

Assessment of Potential Drug-Drug Interactions among the Inpatients of a Tertiary Care Center

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ABSTRACT

Introduction: Drug-drug interactions are the unwanted effects of the drug which occurs when the pharmacological action of one administered drug are modified by another drug. The aim of this study is to explore the potential drug-drug interactions of the prescribed drugs in the inpatients of a tertiary care centre.

Methods: A cross-sectional study using a point prevalence survey method was conducted among inpatients at Patan Academy of Health Sciences after obtaining ethical approval from IRC- PAHS. Data were collected from inpatient medical records from 10th June, 2025 to 28th June, 2025 across different wards. Free online checker (available at https://www.drugs.com/drug_interactions.html) were used to identify potential drug-drug interactions.

Results: Among the 265 medical records collected, 152 (57.35%) medical records were identified as drug interactions. Out of 265 medical records, 37 (13.96%) had mild drug interaction 93 (35.09%) had moderate drug interaction and 22 (8.30%) had major drug interaction. The most frequently encountered major drug interactions was between ondansetron and tramadol 6 (2.26%) followed by drug interaction between olanzapine and lorazepam 2 (0.75%). Another important drug interaction encountered was between ceftriaxone and calcium gluconate in 2 (0.75%) of inpatients records.

Conclusion: The current study shows that drug-drug interactions are commonly encountered in day to day practice. This study can be regarded as a baseline study which provides valuable information to the prescribers. Use of drug-drug interactions checker will help to play an important role to minimize drug interactions.



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INTRODUCTION

Drug-drug interactions (DDIs) are the unwanted side effects of the drug which occurs when the pharmacological action of one administered drug are modified by another drug.¹ DDIs can cause treatment failure and adverse drug reactions, which increases the risk of mortality.²⁻⁴

It has been estimated that every year in the USA, there are almost 74000 emergency room visits and 19500 hospitalizations due to DDIs.^{5,6} Study done in Croatia has reported that 38% of adverse drug reactions in the outpatient settings are due to DDIs.⁷ Research conducted in Jordan showed 96% of potential DDIs.⁸ Another study conducted in India reported a prevalence of 83.25%.¹ Similarly, a study conducted in a tertiary care centre of Kathmandu Valley showed 89.11% of potential DDIs.⁹

The aim of this study was to explore the potential DDIs of the prescribed drugs in the inpatient departments of a tertiary care center.

METHODS

A cross-sectional study was conducted among inpatients at Patan Academy of Health Sciences, Patan Hospital. Point prevalence survey method was used. The study was conducted from 10th June, 2025 to 28th June, 2025. Ethical approval was obtained from Patan Academy of Health Sciences (Reference number: bss2505132011).

All patients admitted to the hospital on the study day were included. Those who had already been discharged but were waiting for discharge procedures were excluded. Only prescriptions with more than one drug were included and the interactions related to food, alcohol, or smoking were not included. Total population sampling was used, and data were collected from medical records, so patient consent was not taken. The study team, including the principal investigator and co-investigators, collected data from different wards, such as Medicine ICU, Surgery ICU, Medical Ward, Geriatric Ward, Oncology Ward, Surgery Ward, Orthopedic Ward, Pediatric ICU,

Neonatal ICU and Nursery, Pediatric Ward, Gynecology Ward, Obstetric Ward (Maternity), Mixed Ward (Private), Psychiatric Ward, Dermatology, Ophthalmology, and ENT. Data collection started at 2 PM in each ward and was completed on the same day using a structured proforma.

Potential drug–drug interactions (DDIs) were identified using free online checkers (https://www.drugs.com/drug_interactions.html) and were classified as mild, moderate, or major.¹⁰ Mild refers to minimally clinically significant. Risk assessment should be done and alternative drugs may be considered.

Moderate refers to moderately clinically significant. Combinations of drugs should be avoided and they are used only under special circumstances. Major drug interactions are highly clinically significant and may lead to life threatening conditions. The total duration of study was two weeks. The collected data were entered in the drug interaction checker software. Data were analyzed using descriptive statistics.

RESULTS

Among the 265 participants, 101 (38.11%) were male and 164 (61.88%) were female. A total of 57 (21.5%) patients were between the age group of 31 to 40 years (Table 1).

Table 1. Demographic characteristics of participants (n=265).

Demographic characteristics	n(%)
Gender	
Male	101(38.11)
Female	164(61.88)
Age	
<10	28(10.56)
11 to 20	28(10.56)
21 to 30	37(13.96)
31 to 40	57(21.50)
41 to 50	32(12.07)
51 to 60	30(11.32)
61 to 70	29(10.94)
71 to 80	17(6.41)
81 to 90	6(2.26)
91 to 100	1(0.37)

The total data collected were 265 and they were classified as mild, moderate and major. Out of 152 medical records, 37 (13.96%) had mild drug interaction 93 (35.09%) had moderate drug interaction and 22 (8.30%) had major drug interaction (Table 2).

Among different drug–drug interactions major drug interactions between Ondansetron and Tramadol was identified in 6 (16.21%) medical records, Ceftriaxone and Calcium gluconate in 2 (5.40%) medical records and Olanzapine and Lorazepam was identified in 2 (5.40%) of medical records (Table 3).

Table 2. Drug-drug Interaction frequency and severity data (n=265).

Parameter	n(%)
Category of DDI	
Category I (Mild interactions)	37(13.96)
Category II(Moderate interactions)	93(35.09)
Category III (Major interactions)	22(8.30)
Number of prescriptions	
Prescribed drugs >5	135(50.94)
Prescribed drugs <5	130(49.05)

Table 3. List of Major drug reactions and severity based on free online drug interactions checker (n=265).

Drugs	n(%)	Category
Ondansetron and Tramadol	6(16.21)	Serotonin syndrome
Ceftriaxone and Calcium gluconate	2(5.40)	Crystals in bloodstream
Olanzapine + Lorazepam	2(5.40)	Hypotension, bradycardia, death
Midazolam + Tramadol	1(2.70)	CNS depression
Hydrocortisone + Moxifloxacin	1(2.70)	Tendon Rupture
Aspirin + Enoxaparin	1(2.70)	Spinal haematoma
Amikacin + Magnesium sulphate	1(2.70)	Muscle paralysis, Respiratory paralysis
Ondansetron + Linezolid	1(2.70)	Serotonin syndrome
Vitamin D + Calcium	1(2.70)	Hypercalcemia
Clonazepam + Olanzapine	1(2.70)	Hypotension, bradycardia, death
Clozapine + Haloperidol	1(2.70)	CVS-othostatic hypotension
Metoclopramide + Tramadol	1(2.70)	Increase risk of seizures
Tramadol + Escitalopram	1(2.70)	QT Prolongation
Tramadol + Clonazepam	1(2.70)	Sedation + Respiratory Depression
Azithromycin + Escitalopram	1(2.70)	QT Prolongation

Among different drugs Pantoprazole was prescribed to 79 (29.81%) participants, Paracetamol to 27 (10.18%), Amlodipine and Ranitidine to 19 (7.16%) participants each (Table 4).

Table 4. Drugs encountered with frequency more than one percent (n=265).

Drug name	n(%)
Pantoprazole	79(29.81)
Paracetamol	27(10.18)
Amlodipine	19(7.16)
Ranitidine	19(7.16)
Atorvastatin	15(4.90)
Azithromycin	11(4.15)
Piperacillin/Tazobactam	10(3.77)
Clonazepam	10(4.90)
Insulin	10(3.77)
Lorazepam	10(3.77)
Prednisolone	7(2.64)
Lasilactone	7(2.65)
Metformin	6(2.27)
Propranolol	4(1.50)
Levothyroxine	3(0.75)

DISCUSSION

Drug-drug interactions can be regarded as important causes of adverse drug interactions and medications errors. They also affect the quality of life of the patients and increase financial burden. In addition to this, presence of chronic diseases like liver cirrhosis and chronic kidney disease also contributes to drug interactions. Potential drug-drug interactions can also be prevented in some cases. However, patient may require multiple drugs to obtain therapeutic goal even with the risk of possible drug-drug interactions.

The current study was undertaken to find out the potential drug-drug interactions among the inpatients in a tertiary care centre. Our study was conducted from the medical records of 265 inpatients. Among the total 265 medical records collected in our study, 38.11% were male and 61.88% were female, 57(21.5%) were between the age group of 31 to 40 years. Out of 265 medical records collected, 152 medical records showed drug-drug interactions. This finding is similar to another study where 181 drug-drug interactions were identified. However in this study 66.9% were male in comparison to female.¹¹

In the present study, we divided drug-drug interaction into mild, moderate and major drug interactions. Out of 152 medical records that were identified as drug-drug interactions, 37(13.96%) had mild drug interaction 93(35.09%) had moderate drug interaction and 22(8.30%) had major drug interaction. In addition to this, the point prevalence of drug-drug interaction was found to be 57%. However, another study conducted in another centre of Nepal showed a prevalence rate of 78.3%.¹² This difference may be because the data for our study were collected from the different wards. The different wards were Medicine intensive care unit, Surgery intensive care unit, Medical ward, Geriatric ward and Oncology ward, Surgery ward, Orthopedic ward, Pediatric intensive care unit, neonatal intensive care unit and

Nursery, Pediatric ward, Gynecology ward, Obstetric ward (Maternity), Mixed ward (Private ward), Psychiatric ward, Dermatology, Ophthalmology and ENT(Ear, Nose and Throat). However, another study conducted in a tertiary care centre of Nepal had collected data only from Department of Internal Medicine.¹² In our study, we had used free online DDI checkers (available at https://www.drugs.com/drug_interactions.html) to identify potential DDI. Other study conducted in Nepal had used Lexicomp drug interaction software.¹² In another similar study conducted in India, the prevalence of drug interaction was found to be 80.34%.¹³ This study had also used free drug interaction checker software similar to the one we had used in our study. Furthermore, in another study conducted in Pakistan, the prevalence of drug interaction was mentioned to be 91.6%.¹⁴ In contrast to this, a study conducted in Canada among the hospitalized patients showed low prevalence of drug interactions which was mentioned to be 18.8%.¹⁵ Also the prevalence of potential drug-drug interaction was found to be 20.3% in another study done among the hospitalized patients of Iran.¹⁶ In addition to this, another study conducted in India mentioned the incidence of drug-drug interaction to be 21.14%. However, this study was conducted with the help of Micromedex software.¹⁷

The major drug interaction encountered in our study was 22(8.3%) which was done among the different wards in the tertiary care centre. However, major drug interaction encountered in another study conducted in the department of internal medicine in Nepal was 10.7%.¹² Another study conducted in Pakistan mentioned a prevalence of major drug interaction to be 86.3%.¹⁴ This difference in finding maybe due to different diseases pattern in different hospitals. In addition to this, difference in the experience of prescribers may also contribute to the different drug-drug interaction pattern. The most common major drug interaction encountered in our study was ondansetron and tramadol 6(16.21%) which carried the risk of serotonin syndrome in patients.¹⁰ In another study, conducted in ICU of Nepal showed that aspirin and angiotensin converting enzyme inhibitors were the most common drug interactions identified.¹⁸ In addition to this, in another study, ciprofloxacin-insulin and ofloxacin-insulin were the most common drug-drug interactions identified.¹⁷ Major drug interactions can have various outcomes on the patients which may include increase in the morbidity, mortality, prolongation of the hospital stay and increase in the treatment cost of the patient. They may also cause long term complications to the patients.

The most commonly encountered type of drug interaction in our study was of moderate type which was 35.09%. This finding is consistent with several other drug-drug interactions studies which had moderate type of drug interactions. In a study conducted in Nepal, showed that the moderate drug interactions were 76.5 %.¹² Another study conducted in Ethiopia showed moderate drug interaction of 61.2%.¹⁹ Although moderate drug interactions may not be as severe as major drug interaction, pharmacogenetic variations may have adverse outcomes on the patients.

A total of 37(13.96%) mild drug reactions was detected in our

study. This finding is consistent with another study done in India which showed 19.66% of mild drug interactions.¹³ Mild drug interactions are of limited clinical significance and are only of mild risk to the patients. They may not require any interference by the consulting doctors. However, mild drug interactions can have harmful consequences on elderly and children. Hence, close monitoring of the vital organs are required in such populations.

The most commonly prescribed drug in our study was pantoprazole followed by paracetamol. This finding is consistent with another study conducted in Asmara, Eritrea where the commonly prescribed drugs were omeprazole and amoxicillin.²⁰ However, atorvastatin and metformin were the most commonly prescribed drugs in a study conducted in Sri Lanka.²¹ This finding maybe due to difference in the pattern of disease in different countries.

The number of patients receiving total of less than 5 medications in our study were 130(49.05%) and numbers of patients receiving more than 5 medications were 135(50.94%). However, another study showed that number of patient receiving 1 to 4 medications were 30.9%, 5 to 8 were 47.4% and 9 to 12 were 21.7%.¹² When more than five drugs are prescribed, it increases the chances of potential drug-drug interactions. Increase in the number of drugs are associated with increase in the number of drug interactions has been mentioned in many studies.^{22,23}

The use of multiple drugs may be unavoidable in some cases. However, polypharmacy may place a patient at an increased hazard of developing potential drug-drug interactions. This may have harmful consequences on patients.²⁴

Drug interactions can have various impact on human health. Hence, there is a need to carefully monitor potential drug interactions. Hence, health care professional must take into consideration the risk of potential drug interactions while prescribing drugs to the patients. A team consisting of physician and clinical pharmacologists along with the use of drug-drug interaction checker software can be considered as an important step towards prevention of drug interactions. In addition to this patient should also be counseled regarding drug-drug interactions and to consult medical care when required.

Our study had various limitations. Our sample size was small (n=265). The study was conducted over a period of two weeks. It was a cross sectional study and point prevalence survey method was used. Clinical outcomes, patient comorbidities and actual

adverse drug reactions were not assessed. The study was done in only one centre and it did not reflect the prevalence of drug interaction in the whole Nepal. In addition to this, study was conducted only among the inpatients and it did not reflect the prevalence of drug interaction in the outpatient settings. It also did not reflect the drug interactions in special populations like paediatrics and geriatrics. Also, the presence of chronic disease were not considered in this study. In our study, we had used free online DDI checkers (available at https://www.drugs.com/drug_interactions.html) to identify potential DDI. This free tool maybe less sensitive. Only descriptive statistics were used for data analysis.

CONCLUSION

Drug-drug interaction can have various adverse outcomes on the patients including increase in morbidity, mortality and various other adverse consequences. Polypharmacy may also contribute to drug-drug interactions. Most of the drug-drug interactions identified in our study were of moderate severity. These moderate types of drug interactions also have the potential to damage the health of the patient. Drug-drug interaction checker software can play an important role to minimize the prevalence of drug interactions.

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