International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

A Hospital-Based Observational Study on Polypharmacy and Potential Drug-Drug Interactions Among Elderly Patients

Suresh Babu Sayana[1], Aalasyam Naveen[2], Sriharsha Rayam[3]

[1]Associate Professor, Department of Pharmacology, Government Medical College and General Hospital, Bhadradri Kothagudem, Telangana, India
[2]Associate Professor, Department of Pharmacology, Mamata Medical College, Khammam, Telangana, India
[3]Professor, Department of Pharmacology, Mamata Medical College, Khammam, Telangana, India

OPEN ACCESS

Corresponding Author:

Dr Aalasyam Naveen
Associate Professor Department of Pharmacology Mamata Medical College, Khammam Telangana, India
Email: naveenalasyam@gmail.com

Received: 24-02-2026
Accepted: 20-03-2026
Available online: 08-04-2026

ABSTRACT

Background: Polypharmacy is increasingly encountered in older adults because advancing age is frequently accompanied by multimorbidity, repeated healthcare contact, and long-term use of several medicines. This pattern increases the likelihood of potential drug-drug interactions and clinically important medication-related harm.

Objectives: To assess the prevalence of polypharmacy and potential drug-drug interactions among elderly patients attending a tertiary care teaching hospital and to examine their association with medication burden and comorbidity profile.

Methods: This hospital-based observational study was conducted at Mamata Medical College, Khammam, Telangana, from February 2025 to January 2026. One hundred patients aged 60 years and above were evaluated. Demographic data, comorbidities, prescribed medicines, and potential drug-drug interactions were recorded and analyzed using descriptive statistics and chi-square testing.

Results: The mean age was 68.9 ± 6.8 years, and 56% were male. Hypertension was the most common comorbidity (68%), followed by diabetes mellitus (52%). The mean number of drugs prescribed per patient was 7.4 ± 2.3. Polypharmacy was present in 78% of patients, and 24% had 10 or more prescribed drugs. Potential drug-drug interactions were identified in 64% of patients, with 148 interactions detected overall. Moderate interactions constituted the largest proportion (54.7%), followed by mild (27.7%) and major interactions (17.6%). The occurrence of potential drug-drug interactions increased significantly with the number of prescribed drugs ($p < 0.001$) and with the presence of three or more comorbidities ($p = 0.001$).

Conclusion: Polypharmacy and potential drug-drug interactions were highly prevalent in the studied elderly population. Higher medication burden and greater comorbidity load were strongly associated with interaction risk. Regular prescription review, medication reconciliation, and focused geriatric pharmacotherapy surveillance are essential to improve medication safety in tertiary care settings.

Keywords*: elderly; polypharmacy; potential drug-drug interactions; multimorbidity; geriatric pharmacotherapy; tertiary care hospital.*

INTRODUCTION

Population ageing has transformed the medication profile of routine hospital practice. Older adults commonly live with multiple chronic illnesses that require long-term pharmacotherapy, repeated follow-up, and care from more than one specialty. As a result, the simultaneous use of several medicines has become a defining feature of geriatric care [1-5]. Polypharmacy itself is not always inappropriate, because many elderly patients legitimately require combination therapy for conditions such as hypertension, diabetes mellitus, ischemic heart disease, chronic kidney disease, and chronic

respiratory disorders. However, the expanding number of prescribed drugs increases treatment complexity and raises the probability of adverse drug events, non-adherence, inappropriate prescribing, functional decline, and hospital utilization [1-6].

The clinical relevance of polypharmacy in older adults is amplified by age-related physiological changes. Altered renal clearance, hepatic metabolism, body composition, and pharmacodynamic responsiveness can modify the expected effect of medicines and magnify toxicity. Drug-drug interactions therefore become an important safety concern in elderly patients, particularly when cardiovascular drugs, antidiabetic agents, analgesics, proton pump inhibitors, antiplatelet agents, and anticoagulants are used together. These interactions do not all result in overt harm, but they mark a vulnerable therapeutic environment in which bleeding, electrolyte imbalance, hypoglycemia, hypotension, renal dysfunction, and treatment failure become more likely [2-6].

Several authors have used five or more concurrent medicines as an operational threshold for polypharmacy, and this cut-off has been linked to adverse clinical outcomes in older populations [7]. Beyond prevalence alone, recent literature has also emphasized the need to distinguish necessary multidrug therapy from problematic or inappropriate polypharmacy and to support structured medication review and deprescribing where appropriate [5,8]. Thus, evaluating the medication burden of older patients is not merely a descriptive exercise; it is a practical step toward safer prescribing and better quality of care.

Indian and international hospital-based studies have consistently shown that elderly patients experience a substantial burden of polypharmacy and potential drug-drug interactions, with risk increasing as the number of medicines and comorbid conditions rises [9-14]. Even so, the magnitude and pattern of this problem remain context-specific because prescribing habits, disease profile, and the local use of gastroprotective, cardiovascular, antimicrobial, and antidiabetic agents vary across institutions. Local data therefore remain essential for identifying high-risk medication combinations and for guiding hospital-level prescription review strategies.

Against this background, the present study was undertaken at Mamata Medical College, Khammam, Telangana, to assess the burden of polypharmacy and potential drug-drug interactions among elderly patients in a tertiary care setting. The objectives of the study were to describe the demographic and clinical profile of the study population, determine the prevalence of polypharmacy, identify the frequency and severity of potential drug-drug interactions, and evaluate their association with medication burden, comorbidity load, and sex.

METHODOLOGY

Study design and setting. This was a hospital-based observational study conducted at Mamata Medical College, Khammam, Telangana, over a one-year period from February 2025 to January 2026. The study was designed to evaluate prescription burden and the pattern of potential drug-drug interactions among elderly patients receiving care in a tertiary care teaching hospital. Because the study focused on routine clinical practice, no intervention was introduced and all observations were made under usual prescribing conditions.

Study population. Patients aged 60 years and above who attended the hospital during the study period and had complete prescription details available for review were considered eligible. Elderly patients with at least one documented diagnosis and one or more prescribed medicines at the time of evaluation were included. Prescriptions with incomplete medication details, duplicate records, and cases in which drug history could not be reliably verified from the case sheet or accompanying treatment records were excluded from analysis.

Sample size and sampling. A total of 100 elderly patients were included in the final dataset. Participants were enrolled by a consecutive sampling approach until the required sample size was reached. This method allowed inclusion of routinely encountered geriatric cases across the study period and provided a practical cross-section of prescribing patterns observed in the institution.

Data collection. Data were collected using a structured proforma. Information recorded for each participant included age, sex, diagnosed comorbidities, number of comorbid conditions, total number of prescribed medicines, therapeutic classes used, and combinations with potential to cause drug-drug interactions. Medication profiles were reviewed from prescription records and treatment charts. Drugs were grouped into broad therapeutic categories such as antihypertensives, antidiabetic drugs, antiplatelet agents, proton pump inhibitors, statins, analgesics/non-steroidal anti-inflammatory drugs, antibiotics, and anticoagulants. Potential drug-drug interactions were identified using a standard drug interaction checking approach and categorized by severity as mild, moderate, or major according to the clinical significance assigned in the interaction source used for review.

Operational definitions. Polypharmacy was operationally defined as the concurrent use of five or more medications, while excessive polypharmacy was defined as the use of 10 or more medications [7]. Potential drug-drug interaction referred to

a theoretically or previously documented interaction between concurrently prescribed medicines, regardless of whether a clinically manifest adverse event was documented during the observation period. Comorbidity burden was grouped as fewer than three comorbidities and three or more comorbidities for analytical comparison.

Statistical analysis. The collected data were entered into a spreadsheet and analyzed using standard statistical software. Continuous variables were summarized as mean ± standard deviation, and categorical variables were expressed as frequency and percentage. Associations between occurrence of potential drug-drug interactions and selected variables such as number of prescribed drugs, comorbidity burden, and sex were examined using the chi-square test or Fisher's exact test wherever appropriate. A p value of less than 0.05 was considered statistically significant.

Ethical considerations. This manuscript draft is based on the study dataset supplied for article preparation. The institutional ethics committee approval number, date of approval, and participant consent statement should be inserted from study records before journal submission. Patient identifiers were not included in the dataset used for writing.

RESULTS

A total of 100 elderly patients were included in the study. The mean age of the participants was 68.9 ± 6.8 years, and most belonged to the 60-69 years age group. Male patients constituted 56% of the study population. More than half of the participants had three or more comorbid conditions. The demographic and basic clinical characteristics of the study population are summarized in Table 1.

Table 1. Demographic and clinical characteristics of the study population [N = 100]

Variable	Category	n [%]
Age group [years]	60-69	52 [52%]
	70-79	34 [34%]
	>=80	14 [14%]
Sex	Male	56 [56%]
	Female	44 [44%]
Number of comorbidities	<3	42 [42%]
	>=3	58 [58%]
Mean age [years]		68.9 ± 6.8

Hypertension was the most common comorbidity, affecting 68% of patients, followed by diabetes mellitus in 52%, osteoarthritis in 34%, and ischemic heart disease in 28%. Chronic kidney disease and chronic obstructive pulmonary disease were present in 18% and 16% of patients, respectively. Because several patients had more than one illness, the cumulative comorbidity percentages exceeded 100%. The distribution of comorbidities is shown in Table 2.

Table 2. Distribution of comorbidities among study participants [N = 100]

Comorbidity	n [%]
Hypertension	68 [68%]
Diabetes mellitus	52 [52%]
Osteoarthritis	34 [34%]
Ischemic heart disease	28 [28%]
Chronic kidney disease	18 [18%]
Chronic obstructive pulmonary disease	16 [16%]

Note: Multiple comorbidities were present in the same patient; therefore, percentages exceed 100%.

The mean number of drugs prescribed per patient was 7.4 ± 2.3, with a total of 742 medications prescribed to 100 patients. Polypharmacy, defined as five or more concurrent drugs, was observed in 78% of the study population, while 24% had excessive polypharmacy with 10 or more medications. Antihypertensive agents were the most frequently prescribed class, followed by antidiabetic drugs, antiplatelet agents, proton pump inhibitors, and statins. The detailed pattern of drug utilization is presented in Table 3.

Table 3. Pattern of drug utilization and polypharmacy [N = 100]

Variable	Category	n [%] / Mean ± SD
Number of drugs prescribed	<5 drugs	22 [22%]
	5-9 drugs	54 [54%]
	>=10 drugs	24 [24%]
Polypharmacy status	Present [>=5 drugs]	78 [78%]
	Absent [<5 drugs]	22 [22%]
Mean number of drugs per prescription		7.4 ± 2.3
Total number of medications prescribed		742
Commonly prescribed drug classes	Antihypertensives	72 [72%]
	Antidiabetic drugs	49 [49%]
	Antiplatelets	42 [42%]
	Proton pump inhibitors	40 [40%]
	Statins	38 [38%]
	Analgesics/NSAIDs	24 [24%]
	Antibiotics	21 [21%]
	Anticoagulants	14 [14%]

Note: More than one drug class could be prescribed to the same patient.

Potential drug-drug interactions were identified in 64% of patients. A total of 148 potential interactions were detected, and moderate interactions formed the largest category, followed by mild and major interactions. The mean number of potential interactions among affected patients was 2.3 ± 1.1. Aspirin plus clopidogrel was the most common interaction pair, followed by insulin plus beta-blockers and combinations involving ACE inhibitors or angiotensin receptor blockers with potassium-sparing diuretics. The profile of potential drug-drug interactions is shown in Table 4 and the most frequent interaction pairs are listed in Table 5.

Table 4. Potential drug-drug interactions and associated factors [N = 100]

Variable	Category	n [%] / n/N [%]	p value
Patients with at least one pDDI	Yes	64 [64%]	
	No	36 [36%]	
Total number of pDDIs detected		148	
Severity of pDDIs	Mild	41 [27.7%]	
	Moderate	81 [54.7%]	
	Major	26 [17.6%]	
Mean pDDIs per affected patient		2.3 ± 1.1	
Number of drugs prescribed	<5	4/22 [18.2%]	<0.001
	5-9	37/54 [69.2%]	
	>=10	22/24 [91.7%]	
Number of comorbidities	<3	18/42 [42.9%]	0.001
	>=3	46/58 [79.3%]	
Sex	Male	38/56 [67.9%]	0.41

	Female	26/44 [59.1%]	

Table 5. Most frequent potential drug-drug interactions

Drug combination	Number of cases
Aspirin + clopidogrel	12
Insulin + beta-blockers	9
ACE inhibitors/ARBs + potassium-sparing diuretics	8
NSAIDs + antihypertensive drugs	8
Aspirin + anticoagulants	7
Antidiabetic agents with interacting supportive medications	6

The frequency of potential drug-drug interactions rose sharply with increasing medication burden. Only 18.2% of patients receiving fewer than five drugs had at least one potential interaction, compared with 69.2% of those receiving 5-9 drugs and 91.7% of those receiving 10 or more drugs. A significant association was also observed between the presence of three or more comorbidities and interaction burden. Sex was not significantly associated with occurrence of potential drug-drug interactions. These associations are also detailed in Table 4.

DISCUSSION

The present study demonstrates a high burden of polypharmacy and potential drug-drug interactions among elderly patients in a tertiary care setting. Nearly four out of five participants were exposed to polypharmacy, and almost two-thirds had at least one potential interaction. These findings reinforce the central concern of geriatric pharmacotherapy, namely that medication burden rises rapidly when multimorbidity becomes the dominant clinical reality of older age [1-6]. The mean prescription load of 7.4 drugs per patient in our series reflects substantial therapeutic complexity and supports the need for routine medication review in older adults.

Hypertension and diabetes mellitus were the most frequent comorbidities in the present study. This pattern is clinically important because such patients often require multidrug treatment with antihypertensives, antiplatelet agents, statins, antidiabetic drugs, gastroprotective agents, and adjunctive symptomatic medications. Consequently, the probability of interaction-prone combinations increases even when each individual prescription is clinically justified. Contemporary reviews have emphasized that polypharmacy in older adults is driven not only by inappropriate prescribing but also by the cumulative effect of multimorbidity and layered guideline-based treatment [4,5,8].

The prevalence of polypharmacy observed in our study is consistent with earlier Indian hospital-based work. Harugeri et al. documented high-level polypharmacy among elderly patients in Indian teaching hospitals [9]. Salwe et al. similarly reported a substantial burden of polypharmacy and found that most potential drug-drug interactions were of moderate severity [10]. Shetty et al. also demonstrated that increasing age and polypharmacy were important predictors of potential interactions in geriatric prescriptions from a tertiary care center [11]. Our findings extend these observations by showing a clear rise in interaction burden with increasing drug count and comorbidity load.

The predominance of moderate interactions in the present analysis is also in line with international evidence. Dagnew et al. observed a high prevalence of drug-drug interactions among hospitalized elderly patients in Ethiopia and identified polypharmacy as a strong associated factor [12]. Santos et al., in a population-based study, showed that potential interactions are common even outside acute inpatient settings [13]. Nobili et al. reported that severe interactions increased with age and with the number of prescribed drugs, a pattern that mirrors the steep gradient seen in our data across the <5, 5-9, and >=10 drug categories [14]. These parallels indicate that medication count remains one of the most reliable practical markers of interaction risk.

The most common interaction pairs in our cohort were clinically plausible and therapeutically important. Aspirin plus clopidogrel and aspirin plus anticoagulants reflect the bleeding risk of combined antithrombotic therapy, whereas insulin plus beta-blockers can obscure adrenergic warning symptoms of hypoglycemia. Likewise, combinations of renin-angiotensin system blockers with potassium-sparing diuretics warrant careful biochemical monitoring because of hyperkalemia risk. From a practice perspective, these findings support regular prescription audit, medication reconciliation, and structured prescription optimization in elderly patients, especially those receiving five or more drugs. The contemporary geriatric literature also supports repeated medication review and deprescribing when the risk-benefit balance becomes unfavorable.

Limitations

The study was conducted at a single tertiary care teaching hospital with a sample of 100 patients, which limits generalizability. The observational design identifies associations but does not establish causation. Potential drug-drug interactions were determined from prescription review rather than confirmed adverse clinical events. Over-the-counter medicines, herbal preparations, medication adherence, and post-discharge outcomes were not captured in the present analysis.

CONCLUSION

This hospital-based observational study shows that polypharmacy and potential drug-drug interactions are highly prevalent among elderly patients attending a tertiary care teaching hospital. A large proportion of patients received five or more medications, and interaction risk increased markedly with both rising medication count and greater comorbidity burden. Moderate interactions constituted the largest share, while several frequently encountered combinations carried clear clinical implications such as bleeding, hypoglycemia masking, and hyperkalemia. These findings support routine prescription review, medication reconciliation, and targeted monitoring of high-risk drug combinations in geriatric practice. Strengthening institutional medication safety processes can improve the quality and safety of care provided to older adults.

REFERENCES

1. Hajjar ER, Cafiero AC, Hanlon JT. Polypharmacy in elderly patients. Am J Geriatr Pharmacother. 2007;5(4):345-351. doi:10.1016/j.amjopharm.2007.12.002.
2. Maher RL Jr, Hanlon J, Hajjar ER. Clinical consequences of polypharmacy in elderly. Expert Opin Drug Saf. 2014;13(1):57-65. doi:10.1517/14740338.2013.827660.
3. Wastesson JW, Morin L, Tan ECK, Johnell K. An update on the clinical consequences of polypharmacy in older adults: a narrative review. Expert Opin Drug Saf. 2018;17(12):1185-1196. doi:10.1080/14740338.2018.1546841.
4. Dovjak P. Polypharmacy in elderly people. Wien Med Wochenschr. 2022;172(5-6):109-113. doi:10.1007/s10354-021-00903-0.
5. Pazan F, Wehling M. Polypharmacy in older adults: a narrative review of definitions, epidemiology and consequences. Eur Geriatr Med. 2021;12(3):443-452. doi:10.1007/s41999-021-00479-3.
6. Davies LE, Spiers G, Kingston A, Todd A, Adamson J, Hanratty B. Adverse outcomes of polypharmacy in older people: systematic review of reviews. J Am Med Dir Assoc. 2020;21(2):181-187. doi:10.1016/j.jamda.2019.10.022.
7. Gnjidic D, Hilmer SN, Blyth FM, et al. Polypharmacy cutoff and outcomes: five or more medicines were used to identify community-dwelling older men at risk of different adverse outcomes. J Clin Epidemiol. 2012;65(9):989-995. doi:10.1016/j.jclinepi.2012.02.018.
8. Scott IA, Hilmer SN, Reeve E, et al. Reducing inappropriate polypharmacy: the process of deprescribing. JAMA Intern Med. 2015;175(5):827-834. doi:10.1001/jamainternmed.2015.0324.
9. Harugeri A, Joseph J, Parthasarathi G, Ramesh M, Guido S. Prescribing patterns and predictors of high-level polypharmacy in the elderly population: a prospective surveillance study from two teaching hospitals in India. Am J Geriatr Pharmacother. 2010;8(3):271-280. doi:10.1016/j.amjopharm.2010.06.004.
10. Salwe KJ, Kalyansundaram D, Bahurupi Y. A study on polypharmacy and potential drug-drug interactions among elderly patients admitted in Department of Medicine of a tertiary care hospital in Puducherry. J Clin Diagn Res. 2016;10(2):FC06-FC10. doi:10.7860/JCDR/2016/16284.7273.
11. Shetty V, Chowta MN, Chowta KN, Shenoy A, Kamath A, Kamath P. Evaluation of potential drug-drug interactions with medications prescribed to geriatric patients in a tertiary care hospital. J Aging Res. 2018;2018:5728957. doi:10.1155/2018/5728957.
12. Dagnew SB, Tadesse TY, Zeleke MM, Yiblet TG, Addis GT, Mekonnen GB, et al. Drug-drug interactions among hospitalized elderly in patients at medical wards of Northwest Ethiopia's Comprehensive Specialized Hospitals: a multicenter observational study. SAGE Open Med. 2022;10:20503121221135874. doi:10.1177/20503121221135874.
13. Santos TRA, Silveira EA, Pereira LV, Provin MP, Lima DM, Amaral RG. Potential drug-drug interactions in older adults: a population-based study. Geriatr Gerontol Int. 2017;17(12):2336-2346. doi:10.1111/ggi.13070.
14. Nobili A, Pasina L, Tettamanti M, et al. Potentially severe drug interactions in elderly outpatients: results of an observational study of an administrative prescription database. J Clin Pharm Ther. 2009;34(4):377-386. doi:10.1111/j.1365-2710.2009.01021.x.