www.ijarp.com ISSN 2456-9992 Page: 01-07

International Journal Advanced Research Publications

Research Article

Volume: 02
Issue: 07

ANALYSIS OF POTENTIAL DRUG–DRUG INTERACTIONS AMONG HOSPITALIZED PATIENTS IN A TERTIARY CARE TEACHING HOSPITAL

Dr. Deepa N.*, Dr. Geetha P., R. Porselvi, M. D. Prasanth Sah, S. Praveen, S. Pushpalatha

Faculty of Pharmacy, Sree Balaji Medical College and Hospital Campus, BIHER, Chromepet, Chennai, Tamil Nadu, India.

Article Received: 01 June 2026, Article Revised: 20 June 2026, Published on: 09 July 2026

***Corresponding Author: Dr. Deepa N.**
Faculty of Pharmacy, Sree Balaji Medical College and Hospital Campus, BIHER, Chromepet, Chennai, Tamil Nadu, India.

Doi: https://doi-doi.org/101555/ijrpa.4041

ABSTRACT

Background

Potential drug–drug interactions (DDIs) are a major concern among hospitalized patients and may contribute to increased morbidity, mortality, prolonged hospital stay, and healthcare costs. Early identification of potential DDIs is essential to improve patient safety and optimize therapeutic outcomes. This study aimed to assess the prevalence and severity of potential DDIs among hospitalized patients.

Methods

A prospective observational study was conducted over a period of six months at a tertiary care teaching hospital in Chennai, Tamil Nadu. A total of 100 inpatient prescriptions from various departments were evaluated for potential DDIs using the Micromedex Drug Interaction Database. Identified interactions were classified according to their severity as major, moderate, or minor.

Results

Among the 100 prescriptions analyzed, 67 potential DDIs were identified. Of these, 40 (57.7%) were classified as major, 22 (32.8%) as moderate, and 5 (7.5%) as minor interactions. The average number of drugs prescribed per prescription was 6.2, indicating a high prevalence of polypharmacy. Fluoroquinolone-based antibiotics and antidiabetic agents were the drug classes most frequently involved in clinically significant interactions.

Conclusion

Potential DDIs were common among hospitalized patients and were strongly associated with polypharmacy. Routine prescription review using drug interaction screening tools and active involvement of clinical pharmacists can help identify, prevent, and manage potential DDIs, thereby improving medication safety and patient care.

KEYWORDS: Drug-drug interactions, prescription, severity, patient safety.

INTRODUCTION

A drug-drug interaction (DDI) occurs when the effect of a drug is altered by the concurrent administration of another drug or substance.[1] DDIs are a significant cause of adverse drug events and may contribute to increased morbidity, mortality, prolonged hospitalization, and healthcare costs.[2] The risk of DDIs is particularly high among hospitalized patients due to polypharmacy and the presence of multiple comorbidities.[3] A study conducted in India by Mahakalkar et al., reported a prevalence of potential drug-drug interactions of 14.39%.[4]

Drug interactions are broadly classified into pharmacokinetic and pharmacodynamic interactions. Pharmacokinetic interactions influence the absorption, distribution, metabolism, or excretion of drugs, whereas pharmacodynamic interactions occur when two or more drugs produce additive, synergistic, or antagonistic effects at the same physiological target.[5,6] Common mechanisms include cytochrome P450 enzyme inhibition or induction, alterations in protein binding, and receptor-mediated interactions. [5,7]

Older adults and patients with chronic diseases are especially vulnerable to DDIs because of age-related physiological changes and the frequent use of multiple medications. [8] Early identification of potential DDIs through prescription review and drug interaction screening tools can help prevent adverse clinical outcomes and optimize pharmacotherapy. [9,10] Therefore, assessing the prevalence and severity of potential DDIs is essential to improve patient safety and promote rational drug use in hospital settings.

MATERIALS AND METHODS

A prospective observational study was conducted over a period of six months during the year 2025 at a tertiary care teaching hospital located in Chromepet, Chennai, Tamil Nadu, India. A total of 100 inpatient prescriptions from various hospital departments were included in the study.

Patients with valid inpatient prescriptions and diagnosed with medical conditions such as diabetes mellitus, hypertension, osteoporosis, respiratory disorders, and other diseases were

included. Patients with illegible prescriptions, incomplete medical records, pregnant women, and those without valid prescriptions were excluded from the study.

Patient demographic details, diagnosis, medication history, prescribed drugs, and relevant clinical information were recorded using a structured data collection form. Potential drug–drug interactions (DDIs) were identified using the Micromedex Drug Interaction Database and classified according to their severity as major, moderate, or minor.

STATISTICAL ANALYSIS

The collected data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Descriptive statistics were used to summarize demographic characteristics, the number of drugs prescribed, and the frequency and severity of potential DDIs. Data were expressed as frequencies, percentages, mean, and standard deviation. The association between the number of prescribed drugs and the occurrence of potential DDIs was assessed using the chi-square test, while Spearman's rank correlation analysis was performed to evaluate the relationship between the number of prescribed drugs and the occurrence of major DDIs. A *p*-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Table 1. Distribution of drugs per prescription.

No of drugs per prescription	No of prescriptions	Percentage (%)
1-2	18	18
3-4	29	29
5-6	28	28
7-9	16	16
>10	9	9

A total of 100 inpatient prescriptions were analyzed, comprising 54 males and 46 females. The average number of drugs prescribed per prescription was 6.2, indicating a high prevalence of polypharmacy among hospitalized patients. As shown in Table 1, the majority of prescriptions contained 3-4 drugs (29%) and 5-6 drugs (28%), while 9% of prescriptions contained more than 10 drugs. An increased number of prescribed medications is a recognized risk factor for the development of potential drug-drug interactions (DDIs). This finding indicates that polypharmacy was common among the study population and may have contributed to the occurrence of potential DDIs.

Table 2. Severity of Drug-drug Interaction.

Severity	No of interactions (n)	Percentage (%)
Major	40	30.77
Moderate	22	16.9
Minor	5	3.84
No interactions	63	48.46

The severity of identified DDIs is presented in Table 2. Major interactions accounted for the largest proportion (30.77%), followed by moderate (16.90%) and minor (3.84%) interactions. The predominance of major interactions highlights the importance of routine prescription review and medication monitoring, consistent with previous studies.[3,12,13]

Table 3. Interaction load per prescription.

No of interactions per prescription	No of prescriptions(n)
0	58
1-2	18
3-4	12
≥5	12

The interaction burden per prescription is shown in Table 3. Most prescriptions (58%) did not contain any potential DDIs, whereas 18% contained one to two interactions, 12% contained three to four interactions, and another 12% contained more than five interactions. The occurrence of multiple interactions within individual prescriptions may be attributed to polypharmacy. However, appropriate polypharmacy aimed at achieving therapeutic goals should be distinguished from inappropriate polypharmacy, as optimized pharmacotherapy may reduce adverse clinical outcomes.[11]

Table 4. Frequencies of common drug-drug interaction and severity.

Drug Combination	Severity	No. of Interactions Identified	Potential Clinical Outcome
Aspirin + Clopidogrel	Major	**1**	Increased risk of gastrointestinal and intracranial bleeding
Warfarin + Aspirin	Major	**1**	Severe bleeding, elevated INR
Ciprofloxacin + Metronidazole	Major	**6**	QT interval prolongation, cardiac arrhythmias
Ciprofloxacin + Prednisolone	Major	**5**	Increased risk of tendon rupture
Fluoroquinolones + Metformin	Major	**6**	Hypoglycemia or

			hyperglycemia
Metronidazole + Ondansetron	Major	**4**	QT prolongation, risk of torsades de pointes
Albuterol (Salbutamol) + Beta-blockers (Bisoprolol/Carvedilol)	Major	**4**	Reduced bronchodilator effect, bronchospasm
Atorvastatin + Fenofibrate	Major	**2**	Myopathy, rhabdomyolysis
Atorvastatin + Clopidogrel	Moderate	**4**	Reduced antiplatelet efficacy
Amlodipine + Metformin	Moderate	**6**	Poor glycemic control, hyperglycemia
Metformin + Corticosteroids (Prednisolone/Dexamethasone)	Moderate	**5**	Hyperglycemia, loss of glycemic control
Beta-blockers + Antidiabetic drugs	Moderate	**4**	Masked hypoglycemia, glycemic variability
Corticosteroids + Vaccines (Tetanus toxoid)	Moderate	**4**	Reduced vaccine response
Digoxin + Diuretics	Moderate	**2**	Digoxin toxicity, arrhythmias
Folic acid + Methotrexate	Minor	**1**	Reduced efficacy of methotrexate
Folic acid + Nitrofurantoin	Minor	**1**	Reduced folic acid levels

The major frequently identified drug combination and their clinical significance are presented in Table 4. Among the major interactions, ciprofloxacin with metronidazole and fluoroquinolones with metformin were the most frequently identified combinations. These interactions are associated with QT interval prolongation, tendon rupture, and dysglycemia, findings that are consistent with previous studies.[13,14]

Metronidazole combined with ondansetron and salbutamol combined with beta-blockers were also identified as clinically significant interactions because of the risk of QT prolongation, torsades de pointes, and reduced bronchodilator efficacy. Similar observations have been reported previously.[15-17]

Moderate interactions commonly involved metformin, corticosteroids, antihypertensive agents, and atorvastatin. These combinations may alter glycemic control, reduce therapeutic efficacy, or increase the risk of myopathy, consistent with previous reports.[18,19] Minor interactions were infrequent and primarily involved folic acid combinations with methotrexate and nitrofurantoin.

CONCLUSION

Potential drug–drug interactions were common among hospitalized patients and were strongly associated with polypharmacy. Major and moderate interactions were predominantly observed with antimicrobials, antidiabetic agents, and cardiovascular drugs. Routine prescription review using drug interaction screening tools, along with active involvement of clinical pharmacists, can help identify and prevent potential DDIs, thereby improving medication safety and therapeutic outcomes in hospitalized patients.

ACKNOWLEDGEMENT

The authors sincerely thank the management of Sree Balaji Medical College and Hospital for their support during the conduct of this study.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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