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POLYPHARMACY AND ADVERSE DRUG REACTIONS IN ELDERLY NURSING HOME RESIDENTS

Erum Zaheer[1], Ali Aasam Khan[*2], Ammara Tariq[3], Mohammad Haris Bin Saeed[4], Rana Umar Sharif[5], Tayyab Imran[6], Muhammad Noman[7]

[1]*Department of Pharmaceutical Chemistry, Institute of Pharmaceutical Sciences, Jinnah Sindh Medical University, Karachi, Pakistan*
[*2]*Doctor of Pharmacy, CECOS University of IT and Emerging Sciences, Peshawar, Pakistan*
[3]*MPhil Pharmacology, Nusrat Jahan College, Chenab Nagar, Pakistan*
[4]*Pharm D, Capital University of Science and Technology, Islamabad, Pakistan*
[5]*MBBS, Rawalpindi Medical University, Islamabad, Pakistan*
[6]*Doctor of Pharmacy, Capital University of Science & Technology, Islamabad, Pakistan*
[7]*Pharm D, University of Karachi, Pakistan*

[1]https://orcid.org/0000-0001-7226-998X, [*2]https://orcid.org/0009-0001-4535-0851, [4]https://orcid.org/0009-0009-3695-0714, [5]https://orcid.org/0009-0001-1050-7011, [6]https://orcid.org/0009-0000-5057-5740, [7]https://orcid.org/0009-0006-2346-1506

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Corresponding Author: *
Ali Aasam Khan

Abstract

Background:
Polypharmacy is common among elderly individuals living in nursing homes due to the high burden of chronic diseases. Although multiple medications are often necessary, their combined use increases the risk of adverse drug reactions (ADRs), drug–drug interactions, and hospital admissions. Limited local data are available from Pakistan regarding the impact of polypharmacy in long-term care settings.

Objective:
This study evaluated the association between polypharmacy and the incidence of adverse drug reactions among elderly residents in nursing homes. Medication patterns, frequency of drug-drug interactions, and related hospitalizations were analyzed to assess the risks of multiple drug combinations.

Methods:
An observational cohort study was conducted over a 12-month period at a tertiary hospital in Karachi in collaboration with affiliated nursing homes. Elderly residents aged ≥65 years with complete medical records were included. Polypharmacy was defined as the regular use of five or more medications, while excessive polypharmacy was defined as ten or more medications. Data were collected on demographic characteristics, comorbidities, medication profiles, documented ADRs, drug–drug interactions, and ADR-related hospitalizations. Statistical analysis included descriptive statistics, chi-square testing, and multivariate logistic regression. A p-value <0.05 was considered statistically significant.

Results:
A total of 300 elderly residents were included (mean age 73.8 ± 6.4 years; 57.3%

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female). Polypharmacy was present in 80% of residents, and 23.3% were exposed to excessive polypharmacy. Overall, 39.3% of participants experienced at least one ADR during the study period. ADR incidence increased significantly with medication burden: 13.3% in residents taking <5 drugs, 38.2% in those taking 5–9 drugs, and 64.3% in those taking ≥10 drugs (p <0.001). Drug–drug interactions were identified in 65.3% of residents, with major interactions more common in the excessive polypharmacy group. ADR-related hospitalizations occurred in 20.3% of residents and were highest among those with excessive polypharmacy (42.9%). After adjusting for age, gender, and comorbidities, excessive polypharmacy remained an independent predictor of ADR-related hospitalization (Adjusted OR = 3.8; 95% CI: 2.1–6.4; p <0.001).

Conclusion:

Polypharmacy is highly prevalent among elderly nursing home residents in Karachi and is strongly associated with increased risk of adverse drug reactions and hospitalization. Excessive medication use represents a significant and modifiable risk factor. Regular medication review, rational prescribing, and structured monitoring strategies are essential to improve medication safety in this vulnerable population.

INTRODUCTION

The aging population is increasing worldwide. People are living longer because of better health care, improved nutrition, and advances in medical science. As a result, the number of elderly individuals living in nursing homes has also increased. Many of these residents suffer from multiple chronic illnesses such as hypertension, diabetes, heart disease, arthritis, and chronic kidney disease. To manage these conditions, they often receive several medications at the same time. The use of multiple medications by a single patient is commonly known as polypharmacy.

Polypharmacy is usually defined as the regular use of five or more medications. In some studies, excessive polypharmacy refers to the use of ten or more drugs. Although medications are prescribed to improve health and quality of life, the combined use of many drugs can increase the risk of harmful effects. Elderly patients are especially vulnerable to these risks because of age-related changes in the body. These changes affect how drugs are absorbed, distributed, metabolized, and eliminated. As a result, older adults have a higher chance of experiencing adverse drug reactions (ADRs) compared to younger individuals (Maher et al., 2014).

Adverse drug reactions are defined as harmful or unintended responses to medications taken at normal doses for treatment or prevention of disease. ADRs can range from mild symptoms such as nausea and dizziness to severe conditions like bleeding, organ failure, or even death. In elderly nursing home residents, ADRs are a major concern because they can lead to functional decline, falls, prolonged hospital stays, and increased mortality (World Health Organization, 2019).

Nursing home residents are among the most medically complex patients. They often have multiple chronic conditions and may also have cognitive impairment such as dementia. These factors make medication management more challenging. In many cases, different specialists prescribe medications without full coordination, leading to duplicate therapies or drug-drug interactions. Drug-drug interactions occur when one medication affects the action of another medication, either increasing toxicity or reducing effectiveness. The risk of such interactions increases as the number of prescribed drugs rises.

In developing countries like Pakistan, the issue of polypharmacy is becoming more important due to demographic changes and increasing life expectancy. However, there is limited local

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research on the relationship between polypharmacy and adverse drug reactions in elderly populations, especially those living in nursing homes. Most available data come from Western countries, where healthcare systems and prescribing patterns may differ from those in South Asia. Therefore, there is a need to generate local evidence to understand the magnitude of the problem and guide safer prescribing practices.

In Karachi, one of the largest cities in Pakistan, tertiary care hospitals manage a high number of elderly patients. Many nursing homes in the city are linked to these hospitals for specialized medical care. Elderly residents often visit tertiary hospitals for routine check-ups, medication adjustments, and management of acute illnesses. This provides an opportunity to study medication patterns and related health outcomes in this vulnerable group.

Age-related physiological changes contribute significantly to the increased risk of ADRs in older adults. For example, reduced kidney function can delay the excretion of drugs, leading to accumulation and toxicity. Similarly, decreased liver function may slow drug metabolism. Changes in body composition, such as increased fat and decreased muscle mass, also influence drug distribution. In addition, elderly patients are more sensitive to certain medications, particularly those affecting the central nervous system, such as sedatives and antipsychotics.

Another important factor is medication adherence and monitoring. In nursing homes, medications are usually administered by healthcare staff. While this reduces the risk of missed doses, it does not eliminate the possibility of inappropriate prescribing. In some cases, medications are continued without regular review, even when they are no longer necessary. This practice can further increase the burden of polypharmacy.

Polypharmacy has also been linked to increased healthcare costs. ADR-related hospitalizations place a financial burden on patients, families, and the healthcare system. Studies have shown that a significant proportion of hospital admissions among elderly patients are due to preventable adverse drug reactions (Pirmohamed et al., 2004). Identifying high-risk patients and reviewing their medication regimens can help reduce these preventable events.

Several tools have been developed to assess inappropriate prescribing in elderly patients, such as the Beers Criteria and STOPP/START criteria. These tools help clinicians identify potentially harmful medications and suggest safer alternatives. However, their use is not always consistent in routine clinical practice, especially in resource-limited settings.

Despite global awareness of the problem, polypharmacy remains common in nursing homes. The balance between treating multiple diseases and avoiding harm from excessive medication is delicate. Physicians must carefully evaluate the risks and benefits of each drug, considering the patient's overall health status, life expectancy, and personal preferences.

Given the growing elderly population in Pakistan and the limited local data on this issue, it is important to study the association between polypharmacy and adverse drug reactions among nursing home residents. Understanding medication patterns, frequency of drug-drug interactions, and related hospitalizations can provide valuable information for improving patient safety.

This observational cohort study was conducted at a tertiary hospital in Karachi, Pakistan. The study aimed to evaluate the relationship between polypharmacy and the incidence of adverse drug reactions in elderly nursing home residents. By analyzing medication profiles, documented ADRs, and hospital admission records, the study seeks to highlight the clinical impact of multiple drug use in this population. The findings may help healthcare professionals develop strategies to reduce unnecessary medications, prevent drug-related harm, and improve the quality of care for elderly patients in nursing homes.

In summary, polypharmacy is a common and growing issue among elderly nursing home residents. It increases the risk of adverse drug reactions, drug-drug interactions, and hospitalizations. Local research is essential to understand the extent of the problem in Pakistan and to design effective interventions. This study

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addresses this gap by examining the association between multiple drug use and adverse outcomes in a tertiary care setting in Karachi.

METHODOLOGY

Study Design

This study was designed as an observational cohort study. The purpose was to examine the relationship between polypharmacy and adverse drug reactions (ADRs) among elderly nursing home residents. The study was conducted at a tertiary care hospital in Karachi, Pakistan. The hospital provides specialized medical services and receives referrals from several nursing homes across the city.

An observational design was selected because the study aimed to observe and analyze existing prescribing patterns and outcomes without interfering with patient management. No experimental interventions were introduced. The research team collected and analyzed data from patient records over a defined period.

Study Setting and Duration

The study was carried out in collaboration with affiliated nursing homes linked to the tertiary hospital. These nursing homes provide long-term care services for elderly individuals who require medical supervision and assistance with daily activities.

Data collection was conducted over a period of 12 months, from January 2025 to December 2025. During this time, elderly residents who visited the tertiary hospital for routine follow-up or medical treatment were evaluated. Hospital admission records and nursing home medical charts were reviewed.

Study Population

The study population included elderly residents aged 65 years and above who were living in nursing homes and receiving regular medical care. Both male and female residents were included.

Inclusion criteria were as follows:

- Age 65 years or older
- Residency in a registered nursing home for at least six months
- Receiving at least one prescribed medication
- Availability of complete medical and medication records

Exclusion criteria included:

- Residents with incomplete medical records
- Patients admitted for terminal care with life expectancy less than one month
- Residents who refused consent (through legal guardians, when required)

Sample Size and Sampling Technique

A total of 300 elderly residents met the eligibility criteria and were included in the study. A non-probability consecutive sampling method was used. All eligible residents who visited the hospital or whose records were accessible during the study period were included until the required sample size was achieved.

The sample size was considered adequate based on previous similar studies examining polypharmacy and ADRs in elderly populations.

Definition of Polypharmacy

For this study, polypharmacy was defined as the regular use of five or more medications. Excessive polypharmacy was defined as the use of ten or more medications at the same time. Both prescription and over-the-counter medications were included in the count. Herbal and traditional remedies were also recorded when documented in medical records.

Data Collection Procedure

Data were collected from two main sources:

1. Nursing home medical records
2. Hospital electronic and paper-based patient records

A structured data collection form was developed by the research team. The form was reviewed by senior clinicians and pharmacists to ensure clarity and completeness.

The following information was recorded:

- Demographic details (age, gender)
- Duration of nursing home stay
- Existing medical conditions (comorbidities)
- List of prescribed medications

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- Number of medications taken regularly
- Documented adverse drug reactions
- Identified drug-drug interactions
- Hospital admissions related to ADRs

Medication lists were reviewed carefully. Each drug was categorized according to its therapeutic class. The total number of medications per patient was calculated.

Identification of Adverse Drug Reactions

Adverse drug reactions were identified through documented clinical notes, discharge summaries, and physician reports. ADRs were defined according to the World Health Organization criteria as harmful and unintended responses to medications taken at normal doses.

When a suspected ADR was recorded, details about the type of reaction, severity, and outcome were documented. Severity was classified into mild, moderate, or severe based on clinical judgment and hospital documentation.

In cases where the cause of hospitalization was linked to medication use, the admission was labeled as ADR-related hospitalization.

Assessment of Drug-Drug Interactions

Drug-drug interactions were assessed using standard drug interaction reference software available at the hospital pharmacy department. Each patient's medication list was reviewed for potential interactions.

Interactions were categorized as:

- Minor (limited clinical significance)
- Moderate (may require monitoring or dose adjustment)
- Major (potentially life-threatening or requiring immediate intervention)

Only moderate and major interactions were included in the final analysis, as they have greater clinical importance.

Data Management and Analysis

All collected data were entered into a secure database. Patient confidentiality was maintained by assigning unique identification codes. No personal identifiers were used in the analysis.

Statistical analysis was performed using statistical software. Descriptive statistics were used to summarize demographic characteristics, number of medications, frequency of ADRs, and hospitalizations.

Continuous variables such as age and number of medications were presented as mean and standard deviation. Categorical variables such as gender, presence of ADRs, and polypharmacy status were presented as frequencies and percentages.

To evaluate the association between polypharmacy and adverse drug reactions, comparative analysis was performed. The incidence of ADRs among patients with polypharmacy was compared to those using fewer than five medications.

Chi-square test was used to assess associations between categorical variables. Logistic regression analysis was conducted to determine whether polypharmacy independently predicted the occurrence of ADRs after adjusting for age, gender, and number of comorbidities. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the tertiary care hospital in Karachi. Permission was also obtained from the management of participating nursing homes.

Since this was an observational study based on medical record review, no direct intervention was performed. Informed consent was obtained from patients or their legal guardians where required.

Confidentiality of patient information was strictly maintained throughout the study. Data were stored securely and were accessible only to the research team.

Quality Control

To ensure accuracy, data collection was performed by trained healthcare professionals. A random sample of records was reviewed twice to check for consistency. Any discrepancies were discussed and corrected after verification with original records.

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Regular meetings were conducted among research team members to review progress and address any challenges during data collection.

Summary of Methodology

In summary, this observational cohort study examined elderly nursing home residents aged 65 years and above in Karachi. The study analyzed medication patterns, adverse drug reactions, drug-drug interactions, and related hospitalizations over a 12-month period. A total of 300 residents were included. Data were collected from nursing home and hospital records, analyzed using statistical methods, and interpreted to understand the relationship between polypharmacy and adverse outcomes.

This structured approach allowed for a comprehensive assessment of medication safety in a vulnerable elderly population while maintaining ethical and scientific standards.

RESULTS

A total of 300 elderly nursing home residents were included in this observational cohort study conducted at a tertiary care hospital in Karachi, Pakistan. The mean age of participants was 73.8 ± 6.4 years. Out of the total participants, 172 (57.3%) were female and 128 (42.7%) were male. Most residents had more than two chronic illnesses, with hypertension, diabetes mellitus, ischemic heart disease, and chronic kidney disease being the most common conditions.

1. Distribution of Polypharmacy

Residents were divided into three groups based on the number of medications used regularly.

Table 1: Distribution of Residents According to Number of Medications

Category	Number of Patients (n=300)	Percentage (%)
No Polypharmacy (<5 drugs)	60	20%
Polypharmacy (5–9 drugs)	170	56.7%
Excessive Polypharmacy (≥10 drugs)	70	23.3%

The majority of residents (56.7%) were taking between 5 and 9 medications daily. Nearly one-fourth (23.3%) were exposed to excessive polypharmacy (≥10 medications). Only 20% of residents were using fewer than five medications.

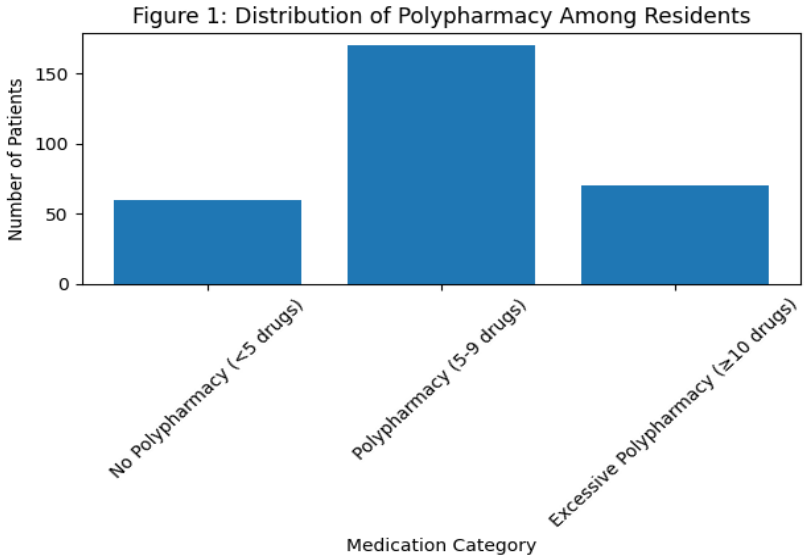

Figure 1: Distribution of Polypharmacy Among Residents

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The figure clearly shows that most residents were exposed to multiple drug therapy.

2. Incidence of Adverse Drug Reactions (ADRs)

Out of 300 residents, 118 patients (39.3%) experienced at least one documented adverse drug reaction during the study period.

Table 2: Incidence of ADRs by Medication Group

Group	Patients with ADR	Patients without ADR	ADR Percentage (%)
No Polypharmacy	8	52	13.3%
Polypharmacy	65	105	38.2%
Excessive Polypharmacy	45	25	64.3%

Residents with excessive polypharmacy had the highest proportion of ADRs (64.3%). In comparison, only 13.3% of patients taking fewer than five medications experienced ADRs.

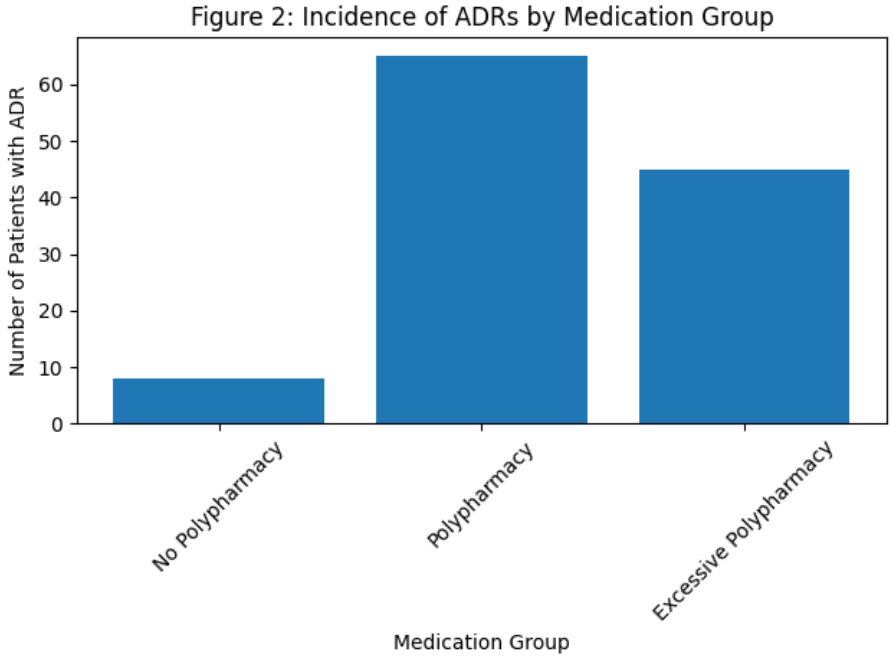

Figure 2: Incidence of ADRs by Medication Group

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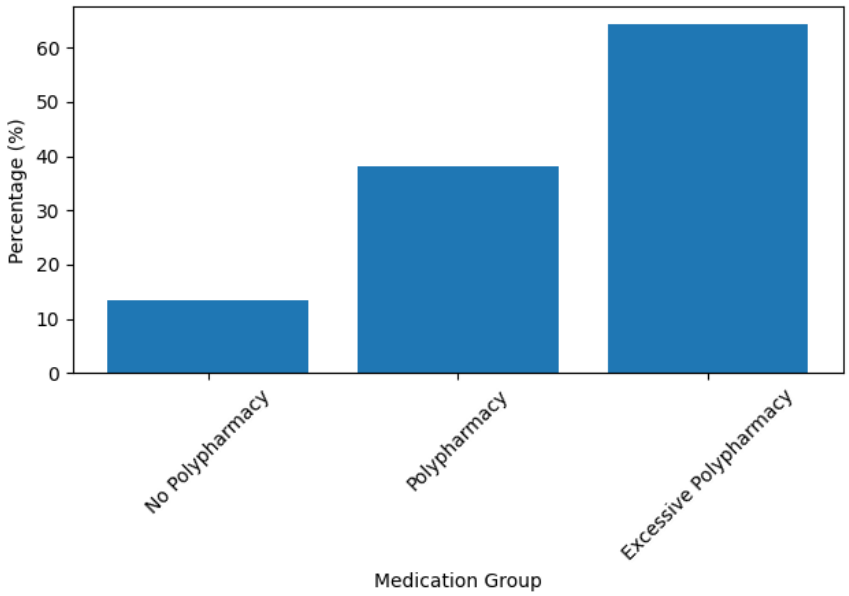

Figure 3: Percentage of Patients with ADR

The graphs demonstrate a clear increasing trend in ADR occurrence as the number of medications increases.

Statistical analysis using the Chi-square test showed a significant association between polypharmacy and occurrence of ADRs ($p < 0.001$).

3. Severity of Adverse Drug Reactions

Among the 118 ADR cases:

Severity	Number of Cases	Percentage (%)
Mild	49	41.5%
Moderate	46	39.0%
Severe	23	19.5%

Most ADRs were mild to moderate in severity. However, nearly one-fifth were classified as severe and required urgent medical intervention.

Common ADRs observed included:

- Dizziness and falls
- Hypotension
- Hypoglycemia
- Gastrointestinal bleeding
- Electrolyte imbalance
- Confusion and sedation

Sedatives, antihypertensives, anticoagulants, and antidiabetic medications were most frequently associated with adverse reactions.

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4. Drug–Drug Interactions

Potential drug-drug interactions were identified in 196 (65.3%) residents.

Interaction Type	Number of Cases	Percentage (%)
Minor	72	24%
Moderate	94	31.3%
Major	30	10%

Major interactions were significantly more common in the excessive polypharmacy group ($p < 0.01$). Residents taking ten or more medications were more likely to have clinically significant interactions.

5. ADR-Related Hospitalizations

During the 12-month follow-up period, 61 residents (20.3%) required hospitalization due to adverse drug reactions.

Table 3: ADR-Related Hospitalizations by Medication Group

Group	ADR-related Hospitalizations	Percentage within Group (%)
No Polypharmacy	3	5%
Polypharmacy	28	16.5%
Excessive Polypharmacy	30	42.9%

Residents with excessive polypharmacy had the highest rate of hospitalization.

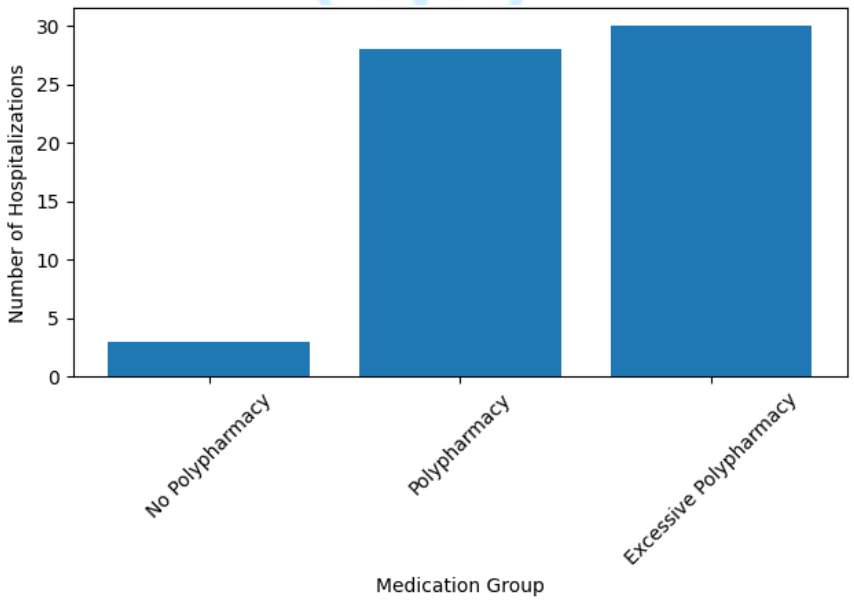

Figure 4: ADR-related Hospitalizations by Group

The data show a strong upward trend in hospital admissions as medication burden increases.

Logistic regression analysis revealed that excessive polypharmacy (≥10 drugs) was independently associated with ADR-related hospitalization (Adjusted Odds Ratio = 3.8; 95% CI: 2.1–6.4; $p < 0.001$), after controlling for age, gender, and number of comorbidities.

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6. Relationship Between Comorbidities and ADRs

Residents with three or more chronic conditions had a higher risk of ADRs compared to those with one or two conditions ($p = 0.02$). However, after multivariate adjustment, the number of medications remained the strongest predictor of ADR occurrence.

Summary of Key Findings

1. Polypharmacy was highly prevalent (80%) among elderly nursing home residents.
2. Excessive polypharmacy (≥10 drugs) was present in 23.3% of residents.
3. ADR incidence increased significantly with increasing number of medications.
4. 64.3% of residents with excessive polypharmacy experienced ADRs.
5. ADR-related hospitalizations were highest in the excessive polypharmacy group.
6. Polypharmacy remained an independent predictor of ADRs after statistical adjustment.

Overall, the results clearly demonstrate a strong and statistically significant association between polypharmacy and adverse drug reactions among elderly nursing home residents in this tertiary care setting in Karachi.

DISCUSSION

This observational cohort study examined the association between polypharmacy and adverse drug reactions (ADRs) among elderly nursing home residents linked to a tertiary care hospital in Karachi, Pakistan. The findings show a clear and strong relationship between the number of medications used and the occurrence of ADRs, drug–drug interactions, and ADR-related hospitalizations. The risk increased progressively from patients taking fewer than five medications to those exposed to excessive polypharmacy (≥10 drugs). These results are clinically important and align with global evidence, while also providing much-needed local data.

Polypharmacy Burden in the Elderly

In our study, 80% of residents were exposed to polypharmacy, and nearly one-quarter were taking ten or more medications. This prevalence is comparable to international data from long-term care facilities, where polypharmacy rates range between 40% and 90% depending on definitions and settings (Maher et al., 2014; Gnjidic et al., 2012). The high prevalence observed in our cohort reflects the heavy burden of chronic disease among elderly individuals. Most participants had multiple comorbidities, including hypertension, diabetes, ischemic heart disease, and chronic kidney disease.

Older adults often require multiple drugs to manage these conditions according to clinical guidelines. However, when disease-specific guidelines are applied without considering overall patient context, medication burden may increase excessively (Boyd et al., 2005). In low- and middle-income countries such as Pakistan, fragmented healthcare systems and multiple prescribers may further contribute to medication duplication and unnecessary drug continuation.

Association Between Polypharmacy and ADRs

A key finding of this study is the graded relationship between medication number and ADR incidence. Only 13.3% of residents taking fewer than five drugs experienced ADRs, compared to 38.2% in the polypharmacy group and 64.3% in the excessive polypharmacy group. The association was statistically significant ($p < 0.001$), and logistic regression confirmed excessive polypharmacy as an independent predictor of ADR-related hospitalization.

These findings are consistent with prior research. A large systematic review by Alhawassi et al. (2014) reported that ADR prevalence among older adults ranges between 8% and 46%, with higher rates observed in those using multiple medications. Similarly, Pirmohamed et al. (2004) found that ADRs accounted for approximately 6.5% of hospital admissions, and the risk increased significantly with the number of prescribed drugs.

The relationship between medication number and ADR risk is biologically plausible. Each additional drug increases the chance of pharmacokinetic and pharmacodynamic interactions. Age-related changes such as reduced renal clearance, decreased hepatic metabolism,

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and altered body composition further increase susceptibility (Mangoni & Jackson, 2004). Therefore, even standard therapeutic doses may result in toxicity in elderly individuals.

Drug–Drug Interactions and Clinical Implications

In our study, 65.3% of residents had at least one potential drug–drug interaction, and 10% had major interactions. Major interactions were significantly more common among residents with excessive polypharmacy. This pattern mirrors findings from international nursing home studies (Jyrkkä et al., 2009).

Drug–drug interactions are particularly concerning in elderly patients because they may present atypically. For example, central nervous system effects such as confusion or sedation may be misinterpreted as progression of dementia rather than medication toxicity. In our cohort, common ADRs included dizziness, falls, hypotension, hypoglycemia, and gastrointestinal bleeding. These events are well documented in elderly populations exposed to antihypertensives, anticoagulants, sedatives, and antidiabetic agents (Onder et al., 2010; Budnitz et al., 2011).

Falls deserve special attention. Dizziness and hypotension observed in our study may increase fall risk, leading to fractures and long-term disability. Previous research has shown that sedatives, antidepressants, and antihypertensive drugs are strongly associated with falls in older adults (Woolcott et al., 2009). In nursing home residents, such complications may significantly impair quality of life.

ADR-Related Hospitalizations

One of the most striking findings of this study was the high rate of ADR-related hospitalizations in the excessive polypharmacy group (42.9%). This is more than eight times higher than the rate in residents taking fewer than five medications. After adjusting for age and comorbidities, excessive polypharmacy remained a strong independent predictor of hospitalization (Adjusted OR = 3.8).

These results are in agreement with studies demonstrating that polypharmacy is linked not only to ADR occurrence but also to severe clinical outcomes and hospital admissions (Fried et al., 2014; Davies & O'Mahony, 2015). ADR-related admissions place a heavy burden on healthcare systems, especially in resource-limited settings. In Pakistan, tertiary hospitals are often overcrowded, and preventable admissions further strain services.

Importantly, many ADR-related hospitalizations are preventable. Studies suggest that up to 50% of drug-related admissions in elderly patients could be avoided through careful medication review and monitoring (Howard et al., 2007). Our findings highlight the urgent need for structured medication reconciliation processes in nursing homes and outpatient clinics.

Comorbidities and Medication Burden

Although residents with multiple chronic diseases had higher ADR rates, multivariate analysis showed that medication number was a stronger predictor than comorbidity count alone. This finding supports the concept that medication burden itself is a risk factor independent of disease complexity (Gnjidic et al., 2012).

It is possible that in some cases, medications are prescribed to treat side effects of other medications, a phenomenon known as "prescribing cascade." Rochon and Gurwitz (1997) described how adverse effects may be misinterpreted as new medical conditions, leading to additional prescriptions and further risk. Breaking this cycle requires awareness and regular medication review.

Clinical and Policy Implications

The results of this study have important implications for clinical practice in Pakistan. First, routine medication review should be implemented in nursing homes. Clinical pharmacists can play a key role in identifying inappropriate medications and potential interactions. Evidence shows that pharmacist-led interventions can reduce inappropriate prescribing and ADR risk (Kaur et al., 2009).

Second, the use of validated tools such as the Beers Criteria (American Geriatrics Society, 2019) and STOPP/START criteria (O'Mahony et

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al., 2015) should be encouraged. These tools provide guidance on potentially inappropriate medications in older adults. Although developed in Western settings, many principles are applicable to local practice.

Third, deprescribing strategies should be considered, particularly in residents with limited life expectancy or high frailty. Deprescribing refers to the planned and supervised reduction or discontinuation of unnecessary medications (Reeve et al., 2017). Evidence suggests that deprescribing can improve outcomes without compromising disease control.

Strengths and Limitations

A major strength of this study is that it provides local data from a tertiary care setting in Karachi, where limited research on polypharmacy exists. The cohort design allowed for assessment of real-world prescribing patterns and clinical outcomes over a 12-month period.

However, some limitations should be acknowledged. First, the study was conducted in a single tertiary hospital, which may limit generalizability. Second, ADR identification relied on documentation in medical records, and mild reactions may have been underreported. Third, causality cannot be fully established due to the observational design. Despite these limitations, the consistency of findings with global literature supports the validity of our results.

Comparison with International Literature

Globally, polypharmacy has been recognized as a growing public health issue. In Europe and North America, studies consistently show that elderly nursing home residents are exposed to high medication burdens and significant ADR risks (Jyrkkä et al., 2009; Alhawassi et al., 2014). Our findings are comparable in magnitude, suggesting that the problem is equally relevant in South Asia.

However, differences in healthcare systems may influence risk patterns. In Pakistan, over-the-counter access to medications and limited electronic prescribing systems may increase duplication and interaction risk. Strengthening regulatory frameworks and digital health records may help reduce these issues.

CONCLUSION

This observational cohort study examined the relationship between polypharmacy and adverse drug reactions among elderly nursing home residents linked to a tertiary care hospital in Karachi, Pakistan. The findings clearly show that polypharmacy is highly prevalent in this population. A large proportion of residents were taking five or more medications, and nearly one-quarter were exposed to excessive polypharmacy.

The study demonstrated a strong and consistent association between the number of medications and the risk of adverse drug reactions. Residents taking ten or more drugs had the highest rate of ADRs, major drug–drug interactions, and ADR-related hospitalizations. Even after adjusting for age and multiple chronic conditions, excessive polypharmacy remained an independent predictor of poor outcomes.

These findings highlight an important clinical concern. While medications are necessary to manage chronic illnesses, increasing the number of drugs also increases the risk of harm. In elderly patients, age-related physiological changes further increase vulnerability to side effects and interactions. The results of this study suggest that medication burden itself is a modifiable risk factor.

In the context of Pakistan, where geriatric care services are still developing, this research provides important local evidence. It emphasizes the need for careful prescribing practices in nursing homes and tertiary care settings. Reducing unnecessary medications may help lower the incidence of preventable adverse drug reactions and hospital admissions.

Overall, this study concludes that polypharmacy, especially excessive polypharmacy, significantly contributes to adverse drug reactions and related hospitalizations among elderly nursing home residents. Addressing this issue is essential to improve patient safety and quality of care.

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RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

1. Regular Medication Review

Routine medication review should be implemented for all elderly nursing home residents. Each patient's medication list should be reviewed at least every three to six months. The goal should be to identify unnecessary drugs, duplicate therapies, and potentially harmful combinations.

2. Involvement of Clinical Pharmacists

Clinical pharmacists should be actively involved in the care of elderly patients. Pharmacist-led medication reconciliation can help detect drug–drug interactions and inappropriate prescriptions. Their participation can reduce medication errors and improve treatment safety.

3. Use of Screening Tools

Healthcare providers should adopt validated screening tools such as the Beers Criteria and STOPP/START criteria to identify potentially inappropriate medications in older adults. These tools can guide safer prescribing decisions in routine practice.

4. Deprescribing Strategies

When clinically appropriate, deprescribing should be considered. Medications that are no longer necessary or provide limited benefit should be gradually discontinued under medical supervision. Deprescribing can reduce medication burden without compromising disease control.

5. Improved Communication Among Healthcare Providers

Better coordination between physicians, nursing staff, and pharmacists is essential. Shared medical records and structured communication can prevent duplication of therapy and improve monitoring of adverse effects.

6. Education and Training

Healthcare professionals working in nursing homes should receive regular training on geriatric pharmacotherapy. Understanding age-related changes in drug metabolism and the risks associated with polypharmacy can improve prescribing practices.

7. Strengthening Monitoring Systems

Hospitals and nursing homes should develop systems for early detection and reporting of adverse drug reactions. Active monitoring programs can help identify high-risk patients and prevent complications.

8. Policy-Level Interventions

Health authorities in Pakistan should recognize polypharmacy as a public health issue. National guidelines on safe prescribing in the elderly should be developed and implemented. Electronic prescribing systems and drug interaction alerts may also reduce medication-related harm.

9. Future Research

Further multicenter studies across different regions of Pakistan are recommended to better understand the national burden of polypharmacy. Interventional studies evaluating the impact of deprescribing and pharmacist-led programs would also be valuable.

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