

Potentially inappropriate prescribing in elderly population: A study in medicine out-patient department

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ABSTRACT

Background & Objectives: Older individuals often suffer from multiple systemic diseases and are particularly more vulnerable to potentially inappropriate medicine prescribing. Inappropriate medication can cause serious medical problem for the elderly. The study was conducted with objectives to determine the prevalence of potentially inappropriate medicine (PIM) prescribing in older Nepalese patients in a medicine outpatient department. **Materials & Methods:** A prospective observational analysis of drugs prescribed in medicine out-patient department (OPD) of a tertiary hospital of central Nepal was conducted during November 2012 to October 2013 among 869 older adults aged 65 years and above. The use of potentially inappropriate medications (PIM) in elderly patients was analysed using Beer's Criteria updated to 2013. **Results:** In the 869 patients included, the average number of drugs prescribed per prescription was 5.56. The most commonly used drugs were atenolol (24.3%), amlodipine (23.16%), paracetamol (17.6%), salbutamol (15.72%) and vitamin B complex (13.26%). The total number of medications prescribed was 4833. At least one instance of PIM was experienced by approximately 26.3% of patients when evaluated using the Beers criteria. **Conclusion:** Potentially inappropriate medications are highly prevalent among older patients attending medical OPD and are associated with number of medications prescribed. Further research is warranted to study the impact of PIMs towards health related outcomes in these elderly.

Key words: Beer's criteria; elderly; potentially inappropriate medicine

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INTRODUCTION

In the rapid changing scenario of population demographics, the current number of population aged 60 years and over (approximately 60 million) is expected to be double by year 2025 in the world.¹ According to national census 2011, Nepal has 5.28% elderly people aged ≥ 65 years out of total population.² As the age progress, the persons are more susceptible to suffer from many diseases. Medications are essential for managing their health. The high prevalence of multiple drug use and polypharmacy in elderly exposes them to greater risk of medication error which increases the probability of adverse drug reactions, compliance

errors etc. along with increased cost of therapy.^{4,5,6}

Inappropriate prescribing has therefore become a significant public health issue worldwide.⁷

To quantify potential inappropriate prescribing (IP) in older people, Beers' criteria were found to be most widely cited in the literature.³ We explored the appropriateness of use of medicines for older patients from the perspectives of healthcare professionals and patients using Beers' criteria to quantify Potentially Inappropriate Medicines (PIM).

MATERIALS AND METHODS

The data were collected prospectively in medicine out-patient department (OPD) of a tertiary hospital

of Bharatpur, Chitwan, Nepal. All the patients who have visited medicine OPD for treatment of diseases; who were aged 65 years and above and consented for study were included. All the new cases were included in the study during the period May 2013 to April 2014. Data were recorded in a performa which includes Patient demographic data, medical histories, current diagnoses and prescribed medications. The study protocol was approved by the institutional review committee.

The recorded data were analysed for potentially inappropriate use with the help of Beers criteria 2003.^{8,9}

According to Beers criteria, drugs which 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

RESULTS

A total of 869 patients were included into the study. Of these, 574 (66.1%) were males and 295 (33.9%) were females. In total, 4833 drugs were prescribed to the patients ranging from two to 11 drugs per prescription with mean of 5.56 per patient. Atenolol (24.3%) and amlodipine (23.16%) were the most frequently used medicines. Other commonly prescribed drugs were Paracetamol (17.6%), Salbutamol (15.72%) and Vitamin B complex (13.26%).

The pattern of the diseases found in this study is shown in Table 1. A total of 408 (47.0%) patients

presented with cardiovascular disorders followed by respiratory disorders 183 (21.06%) and endocrine disorders 108 (12.43%). Hypertension was the most common disease affecting the older people who had visited Medicine OPD among the cardiovascular disorder, followed by COPD (chronic obstructive pulmonary disease) among the respiratory disorders and diabetes mellitus among the endocrine disorders.

As per Beers' criteria; a total of 298 (34.3%) patients were prescribed 939 (19.43%) PIMs. Among them one PIM prescribed were 132 (15.19%) patients while 166 (19.1%) had more than one PIM prescribed per prescription. Category A, drugs to be avoided in geriatric patients, were the most common group of PIM prescribed (12.48%) followed by category B (3.56%), drugs that exceed maximum recommended daily dose and category C (3.39%), drugs to be avoided in combination with specific co-morbidity [Table 2 A and 2 B]. Pearson correlation test showed highly significant association between the number of drugs prescribed and frequency of use of PIMs ($P < 0.001$). (Figure 1)

DISCUSSION

The drug prescription for elderly people who generally suffer from multiple chronic diseases and have to use drug for longer period of time is a challenging task. The safety and quality of prescribing in primary care for them is very important when the necessity for drug therapy intensifies.¹⁰ Poly-pharmacy and the prescription of PIMs were found as a major problem in older patients in our study.

The preponderance of male patients (66.1%) in this study was similar to results from the previous studies in Nepal.¹¹ 69% and in India^{6,12} where 53.07% to 60.6% were found. This may be due to economic factors in the health seeking pattern of this gender in South Asian countries in contrast to some western countries like USA¹³ and Europe¹⁴ where life expectancy of female is higher than the male. The average age found in this study (76.4 years) is similar to that found in other studies.^{15,16}

In our study, we found the average number of drugs prescribed was 5.56 per prescription. Similar studies carried out among geriatric patients in another place of Nepal,¹⁷ Turkey,¹⁸ USA,¹³ India,⁶ Brazil,¹⁹ and Argentina²⁰ had found an average of 7.73, 2.9, 8.1, 4.3, 3.2, and 6.1 drugs per prescription respectively. The prescription with the highest number of drugs in our study had 11 while

Table 1: Diseases pattern and frequency of the patients

Diseases	Frequency (%)
Blood Disorder	12 (1.38)
Central nervous system Disorder	33(3.8)
Cardiovascular system Disorder	408(46.9)
Endocrine Disorder	108(12.4)
Gastrointestinal Disorder	102(11.7)
Infectious Disorder	23(2.66)
Respiratory Tract Disorder	183(21.1)
Total	869(100)

Table 2 A: Category of inappropriate drug use according to Beers criteria

Name of the Drugs	Severity Rating	Frequency (%)*
Generally should be avoided in older patients (Category A)		
Chlorphinaramine	High	113(12)
Hyoscine Butyl Bromide	High	98(10.43)
Piroxicam	High	57(6)
Chlorzoxazone	High	56(5.9)
Dicyclomine	High	48(5.1)
Indomethacine	High	43(4.6)
Diphenhydramine	High	38(4)
Cimetidine	Low	27(2.9)
Diazepam	High	23(2.4)
Bisacodyl	High	21(2.2)
Amitriptylene	High	17(1.8)
Nitrofurantoin	High	13(1.4)
Flurazepam	High	12(1.3)
Ketorolac	High	12(1.3)
Amiodarone	High	11(1.2)
Methyldopa	High	7(0.7)
Chlordiazepoxide	High	5(0.5)
Cyproheptadine	High	2(0.2)

* The percentage is calculated out of total PIM (Potentially Inappropriate Medicines) prescribed (939).

similar studies in other countries have shown maximum of 17 and 25 drugs in a prescription.^{19,20} The less number of drugs prescribed in our study compared to studies conducted in other countries might be due to a functional health insurance policy for the elderly in those countries which might have provided easier access to medications.

The most common form of morbidities found in this study was from cardiovascular system (47.0%) with hypertension. Hypertension was revealed as the major cause of morbidity also by similar studies carried out in western Nepal¹⁷ (27.4%) and India^{20,10} (40.3% to 45%). This result also shows the difference in prevalence of hypertensive patients seeking treatment (47% vs. 27.4%) in mid and western part of Nepal. However, better accessibility of the patients to the health centers in mid terai than in the hilly western region of the country might be confounding factor for this difference.

This study showed that 19.43% of total drugs prescribed were potentially inappropriate, higher

than the study conducted in India^{6,21} where 7.42% and 4.1% PIM prescribed but lower than the study conducted in Nigeria,²² USA,²³ Turkey¹⁸ and USA²⁴ where 25.5%, 27.5%, 25% and 31.9% of the patients had at least one encounter with a PIM respectively. We found that 132 patients out of 869 (15.19%) elderly patients received PIM prescription of at least one drug. This finding is lower than studies carried out in India,⁶ Netherland²⁵ and other region of Nepal,¹¹ where 23.59%, 20%, and 53% ambulatory older adults received at least one PIM drug prescription respectively.

According to Beers criteria, most of the PIM prescribed in this study population was from the category A, which includes drugs those should be avoided in elderly and should not be prescribed. Beers has enlisted 46 drugs/drug groups under this category.⁹ In this study, the drugs prescribed from the category A were from first generation antihistamines: Chlorphinaramine (13%), diphenhydramine (4.3%), anticholinergic hyoscine butyl bromide (10.44%), dicyclomine (5.11%).

Table 2 B: Category of inappropriate drug use according to Beers criteria.

Name of the Drugs	Severity Rating	Frequency (%)*
Dose that exceed maximum recommended daily dose (Category B)		
Digoxin 125/day	Low	98(10.4)
Lorazepam 3mg/d	High	38(4)
Alprazolam 2mg/d	High	22(2.3)
Ferrous sulphate 325mg/d	Low	14(1.5)
To be avoided in combination with specific co-morbidity (Category C)		
Pseudoephedrine with hypertension	High	67(7.1)
Propranolol with chronic obstructive pulmonary disease (COPD)	High	43(4.6)
Non-steroid anti-inflammatory drugs (NSAIDs) with peptic ulcer	High	34(3.6)
Sodium content drugs with Heart failure	High	13(1.4)
Diazepam with COPD	High	4(0.4)
Olanzapine with Obesity	Low	3(0.3)

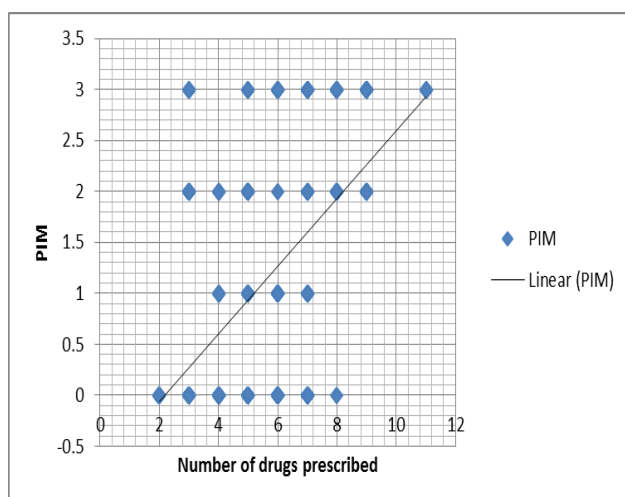


Figure 1: Correlation between the number of drugs prescribed and frequency of potentially inappropriate medication (PIM)

Other drugs like indomethacine and piroxicam, non-steroidal anti-inflammatory drugs; chlorzoxazone; muscle relaxant; amiodarone, a class III antiarrhythmic, amitriptyline, an antidepressant drug with sedative property and diazepam, a long acting sedative hypnotic were prescribed. When compared to the study from India,⁶ our findings showed higher percentage for most of the drugs such as antihistamines 10.7%, dicyclomine 3.1%, diazepam 0.7% and amiodarone 0.7% while lower from the study in Iran¹⁶ where antihistamines 29%, Non-steroid anti-inflammatory drugs (NSAIDs)

23% and benzodiazepine 16% were prescribed. In a study from Japan had reported the prevalence of PIM for different drugs like antihistamines (1.4%), antispasmodic (0.1%), amitriptyline (0%), and long acting benzodiazepines (0.1%).²⁶ Category B of Beers criteria which includes four drugs/drug groups define maximum daily dose of certain drugs for elderly. If dose of any of these drugs exceeds the maximum dose it is considered as PIM.⁹ Digoxin, a drug used in heart failure, should not exceed >0.125 mg/day and for benzodiazepines, daily doses should not exceed >2 mg alprazolam, >3 mg lorazepam, and >325 mg/day ferrous sulfate. In this study, the prevalence prescribing of digoxin >0.125 mg/day was found to be 10.44% which is much higher than the study conducted in India⁶ (4.9%), Netherlands²⁵ (0.5%) and Japan²⁶ (0%). In our study alprazolam was given in higher doses to 2.5% of patients. Our finding was consistent with censuses of the study conducted in India where 2.45% of patients received alprazolam in higher doses while similar study from Netherlands²⁵ and Japan²⁶ reported none of the patients with such inappropriate use of alprazolam. Lorazepam in higher doses prescribed to 4.3% of patients in our study while 0.1% prescribed in Netherlands²⁵ and 0% in Japan.²⁶ In this study 1.6% of elderly people received 325 mg/day ferrous sulphate compared to 0.7% in India,¹¹ 0.2% in Japan²⁶ and none in the Netherlands.²⁵

Pseudoephedrine is commonly available as anti-cold preparations in Nepal which is inappropriate in a patient of hypertension, as it may produce elevation of blood pressure secondary to sympathomimetic activity. Hence, it is a PIM category C which includes drugs to be avoided in combination with specific co-morbidity. Pseudoephedrine was found to be prescribed to 7.7% of patients with hypertension in our study. Similarly NSAIDs were prescribed to 3.9% of patients with peptic ulcer and beta blockers were prescribed to 4.9% of the patients with chronic obstructive pulmonary diseases (COPD). Increased PIM was found to be associated with some of the important parameters like older patients, polypharmacy, depression, immobilization and hypertension.^{27,28} In our study polypharmacy is the only factor associated with use of PIMs, while disease condition and age did not show any significant association.

Pharmacists are involved in delivering drugs those prescribed to the patients by the physicians. However there are situations where a particular drug has been prescribed above the recommended dosage and further, certain drugs that are not recommended for use in old age are also prescribed by the physician. The different studies focused on such inappropriate prescribing trend should be able to draw the attention of the physician. The findings have suggested that the physicians when prescribing medications for older patients did not strictly follow Beers' criteria and the reasons for which should be explored. The alternative approach or other criteria such as STOPP (Screening Tool of Older Persons' potentially inappropriate Prescriptions) should be used if it is difficult to follow the Beer's criteria considering the risk-benefit ratio for elders in priority. A possible cause of non-specific symptoms such as confusion, falls or constipation in older people might be the prescribed medicines. STOPP criteria, though clearly not a substitute for clinical assessment and judgment, help the clinicians to consider these non-specific symptoms while prescribing the drugs thereby avoiding unnecessary and potentially harmful prescribing cascades.²⁹ A context-sensitive national list of PIMs, if developed, may reflect the peculiarities of the particular population.

CONCLUSION

This study has identified potential errors of

prescribing to elder patients in medicine OPD. We believe that the majority of these instances are avoidable. The predictable adverse drug reactions and polypharmacy can be avoided by preventing the PIM in these patients which will also limit the cost of medication and treatment.

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