ulcer diseases and COPD (Table - 2). There was no significant association between any disease condition and use of PIMs.

Discussion:

The study reveals cardiovascular system (CVS) was the most common (34%) system affected. Most common indication in CVS was hypertension followed by coronary artery disease and congestive heart failure. The second common condition was insomnia (28%) followed by diabetes mellitus (15%), urinary tract infection (9%), peptic ulcer disease (4%) and COPD (2%).

In this study 11.96% of total drugs prescribed were potentially inappropriate, which is higher than that reported (7.42%) by a study conducted in South India.⁹ Total 641 patients out of 2351, i.e. 27.26% elderly patients received potentially inappropriate prescription of at least one drug. These findings are similar with a study from South India, in which 23.59% of ambulatory older adults received at least one potentially inappropriate drug prescription [9]. Several other studies carried out in hospitalized patients shown prevalence from 25% to 49%.¹⁰⁻¹¹

Category A includes drugs which should be avoided in elderly and should not be prescribed, forms a major category of inappropriate use of drugs. Beers criteria has enlisted 46 drugs/ drug groups under this category. Antihypertensive (Nifedipine, Prazosin, Methyldopa, Indapamide and Terazosin) prescribed to 20.92% patients form the majority PIMs in category A. Other drugs like Amiodarone, a class III anti-arrhythmic, Nitrofurantoin, an antibiotic, Amitriptyline, an anti-depressant drug with sedative property, Theophylline, a bronchodilator and Clonidine, a centrally acting anti-hypertensive were prescribed inappropriately to elderly patients in category A. When compared to Netherlands study, our figures are higher for some drugs like anti-hypertensive (20.92%) and Nitrofurantoin (2.6%).¹²⁻¹³

Beers criteria define maximum daily dose of certain drugs for elderly. If dose of any of these drugs exceeds maximum dose it is considered as PIMs category B, 8 drugs/ drug groups being listed in this category. Anti-diabetics like Insulin /Sulfonylurea in higher dose causes profound hypoglycemia found 4.1% patients. Digoxin, a drug with narrow safety margin was prescribed to 2.6% in higher dose (>0.125mg/day), the prevalence being higher than in the Netherlands study.¹⁴⁻¹⁵ Similarly for benzodiazepines daily doses should not exceed 2 mg for

Clonazepam, 3 mg for Bromazepam, 2 mg for Alprazolam, 60 mg for Oxazepam and in our study 5.8% of patients received Benzodiazepines in high doses. Use of Phenobarbital (1.1%) and Citalopram (0.68%) were also higher compared to Netherland study.¹⁶⁻¹⁷

PIMs category C which includes drugs to be avoided in combination with specific co-morbidity.

Aspirin was prescribed to 3.1% of patients with IHD who had gastric or duodenal ulcers. Proton pump inhibitors (PPIs) were prescribed to 1.1% of patients who had history of bone fractures and osteoporosis and NSAIDs were prescribed to 1.0% of patients who had history of heart failure and Warfarin was prescribed to patients with Atrial fibrillation who had history of bleeding disorders. Niwata et al reported inappropriate use of NSAIDs, Anti-platelet and Anti-coagulant drugs to patients with bleeding and clotting disorders.¹⁸

Studies to identify the factors for PIMs have reported older patients, Polypharmacy, Insomnia, Depression, Immobilization and Hypertension as some of the factors associated with increased risk of PIMs.¹⁹⁻²³ In our study Polypharmacy is the only factor associated with use of PIMs, while disease condition and age did not show significant association.

Conclusion:

This study suggests that use of PIMs is common in elderly patients, some of them associated with high degree of risk in terms of adverse drug reactions or worsening of the co-morbidity. Evidence indicates that high prevalence of inappropriate prescribing of medicines in elderly people is associated with increased morbidity and mortality, increased cost and decreased quality of life. Our study has been limited to only one specialty. This study shows high prevalence of inappropriate use of drugs in geriatric patients which needs attention to improve the situation.

Conflict of interest- None.

References:

1. Global Population at a Glance: 2002 and Beyond U.S. Census Bureau, International Programs Center, International Data Base Issued, March 2004.
2. Shah RR. Drug development and use in the elderly: Search for the right dose and dosing regimen (Parts I and II). *Br J Clin Pharmacol* 2004;58:452-69.
3. McLean AJ, Le Couteur DG. Aging biology and geriatric clinical pharmacology *Pharmacol Rev* 2004;56:163-84.
4. Jørgensen T, Johansson S, Kennerfalk A, Wallander MA, Svärdsudd K. Prescription drug use, diagnoses, and healthcare utilization among the elderly. *Ann Pharmacother* 2001;35:1004-9.
5. Kennerfalk A, Ruigómez A, Wallander MA, Wilhelmsen L, Johansson S. Geriatric drug therapy and healthcare utilization in the United Kingdom. *Ann Pharmacother* 2002;36:797-803.

6. Routledge PA, O'Mahony MS, Woodhouse KW. Adverse drug reactions in elderly patients. *Br J Clin Pharmacol* 2004;57:121-6.
7. Beijer HJ, de Blaeij CJ. Hospitalisations caused by adverse drug reactions (ADR): A meta-analysis of observational studies. *Pharm World Sci* 2002;24:46-54.
8. American Geriatrics Society 2015 updated Beers Criteria for potentially inappropriate medications use in older Adults: *J Am Geriatr Soc* 2015.
9. Zaveri HG, Mansuri VJ, Patel VJ. Use of potentially inappropriate medicines in elderly : A prospective study in medicine out-patient department of a tertiary care teaching hospital. *Indian J pharmacol* April 2010.
10. Beers MH. Explicit criteria for determining potentially inappropriate medication use by the elderly. An update. *Arch Intern Med* 1997;157:1531-6.
11. Fick DM, Cooper JW, Wade WE, Waller JL, Maclean JR, Beers MH. Updating the Beers criteria for potentially inappropriate medication use in older adults: Results of a US consensus panel of experts. *Arch Intern Med* 2003;163:2716-24.
12. Van der Hoof CS, Jong GW, Dieleman JP, Verhamme KM, Van der Cammen TJ, Stricker BH, et al. Inappropriate drug prescribing in older adults: The updated 2002 Beers criteria—a population-based cohort study. *Br J Clin Pharmacol* 2005;60:137-44.
13. Radosević N, Gantumur M, Vlahović-Palčevski V. Potentially inappropriate prescribing to hospitalised patients. *Pharmacoepidemiol Drug Saf* 2008;17:733-7.
14. Nixdorff N, Hustey FM, Brady AK, Vaji K, Leonard M, Messinger-Rapport BJ. Potentially inappropriate medications and adverse drug effects in elders in the ED. *Am J Emerg Med* 2008; 26:697-700.
15. Hosia-Randell HM, Muurinen SM, Pitkälä KH. Exposure to potentially inappropriate drugs and drug-drug interactions in elderly nursing home residents in Helsinki, Finland: A cross-sectional study. *Drugs Aging* 2008; 25:683-92.
16. Office of Public Affairs. "HHS Proposes Adoption of ICD-10 Code Sets and Updated Electronic Transaction Standards" (web). News Release. U.S. Department of Health and Human Services. Available from: <http://www.dhhs.gov/news/press/2008pres/08/20080815a.html>. [accessed on 2009Aug 7].
17. Shenoy S. Evaluation of the drug prescribing pattern in elderly patients in tertiary care hospital. *Indian J Pharmacol* 2006; 38: S90.
18. Niwata S, Yamada Y, Ikegami N. Prevalence of inappropriate medication using Beers criteria in Japanese long-term care facilities. *BMC Geriatr* 2006; 6:1.
19. Fick DM, Waller JL, Maclean JR. Potentially inappropriate medication use in a medicare management care population: Association with higher costs and utilization. *J Manag Care Pharm* 2001;7:407-13.
20. Rothberg MB, Pekow PS, Liu F, Korc-Grodzicki B, Brennan MJ, Bellantonio S, et al. Potentially inappropriate medication use in hospitalized elders. *J Hosp Med* 2008;3:91-102.
21. Wawruch M, Fialova D, Zikavska M, Wsolova L, Jezova D, Kuzelova M, et al. Factors influencing the use of potentially inappropriate medication in older patients in Slovakia. *J Clin Pharm Ther* 2008;33:381-92.
22. Viswanathan H, Bharmal M, Thomas J 3rd. Prevalence and correlates of potentially inappropriate prescribing among ambulatory older patients in the year 2001: Comparison of three explicit criteria. *Clin Ther* 2005;27:88-99
23. Gallagher P, O'Mahony D. STOPP (Screening Tool of Older Persons' potentially inappropriate Prescriptions): Application to acutely ill elderly patients and comparison with Beers' criteria. *Age Ageing* 2008;37:673-9.