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ORIGINAL ARTICLE

PRESCRIPTION PATTERN AND EVALUATION OF POLYPHARMACY AMONG GERIATRIC OUTPATIENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: *Geriatric patients may present with multiple disorders, necessitating complex drug regimens that increase the risk of polypharmacy and associated adverse outcomes. This study aimed to evaluate prescribing patterns and assess the prevalence of polypharmacy among elderly patients attending the Family and Veteran Outpatient Department of a tertiary level hospital of Nepal, a lower middle income country.*

Materials and methods: *A cross-sectional study was conducted from February 2024 to January 2025 (12 months), involving 200 patients aged 60 years and above after getting approval from Institutional Review Committee. Data were collected using a structured proforma, capturing demographic details and prescription information. Prescribing patterns were analyzed using the World Health Organization core prescribing indicators. Prevalence of polypharmacy and the factors associated with polypharmacy was determined.*

Results: *The study included 200 elderly outpatients (mean age 73.16±4.56 years) and found average of 3.42 drugs per prescription, with polypharmacy (use of five or more drugs at a time)—affecting 19% of patients. Acute conditions had greater prevalence of polypharmacy than chronic conditions (55% vs. 15%), however there was no association between polypharmacy and age or gender. Patients having polypharmacy had higher levels of satisfaction (63.2% vs. 42.0%). Amlodipine, Metformin, and Losartan were three most frequently prescribed drugs.*

Conclusion: *This study revealed 19% polypharmacy prevalence among elderly outpatients, significantly associated with acute rather than chronic conditions, with affected patients showing higher treatment satisfaction. The finding underscore the need for improved prescribing practices, with good adherence to guidelines and optimization of medicines in elderly.*

Keywords: *Essential Medicine List, Geriatrics, Polypharmacy, Prescribing Patterns, WHO Prescribing Indicators*

INTRODUCTION

Research on prescription patterns provides insights into drug use among elderly populations, where inappropriate medication use is a major concern.[1-3] With adults aged above 60 years reaching one billion globally in 2019 and Nepal's elderly population increasing 38.2% from 2011-2021, addressing polypharmacy becomes critical.[4-7] Polypharmacy, typically defined as using five or more drugs, can cause serious adverse outcomes including falls, delirium, and death.[8-11] However, it may be beneficial for multi-morbid patients when appropriately managed.[11-13] In low- and middle-income countries (LMICs) like Nepal, inappropriate polypharmacy is particularly common due to limited access to geriatric specialists, inaccessible health-care facilities, lack of standardized prescribing guidelines and inadequate medication review system. Assessment tools like Beer's list, the Screening Tool to Alert Doctors to the Right Treatment)/Screening Tool of Older Person's Prescriptions criteria, and Fit fOR The Aged list help evaluate medication appropriateness.[14-20] This study analyzed prescribing patterns and polypharmacy rates in elderly patients at tertiary level hospital of Nepal.

MATERIALS AND METHODS

The cross-sectional study was conducted after getting

approval from Institutional Research Committee (IRC) of Nepalese Army Institute of Health Sciences (NAIHS) (IRC Registration Number: 960, dated January 30, 2024). Written informed consent was taken from each participant before including their prescription in the study. This research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki.[21] The study place was a teaching hospital of a medical college with separate Family and Veteran OPD from where patients are referred to regular OPDs of clinical departments and/or emergency department for admission and/or further management.

Patients over 60 years of age who visited the Family General Outpatient Department at tertiary level hospital and provided consent were included. Patients requiring admission and/or life saving measures were excluded. The sample size was calculated using the formula $n = Z^2pq/d^2$, where Z=1.96 (95% confidence level), p=0.203 (polypharmacy prevalence from a previous study), q=0.797, and d=0.05 (margin of error), resulting in a minimum required sample of 197 patients; therefore, 200 patients were enrolled.[22, 23] A pre-designed proforma was used to collect the data from the prescriptions of the patients fulfilling the criteria. Consecutive sampling was employed, with all eligible patients who attended the outpatient department during the study period recruited until the target sample size was achieved. Proforma included two sections A and B. Section A contained age, gender, marital status, duration of consultation, diagnosis and co-morbidities. Section B included number of drugs prescribed with their names, routes, whether prescribed in generic name or not and patients satisfaction status. Satisfaction was assessed using direct binary question in a dichotomous (Yes/No) format in a mutually exclusive categories through a single, clearly worded question. Proforma was filled by researchers (AK, SSS and SK) from the prescriptions of the patients aged more than 60 years that were obtained by a researcher (KT) from the Family General Outpatient Department. All three researchers were underwent training sessions to ensure uniform understanding of proforma and data extraction criteria.

Data were entered into Microsoft Excel and exported to SPPS version 23 for analysis. Descriptive statistics such as mean (±SD) for continuous variables, and frequency, percentages and appropriate tests for categorical variables were used. Rate of polypharmacy practice was determined. Ten most commonly prescribed drugs in prescriptions of the elderly identified as polypharmacy determined. Diagnoses were categorized as acute diseases (diseases with abrupt onset and brief symptom duration, lasting hours up to 6 weeks) and chronic diseases (diseases that lasts for longer periods, i.e. more than 6 weeks and even a lifetime).[24] Chi-square test was used for contingency tables and Yates correction for continuity was applied when the cell frequency was less than five. The association of polypharmacy was analyzed with gender, age wise groups, type of diseases, consultation time and satisfaction. A p-value < 0.05 was considered to be statistically significant. WHO selected drug use indicators (average number of drugs per encounter, percentage of prescription with antibiotics, percentage of prescription with injection, percentage of drugs prescribed by generic names and percentage of drugs prescribed from the National List of Essential Medicine (NLEM), sixth revision, 2021 were determined using the standard formulas.[25, 26]

RESULTS

The mean age of the patients was 73.16 ± 4.56 years. There were 55.5 % (111) males and 44.5% (89) females in our study. The majority 72% (144) were married, and 28% (56) were single. Among 200 elderly patients, 53% (106) were satisfied and 47% (94) were not satisfied with the treatment they were getting.

The diagnoses were classified as acute and chronic diseases. The number of patients diagnosed with chronic diseases was 180 with hypertension (98, 54.44%), type 2 diabetes mellitus (88, 48.89%), bronchial asthma (40, 22.22%) and chronic obstructive pulmonary diseases (31, 17.22%) being the most common diagnoses (mutually inclusive diagnosis). Similarly, the number of patients with acute diseases was 20 with allergic rhinitis (5, 25%), gastritis (4, 20%), enteric fever (4, 20%) and acute gastroenteritis (2, 10%) being the most common diagnoses (mutually exclusive). The total number of drugs prescribed to 200 patients was 684 and the rate of polypharmacy practice (use of ≥ 5 drugs) was 19% (i.e. 38 patients were prescribed more than or equal to five drugs).

There was significant association between number of drugs used and age group using Chi-square test ($\chi2 = 4.50$, p=0.034); however, applying Yate's continuity correction the association was no longer statistically significant ($\chi2 = 1.90$, p=0.168) (Table 1). The association between number of drugs used and gender was found to be statistically insignificant (Table 1). The distribution of polypharmacy was similar between males and females. Polypharmacy was found to be significantly associated with type of disease ($\chi2 = 18.71$, p=0.000015). However, the patients with acute diseases had higher polypharmacy rate than the patients with chronic diseases (55% vs 15%). Patients receiving polypharmacy (use of ≥ 5 drugs) were satisfied than those receiving less than 5 drugs (63.16%

vs. 41.98%). The association between number of drugs prescribed and the number of patients with satisfaction was statistically significant ($\chi 2 = 4.74$, p=0.029). The number of drugs prescribed did not show any association with the consultation time (($\chi 2 = 0.16$, p=0.693) (Table 1).

Table 1: Association between number of drugs used and various factors

Factors < 5 drugs		Number of drugs used (%)		
		≥ 5 drugs	p-value (Chi-square test)	
Age group	60-80 years	161 (80.50%)	36 (18%)	0.034 (0.168*)
	>80 years	1 (0.5%)	2 (1%)	
Gender	Male	90 (45%)	21 (10.50%)	0.974
	Female	72 (36%)	17 (8.50%)	
Type of diseases	Acute	9 (4.50%)	11 (5.50%)	0.000015
	Chronic	153 (76.50)%	27 (13.50%)	
Satisfaction with treatment	Yes	68 (34%)	24 (12%)	0.029
	No	94 (47%)	14 (7%)	
Consultation time	<10 min	91 (45.50%)	20 (10%)	0.693
	≥10 min	71 (35.50%)	18 (9%)	

* Yate's continuity corrected

The most frequently prescribed drugs was amlodipine (87, 13.43%),followed by metformin (79, 11.54%), losartan (63, 9.21%), salbutamol (62, 9.06%) and omeprazole (35. 5.12%) (Table 2). Majority of drugs targeted cardiovascular conditions (150), respiratory conditions (131), endocrine disorder (118), and gastrointestinal conditions (113).

Table 2: Ten most commonly prescribed drugs in elderly patients attending family general OPD (n=684)

S.N.	Drugs	Number of prescription	%
1	Amlodipine	87 (58 alone, 29 in combination with losartan)	13.43%
2	Metformin	79	11.54%
3	Losartan	63 (34 alone, 29 in combination with amlodipine)	9.21%
4	Salbutamol (inhaled)	62	9.06%
5	Omeprazole	35	5.12%
6	Esomeprazole	29	4.24%
7	Budesonide (inhaled)	22	3.22%
8	Beclomethasone (inhaled)	21	3.07%
9	Pantoprazole	19	2.78%
10	Formoterol (inhaled)	16	2.34%

The average number of drugs per encounter was 3.42 and 53.95% (369 out of 684) of drugs prescribed were from NLEM, 2021 (Table 3).

Table 3: Prescribing indicators from WHO core drug use indicators

Indicator	Formula	Study Findings
1. Average number of drugs per encounter	(Total number of drugs prescribed ÷ Number of encounters)	3.42
2. Percentage of medicines prescribed by generic name	(Total number of drugs prescribed in generic name ÷ total number of drugs prescribed) *100%	23.97%
3. Percentage of encounters with an antibiotic prescribed	(Number of clinical encounters in which one or more antibiotic was prescribed ÷ total number of encounters) *100%	1.16%
4. Percentage of encounters with an injection prescribed	(Number of clinical or drug use encounters in which an injectable form of drug was prescribed ÷ Total number of encounters studied) *100%	2.63%
5. Percentage of drugs prescribed from the essential medicines list	(Number of medicines prescribed from the EML ÷ Total number of medicines prescribed) *100%	53.94%

DISCUSSION

The present study evaluated the drug utilization pattern among 200 geriatric inpatients, majority above 70 years of age with male predominance (55.5%), consistent with findings from previous studies from Jyothsna et al. and Goudanavar et al. in similar populations.[21, 22] The polypharmacy rate of 19% in this study indicated that nearly one in five patients are exposed to potential risks associated with polypharmacy which was higher than that of Khandeparkar et al. (13.85%) and Kanagasanthosh et al. (16.5%) from India and Seixaset al (13.5%) from Brazil.[27-29] However, various studies all around the world reported the overall prevalence of polypharmacy in elderly as 39.48% (Nepal), 49% (India), 26.3 to 39.9% (17 European countries and Israel), and 39.1% (China).[30-33] The lower prevalence of polypharmacy in our setting might be due to awareness of prescribers towards hazards of polypharmacy in elderly and differences in disease prevalence patterns compared to European, Indian and other International contexts.

There was no significant association between the number of drugs used and age group in our study (p=0.168) which is supported by the findings of O'Dwyer et al (p=0.13, polypharmacy 31.5%) and da Costa et al (p=0.12, polypharmacy 29.4%).[34, 35] However, Ye et al (p=<0.001) and Delara et al (p=≤0.01) reported that polypharmacy was more frequent (45.2% and 37% respectively) in elderly people and the association was statistically

significant.[36, 37] Our findings suggest that polypharmacy may be influenced more by disease types and complexity rather than chronological age only. There is need to focus on individual patients and disease severity rather than making age-based assumption on polypharmacy as correlation between age and polypharmacy is largely mediated through the accumulation of chronic diseases over time. Hence, disease burden and treatment complexity—not chronological age itself—are the fundamental determinants of medication use. Polypharmacy was not associated with gender in our study which is in line with previous findings from studies conducted in Brazil, Netherlands, Greece, Croatia, Spain and United Kingdom.[35-37] This finding contradicts the finding of study by Seixas et al which reported that polypharmacy is significantly higher in female than male.[29] The equal rate of polypharmacy across genders (23.33% in male and 23.61% in female) in our study indicates that prescription process appears to be appropriately guided by medical necessity rather than gender bias. These findings supports the importance of individualized treatment approaches rather than demographic factors.

The association of polypharmacy with type of diseases (acute and chronic) was found to be statistically significant. The striking difference in polypharmacy rates between acute and chronic disease patients (55% versus 15%) reveals disease acuity as a crucial determinant of complex medication regimens in our study. However, O'Dwyer et al and Seixas et al demonstrated that polypharmacy more prevalent in people with chronic conditions.[29,34] Our finding underscores the clinical appropriateness of polypharmacy in acute conditions where rapid treatment is essential. The lower polypharmacy rate in patients with chronic conditions might be due to the more streamlined maintenance-focused approach which is optimized over a period of time.

Treatment satisfaction was significantly associated with number of drugs prescribed. Patients receiving five or more medications were more likely to be satisfied with their treatment than those receiving fewer than five drugs (63.2% vs. 42.0%, respectively). This counter-intuitive finding challenges conventional assumptions about over-prescribing burden and patient experience. Patients receiving multiple drugs may interpret this as evidence of complete symptom management and proactive healthcare, leading to increased confidence in their treatment plan by using multiple drugs and another reason could be the free availability of drugs to them. This finding suggests that patient education about the rationale for multiple drugs and clear communication about treatment goals may be more important factors in satisfaction than simply minimizing the numbers of drug used.

The proportion of patients receiving polypharmacy (≥5 drugs) was similar regardless of consultation duration, with 18% in consultations <10 minutes and 20.2% in consultations ≥10 minutes. This may be primarily driven by clinical complexity of patients and established treatment practices rather than duration of consultation. Similarly, in our setting, patients are managed with established treatment for chronic diseases, i.e. diagnoses are made during initial visits and majority of prescriptions represent the continuation of same treatment in every follow up rather than new prescribing decisions in every visit.

Drugs for cardiovascular conditions are most commonly used drugs followed by drugs for endocrine and respiratory conditions. Walckiers et al reported drugs acting on cardiovascular system as most frequently used drugs, followed by the drugs acting on the nervous system.[38] Rathod et al observed ranitidine as commonly prescribed drug (50%) followed by amlodipine (53.3%), diclofneac (46.7%), inhaled salbutamol (28.3%) and losartan (15%) in terms of use of individual drugs which is somewhat similar to our findings.[39]

The average of 3.42 drugs per encounter exceeded the WHO optimal value of less than 2 which indicate that there is potential overprescribing in our healthcare setting posing risk of adverse effects, drug interactions and non-compliance in elderly population.[25] The prescribing rate of 53.94% from NLEM is lower than WHO optimal target of 100% which highlight the opportunities for improvement in formulary adherence and evidence-based prescribing as well as need of training to familiarize the essential drugs among prescribers to improve adherence to essential medicines prescribing and need of health-care institution to strengthen essential medicines procurement. The injectbale drug use rate (2.63%) in our study was well within WHO optimal threshold (<20%) which demonstrate that there is appropriate restraining in prescribing parenteral drugs in our outpatient settings. Similarly, the study was conducted among OPD patients who might not require drugs from parenteral route due to the nature of their illness. The low percentage (1.16%) of antibiotic usage falls below the WHO maximum threshold of 20% which might be due to the non-infectious nature of majority of diagnoses in our study.[40] This finding also showed responsible antibiotics prescribing behavior in our setting. However, the low percentage of drugs (23.97%) prescribed by generic name falls short of WHO optimal target of 100% which necessitates improvement

in generic prescribing.[41] The over-dependency on brand names increased the healthcare costs, potential confusion among prescribers, reduced accessibility of drugs from list of essential medicines and negative influence on prescribing behaviour from pharmaceutical marketing.[42]

Limitations of this study included the use of dichotomous scale, i.e. yes/no for assessing the satisfaction. The cell frequency consisted number less than five (5) while constructing 2x2 contingency table, hence Yate's correction for continuity was used. No investigation on the cross-sectional association between polypharmacy/ hyper-polypharmacy and the presence of prefrailty/ frailty in elderly was made. WHO Drug use indicators for geriatric age is not established yet, hence the indicators designed for primary health care facilities were used which might not reflect the actual scenario. Further study on medication appropriateness, potentially inappropriate medications and frailty assessment in elderly could be done as the follow-up of this study in our settings. Future research should explore longitudinal drug safety outcomes in this population.

CONCLUSION

This study found a polypharmacy rate of 19%, which fell between regional benchmarks (lower rates) and international studies (higher rates). The study challenged preconceived notions about number of drugs used in elder care by demonstrating that polypharmacy was significantly correlated with disease type rather than demographic factors like age or gender. Acute conditions had higher rates of polypharmacy than chronic condition. Notably, patients with polypharmacy were satisfied with the treatment. The study identified areas for improvement in prescribing practices, such as better adherence to WHO guidelines for drug use indicators, increased generic prescribing and compliance with prescribing from essential medicine list.

CONFLICT OF INTEREST: None

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