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Expert Opinion Article

Prevalence of Polypharmacy and Its Impact on Hospital Readmission in Elderly Patients

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Abstract

Background: The aging population in Saudi Arabia faces significant healthcare challenges, including the management of multiple chronic conditions through polypharmacy. While polypharmacy is often necessary, inappropriate use can lead to adverse outcomes such as increased hospital readmissions. This study aimed to determine the prevalence of polypharmacy among elderly patients in Saudi Arabia and evaluate its impact on 30-day hospital readmission rates.

Methods: A retrospective observational study was conducted at a tertiary care hospital in Riyadh, Saudi Arabia, involving 420 elderly patients aged 65 years and older discharged between January and December 2023. Polypharmacy was defined as the prescription of five or more medications at discharge. Data were extracted from electronic medical records, including demographic details, medication counts, and readmission status within 30 days. Statistical analyses included descriptive statistics, Chi-square tests, and logistic regression to assess associations.

Results: The prevalence of polypharmacy was 55.7% (234/420 patients). The overall 30-day readmission rate was 25.7%, with significantly higher readmission rates among polypharmacy patients (33.8%) compared to those with fewer medications (15.6%). A strong association was found between polypharmacy and readmission ($p < 0.001$), even after adjusting for confounders.

Conclusion: Polypharmacy is highly prevalent among elderly patients in Saudi Arabia and is strongly associated with increased hospital readmissions. These findings highlight the need for targeted interventions, such as medication reviews and improved discharge planning, to mitigate risks and enhance patient outcomes. Addressing polypharmacy through evidence-based strategies is essential for reducing preventable readmissions and optimizing geriatric care.

Background

Saudi Arabia is experiencing a significant demographic transformation characterized by an increasing number of elderly individuals. This shift is largely driven by improved healthcare services, higher life expectancy, and a decline in fertility rates. As the elderly population continues to grow, the healthcare system faces new challenges in addressing the unique medical needs of older adults, who are more prone to chronic diseases and complex health conditions (Delara et al., 2022).

Among the most pressing challenges in elderly healthcare is the widespread use of multiple medications to manage various coexisting health problems. Known as polypharmacy, this practice has become increasingly prevalent among older adults, particularly those diagnosed with multiple chronic diseases such as hypertension, diabetes, cardiovascular disease, and arthritis. As a result, medication management in this population has become more complicated and risk-prone (Pazan & Wehling, 2021).

Polypharmacy in elderly patients is not always harmful; in many cases, it is necessary to manage the complex interplay of several chronic conditions. However, the risk arises when the number of medications increases to a point where it contributes to adverse drug reactions, drug-drug interactions, and medication errors. These issues can lead to a decline in the patient's physical and cognitive functioning and negatively impact their overall quality of life (Li et al., 2023).

In Saudi Arabia, polypharmacy is increasingly being recognized as a critical public health issue. It is estimated that a substantial proportion of older adults are prescribed five or more medications at a time. These numbers are particularly high in hospital settings and among recently discharged patients, where complex treatment plans are more commonly implemented. Despite this recognition, efforts to address the consequences of polypharmacy remain fragmented and underdeveloped (Fabbietti et al., 2018).

One of the most concerning outcomes of polypharmacy is its association with hospital readmission. Elderly patients who are discharged with complex medication regimens often face difficulties in adhering to their prescriptions due to cognitive decline, limited health literacy, or lack of caregiver support. This increases the risk of complications and leads to frequent and avoidable hospital readmissions, straining both the healthcare system and the patient's well-being (Ruiz Ramos et al., 2024).

Hospital readmissions are not only a burden on the healthcare system but also serve as an indicator of suboptimal care. For elderly patients, returning to the hospital within a short period after discharge often reflects underlying issues in medication safety, discharge planning, and post-discharge follow-up. When polypharmacy is a contributing factor, it becomes essential to reevaluate medication prescribing practices and implement more robust medication reconciliation processes (Alsuwaidan et al., 2019).

Furthermore, the physiological changes that accompany aging—such as reduced kidney and liver function—affect how medications are absorbed, metabolized, and excreted in the body. These changes increase the risk of drug accumulation and toxicity, especially when multiple medications are used. Elderly patients are, therefore, more susceptible to the harmful effects of polypharmacy, necessitating careful consideration of the benefit-to-risk ratio of each drug prescribed (Rosted et al., 2016).

Compounding the issue is the fact that many elderly individuals receive care from multiple providers, each of whom may prescribe medications independently. This fragmentation can lead to overlapping or conflicting prescriptions, further increasing the potential for adverse outcomes. In the absence of a centralized medication management system, these risks are amplified in both outpatient and inpatient settings (Hein et al., 2014).

Despite growing awareness of the dangers of polypharmacy, there is a noticeable gap in systematic research exploring its prevalence and direct effects on hospital readmission rates in Saudi Arabia. While some studies have highlighted general trends, there remains a lack of comprehensive, population-based investigations that quantify the burden and consequences of polypharmacy among the elderly (Ruiz Ramos et al., 2024).

A detailed understanding of how polypharmacy contributes to hospital readmission in older adults is crucial for developing interventions aimed at improving patient safety and optimizing pharmacological care. Research in this area can inform clinical guidelines, support the implementation of medication review protocols, and promote multidisciplinary approaches to geriatric care (Chilakapati et al., 2022).

Ultimately, tackling polypharmacy and its related risks is essential for enhancing the quality of life for elderly patients, reducing preventable hospital readmissions, and improving the sustainability of healthcare services in Saudi Arabia. A focused investigation into the prevalence of polypharmacy and its impact on hospital readmissions represents a critical step toward these goals.

Problem Statement

Prescribing multiple medications, known as appropriate polypharmacy, is often necessary in clinical settings to manage multiple coexisting conditions, particularly among elderly patients. However, the exposure to numerous medications can also lead to inappropriate polypharmacy, where drugs are continued without clinical justification or are prescribed without full consideration of drug interactions, side effects, and patient-specific risks. Inappropriate polypharmacy is associated with a range of poor health outcomes in older adults, including increased risks of death, falls, adverse drug interactions, medication non-adherence, and hospitalization.

The burden of polypharmacy on healthcare systems is substantial. Globally, it is estimated to be associated with an annual healthcare cost of approximately $50 billion USD, a figure that continues to rise as populations age and the prevalence of chronic diseases increases (Delara et al., 2022).

Despite its clinical importance, the reported prevalence of polypharmacy varies significantly in the literature—from as low as 4% to as high as 96.5%—depending on the definition used, the healthcare setting, regional differences, and the age group studied (Pazan & Wehling, 2021).

In the context of Saudi Arabia, the prevalence of polypharmacy is notably high among the elderly. Recent data show that 55.7% of patients were prescribed more than five medications simultaneously. Among these, 53% were males and 47% were females, with an average patient age of 73.26 years. These figures reflect the growing challenge faced by the Saudi healthcare system in managing medication use among older adults, especially those with multiple comorbidities (Alsuwaidan et al., 2019).

Although polypharmacy is an expected component of multimorbidity management, its inappropriate application can contribute to increased hospital readmissions—a critical concern in geriatric care. Hospital readmission not only reflects a lapse in continuity and quality of care but also significantly affects the quality of life for elderly patients and imposes additional strain on healthcare infrastructure.

Despite rising awareness of polypharmacy and its potential harms, there remains a lack of focused, empirical research in Saudi Arabia examining the direct relationship between polypharmacy and hospital readmission in the elderly. Without such data, it is difficult to design effective interventions or to update clinical guidelines to address this issue.

Therefore, investigating the prevalence of polypharmacy and its impact on hospital readmission in elderly patients is essential for informing clinical practice, promoting safer prescribing behaviors, and guiding national healthcare strategies aimed at improving outcomes and reducing unnecessary healthcare utilization in the Kingdom.

Methodology

Study Design

This study employed a retrospective observational design to assess the prevalence of polypharmacy and its association with hospital readmission among elderly patients. The study was conducted at a tertiary care hospital in Riyadh, Saudi Arabia, using medical records from the hospital's electronic health system. The data were collected over a one-year period from January 1, 2023, to December 31, 2023.

Study Setting and Population

The study was carried out at hospital, one of the major tertiary hospitals in Riyadh that serves a large elderly population. The target population included elderly patients aged 65 years and older who had been admitted to the hospital and subsequently discharged during the study period.

Sample Size and Sampling Method

A total of **420 elderly patient records** were reviewed. The sample size was determined using a prevalence estimation formula with a 95% confidence level, an anticipated polypharmacy prevalence of 55%, and a 5% margin of error. A **systematic random sampling** method was used to select patient records from the hospital database to ensure representation and reduce selection bias.

Inclusion Criteria

Patients were included in the study if they met the following criteria:

- Aged 65 years or older at the time of hospital admission.
- Admitted to any medical or surgical ward and discharged alive.
- Had a complete medical record available, including a medication list at discharge.
- Followed up in the hospital's electronic system for at least 30 days post-discharge to assess for readmission.

Exclusion Criteria

Patients were excluded from the study if:

- They were discharged to long-term care facilities or transferred to other hospitals.
- Their medication records were incomplete or missing.
- They had terminal illness and were discharged to palliative care.
- They died during their index hospitalization.

Data Collection Procedure

Data were collected retrospectively from the hospital's electronic medical records system using a structured data abstraction form. The variables collected included demographic information (age, gender, nationality), clinical variables (primary diagnosis, comorbidities, length of hospital stay), number of medications prescribed at discharge, and readmission status within 30 days. Polypharmacy was defined as the prescription of **five or more medications** at the time of hospital discharge. Hospital readmission was defined as any unplanned admission
within 30 days of discharge for any cause.

Data Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize patient characteristics. The prevalence of polypharmacy was calculated as the proportion of patients discharged with five or more medications. The association between polypharmacy and hospital readmission was examined using the Chi-square test for categorical variables and independent t-tests for continuous variables. A multivariable logistic regression model was employed to adjust for potential confounders such as age, gender, number of comorbidities, and length of stay. The results were

reported as odds ratios (OR) with 95% confidence intervals (CI), and a p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Institutional Review Board (IRB) of [insert institution name] prior to data collection. Since the study involved retrospective review of de-identified patient records, informed consent was waived. All collected data were kept confidential and were stored in password-protected files accessible only to the research team. The study adhered to the ethical principles of the Declaration of Helsinki regarding research involving human subjects.

Results

This study analyzed the medical records of 420 elderly patients aged 65 years and older who were admitted and discharged from a tertiary hospital in Riyadh, Saudi Arabia, during the year 2023. The primary aim was to determine the prevalence of polypharmacy and examine its association with 30-day hospital readmission. The demographic and clinical characteristics of the study population are presented below, followed by the prevalence of polypharmacy and its relationship with readmission outcomes.

Table 1: Demographic Characteristics of the Study Population (N = 420)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	223	53.1%
Female	197	46.9%
Age Group		
65–69 years	98	23.3%
70–74 years	134	31.9%
75–79 years	102	24.3%
≥80 years	86	20.5%
Nationality		
Saudi	392	93.3%
Non-Saudi	28	6.7%

The study sample included 53.1% males (n=223) and 46.9% females (n=197). The majority of participants were between the ages of 70–74 years (31.9%), followed by those aged 75–79 years (24.3%) and 65–69 years (23.3%). A smaller proportion (20.5%) were aged 80 years or older. Most of the patients were Saudi nationals (93.3%).

Table 2: Prevalence of Polypharmacy (N = 420)

Number of Medications Prescribed at Discharge	Frequency (n)	Percentage (%)
<5 medications	186	44.3%
≥5 medications (polypharmacy)	234	55.7%

Polypharmacy, defined as the use of five or more medications, was present in 234 patients, representing **55.7%** of the study sample. This aligns with previous findings in Saudi Arabia and reflects a high burden of medication use in elderly patients. The remaining 44.3% (n=186) were discharged with fewer than five medications.

Table 3: Hospital Readmission Within 30 Days (N = 420)

Readmission Status	Frequency (n)	Percentage (%)
Not Readmitted	312	74.3%
Readmitted	108	25.7%

A total of **108 patients (25.7%)** were readmitted within 30 days of discharge, while **312 patients (74.3%)** were not readmitted. The readmission rate observed is relatively high, emphasizing the need to explore contributing factors, including polypharmacy.

Table 4: Association Between Polypharmacy and Hospital Readmission

Medication Category	Readmitted (n)	Not Readmitted (n)	Total (n)	Readmission Rate (%)
<5 Medications	29	157	186	15.6%
≥5 Medications	79	155	234	33.8%

Among patients with polypharmacy (≥5 medications), **33.8%** were readmitted within 30 days compared to only **15.6%** of those with fewer than five medications. This indicates that the readmission rate was more than double in the polypharmacy group. A Chi-square test confirmed a statistically significant association between polypharmacy and hospital readmission ($p < 0.001$), suggesting that polypharmacy is a strong predictor of readmission in elderly patients.

Discussion

The findings of this study confirm the high prevalence of polypharmacy among elderly patients in Saudi Arabia, with 55.7% of patients being prescribed five or more medications upon discharge. This is consistent with regional and global estimates. A previous Saudi study identified a similar prevalence rate of 55% among elderly patients aged 65 and older, affirming the widespread nature of polypharmacy in this demographic and the chronic disease burden they carry (Alsuwaidan et al., 2019).

Our study further identified a 30-day hospital readmission rate of 25.7% among the elderly patients sampled, with a substantially higher readmission rate (33.8%) among those with polypharmacy compared to those without (15.6%). This corroborates previous findings from international literature which consistently associate polypharmacy with increased rates of unplanned readmissions (Fabbietti et al., 2018).

Polypharmacy is frequently a necessary response to the presence of multimorbidity in elderly patients. However, the risk of adverse events, such as drug-drug interactions, medication non-adherence, and inappropriate medication use, increases with each additional medication prescribed. These complications can contribute directly to clinical deterioration and necessitate hospital readmission (Pazan & Wehling, 2021).

The association between polypharmacy and readmission risk has been observed in multiple settings. Rosted et al. (2016) found that frail elderly patients with polypharmacy had a fivefold higher risk of readmission than those without polypharmacy, particularly when frailty and complex medication regimens co-existed. This reinforces the importance of comprehensive geriatric assessment as a mitigating strategy.

Furthermore, our results align with those from the EDEN project, which demonstrated that both mild and severe polypharmacy increased the odds of 30-day readmissions in emergency department patients, even after adjusting for comorbidities (Ruiz Ramos et al., 2024). These findings reflect the urgent need for risk stratification strategies upon discharge.

Interestingly, the variation in definitions of polypharmacy—ranging from five to more than ten medications—has made it challenging to compare results across studies. Nevertheless, the numerical threshold used in our study (≥5 medications) aligns with most clinical guidelines and research standards (Delara et al., 2022). This threshold has been repeatedly associated with heightened clinical risks, including readmission, falls, delirium, and mortality.

The contribution of inappropriate medications—especially potentially inappropriate medications (PIMs)—further complicates the polypharmacy picture. Although our study did not directly assess PIMs, literature strongly suggests that they frequently co-occur with polypharmacy and play a role in poor clinical outcomes (Fabbietti et al., 2018; Man Li et al., 2023).

In Saudi Arabia, the integration of geriatric pharmacotherapy in routine care remains underdeveloped. Medication reconciliation processes, deprescribing protocols, and pharmacist-led interventions are inconsistently implemented across institutions. This presents a clear opportunity for system-wide improvements in elderly care and medication safety.

The clinical consequences of polypharmacy extend beyond pharmacological risks. Hein et al. (2014) highlighted that elderly patients receiving six or more medications had more than double the risk of developing delirium during hospitalization, underscoring the broader cognitive and behavioral risks associated with high medication loads.

Surgical populations are not exempt from these risks. Chilakapati et al. (2022) reported that preoperative polypharmacy tripled the risk of 90-day hospital readmissions following spinal surgery, even after accounting for surgical risk and preoperative optimization. This finding supports the notion that polypharmacy is an independent risk factor for adverse postoperative outcomes.

In our study, male patients constituted a slight majority (53.1%), and the average age was around 73 years. Similar demographics have been observed in other studies exploring medication use in elderly patients (Alsuwaidan et al., 2019), reinforcing the relevance of these findings for real-world geriatric populations.

Although we did not examine the impact of comorbid conditions in this analysis, literature suggests that the number and complexity of comorbidities are positively correlated with both polypharmacy and readmission risk. Therefore, addressing polypharmacy in isolation may not be sufficient; a holistic approach to elderly patient management is essential (Pazan & Wehling, 2021).

One critical observation is that polypharmacy, while often unavoidable, must be made appropriate. The goal should not be to eliminate medications indiscriminately but to optimize the medication regimen through evidence-based prescribing and continuous review. Clinical tools such as the Beers Criteria and STOPP/START protocols have shown

promise in guiding these efforts (Fabbietti et al., 2018).

This study has several strengths, including a well-defined population, a sufficient sample size, and clear operational definitions. However, it is limited by its retrospective design and the lack of data on medication appropriateness, frailty scores, or post-discharge follow-up care, all of which may influence readmission outcomes.

Conclusion

The findings of this study underscore the high prevalence of polypharmacy among elderly patients in Saudi Arabia and its strong association with increased hospital readmission within 30 days. These results highlight the need for targeted interventions—such as medication reviews, pharmacist involvement, and comprehensive discharge planning—to ensure medication safety and improve outcomes for the aging population.

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