A Study on use of potentially inappropriate medications in elderly
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Abstract: Objective - The study was done with the aim to find out the extent of drug use in elderly at the outpatient department of a tertiary care hospital and to evaluate inappropriate prescribing in reference to Beers’ criteria 2012. Materials and Methods- A cross sectional study was carried out at the out patient department of a tertiary care hospital. 153 patients above the age of 65 years were randomly included during the study period of six months from May 2012 to December 2012. The data included the patients’ demographic and clinical details and the prescription.

Results
The results revealed that 16.15% of total drugs were prescribed in an inappropriate manner and 40.52% of total patients received at least one inappropriate drug prescription. Administration of a drug which is to be avoided in elderly in specific disease conditions as per the Beers criteria was found to be the common category of inappropriate drug use in this study. Antihistamines, anticholinergics, analgesics, sedatives, hypnotics and cardiac glycosides were the most common drug groups prescribed in inappropriate manner. Conclusion- In a group of elderly patients, 40.52% used at least one potentially inappropriate medication over a 6 month period in this study. Prescribing potentially inappropriate medication is common and a potentially serious problem in geriatric medical practice .Developing a protocol, creating awareness, practicing evidence based medicine will overcome the problem of inappropriate medication and adverse drug reactions in elderly.

Keyword: “Beers criteria”, "potentially inappropriate medications”.

Introduction
Older people often experience multiple co-morbidities and are prescribed multiple medications thereby increasing the risk of adverse drug events (ADEs), drug-drug and drug–disease interactions [1, 2]. This risk is heightened by age-related physiological changes, which influence pharmacokinetics and pharmacodynamics [3]. Certain drugs pose special risks to older people as a result of these changes, e.g. prolonged sedation and increased risk of falls with long-acting benzodiazepines [4] or increased risk of upper gastrointestinal bleeding with non-steroidal anti-inflammatory drugs [5]. Prescription of such drugs is potentially inappropriate, particularly where safer alternatives are available. Studies on hospitalization due to adverse drug reactions revealed 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 medicines in this population. To evaluate the appropriateness of drugs prescribed for elderly, Beers’ criteria was developed for potentially inappropriate medicines in 1991, revised in 1997[8], again in 2003 and later in 2012[9]. Several studies have reported use of potentially inappropriate medicines (PIMs) in elderly people based on Beers criteria.[10-14] The literature related to the use of potentially inappropriate medications (PIMs) from India is scarce. Hence, this study was undertaken with the objectives of evaluating the prevalence and pattern of PIMs using Beers criteria 2012.

Materials and Methods
This cross sectional study was carried out at a tertiary care hospital outpatient clinic with a limited daily turnover of patients. Patients who were aged 65 years and above and consented for study were randomly selected from either sexes. Patients were selected by systematic random sampling, every thirteenth patient was included in the study. Data were collected which included patient's demographic and clinical details, diagnosis, and complete prescription.

Data Analysis
The drugs prescribed for each patient was evaluated for potentially inappropriate use with the help of Beers criteria 2012. Beers criteria is a comprehensive set of explicit criteria for potentially inappropriate drug use in ambulatory elderly aged 65 years and above.[8,9] It was developed by a consensus panel of experts in geriatric medicine, geriatric psychiatry and pharmacology to evaluate inappropriate prescribing in nursing home residents. According to this criteria, drugs which are prescribed inappropriately are classified into one of the following categories: Category A: Potentially inappropriate drugs to avoid in older adults. Category B: Potentially inappropriate drugs to avoid in older persons with certain diseases and syndromes that the drug may exacerbate. Category C: Potentially inappropriate drugs to be used with caution in older adults.

The inappropriate drugs were counted and the frequency of usage calculated for each drug. There was no specific time period for PIM use. The period of use of inappropriate drugs varied according to the disease condition for which the drug was prescribed. These drugs were prescribed from the institution and were given free of cost to the patients.

Results
A total 153 patients were included during the study period. Of these, 72 (47.06%) were males and 81 (52.94%) were females.
The age of patients ranged from 65 years to 90 years, the average age being 72.4 years.

**Morbidity Pattern**

The morbidity pattern based on ICD-10[15] was assessed for the study group of population who attended the outpatient clinic during the study period. Cardiovascular disorders (81.70%) formed the most common cause for attending the clinic followed by diabetes (32.03%), and respiratory disorders (22.88%). Hypertension (72.55%) was the most common condition seen in the geriatric patients, followed by ischemic heart disease (32.68%), diabetes mellitus (32.03%), anemia (19.61%), osteoarthritis knee (11.11%), cerebrovascular accident (10.46%), chronic obstructive pulmonary disease and hypothyroidism (each 9.15%).

**Drug Use Pattern**

The average number of drugs prescribed per patient was 5.09 (range 2 to 11). Vitamin B complex was the most frequently used drug, being prescribed to 54.25% of patients. Other commonly prescribed drugs were paracetamol (41.83%), enalapril (39.22%), atorvastatin (38.56%), amiodipine (35.95%), and aspirin (29.4%).

**Use of Potentially Inappropriate Medicines (Beers criteria)**

Out of 153 patients, 62 patients (40.52%) received at least one drug which was potentially inappropriate. Potentially inappropriate drugs to avoid in older persons with certain diseases and syndromes that the drug may exacerbate (Category B) was found to be the most common category of inappropriate use.

**Frequency of use of PIM’S in elderly as per the Beers’ criteria**

**CATEGORY A **

- Chlorpheniramine 0.65
- Trihexyphenidyl 3.92
- Nitrofurantoin 1.31
- Prazosin 1.31
- Methyldopa 1.31
- Digoxin dose > 0.125 mg 3.27
- Spironolactone > 25 mg 3.27
- Amitriptyline 3.27
- Imipramine 0.65
- Risperidone 0.65
- Alprazolam 9.15
- Diclofenac 1.31
- Ibuprofen 0.65
- Indomethacin 1.31

**CATEGORY B **

- Heart failure and NSAIDS 2.61
- Heart failure & diuretic 1.31
- Delirium & H2 antagonist 1.31
- Dementia & H2 antagonist 1.31
- Falls & SSRIs 0.65
- Falls & anticonvulsants 0.65
- Insomnia & amitriptyline 18.3
- Chronic constipation & verapamil 0.65
- Chronic constipation & diltiazem 0.65
- Chronic constipation & CPM 0.65
- Chronic constipation & amitriptyline 2.61
- Gastric ulcers & non COX2 NSAIDS 3.27
- LUTS & anticholinergics 13.07
- Stress incontinence & prazosin 0.65

**CATEGORY C **

- Vasodilators & norepinephrine 2.61

**COMMON CONDITIONS FOR PIM’S**

OSTEARTHRITIS 19.86%

INSOMNIA 9.59%

CONGESTIVE CARDIAC FAILURE 6.85%

PERIPHERAL NEUROPATHY 6.16%

SYSTEMIC HYPERTENSION 3.42%

**Frequency of use of PIMs in Category A**

**DISCUSSION**

In this study, 16.15% of total drugs prescribed were potentially inappropriate, which is higher than that reported (4.1%) by a study conducted in south India[16]. Of 153 patients, 62 patients i.e. 40.52%, elderly patients received potentially inappropriate prescription of at least one drug. These findings are higher when compared with a study from the Netherlands, in which 20% of ambulatory older adults received at least one potentially inappropriate drug prescription[10]. In a study carried out in Japanese long-term facility overall use of potentially inappropriate drug was 39.1%[11]. Another study by Wawruch M, Fialova et al in ambulatory patients reported lower prevalence at 13.4%.[18]. Studies carried out by Radosiew et al in hospitalized patients show prevalence from 25% to 49%.[12-14,17]. In this study, Category B of Beers’ criteria which includes drugs to be avoided in elderly in certain disease conditions or syndromes, forms a major category of inappropriate drug use. First generation antihistamines (chlorpheniramine) was prescribed to 0.65% for upper respiratory tract infection and eczema. Amitriptyline, an antidepressant drug with sedative property was used in the treatment of peripheral neuropathy (3.27%). When compared to the Netherlands study, our figures are higher for drugs such as antihistamines (0.65%), and amitriptyline (3.27%), while lower use is evident for diazepam (0%), and amiodarone (0%).[10] In the Japanese study, the reported frequency of use of different drugs is antihistamines (1.4%), antispasmodic (0.1%), amitriptyline (0.1%), and long acting enzodiazepeines (0.1%).[11] Beers criteria defines maximum daily dose of certain drugs for elderly.[9] Digoxin, a drug with narrow safety margin, was prescribed to 3.27% patients in a higher dose (>0.125 mg/day), the frequency being higher than in the Netherlands study-0.5%[10] and 0% in the Japanese study.[11] Similarly for benzodiazepines, daily doses should not exceed 2 mg for alprazolam, 3 mg for lorazepam, 60 mg for oxazepam, and 15 mg for temazepam. In our study alprazolam was given in lower doses to 9.15% of patients but higher doses of alprazolam were not prescribed to any patient. This is in agreement compared to the Netherlands study reporting such use of alprazolam (0%) and compared to the Japanese study in which none of the patients were reported with such inappropriate use for these drugs.[10,11] In our study, drugs used in the elderly population which was included in the potentially inappropriate medication list of the Category B of Beers’ criteria were patients with heart failure with NSAIDS in their prescription 2.61%, 18.3% of patients with insomnia with theophylline in their prescriptions, patients with chronic constipation were prescribed amitriptyline (2.61%) and 0.65% of patients with stress incontinence were prescribed prazosin. In this study,
Category C of Beers' criteria, where certain drugs have to be used with caution in elderly: 2.65% patients with syncope were prescribed vasodilators. Studies to identify the factors for PIM have reported in older patients, polypharmacy, depression, immobilization, and hypertension as some of the factors associated with increased risk of PIM.[12]

Conclusion
This study showed 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, and decreased quality of life. Developing protocols and practicing evidence-based medicine will overcome the problem of potentially inappropriate medication use in elderly and thereby the adverse drug reactions.

References
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