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

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.

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Key Words: Beers criteria, Potentially Inappropriate Medications (PIMs), Geriatric.

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 scare. Hence
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%).

**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               | Frequency (N=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               | Frequency (N=341) |
|-----------------------------|-------------------|
| Insulin/ Sulfonylurea       | 98 (4.10%)        |
| Digoxin                     | 63 (2.60%)        |
| Clonazepam                  | 49 (2.00%)        |
| Bromazepam                  | 44 (1.80%)        |
| Alprazolam                  | 35 (1.40%)        |
| Phenobarbital               | 27 (1.00%)        |
| Citalopram                  | 16 (68.00%)       |
| Oxazepam                    | 09 (0.38%)        |

**Category C**
To be avoided in combination with specific co-morbidity

| Name of drugs               | Frequency (N=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 (%) |
|-------------------------------------------------|---------------|
| 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, Amitryptiline, an anti-depressant drug with sedative property, Theophyline, a bronchodilator and Clonidine, a centrally acting anti-hypertensivewere 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.

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