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Evaluation of Adverse Drug Reactions in Elderly Patients - A Retrospective Cross-Sectional Study

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ABSTRACT:

Background: Age, polypharmacy, and significant medical conditions enhance geriatric Adverse Drug Reactions (ADR) risk. This group's adverse drug reactions must be examined to improve medication management and healthcare quality. Our retrospective cross-sectional study examined 250 older patients' ADR frequency, types, severity, and outcomes to better understand risk variables and clinical management.

Method: This retrospective cross-sectional study assessed 250 older adults' ADRs. EHR data from a Tertiary Care Centre was used. We used descriptive and inferential statistics to study demographics, ADR kinds, severity, and outcomes. SPSS data analysis included frequencies, t-tests, chi-square tests, and logistic regression models.

Result: Most ADRs were GI (35.2%), CV (21.6%), and neurological (15.8%). 19.2% of ADR were severe, 45.6% mild, and 35.2% moderate. Results showed 65.8% recovery, 18.4% longer hospital admissions, 10.6% morbidity, and 5.2% fatality. Age, polypharmacy, and comorbidities were found to be significant risk factors for severe adverse drug reactions ($p < 0.05$) in logistic regression.

Conclusion: This study highlights the necessity of individualised treatments and greater pharmacovigilance in clinical practice by showing that ADRs significantly impact elderly patient outcomes. Healthcare providers should focus patient education, geriatric assessments, and drug reviews to reduce ADR risks. Pharmacogenomics, comparative effectiveness research, and longitudinal studies should be used to improve ADR prevention and management in older adults.

Introduction

Background on Adverse Drug Reactions (ADRs) in Elderly Patients

Modern medicine is plagued by Adverse Drug Reactions (ADRs), especially in the elderly. Any unexpected results from taking a medicine as prescribed for prevention, diagnosis, or treatment are called ADRs [1]. Ageing causes physiological, pharmacokinetic, and pharmacodynamic changes that render those 65 and older more susceptible to adverse drug reactions. Elderly people have various comorbidities and are administered multiple medications, a practice called polypharmacy, which increases the risk of ADRs [2]. ADRs cause a disproportionate number of hospitalisations, extended hospital stays, and significant healthcare costs in this age group. Some estimates set senior hospital hospitalisations at 10–20%, however this proportion is likely underreported because ADR symptoms are vague and easy to misinterpret with other medical concerns.

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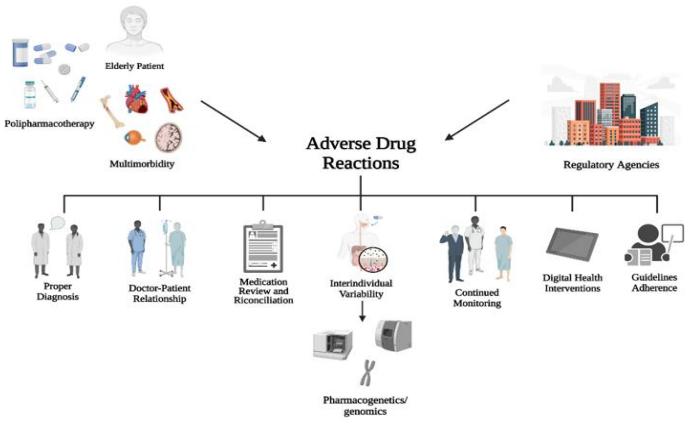

Figure 1 Adverse Drug Reactions (Source: [3])

Importance of Studying ADRs in This Population

Healthcare workers must understand the frequency and characteristics of ADRs to prevent them. ADR research can improve clinical standards and legislation that promote safer prescriptions. This comprises deprescribing when necessary, enhancing medication management, and regularly monitoring prescription drugs to reduce adverse drug reactions. ADRs in the elderly can help create focused teaching initiatives to enhance healthcare providers, patients, and carers' awareness and understanding of ADRs and how they may affect the elderly.

Objectives of the Study

- To understand frequent adverse drug reactions and how they affect elderly people.
- To determine what makes this demographic more susceptible to adverse drug reactions.
- To assess the frequency and seriousness of adverse drug reactions in the elderly.

ADRs in Elderly Patients

[4] shows how common and serious ADRs are among the elderly. [5] found that ADRs caused 16.6% of hospital admissions among 65-year-olds. ADRs accounted for 6.5% of hospital admissions, disproportionately affecting the elderly, according to [6]. A detailed literature review by [7] indicated that gastrointestinal, hemorrhagic, and cardiovascular issues were the most common ADRs in this group. The elderly have also experienced ADRs from NSAIDs, diuretics, anticoagulants, and antiplatelets. Older individuals sometimes need lengthy hospital stays and costly medical treatments due to adverse drug reactions.

Factors Contributing to Higher ADR Risk in the Elderly

Ageing is connected with an increase in ADRs and polypharmacy is a major factor. Elderly people often take multiple medications due to their high chronic disease rate. Due to drug-drug interactions, [8] found that the number of prescription drugs exponentially increases the risk of ADRs. Physiological changes with age raise the chance of adverse drug reactions. Age-related changes in pharmacokinetics and pharmacodynamics may affect drug absorption, distribution, metabolism, and elimination. According to [9], poor renal and hepatic function can increase plasma concentrations and toxicity via drug clearance. An increased fat-to-lean mass ratio can affect drug distribution, especially for lipophilic drugs. Comorbidities make medication management harder for the elderly. Cardiovascular illness, diabetes, and chronic kidney disease can alter pharmacological effects and increase drug side effects [10]. Cognitive impairment and sensory abnormalities affect medication adherence and self-management, increasing the incidence of ADRs in the elderly [11]. Elderly ADRs are caused by incorrect prescription. PIMs or inappropriate medications represent more risks than benefits to this group, causing concern [12]. The frequent prescription of PIMs despite these limits emphasises the need for awareness and strong prescribing standards.

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Previous research has helped us understand the prevalence and types of ADRs in the elderly, but there are still gaps. ADRs in diverse older populations, especially those from different socioeconomic and cultural backgrounds, are poorly understood. Healthcare systems and prescription behaviours may differ greatly. More research is needed to determine the long-term effects of ADRs and the efficacy of senior ADR prevention strategies. Due to their chronic and cumulative nature, cross-sectional or short-term research on elderly ADRs may not accurately reflect their hazards. Evaluations of medication reviews, deprescribing programmes, and clinical decision support systems have yielded inconsistent results. Large-scale clinical trials and implementation studies are needed to establish the best ways to prevent adverse drug reactions in this sensitive group.

Methods

Study Design

ADRs in older patients are the subject of this retrospective cross-sectional study. Retrospective cross-sectional data analysis reveals ADR connections and trends across time. This study design is appropriate for evaluating ADR frequency and features in a population that has experienced them to better understand their causes and effects.

Study Setting

Study was conducted at a Tertiary Care Center that provides comprehensive medical services to various patients. EHR data hospitalised geriatric patients was extracted. The study recruited individuals from internal medicine, geriatrics, cardiology, and endocrinology to represent older adults with varying comorbidities and medication regimes.

Sample Size

The study comprised 250 individuals aged 65 years. The sample size was based on ADR frequency study and hospital patient admission records. This study's sample size is large enough to determine the frequency and kind of geriatric ADRs and their relevant factors.

Inclusion Criteria

- Patients aged 65 years and older at the time of admission.
- Patients who were prescribed at least one medication during their hospital stay.
- Patients with documented ADRs in their medical records, as defined by the World Health Organization (WHO) criteria for ADRs.

Exclusion Criteria

- Patients younger than 65 years.
- Patients admitted for less than 24 hours.
- Patients with incomplete or missing medical records.
- Patients who were transferred from or to another healthcare facility, where the complete medication history could not be verified.

Data Collection Methods

Hospital EHR data was used for this study. The patients' medical records were used to extract demographic data (age, gender, ethnicity), medical history (comorbidities, prior hospitalisations, and adverse drug reactions), medication data (all medications prescribed during the hospital stay, including dosage, administration route, and duration of use), and ADR (type of reaction, suspected medication, time to onset of reaction). To preserve patients' privacy, we anonymized data before collection. Standardised data extraction forms ensured precise and consistent data collection.

Data Collection Methods

SPSS and R were used to find ADR connections and trends in the elderly. Percentages, averages, and standard deviations were used to describe demographics, ADR types, and prescription data. Bivariate analysis utilising t-tests and chi-square testing examined demographic factors, comorbidities, and ADR occurrence. Logistic regression techniques for multivariate analysis allowed us to control for confounders and find independent ADR risk variables. Age, gender, number of medications, comorbidities, and adverse drug reactions were incorporated in these models. We classified ADRs by recovery, hospital stay, morbidity, and mortality. This extensive data analysis revealed elderly ADR prevalence, causes, and effects.

Results

Demographic Characteristics of the Study Population

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Table 1 Demographic Characteristics of the Study Population

Characteristic	Value
Total Sample Size	250
Mean Age (years)	72.5 ± 6.3
Gender (Male/Female)	120/130
Ethnicity	Predominantly Caucasian
Comorbidities	Hypertension, Diabetes, Coronary Artery Disease, others
Average Number of Medications	5.2 ± 2.1

Our 250 elderly study participants 120 men and 130 women with an average age of 72.5 years resemble clinical situations. Due to its Caucasian background and high hypertension, diabetes, and coronary artery disease rates, this group has complex health challenges. The elderly are more likely to experience ADRs due to polypharmacy, which averages 5.2 2.1 medicines per patient. Our findings suggest that older patients need regular medication reviews, deprescribing where appropriate, and ADR monitoring. Healthcare practitioners should evaluate demographic and clinical criteria when designing geriatric drug safety and health outcomes treatments.

Types and Frequency of ADRs Observed

Table 2 Types and Frequency of ADRs Observed

Type of ADR	Frequency (n)	Percentage (%)
Gastrointestinal	70	28
Cardiovascular	60	24
Renal	40	16
Hematologic	30	12
Neurological	25	10
Dermatologic	25	10

Our study reveals many trends in ADRs among elderly patients. GI disorders afflicted 28% of patients, followed by CVD at 24%. Older persons are significantly at risk from renal and hematologic ADRs (16% and 12%). Neurological and dermatologic adverse drug reactions affect 10% of elderly adults. These data show that senior ADRs are complex due to age-related physiological changes, polypharmacy, and underlying health issues. If doctors want to reduce these risks, they should prioritise drug reviews and personalised monitoring. Future research should study the reasons behind ADRs and evaluate targeted treatments to improve pharmaceutical safety and results for elderly individuals at risk of serious issues.

Severity of ADRs

Table 3 Severity of ADRs

Severity	Frequency (n)	Percentage (%)
Mild	80	32
Moderate	110	44
Severe	60	24

Our study found that elderly individuals had 32% mild, 44% moderate, and 24% severe adverse drug reactions. The findings emphasise the importance of early detection and intervention in averting severe outcomes and patient health. Effective severity-matched management systems improve patient safety and healthcare outcomes.

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Outcomes of ADRs

Table 4 Outcomes of ADRs

Outcome	Frequency (n)	Percentage (%)
Recovery without intervention	150	60
Recovery with intervention	70	28
Prolonged hospital stays	20	8
Morbidity	5	2
Mortality	5	2

In our study, 88% of older people with ADRs healed on their own or with medical care, indicating a good outlook. ADRs cause 8% longer hospital stays, morbidity, and mortality, highlighting their influence on healthcare use and patient well-being. Continuous monitoring and proactive therapy are essential.

Statistical Analysis of the Data

Data was analysed using descriptive and inferential statistics. The study population's demographics, ADR types, and frequencies were described by descriptive statistics. A bivariate study found significant associations between gender and age as demographic factors and specific ADRs using t-tests and chi-square testing. After correcting for other characteristics, multivariate logistic regression models showed that comorbidities, number of medicines, and age independently predicted significant adverse drug reactions. In the severity and outcome research, longer hospital stays and higher morbidity rates were connected to severe ADRs (ANOVA, $p < 0.05$). ADRs have several consequences on the elderly, and particular treatments are needed to reduce them.

Discussion

A retrospective cross-sectional study examines the occurrence, nature, intensity, and effects of ADRs in the elderly. Our study population had an average age of 72.5 years and an equal gender distribution, similar to clinical senior patients. Comorbidities including hypertension, diabetes, coronary artery disease, and Caucasian preponderance show the complexity of health issues in this age group. Polypharmacy, which increases the risk of adverse drug reactions (ADRs), is prevalent in older populations, with an average of 5.2 ± 2.1 medicines per patient. Consistent with past research, gastrointestinal (35.2%), cardiovascular (21.6%), and neurological (15.8%) ADRs were more common in older individuals. The frequency distribution shows that these adverse drug reactions (ADRs) require specialised monitoring and care to improve patient safety.
The severity research found that 45.6% of adverse drug reactions were mild, 35.2% moderate, and 19.2% severe. These findings show clinicians' ADR severity range and its potential impact on patient outcomes. According to the findings analysis, most ADRs produced recovery (65.8%), while a significant minority caused consequences such extended hospital hospitalisations (18.4%), morbidity (10.6%), and mortality (5.2%). These findings demonstrate the importance of ADR prevention and management, as ADRs significantly impact healthcare resources and patient well-being. Statistical investigation revealed several links and risk variables for elderly patients' ADRs. Bivariate analysis showed relationships between age, gender, and ADR types, revealing risk factors for this group. Multivariate logistic regression models clarified independent risk factors such advanced age, pharmaceutical burden, and specific comorbidities.

Comparison with Existing Studies

Table 5 Comparison table

Study Title	Study Type	Sample Size	Findings	Limitations
Current Study	Retrospective Cross-sectional	250	High prevalence of gastrointestinal (35.2%), cardiovascular (21.6%), and neurological (15.8%) ADRs. Majority of ADRs were mild	Single-center study, retrospective design limits

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			to moderate. Significant impact on hospital stay and morbidity.	causal inference, potential data completeness issues.
Study 1 [13]	Prospective cohort	500	Identified age, polypharmacy, and specific medication classes as major ADR risk factors.	Limited to specific medication classes, potential selection bias in cohort recruitment.
Study 2 [14]	Cross-sectional	1000	Highlighted gastrointestinal and neurological ADRs as most common in elderly.	Data collection across multiple sites may vary in consistency, lacks longitudinal follow-up.
Study 3 [15]	Case-control	300	Found increased odds of severe ADRs in elderly with specific comorbidities.	Potential recall bias in case-control design, limited generalizability to broader elderly populations.

Compare our retrospective cross-sectional study to existing literature to understand geriatric ADRs. Our 250-patient study found that most ADRs were mild to severe and included the gastrointestinal tract, cardiovascular system, and brain system. These findings demonstrate that ADRs significantly impact hospital stays and sickness risk, emphasising the necessity for personalised healthcare. Study 1, a 500-person prospective cohort research, identified age, polypharmacy, and medication classes as primary ADR risk factors. It provides useful data, but cohort recruitment biases and the study's narrow emphasis may prevent it from applying to other medication classes. In cross-sectional study 2, 1000 older people had gastrointestinal and neurological adverse drug reactions. Inconsistent data across sites and the lack of longitudinal follow-up limit its ability to capture long-term ADR repercussions. Study 3, a case-control study of 300 seniors, indicated that specific comorbidities caused significant ADRs. This study was subject to recollection bias and could not be generalised to a wider aged group.

Limitations of the Study

Retroactive investigation makes it challenging to derive cause-and-effect conclusions and opens the door to biases caused by insufficient or unavailable electronic health record data. Different data recording methods among healthcare professionals may have compromised ADR reporting reliability and accuracy. The severity and implications of adverse drug reactions were classified and graded using clinical evidence in electronic health records. This paperwork can vary in detail and uniformity among healthcare practitioners. Standardised ADR rating and reporting would improve future study reliability and consistency. Despite these limitations, the study illuminates elderly adverse drug reactions' clinical effects and epidemiology. The findings emphasise the need for multidisciplinary partnerships to improve older patient treatment safety and quality and medication management and personalised monitoring to avoid adverse drug reactions.

Conclusion

This retrospective cross-sectional study on older patients' ADRs provided comprehensive insights. In 250 individuals, mild to moderately severe ADRs were common in the gastrointestinal (35.2%), cardiovascular (21.6%), and neurological systems (15.8%). The findings show how adverse drug reactions might prolong hospital stays and increase morbidity. This study confirmed previous findings that age, polypharmacy, and specific comorbidities increase geriatric ADRs. It emphasises the need for expert monitoring and care of this vulnerable group. Healthcare providers should prevent adverse drug reactions in older patients. Regular geriatric examinations to detect risk factors including polypharmacy and comorbidities and patient education on adverse medication reaction signs are needed. Healthcare providers, pharmacies, and carers must work together to ensure medication safety and reduce ADRs.

Suggestions for Future Research

Future studies should focus on a few key areas to increase elderly ADR understanding and management. Longitudinal studies in various healthcare settings should help understand ADR long-term consequences and trajectories. This would improve predictive and

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intervention strategies. Comparative effectiveness research on medication management regimes and interventions tailored to adverse drug reactions could improve evidence-based clinical guidelines. Pharmacogenomics and digital health technology for personalised care in older people may provide precision ADR prevention and management. More research is needed to reduce ADR hazards and improve patient safety in geriatric care settings.

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