

PRESCRIBING PATTERN AND APPROPRIATENESS OF PRESCRIPTION AMONG ELDERLY PATIENTS IN A TERTIARY CARE HOSPITAL OF WESTERN NEPAL – A PROSPECTIVE CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: The current study aims to evaluate prescribing pattern and potentially inappropriate medicine (PIM) among elderly patients in a tertiary care hospital of western Nepal.

Methods: A prospective cross-sectional study was conducted in the outpatient department of Manipal Teaching Hospital of Western Nepal. The World Health Organization prescribing indicators and Beers' 2015 updated criteria were assessed to analyze the result.

Results: The mean±standard deviation of the age was 73.47±6.42 years and the majority of patients were in the age group 65–74 (58.81%). Male preponderance (male: female=1.20:1) was found. The value of prescribing indicator includes the average number of drug per prescription (4.91), percentage of generic name prescription (3.40%), percentage of antimicrobials prescribed (19.40%), percentage of injections prescribed (2.70%), and percentage of the drug from essential drug list of Nepal (42.22%). At least one PIM was prescribed to 87 (21.6%) patients. Non-cyclooxygenase-selective nonsteroidal anti-inflammatory drugs (44%) and anticholinergics (18%) were the most frequently prescribed PIMs.

Conclusions: Polypharmacy, PIMs, and potential drug-drug interaction were prevalent in this study. It is recommended that all the doctors, pharmacists, other concerned health-care professionals, patients, policymakers, and all other stakeholders must be aware of these situations and a multidisciplinary approach must be developed for the promotion of rational use of drugs.

Keywords: Beers Criteria, Elderly patients, Polypharmacy, Potentially inappropriate medicine, Prescribing pattern.

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INTRODUCTION

In this 21st century, there is an increment in the life expectancy of the majority of the population around the world; due to improved nutrition, sanitation, medical advances, health care, education, and economic well-being [1]. The global population of the older population is projected to reach nearly 2.1 billion by 2050 [2]. The census of 2012 showed the presence of 5.28% of elderly people aged ≥65 years in Nepal [3].

Elderly people aged over 65 years are generally more likely to be on multiple medication or polypharmacy than younger people as they have a higher prevalence of chronic illness, disability, and dependency [4,5]. Due to reasons such as multiple comorbidities and multiple prescribing habits of physicians, polypharmacy is an increasingly serious global problem in the current health-care system. Polypharmacy in the elderly exposes them to adverse consequences such as greater health-care costs, increased risk of adverse drug events, drug-drug interactions (DDIs), medication non-adherence, reduced functional capacity, and multiple geriatric syndromes [6-8].

A potentially inappropriate medication (PIM) is defined as a drug in which the risks associated with prescribing it outweigh its potential benefits, particularly when safer alternatives exist. Inappropriate prescribing causes high cost of treatment, ineffective, unsafe treatment, exacerbation or prolongation of illness, distress, and harm to the patient [9]. Polypharmacy and PIM are commonly encountered scenarios in Nepal [10,11]. Evaluating drug prescribing pattern provides advantageous feedback to prescribers to improve their prescribing behavior and help the policymakers to set the priorities to promote the rational use of medicines nationwide [9]. The Beers Criteria are the most

commonly used method for assessing the appropriateness of prescribed drugs for older people in all clinical settings [12-14]. Therefore, this study is aimed to determine the current prescribing pattern and inappropriate prescribing in the elderly population in the western part of Nepal.

METHODS

The study was a prospective cross-sectional study which was conducted in the outpatient department of Manipal Teaching Hospital, Pokhara, Nepal. Patients of all gender and age 65 years and above, who attended the various outpatient departments and hospital pharmacy for purchasing medicines, were included in this study with written consent.

The data were collected from August 2018 to November 2018. The study was approved by Institutional Review Committee (IRC), Pokhara University Research Centre Kaski, Nepal.

Data were collected in a structured pro forma, which include the patient's demographic details (age and sex) and the department visited by the patient. Diseases and drugs were classified according to the international classification of diseases-10 and the anatomical therapeutic chemical classification, respectively [15,16].

The World Health Organization (WHO) prescribing indicators were assessed such as (1) Average number of the drugs per prescription, (2) percentage of the drugs prescribed by generic name, (3) percentage of prescriptions with antimicrobial(s) prescribed, (4) percentage of prescriptions with injection(s) prescribed, and (5) percentage of the drugs prescribed from an essential drug list. National list of essential medicines, Nepal (2016), was used to find out the percentages of drugs prescribed from the lists [17,18]. The prevalence of polypharmacy

Table 1: Age class of the patients

Age class	Gender		Frequency	Percentage	Average number of drugs
	Male (n=220, 54.59%)	Female (n=183, 45.41%)			
65-74	118	119	237	58.81	4.77
75-84	87	49	136	33.75	5.10
≥85	15	15	30	7.44	5.20

Table 2: Number of medication per prescription

Number of medicine prescribed	Frequency	Percentage
1.0	20	4.96
2.0	45	11.17
3.0	71	17.62
4.0	69	17.12
5.0	60	14.89
6.0	38	9.43
7.0	35	8.68
8.0	23	5.71
9.0	22	5.46
10.0	9	2.23
11.0	4	0.99
12.0	3	0.74
13.0	1	0.25
14.0	2	0.50
15.0	1	0.25

% Calculated from a total of 403 patients

Table 3: Drug prescribing pattern in elderly patients using the WHO core drug indicator

Prescribing indicators	Findings (%)
Average number of drugs per prescription	4.91
Percentage of drugs prescribed by generic name	3.40
Percentage of prescriptions with antimicrobial(s)	19.40
Percentage of prescriptions with injection(s)	2.70
Percentage of drugs prescribed from national essential drug list	42.22

(5-9 medications) and high-level polypharmacy (≥10 medications) was determined. Inappropriate medications for older adults were identified using Beers' 2015 updated criteria. The DDIs were checked using Medscape drug interaction checker [10,19,20]. All the data were entered in Microsoft Excel version 2013 and analyzed using Statistical Package for the Social Science version 20.

RESULTS

Demographics

A total of 403 patients were enrolled in this study. Of which 220 were male (54.59%) and 183 were female (45.41%). The overall mean±standard deviation of age was 73.47±6.43 years. The majority of the patients were in the age group 65-74 (58.81%) followed by age group 75-84 (33.75%) and ≥85 (7.44%). The mean number of drugs prescribed within the age group of 65-74 years was 4.77, for those within the age group 75-84 was 5.10 and within the age group of ≥85 years was 5.20 as shown in Table 1.

Number of medication per prescription and polypharmacy

Most of the patients were prescribed with three medicine followed by four and least were taking 15 medicine. Among 198 (49.13%) patients with polypharmacy, high-level polypharmacy was present on 20 (4.96%) patients, as shown in Table 2.

Drug prescription pattern in elderly patients using the WHO core drug indicator

The total number of drug prescribed to 403 patients was 1980, with an average of 4.91±2.56 per person. The prescribing pattern evaluated based on the WHO core drug use indicator is shown in Table 3.

Table 4: Department wise categorization of prescription

Department	Frequency	Percentage
Medicine	277	68.73
Orthopedics	63	15.63
Surgery	38	9.43
Ear, nose and throat	22	5.46
Eye	20	4.96
Dermatology	17	4.22
Psychiatric	15	3.72

% Calculated from a total of 403 patients

Department wise categorization of prescription

In this study, most of the enrolled patients were from the medicine department (68.73%) followed by orthopedics (15.63%) and surgery (9.43%), as shown in Table 4.

Prevalence of disease conditions among elderly patients

Diseases from the circulatory system (271, 67.25%) were the most prevalent in which hypertensive patients were 163. Diseases of the circulatory system were followed by endocrine, nutritional and metabolic diseases (91, 22.58%), and respiratory system (87, 21.59%), respectively. The disease classification and comorbidities are shown in Table 5.

Medicines mainly prescribed in elderly

Most drugs prescribed were cardiovascular (29.75%) followed by those of alimentary tract and metabolism (24.09%). The detailed classification of drug prescribed is shown in Table 6.

PIM use for the elderly based on Beers Criteria

In the total of 1980 drugs prescribed, 100 (5.05%) were found to be potentially inappropriate. At least one case of PIM prescription was found in every 87 (21.6%) cases. Non-cyclooxygenase-selective nonsteroidal anti-inflammatory drugs (NSAIDs) (44%) followed by anticholinergics (18%) were most frequently prescribed, as shown in Table 7.

Most frequently prescribed drugs with potential DDI

All the prescriptions were checked for DDI using Medscape drug interaction checker and 210 (52.10%) of the prescription were detected with at least one potential DDI, as shown in Table 8. Pantoprazole and digoxin was the most frequently prescribed drug with potentially serious DDIs. All the interaction listed in Table 8 has the possibility of interaction requiring caution and monitoring.

DISCUSSION

The drug prescription for elderly people affected with multiple chronic diseases with the lurking cases of polypharmacy is a challenging task [20]. Polypharmacy and the prescription of PIMs were frequently encountered among elderly patients enrolled in this study. Among 403 patients enrolled in this study, male preponderance (male: female=1.20:1) was seen in accordance with studies of Basnet *et al.*, (1.10:1) [10], Sah *et al.*, (1.95:1) [20], and Rakesh *et al.*, (1.03:1)[21]. The possible reason for male preponderance can be due to easy access to medications, awareness, and comparatively good economic liberty of males in South Asian countries, including Nepal [22].

In this study, the majority of individual patients were found to be administered with three medicines at a time while some were found

Table 5: Prevalence of disease conditions among elderly patients

Disease group	Specific condition	Number	Total (percentage of comorbidity)
Circulatory system	Hypertension	163	271 (67.25)
	Others	108	
Endocrine, nutritional, and metabolic diseases	Diabetes mellitus	64	91 (22.58)
	Endocrine disorder	27	
Respiratory system	Chronic obstructive respiratory disease	57	87 (21.59)
	Others	30	
Musculoskeletal system and connective tissue	Rheumatoid arthritis	7	70 (17.37)
	Others	63	
Digestive system	Peptic ulcer, gastritis, and duodenitis	20	44 (10.92)
	Others	24	
Genitourinary system	Benign prostatic hyperplasia	15	39 (9.68)
	Renal failure	8	
	Others	16	
Eye and adnexa	Conjunctivitis	6	25 (6.20)
	Cataract	5	
	Others	14	
Nervous system	Sleep disorders and others	17	17 (4.22)
Certain infectious and parasitic diseases	Bacterial, viral, and other infections	17	17 (4.22)
Skin and subcutaneous tissue	Urticaria, erythema, and others	14	14 (3.47)
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	Anorexia and other	12	12 (2.98)
Mental and behavioral disorders	Schizophrenia and others	9	9 (2.23)
Ear and mastoid process	Disorder of internal, middle, and external ear	6	6 (1.49)
Blood and blood-forming organs and certain disorders involving the immune mechanism	Anemia	5	5 (1.24)

% Calculated from a total of 403 patients

Table 6: Medicines mainly prescribed in elderly

Anatomical therapeutic chemical system main group	Medicines mainly used	No. of drugs	Total (percentage)
Alimentary tract and metabolism	A02BC Proton pump inhibitors	209	477 (24.09)
	A10 Drugs used in diabetes	95	
	A12 Mineral supplements	81	
	Others	92	
Blood	B01AC Platelet aggregation inhibitors excl. heparin	128	197 (9.95)
	B03 Antianemic preparations	24	
	Others	45	
Cardiovascular	C01DA Organic nitrates	21	589 (29.75)
	C03 Diuretics	118	
	C07 Beta blocking agents	99	
	C08 Calcium channel blockers	59	
	C09 Agents acting on renin-angiotensin system	132	
	C10AA HMG CoA reductase inhibitors	113	
	Others	47	
	Derma	D01 Antifungals for dermatological use	
	D07 Corticosteroids, dermatological preparations	7	
	Others	7	
Genitourinary system	G04 Urologicals	37	37 (1.87)
Systemic	H02 Corticosteroids for systemic use	18	37 (1.87)
	H03 Thyroid therapy	19	
	J01C Beta-lactam antibacterials, penicillins	22	
Anti-infective	J01F Macrolides, lincosamides, and streptogramins	18	102 (5.15)
	Others	62	
	L01 Antineoplastic agents	2	
Antineoplastic	M01A Anti-inflammatory and antirheumatic products, nonsteroids	67	118 (5.96)
Musculoskeletal	Others	51	121 (6.11)
	N02 Analgesics	40	
	N03 Antiepiletics	33	
Nervous System	Others	48	10 (0.51)
	P02 Anthelmintics	10	
Antiparasitic	P02 Anthelmintics	10	10 (0.51)
Respiratory	R03 Drugs for obstructive airway diseases	133	218 (11.01)
	Others	85	
Sensory	S01 Ophthalmologicals	28	47 (2.37)
	Others	19	

% Calculated from a total of 1980 drugs

to be administered with four. These findings were similar to the study conducted by Kanagasanthosh *et al.*, in which the majority of patients were administered with two medications and to a lesser content were administered with three, four, and five medicines [23]. The difference in the number of medicines in this study might be due to many factors such as the case of ailments and trends in prescription patterns [24].

With regard to the WHO drug prescribing indicator, the average number of drugs prescribed per individual in this study (4.91) was found concordant with another study conducted in Nepal (5.56) [20] and in India (4.8) [21]. However, the finding was higher than that found in Turkey (2.9 ±2.0) [25] and lower than that found in Argentina (6.1±2.7) [26]. The higher number of drugs prescribed can be stated as a practice of polypharmacy, which has been repeatedly found in various studies conducted in Nepal [10,20]. The percentage of medicines prescribed by their generic names was found to be 3.40% which was, however, found to be higher in similar studies carried out in India (12.60%) [27] and in Pakistan (56.6%) [28]. The decrement in the rate of prescription of medicines by their generic names can be due to the inefficient practice of prescribing medicines by their brand names for the sake of business. Prescribing by generic name allows flexibility of stocking and dispensing various brands of a particular drug that is cheaper than but as effective as proprietary brands [27].

In this study, percentage of antibiotics prescribed during the study period was found to be 19.40% which was similar to the findings of Sapkota *et al.*, (18%) [11] in Nepal but higher than that found by Taskeen *et al.*, (3.62%) [29] in India. The judicious use of antibiotic is important to prevent the emergence of resistance and is recommended to be prescribed only after sample culture and sensitivity test [23]. Percentage of prescriptions with injection(s) being prescribed in this study was found to be 2.70%, which is lower than that found in a study conducted in India (26.33%) [23] but higher than that found in a study in Nigeria (0.8%) [30]. The possible reason for minimum cases of prescription of injection in this study may be due to the fact that the patients enrolled were of the outpatient department and injections were prescribed only for diabetic patients. Patient factor, cost factor, prescriber's habit, and risk of infection through the parenteral route often affect the prescription of injection(s) [23].

Percentage of medicines prescribed which belong to the national essential medicines list was found to be 42.44% which was lower than that found in a study carried out in Kathmandu, Nepal (75%)[11] and also lower than the result found in a study in Pakistan (98.8 %) [28]. It is recommended to make usage of drugs enlisted in the essential drug list so that optimal use of limited financial resources takes place and also to have acceptable safety and satisfaction of the health needs of the majority of the population [11]. The reason for least number of medicines prescribed from the essential medicine list could be related to a lack of awareness about essential drug concept and essential drug list among prescribers along with irrational prescribing habits [11,31].

In this study, most commonly visited departments by elderly patients were found to be of medicine (68.73%) and orthopedics (15.63%); this finding was similar to that of a study in India where elderly patients most commonly visited the medicine department (28.83%), which was followed by the orthopedic department (25%) and cardiology department (15.83%) [23]. This pattern of patients visiting respective departments can be attributed to the fact that most of the patients in the study were suffering from hypertension, diabetes mellitus, chronic obstructive respiratory disease, and metabolic disorders.

Cases of polypharmacy were found common among 49.10% of patients enrolled in this study; this value was found to be lower than that found

in a study conducted in Bharatpur, Chitwan, Nepal (86.66%) [10] but greater than that found in a study in Italy (39.4%) [32]. Along with polypharmacy, multiple comorbidities were found among the patients. In this study, most of the patients were suffering from hypertension (n=163, 40.45%), ischemic heart disease, and other cardiovascular diseases (n=108, 26.80%) and also from diabetes mellitus (n=64, 15.88%). These findings were similar to the findings of another study carried out in Nepal and India [20,21]. Polypharmacy is common in the elderly due to multiple comorbidities and inappropriate prescribing trends among physicians [7]. Most of the drugs prescribed in this study were from Group C (cardiovascular drugs - 589, 29.75%), Group A (alimentary and metabolism drugs - 477, 24.09%), and Group R (respiratory drugs - 218, 11.01%). This is similar to the findings in another study conducted by Basnet *et al.*, in Nepal [10]. These kinds of prescriptions can be due to the fact that most of the patients in the study were suffering from circulatory, endocrine-metabolic, and respiratory disorders.

Of total 403 prescriptions in this study, 87 (21.6%) prescriptions were found to be potentially inappropriate which was similar to the findings of studies conducted in Nepal (26.3%) [20], India (19.9%)[21], and Netherland (20%) [33]. However, it was lower than that found by another study in Nepal conducted by Basnet *et al.*, which demonstrated 34.67% inappropriate prescriptions [10]. This study also shows that NSAIDs were commonly encountered class of PIMs which constitute 44% of total cases; this finding is similar to that reported in India (30.66%) [23].

This study also shows that 210 (52.10%) of the total prescriptions had drug interactions which are similar to the findings of another study done in Nepal that showed 48.9% drug interaction cases [10]. This study had one case of contraindicated reaction and 36 cases of serious interactions. Digoxin-pantoprazole was the frequently prescribed combination (11 patients) having potential DDIs. The possible reason for the higher DDI might be due to the cases of multiple comorbidities, polypharmacy, and multiple prescriptions by physicians [7].

Table 7: Potentially inappropriate medication use for the elderly based on Beers Criteria

Medications and class to avoid in older adults			
Category of drugs	Name of drug	Number of drugs	Frequency (%)
Anticholinergics	Chlorpheniramine	6	18
	Cyproheptadine	5	
	Hydroxyzine	3	
	Triprolidine	4	
Antiparkinsonian agents	Trihexyphenidyl	2	2
Anti-infective	Nitrofurantoin	4	4
Benzodiazepines	Alprazolam	1	7
	Clonazepam	6	
Cardiovascular	Prazosin	5	13
	Methyldopa	3	
	Digoxin (>0.125 mg/day)	1	
	Amiodarone	4	
Central nervous system	Amitriptyline	4	7
	Nortriptyline	2	
	Paroxetine	1	
Non-cyclooxygenase-selective NSAIDs	Diclofenac	10	44
	Ibuprofen	1	
	Naproxen	15	
	Indomethacin	4	
Skeletal muscle relaxants	Ketorolac	14	5
	Chlorzoxazone	5	

% Calculated from 100 PIMs drugs

Table 8: Most frequently prescribed drugs with potential drug-drug interaction

Interaction	Drugs	No. of interaction	Comment
Contraindicated	Warfarin+cilostazol	1	Increases effects of other by pharmacodynamic synergism. Increased risk of bleeding
Serious	Pantoprazole+digoxin	11	Increasing gastric pH, pantoprazole increases digoxin absorption and toxicity Digoxin increases toxicity of metoprolol. Can increase risk of bradycardia
	Digoxin+metoprolol	8	
	Others	17	
Monitor closely	Spironolactone+furosemide	58	Monitor serum potassium level
	Metoprolol+losartan	42	Monitor serum potassium level
	Losartan+furosemide	39	Monitor serum potassium level
	Metoprolol+furosemide	37	Monitor serum potassium level
	Losartan+spironolactone	37	Monitor serum potassium level
	Pantoprazole+clopidogrel	31	Pantoprazole decreases effects of clopidogrel by affecting hepatic enzyme CYP2C19 metabolism
	Others	641	
Minor	Aspirin+furosemide	30	Aspirin decreases effects of furosemide by pharmacodynamic antagonism
	Metformin+furosemide	9	Metformin decreases levels of furosemide by unspecified interaction mechanism
	Aspirin+glimepiride	7	Aspirin increases effects of Glimepiride by plasma protein binding competition
	Others	120	

CONCLUSIONS

Polypharmacy and prescription of inappropriate medication with potential DDI were observed in this study. The cases of prescriptions by generic names were found to be low, and thus efforts to encourage prescribing by generic name should be initiated. It is recommended that all the doctors, pharmacists, other concerned health-care professionals, patients, policymakers, and all other stakeholders must be aware of these situations and a multidisciplinary approach must be developed for the promotion of rational use of drugs.

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AUTHORS' CONTRIBUTIONS

Sagaranda Giri, conception, data collection, data analysis, interpretation, and drafting of the article. Gulam Muhammad Khan conceptualized the study design and proofreading of the manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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