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RESEARCH ARTICLE

Prevalence and predictors of polypharmacy in elderly patients discharged from a tertiary care teaching hospital in Swat, Pakistan: A retrospective cross-sectional study

Shah Faisal¹ , Junaidi Khotib² , Elida Zairina^{2,3,4} 

¹ Doctoral Programme of Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia

² Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia

³ Innovative Pharmacy Practice and Integrated Outcome Research (INACORE) Group Universitas Airlangga, Surabaya, Indonesia

⁴ Centre of Excellence for Patient Safety and Quality, Universitas Airlangga, Surabaya, Indonesia

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Correspondence

Elida Zairina
Department of Pharmacy Practice
Faculty of Pharmacy
Universitas Airlangga
Surabaya
Indonesia
elida-z@ff.unair.ac.id

Abstract

Background: The use of polypharmacy in the elderly has been the subject of much consideration in recent years. However, its prevalence and risk factors are yet to be properly investigated in Pakistan. **Objective:** The study investigated the prevalence and risk factors of polypharmacy at discharge in Pakistan. **Method:** A retrospective cross-sectional study of elderly patients' medical profiles for the year 2021 was performed, and the profiles that met the inclusion criteria were included. **Results:** The total sample size was 800, and 51.9% of patients received polypharmacy at discharge. The authors found that the female gender (OR = 0.469) has comparatively less risk of receiving polypharmacy. Furthermore, patients with an increased length of stay and increased medication use in the hospital (OR 1.1295, OR = 17.189, respectively) have a high risk of receiving polypharmacy at discharge. Furthermore, patients diagnosed with peripheral vascular disease (OR = 4.689), cerebrovascular accident (OR = 2.764), chronic obstructive pulmonary disease (OR = 3.748), asthma (OR = 2.321), and diabetes mellitus (OR = 2.754) had higher risks of receiving polypharmacy. **Conclusion:** The study found a high prevalence of polypharmacy at discharge in Pakistan and identified several risk factors that could help to reduce polypharmacy by targeting vulnerable groups.

Introduction

The healthcare sector has paid significant attention to elderly patients. This is because the elderly age group is the most significant consumer of drugs and the most rapidly growing population (World Health Organisation, 2021). Chronological age fails to account for the heterogeneity seen among the elderly, especially when it comes to their pharmacotherapy requirements, where pharmacokinetic and pharmacodynamic considerations need individualising regimens (Levine, 2012). Elderly patients are more prone to polypharmacy problems because of increasing age, which not only affects how the body handles

medication but also because they take more medicines than younger ones (Mortazavi *et al.*, 2016). Polypharmacy could be referred to as prescribing an excessive number of medications appropriately or too many drugs problematically (Payne & Avery, 2011). The authors defined polypharmacy as "*the use of five or more medications*", as this numerical definition is used by several studies (Masnoon *et al.*, 2017).

Multiple medications are associated with medication regimen complexity and a higher risk of adverse outcomes. Polypharmacy is associated with an elevated risk of adverse drug reactions (ADRs), drug interactions, non-adherence, decreased quality of life, and various

geriatric syndromes, including cognitive impairments, falls, urinary incontinence, and poor nutritional status (Jyrkkä *et al.*, 2011; Kojima *et al.*, 2012; Shah & Hajjar, 2012). It has also been linked to increased mortality, longer hospital stays, and hospital readmissions shortly after discharge (Masnoon *et al.*, 2017). Drug interactions and adverse reactions often result from polypharmacy, leading to functional deterioration (Haider *et al.*, 2007; Martikainen & Enlund, 2009)

The prevalence of polypharmacy ranged from 10% to around 90% globally in various populations (Khezrian *et al.*, 2020). The use of polypharmacy is frequently increasing and varies globally, and it ranges from 36.8% to 95% in the United States (US) (Sheikh-Taha & Asmar, 2021; Young *et al.*, 2021). Compared to the younger, individuals aged 65 years or more are using more medications, and they are usually taking several drugs to treat concomitant disease processes (Gallagher *et al.*, 2007). In Pakistan, the prevalence of polypharmacy ranged up to 70% (Ahmed *et al.*, 2014). However, based on the literature search, this is the first study to investigate the risk factors associated with polypharmacy in elderly patients in Pakistan. A prior study reported a high number of drugs in prescriptions with poor legibility and missing essential components of prescriptions (Raza *et al.*, 2014). Thus, it is necessary to investigate the prevalence and predictors associated with the use of excessive medications. Thus, the current study aimed to investigate the prevalence and risk factors associated with polypharmacy in Pakistan.

Methods

Design

A retrospective cross-sectional study that collected data from a tertiary care teaching hospital in Swat, Pakistan, was conducted. Data was obtained from the medical record department of Saidu Group of Teaching Hospital, Swat. Patients' medical record profiles from January to December 2021 were included, and a convenient sampling technique was used to complete the sample size. Medical records that met the study criteria, i.e. complete medical profiles, aged 60 or more years, and patients admitted for at least 24 hours, were included in the study. Incomplete medical records, patients aged less than 60 years, and patients admitted for less than 24 hours were excluded. Information regarding the patient's demographic and clinical characteristics was obtained from the profiles. The study's main objective was to investigate the prevalence and predictors of polypharmacy based on the patient's demographic and clinical characteristics available in their medical record profiles. The data was

cross-checked to ensure any potential bias in data collection. Ethical approval was obtained from the Faculty of Pharmacy Universitas Airlangga (reference No.29/LE/2022) and Saidu Group of Teaching Hospitals, Swat (reference 15491-92/0-3).

Assessment

The data analysis was done using a statistical package for social science (SPSS) version 26. The authors conducted descriptive analysis, utilising frequencies and percentages for categorical variables and mean with standard deviation for continuous variables. Statistical tests, including Chi-square, Fisher exact, and Mann U Whitney, identified significant differences in patient characteristics related to polypharmacy at discharge. To investigate the risk factors for discharge polypharmacy, the authors used binary logistic regression analysis. The authors ran a multicollinearity diagnostic test before performing a binary logistic regression analysis. Variables with a variance inflation factor (VIF) greater than three were excluded from the regression analysis, including patient wards.

Results

The total number of patients included in the study was 800. The female gender was slightly more (53.9%) compared to the male gender (46.1%). The mean age of the patients was 68.61 (SD = ± 0.328), and the mean stay of hospital was 3.89 (SD = ± 0.078). The mean number of medications used during hospital stay was 6.62 (SD = ± 0.060). Different clinical conditions were noted, and it was found that hypertension was the most diagnosed clinical condition (36.9%), followed by diabetes mellitus 22.8%, and asthma 21.4%. The prevalence of polypharmacy was 51.9% at the time of discharge from the hospital, as shown in Figure 1. Patients' demographic and clinical characteristics can be seen in Table I.

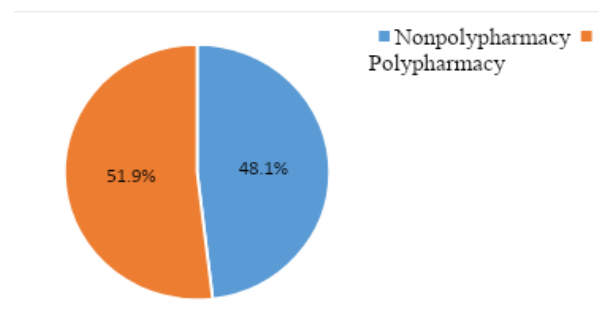


Figure 1: Prevalence of discharge polypharmacy at discharge in a tertiary care hospital in Pakistan (n = 800)

Table I also explains the prevalence of discharge polypharmacy based on patients' demographics and clinical characteristics. The authors found a significant difference in polypharmacy prevalence among different wards. The authors also found that those patients who received polypharmacy in the hospital significantly received polypharmacy at discharge. Furthermore, the authors also found a significant increase ($p < 0.05$) in the prevalence of polypharmacy in patients with myocardial infarction, heart failure, congestive heart failure, cerebrovascular disease,

chronic obstructive pulmonary disease, asthma, peripheral vascular disease, pneumonia, renal disease, diabetes mellitus, and hypertension. Table II shows the risk factors associated with polypharmacy at discharge. The authors found that the female gender has comparatively less risk of receiving polypharmacy at discharge (OR = 0.469, $p = 0.011$) compared to the male gender. Furthermore, the authors found that patients with an increased length of stay (OR = 1.29) and increased medication use in the hospital (OR = 17.18) have a high risk of receiving discharge polypharmacy.

Table I: Patient characteristics based on polypharmacy status

Patient characteristics	Total	Polypharmacy at discharge		p-value
		Non-polypharmacy	Polypharmacy	
Age (Mean \pm SD)	68.61 \pm 0.328	66.94 8.94	70.06 8.78	0.000*
Gender, n (%)				
Male	431 (53.9)	210 (48.7)	221 (51.3)	0.723
Female	369 (46.1)	175 (47.4)	194 (52.6)	
City Of Living, n (%)				
Urban	342 (42.8)	178 (52.0)	164 (48)	0.063
Rural	458 (57.3)	207 (45.2)	251 (54.8)	
Wards of patients, n (%)				
Cardiology ward	200 (25)	91 (45.5)	109 (54.5)	0.014*
Medical Ward	200 (25)	109 (54.5)	91 (45.5)	
Nephrology Ward	200 (25)	105 (52.5)	95 (47.5)	
Pulmonology Ward	200 (25)	80 (40)	120 (60)	
Polypharmacy in hospital, n (%)				
No	354 (44.3)	348 (98.3)	6 (1.7)	0.000*
Yes	446 (55.8)	37 (8.3)	409 (91.7)	
Length of hospital stay (Mean \pm SD)	3.89 \pm 0.078	2.85 1.22	4.72 2.44	0.000*
Pleural effusion	39 (4.9)	24 (61.5) 3	15 (38.5) 1.9	0.086
Productive cough	90 (11.3)	35 (38.9)	55 (61.1)	0.063
Fever	79 (9.9)	45 (57)5.6	34 (43) 4.3	0.098
Myocardial infarction, n (%)	143 (17.9)	58 (40.6) 7.2	85 (49.9) 10.6	0.046
Heart failure, n (%)	73 (9.1)	21 (28.8) 2.6	52 (71.2) 6.5	0.001*
Congestive heart failure, n (%)	48 (6)	15 (31.3) 1.9	33 (68.8) 4.1	0.016
Peripheral vascular disease, n (%)	31 (3.9)	5 (16.1) 0.6	26 (83.9) 3.3	0.000*
Cerebrovascular disease, n (%)	97 (12.1)	26 (26.8)3.3	71 (73.2) 8.9	0.000*
Unstable angina, n (%)	27 (3.4)	11 (40.7) 1.4	16 (59.3) 2	0.453
COPD, n (%)	96 (12)	17 (17.7) 2.1	79 (82.3) 9.9	0.000*
Asthma/SOB, n (%)	171 (21.4)	61 (35.7) 7.6	110 (64.3) 13.8	0.000*
Tuberculosis, n (%)	25 (3.1)	6 (24) 0.8	19 (76) 2.4	0.014*
Pneumonia, n (%)	64 (8)	21 (32.8)	43 (67.2)	0.011*
Diabetes mellitus, n (%)	182 (22.8)	53 (29.1) 6.6	129 (70.9) 16.1	0.000*
Renal disease, n (%)	63 (7.9)	17 (27) 2.1	46 (73) 5.8	0.000*
Mild liver, n (%)	10 (1.3)	6 (60) 0.8	4 (40) 0.5	0.449
Severe liver, n (%)	6 (0.8)	1 (16.7) 0.1	5 (83.3) 0.6	0.219
Hypertension, n (%)	295 (36.9)	95 (32.2) 11.9	200 (67.8) 25	0.000*
Other diseases, n (%)	192 (24%)	115 (14.4)	77 (9.6)	0.000*

Table II: Risk factors of polypharmacy at discharge

Characteristics	S.E.	Wald	Exp(B)	95% Confidence interval		p-value
				Lower	Upper	
Age	0.018	1.063	0.982	0.949	1.016	0.302
Gender, Male	Reference					
Female	0.297	6.510	0.469	0.262	0.839	0.011*
City of living, Urban	Reference					
Rural	0.296	3.133	1.688	0.945	3.015	0.077
Length of hospital stay	0.102	6.412	1.295	1.060	1.581	0.011*
Medication at hospital	0.262	117.715	17.189	10.283	28.735	0.000*
Pleural effusion	0.814	0.019	0.893	0.181	4.406	0.890
Productive cough	0.528	0.613	0.662	0.235	1.861	0.434
Fever	0.535	0.236	0.771	0.270	2.200	0.627
Myocardial infarction	0.394	0.000	1.002	0.463	2.167	0.996
Heart failure	0.492	0.023	1.078	0.411	2.826	0.878
Congestive heart failure	0.626	0.005	1.044	0.306	3.563	0.945
Peripheral vascular disease	0.789	4.029	4.869	1.038	22.840	0.045*
Cerebrovascular accident	0.494	4.234	2.764	1.049	7.281	0.040*
Unstable angina	0.803	0.228	0.682	0.141	3.288	0.633
COPD	0.540	5.992	3.748	1.301	10.794	0.014*
Asthma	0.426	3.898	2.321	1.006	5.352	0.048*
Tuberculosis	1.152	0.044	1.272	0.133	12.156	0.835
Pneumonia	0.622	0.429	1.503	0.444	5.090	0.512
Diabetes mellitus	0.357	8.040	2.754	1.367	5.546	0.005*
Renal diseases	0.567	1.974	2.219	0.730	6.746	0.160
Mild liver	1.211	0.165	0.611	0.057	6.568	0.685
Severe liver	2.466	0.258	3.495	0.028	438.901	0.612
Hypertension	0.316	3.374	1.786	0.962	3.316	0.066
Other disease	0.389	1.692	1.658	0.774	3.554	0.193

Among the clinical conditions, the authors found that patients with peripheral vascular disease (OR = 4.86), cerebrovascular accident (OR = 2.76), COPD (OR = 3.74), and asthma (OR = 2.32) have a comparatively high risk of receiving polypharmacy at discharge as compared to their counterparts.

Discussion

The study observed a high prevalence (51.9%) of polypharmacy in Pakistani elderly patients. Prior studies in Pakistan showed the prevalence of polypharmacy to be up to 70% (Ahmed *et al.*, 2014; Sarwar *et al.*, 2018). The authors found that the female gender has comparatively less risk of reducing polypharmacy at discharge (OR = 0.469, $p = 0.011$) as compared to the male gender. The association of polypharmacy with gender is conflicting, and some studies have shown that

females are at higher risk of receiving more medications than males (Zhang *et al.*, 2020; Maxwell *et al.*, 2021), while another study showed that male gender is at higher risk to receive polypharmacy in line with these results (Slabaugh *et al.*, 2010). In addition, a study also found no significant association between gender and polypharmacy (Haider *et al.*, 2008). Thus, gender remained a controversial determinant of polypharmacy, with studies that found a higher risk in women or a higher risk in men.

In the current study, the authors also noted that patients with an increased length of stay (OR = 1.29) had more risk of receiving polypharmacy at discharge, consistent with the prior studies (Harugeri *et al.*, 2010; Faisal *et al.*, 2023). Furthermore, patients who had received a higher number of drugs during their stay in the hospital were also significantly found to be associated with increased odds (OR = 17.18) of receiving polypharmacy at discharge. The study suggests that patients with serious

illnesses in the hospital tend to be prescribed more drugs at discharge to manage the disease at home. The patient's risk of polypharmacy was increased in the case of certain particular diseases. The authors found that patients with peripheral vascular disease (OR = 4.86) and cerebrovascular accident (OR = 2.76) have comparatively more risk of receiving polypharmacy at discharge. It is not surprising that polypharmacy prevalence was high in patients with cardiovascular diseases. Polypharmacy in cardiovascular diseases is guided by evidence-based guidelines recommending treatment with multiple drug classes (Appleton *et al.*, 2014). In addition, previous studies have found that cardiovascular disease increases the risk of polypharmacy in the elderly (Sheikh-Taha & Asmar, 2021). Unsurprisingly, patients with diabetes were also associated with high risks of polypharmacy.

Typically, multidrug regimens are required to control hyperglycaemia and the associated metabolic risk factors of hypertension and hyperlipidaemia (Grant *et al.*, 2002). Furthermore, the authors also found that patients diagnosed with asthma (OR = 2.32) and COPD (OR = 3.74) have increased risks of receiving polypharmacy at discharge. International guidelines recommend the use of multiple medications for the management of COPD, and the number of these respiratory drugs in COPD patients increases as the severity of symptoms increases (Franssen *et al.*, 2011; Díez-Manglano *et al.*, 2014). Prior studies also recorded that COPD increases the risk of receiving polypharmacy in elderly patients, in line with these results (Payne *et al.*, 2014; Aggarwal *et al.*, 2020). The current study provides insight into the prevalence and predictors of polypharmacy in elderly patients in Pakistan. Various important factors that contribute to polypharmacy are highlighted that could help to identify the vulnerable groups and pay attention to avoid polypharmacy and prevent drug-related problems.

The current study has a few limitations that deserve consideration. Firstly, the study was conducted in a single healthcare setting, which could limit its generalisability. The retrospective nature of the study is another shortcoming of this study, which is that the authors were unable to gather information about home medications and self-medications that might put the patients in the non-polypharmacy group.

Conclusion

The study found a high prevalence of polypharmacy in Pakistan. Female gender, increased length of hospital stay, and various clinical conditions, i.e. peripheral vascular disease, cerebrovascular accident, asthma, and COPD, were the independent risk factors of

polypharmacy at discharge. There is a need for sound strategies to minimise the use of polypharmacy and prevent the risk of early or late drug-related problems in the most vulnerable groups.

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