Original Article

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Prevalence of Polypharmacy and Potentially Inappropriate Medications Prescribed among Elderly Inpatients in a Primary Care Setting of Pokhara, Nepal

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ABSTRACT

Introduction: Polypharmacy, referred to as prescription several medications is major concern in the elderly population. Potentially inappropriate medications (PIMs) are those medications that should be avoided due to their adverse clinical effects. This study aimed to estimate the prevalence of polypharmacy and identify PIMs in primary care practice using Beer's criteria and the Screening Tool of Older People's Potentially Inappropriate Prescription (STOPP) criteria.

Methods: This was an observational cross-sectional study. A total of 102 elderly patients aged ≥ 65 years were enrolled in the study from a primary care centre in Pokhara, Nepal. A questionnaire comprising sociodemographic and prescribed medication information was used for data collection. Potentially inappropriate prescriptions were assessed using Beer's and STOPP criteria.

Results: The majority of the study population were females (53%) age group 65-74 years (74.5%). Comorbidities were common in 69% of the elderly, and major polypharmacy was prevalent in approximately 73% of the elderly. PIM prevalence rates of 36.12% and 6.86% were identified using the Beer's criteria and STOPP criteria, respectively.

Conclusion: This study reports the prevalence of polypharmacy and PIM prescriptions among elderly patients. Appropriate drug therapy can be achieved by using appropriate tools for the detection of PIM use in elderly patients. Further research on interventions related to PIMs is warranted to prevent adverse

Keywords: *Adverse drug events, Beer's criteria, Elderly population, Polypharmacy, Potentially inappropriate medications, STOPP criteria*

INTRODUCTION

With increasing age organ functions is reduced leading to the emergence of different diseases.[1] For the prevention, treatment and rehabilitation of the illnesses, elderly people must take many medicines as a result of concurrent disorders.[2] Polypharmacy is defined as the concurrent use of multiple medications by the same patient and is most commonly defined as the use of ≥ 5 medicines.[3,4]

Polypharmacy poses a great risk to the elderly population owing to age-related changes that lead to altered pharmacokinetics and pharmacodynamics of medicine.[1] The consequences of polypharmacy include adverse drug events, medication cascade effects and drug interactions.[5] Polypharmacy is also linked with increased suffering from symptoms and decreased quality of life (QOL) in adults with advanced illness.[6]

Potentially inappropriate medicines (PIMs) refer to the use of medications whose actual or potential harm exceeds the actual or potential benefits when equally or more effective therapeutic alternatives are available.[7] Medications that increase the likelihood of drug interactions and those misused, overused and underused are included in PIMs.[8] Various tools have been developed to enable healthcare professionals to verify potentially inappropriate medications. Beer's criteria and the Screening Tool of Older Person's Potentially Inappropriate Prescriptions (STOPP) are two widely recognized standard for PIMs.[9]

Safe and effective prescribing in the elderly population are particularly challenging. The exploration of polypharmacy and PIMs help to monitor the economic and disease burden.[10] To date, some studies[11,12,13] have investigated PIMs among geriatric patients.

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have investigated PIMs among geriatric patients. Studies found that 34.67%[11] and 21.6 %[12] had at least one PIM as identified by the 2012 and 2015 Beers criteria respectively. There is a scarcity of available literature that identifies the polypharmacy and investigate PIM using updated Beer's criteria and STOPP criteria. Therefore, this study was performed to explore the prevalence of polypharmacy and PIM prescribing for elderly inpatients in a primary care setting of Pokhara, Nepal.

METHODS

The study was conducted on patients in a primary care hospital of ward number 30, Pokhara Metropolitan city. This study used an observational cross-sectional design. A Convenience sampling technique was applied for this study. As convenience sampling can lead to selection bias this technique was utilized as it is not time consuming. The study was carried out from January 28, 2020 to April 22, 2020. The target population was patients aged ≥ 65 years who attended healthcare centre. A sample size of >100, as suggested by WHO,[14] were included in the study by collecting data from all eligible participants.

The data were collected prospectively by using the data collection form. After obtaining informed consent from patients, they were asked the questions to assess sociodemographic characteristics (age, gender, medical history) in the data collection form. Medication data were gathered from the participant's medical records. Polypharmacy was categorized as: a. no polypharmacy (<2 medications), b. minor polypharmacy (2-3 medications), c. moderate polypharmacy (4-5 medications), and major polypharmacy (>5 medications).[15] We applied the American Geriatrics Society 2019 Beers Criteria and the STOPP criteria for the detection of PIM. Detection was based on the patient's medications used in the study period.

Permission to conduct this study was obtained from the Institutional Review Committee of Pokhara University, Nepal (Reference Number:130/076/077) and study approval was obtained from the study site.

Participants were informed about all aspects of the study before data collection. Signed informed consent was obtained from each participant following a detailed explanation of the research purpose. The data from the study was entered in MS Excel and analyzed using SPSS version 20. Descriptive analyses were used to describe the patient's characteristics, prevalence of polypharmacy and potentially inappropriate medications. The concordance between the two PIM criteria was calculated using kappa tests. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 102 patients aged 65 years and above participated in the study (Table 1). Approximately 53% of the participants were females. The distribution of patients according to age group revealed that 74.5% of patients were 65-74 years old, while 18% and 8% were 75-84 years and 85 or above years, respectively. Most of the patients (69%) presented with comorbidities.

Table 1: Sociodemographic characteristics of patients attending the primary care hospital

Sociodemographic Variables	Frequency (%)
Sex	
Male	48 (47.1)
Female	54 (52.9)
Age classification	
65-74	76 (74.5)
75-84	18 (17.6)
≥ 85	8 (7.8)
Smoking History	
Yes	37 (36.3)
No	65 (63.7)
Alcohol Intake	
Yes	41 (40.2)
No	61 (59.8)
Comorbidity	
Yes	70 (68.6)
No	32 (31.4)

The number of medications prescribed for elderly individuals ranged from 3 to 15, with a total of 770 drugs prescribed to the study participants. Approximately 73% of the patients were prescribed six or more drugs (major polypharmacy) whereas the remaining patients were prescribed up to five drugs (minor or moderate polypharmacy) (Table 2).

Table 2: Prevalence of polypharmacy among elderly participants

Polypharmacy	Frequency (%)
Minor	4 (3.9)
Moderate	24 (23.5)
Major	74 (72.5)

Based on STOPP criteria, four PIM were identified among the elderly participants, which included metoprolol, prednisolone, tamsulosin, and cefixime + (ceftriaxone) (Table 3).

Table 3: List of Potential Inappropriate Medications (PIM) identified according to STOPP criteria

Drug Name	Frequency of PIMs	Reasons for inappropriateness
Metoprolol	3	Risk of masking hypoglycaemic symptoms
Prednisolone	2	Unnecessary exposure to long term side effects of systemic steroids
Tamsulosin	1	Risk of urinary frequency and worsening of incon tinence
Cefixime + (Ceftriaxone)	1	Prescribing from the same class

The medications while reviewing through Beers Criteria identified proton pump inhibitors (e.g., pantoprazole, rabeprazole, omeprazole) as the most frequent PIMs (29 cases) whereas digoxin and nitrofurantoin as PIM shared 4 cases each (Table 4)

Drugs	Frequency	Reason for inappropriateness	Recommendation
Pantoprazole	24		
Rabeprazole	4		
Omeprazole	1	Risk of *Clostridium difficile* infection and bone loss and Fractures	Avoid scheduled use for >8 weeks unless for high-risk patients (e.g., oral corticosteroids or chronic NSAID use), erosive esophagitis, Barrett esophagitis, pathological hypersecretory condition, or demonstrated need for maintenance treatment
Prazosin	2	High risk of orthostatic hypotension and associated harms, especially in older adults; not recommended as routine treatment for hypertension; alternative agents	Avoid use as an antihypertensive
Diazepam	1	Older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents; in general, all benzodiazepines increase the risk of cognitive impairment, delirium, falls, fractures, and motor vehicle crashes in older adult	Avoid
Lorazepam	1		

Digoxin	4	Use in atrial fibrillation: should not be used as a first-line agent in atrial fibrillation, because there are safer and more effective alternatives for rate control supported by high-quality evidence. Use in heart failure: evidence for benefits and harms of digoxin is conflicting and of lower quality	Avoid this rate control agent as first-line therapy for atrial fibrillation Avoid as first-line therapy for heart failure If used for atrial fibrillation or heart failure, avoid dosages >0.125 mg/day
Nitrofurantoin	4	Potential for pulmonary toxicity, hepatotoxicity, and peripheral neuropathy especially with long term use	Avoid in individuals with creatinine < 30 mL/min or for long term suppression
Ketorolac	3	Increased risk of gastrointestinal bleeding or peptic ulcer disease and acute kidney injury in older adults	Avoid chronic use
Amiodarone	2	Effective for maintaining sinus rhythm but has greater toxicities than other antiarrhythmics used in atrial fibrillation	Avoid as first-line therapy for atrial fibrillation unless the patient has heart failure or substantial left ventricular hypertrophy
Cyproheptadine	1	Highly anticholinergic; clearance reduced with advanced age	Avoid

There was no significant difference between the PIM identified using Beer's criteria and STOPP criteria (p=0.157). The concordance between the two criteria was calculated using kappa tests where poor agreement between the two criteria (κ= 0.102) was observed as shown in Table 5.

Table 5: Concordance between Beers and STOPP criteria

Beers criteria PIM	**STOPP criteria PIM**		**κ**	**p value**
	Yes	No		
Yes	4	43	0.102	0.157
No	10	45		

DISCUSSION

In this study, the prevalence of polypharmacy and PIM prescribed among the elderly population admitted to the primary care hospital of Pokhara, Nepal, was evaluated. Identification of inappropriate medications is very useful because this will help prevent overprescribing. This will help both the healthcare practitioners and the patients as well.

The majority of the study participants (53%) were females. This distribution pattern correlates with the male and female population ratio of Nepal (Census, 2021). The descending order of age groups, based on enrolled patient frequency, followed the pattern 65-74 years >75-84 years >85 or above years. The life expectancy of Nepal is around 71 years[16] and hence the majority of the elderly population were of the age group 65-74 years. The percentage of study participants who consumed alcohol (40%) was similar to the study results obtained for alcohol consumption patterns in western Nepal.[17] Furthermore, owing to 36% of participants with a smoking history, a similar prevalence was observed in a cross-sectional study among adults from Kathmandu, Nepal.[18] Most patients (69%) were presented with comorbidities attributable to the reduction of different organ functions with an increase in age.[1]

The number of medications prescribed for an elderly individual ranged from 3 to 15 drugs. Major polypharmacy (>5 medications) was prevalent among the elderly patients (73%) enrolled in our study. A cross-sectional study, performed in the United States with an aging population, determined

major polypharmacy in 36.8% of participants.[15] Previous study conducted by Giri et al identified that the prevalence of polypharmacy among 49.13% of patients.[12] Variations in the number of prescribed medications may result from differences in the prevalence of comorbidities, prescribing patterns, and health insurance policies that cover expenses.

The PIM poses a great clinical challenge for the optimal treatment of elderly patients. STOPP criteria identified PIMs in 6.86% of cases. In our study, the most frequently used PIM based on STOPP criteria was metoprolol. It is advised not to prescribe this drug because of the risk of masking the hypoglycemic symptoms.[19] Other PIMs included prednisolone (unnecessary exposure to long-term side effects of systemic steroids),[20] tamsulosin (risk of urinary frequency and worsening of incontinence),[21] and cefixime + (ceftriaxone) (prescribed from the same class).[22]

Alternatively, Beer's criteria identified PIMs in 39.2% of cases. This value is slightly higher than that reported in a study conducted in a tertiary Care hospital of western Nepal[12] while other reported similar results to the present study,[11] This discrepancy might be due to the difference in prescribing patterns and the nature of patients that are available in primary care and tertiary care centres. The most common PIMs, based on Beer's criteria were proton pump inhibitors followed by insulin, digoxin, and nitrofurantoin. This is consistent with the study done in India.[23] The Proton pump inhibitors, approved for the reduction of gastric acid production, are considered PIM attributable to their association with the risk of Clostridium difficile infection[24] and a potential increase in bone loss and fractures.[25] A study in Nepal[26] showed that prazosin was the most frequently prescribed drug followed by nitrofurantoin and amitriptyline. This variation in the findings may be due to the reason that the study is being conducted in different regions and prescription may vary according to region and time of the study.

The PIMs identified by STOPP criteria were significantly less than those identified by Beer's criteria. This observation complies with the study results in Lebanon[27] and Italy.[28] Consideration of the clinical situation of patients in Beer's criteria makes it less specific as compared to STOPP criteria29 resulting in more PIMs using Beer's criteria. A poor concordance was observed between Beers criterium and STOPP criteria as observed by the κ value < 0.40.[30] The low concordance suggests that the applicability of tools depends upon the specific population, setting and country in which it is used. This also suggests a need for a country-specific PIM list.

The use of PIMs is associated with a higher risk of adverse drug reactions and drug interactions in elderly.[31] Therefore, the utilization of suitable criteria (e.g., Beers and STOPP criteria) is important for the identification of PIM. Timely evaluation of PIMs and appropriate intervention is critical to avoid unwarranted therapeutic failure, avoid loss of time and money for nonoptimal healthcare, and improve the quality of life of the elderly.[32,33]

Our study had some limitations. The limited size of the study population may have affected the results. Since the tool we employed is used in USA and European countries the medications listed on the criteria may not have the same adverse effects in different population.

This study examined the profile of patients in primary healthcare facilities so the findings may not be applicable to the broader population. Further studies in the secondary and tertiary healthcare facilities are needed.

CONCLUSION

The research indicates that use of polypharmacy was frequently employed among elderly individuals. It was demonstrated that PIMs were prevalent in less than half of the elderly in our sample. Appropriate tools for the detection of PIM use in elderly patients will be useful in identifying inappropriate prescriptions. It is necessary to employ an interdisciplinary approach to monitor the utilization of medication in elderly population.

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CONFLICT OF INTEREST

The author declares no conflict of interest, financial or otherwise.

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