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Evaluation of Drug - Drug Interactions in Urban Area Community Pharmacies.

P Maheshwari*, R Sivabalakrishnan*, and N Pooja*.

Department of Pharmacy Practice, School of pharmaceutical Sciences, Vels University(VISTAS), Pallavaram, Chennai-600117, Tamil Nadu, India.

ABSTRACT

This study aim to evaluate the prevalence, types, and severity of Potential adverse drug-drug interaction in urban area community pharmacies. The study was a prospective observational prescription analysis conducted for a period of 6 months. The drug in the prescription was analyzed for potential DDI by drug interaction checker software. The DDIs were classified based on the mechanism of interactions, severity of interactions, relation to the number of drugs prescribed, and disease conditions were also determined. The identified DDIs were categorized according to their level of significance into three classes (Mild, Moderate and Severe).A total of 140 prescriptions were analyzed during the study period and it was found that 66 patients were confirmed with minimum of one DDI, maximum six DDI. A total of 113 drug interactions were found in prescriptions. Out of 113 interactions, 22 (33.33%) were severe, 68(103.03%) were moderate, 23(34.84%) were mild interaction.Potential drug interactions are frequent among prescribed multiple medications and the rate is directly related to the number of drugs prescribed. Safeguards need to be introduced to prevent patients from receiving medications that have the potential to cause adverse Drug interactions. Physicians should be aware of potentially harmful DDIs. Meanwhile Pharmacists can contribute to the detection and prevention of drug-related injuries. Appropriate education, collaborating drug selection and pharmaceutical care are strongly recommended for physicians and pharmacists.

Keywords: Drug – Drug interactions, Community pharmacy, Prescriptions.

Corresponding author

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INTRODUCTION

Many drug related problems are caused by drug interactions. Numerous studies have demonstrated that many patients receive multiple drug therapy with agents of recognized potential for interaction.[4]As the number of drugs in patient's therapeutic regimen increases, the greater is the risk of occurrence of drug interaction.

Goodman and Gilman's, on the pharmacological basis of therapeutics, in an attempt to define drug interaction states –

"Drug interaction is a situation in which the effects of one drug are altered by prior or concurrent administration of another drug." (i.e. Drug-Drug interaction.).[6]Drug interaction may arise either from alteration of the absorption, distribution, biotransformation or excretion of one drug by another or from combination of their action or effects.[7]

Drug interactions may become harmful to the patient by increasing efficacy or toxicity or by decreasing the therapeutic effect of a co administered drug. But sometimes drug interactions may prove beneficial when allows reduction in dose by enhanced efficacy without increased toxicity.[8]Drug interactions become clinically more important in patients with renal impairment, alcoholic, patients receiving chronic medication or having abnormal metabolic activity. Oral hypoglycemic agents, Anticoagulants, Cytotoxic drugs, Digoxin, MAO inhibitors show large number of drug interactions.[5]

Different factors are associated with the occurrence of potential DDIs. Community pharmacy is now common and carries a high risk of DDIs.[1]The prescribed medications and doses, intervals and length of drug use were recorded in a document designed for this purpose. Several factors have been identified that increase a patient's risk of DDIs. The highest risk for DDIs occurs in those patients with advanced age, those taking more than four medications, or those taking medications with a narrow therapeutic index, or requiring therapeutic drug monitoring. It is therefore not surprising that older patients, who often take many medications, are at the highest risk.[3]

Drug interactions can be pharmacodynamics or pharmacokinetic in nature. Pharmacodynamic interaction, involves receptor effects of different agents which interact to produce synergy or antagonism of drug effects.[9] In pharmacokinetic interaction, the blood levels of given agents may be raised or lowered based on the type of interaction. When a therapeutic combination of drug could lead to an unexpected change in the condition of the patient, this would be described as an interaction of potential clinical significance.[10]

Among medication errors, drug interactions could be easily prevented. Unfortunately most physicians are unaware of potential DDIs; therefore in some countries, the pharmacists are responsible for preventing the use of unsafe drug regimens to avoid dispensing of combination therapies that may cause serious DDIs. So we decided to investigate the prevalence and type of DDIs in prescriptions of urban area community pharmacies.[2]

MATERIALS AND METHODS

The study was a prospective observational prescription analysis conducted for a period of 6 months. A total number of 140 prescriptions were analyzed during the study period. The prescriptions were collected from the urban areas of community pharmacies and the generic names of the drugs and interactions are analyzed. Data were collected and potential drug-drug interactions were identified using drug interaction checker.The prescriptions having three or more drugs and where a DDI was suspected were selected by the physician. The drug in the prescription was analyzed for potential DDI by online Micromedex drug interaction checker software. The DDIs were classified based on the mechanism of interactions, severity of interactions, relation to the number of drugs prescribed, and disease conditions were also determined. The identified DDIs were categorized according to their level of significance into three classes (Mild, Moderate and Severe).

The demographic data were extracted on predesigned forms including patient characteristics such as age, gender, disease, the number of prescribed drugs, and severity and significance of drug interactions and complete prescription details were recorded.

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RESULTS

A total of 140 prescriptions were analyzed during the study period and it was found that 66 cases were confirmed with minimum of one DDI and maximum six DDI. A total of 113 interactions were found in prescriptions. Out of all interactions, 22 (33.33%) were severe, 68(103.03%) were moderate, 23(34.84%) were mild interaction. Table 5 represents the interaction distributions study population in community pharmacies. The frequencies of drug interactions in community pharmacies are shown in Table 3. The patients belonged to(31 – 50) age groups were had more drug-drug interactions. These showing in Table 2. Therefore the interactions belonged to the gender females had more number of interactions than male, it represents in Table 1.

The overall most observed drug interactions were as follow: Ofloxacin and Ciprofloxacin, Ondansetron and Tramadol in outpatient community pharmacies. All of the observed type interactions in retrieved prescriptions were from outpatient community pharmacies.

Table 1: Gender Distribution of Study Population

S.NO	GENDER	TOTAL NO OF PATIENTS (n = 140)	NO. OF PATIENTS WITH DDI (n = 66)	TOTAL NO. OF DDI (n = 113)	PERCENTAGE OF DDI
1.	Male	69	19	35	30.97%
2.	Female	71	47	78	69.02%

Table 2: Age Distribution of Study Population

S.NO	AGE GROUP	TOTAL NO. OF PATIENTS (n = 140)	NO. OF PATIENTS WITH DDI (n = 66)	TOTAL NO. OF DDI (n = 113)	PERCENTAGE OF DDI
1.	4-30 yrs	48	20	31	27.43%
2.	31-50 yrs	53	25	43	38.05%
3.	51-75 yrs	39	21	39	34.51%

Table 3: Frequencies of Drug Interaction in Community Pharmacies

S.NO	TOTAL PRESCRIPTION COLLECTED	NO. OF PRESCRIPTION WITH DDI (n = 66)	TOTAL NO. OF INTERACTIONS (n = 113)	PERCENTAGE OF INTERACTION
1.	140	66	113	171.2%

Table 4: Disease Distribution of Study Population

S.NO	DISEASE	WITH DDI	WITHOUT DDI
1.	Diabetes mellitus	12	2
2.	Asthma	4	4
3.	Hypertension	4	3
4.	Skin infection	2	5
5.	Typhoid	4	0
6.	Angina pectoris	3	4
7.	Heart stroke	1	4
8.	Urinary tract infection	8	6
9.	Malaria	2	1
10.	Nausea and vomiting	1	3
11.	Congestive heart failure	1	0
12.	Diarrhoea	1	2
13.	Cold and cough	0	3
14.	Gastric ulcer	2	3
15.	Joint pain	1	3
16.	Gout	0	4
17.	Surgical infection	0	1
18.	Congestive heart failure	1	1

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Table 5: Interaction Distribution of Study Population

S.NO	INTERACTIONS TYPE	NO OF INTERACTIONS (n = 113)	PERCENTAGE OF INTERACTIONS
1.	Mild	23	34.84%
2.	Moderate	68	103.03%
3.	Severe	22	33.33%
4.	Sum	113	171.2%

Table 6: Severity of Drug – Drug Interactions

S.NO	INTERACTING DRUGS	INTERACTIONS
1.	Aspirin – Clopidogrel	Concurrent use of aspirin and clopidogrel may result in an increased risk of bleeding.
2.	Metronidazole – Ofloxacin	Concurrent use of metronidazole and selected qt interval prolonging drugs may result in an increased risk of qt-interval prolongation and arrhythmias.
3.	Aspirin – Enoxaparin sodium	Concurrent use of low molecular weight heparins and non-steroidal anti-inflammatory agents may result in an increased risk of bleeding.
4.	Clopidogrel hydrogen sulfate – Enoxaparin sodium	Concurrent use of anti –platelets and low molecular weight heparin may result in an increased risk of bleeding.
5.	Metronidazole – Ondansetron	Concurrent use of metronidazole and selected qt interval prolonging drugs may result i an increased risk of qt-interval prolongation and arrhythmias.
6.	Sodium bicarbonate – Ofloxacin	Concurrent use of sodium bicarbonate and ofloxacin may result in decreased effect of ofloxacin by inhibition of gi absorption
7.	Artemether/Lumefantrine - Levofloxacin	Concurrent use of levofloxacin and qt interval prolonging agents may result in increased risk of qt interval prolongation.
8.	Ciprofloxacin-Ofloxacin	Concurrent use of ciprofloxacin and ofloxacin may result in an increased risk of qt interval prolongation.
9.	Ciprofloxacin – Ondansartan	Concurrent use of ciproffloxacin and ondansertan may result in an increased risk of qt interval prolongation.
10.	Norfloxacin- Sodium bicarbonate	Concurrent use of norfloxacin and sodium bicarbonate may result in decreased effect ofnorfloxacin by inhibition of gi absorbtion
11.	Ciprofloxacin – Metronidazole	Concurrent use of metronidazole and selected ot interval prolonging drugs may result in increased risk of ot interval prolongation and arrhythmias.
12.	Heparin – Ibuprofen	Concurrent use of heparin and nonsteroidal antiinflamatory agents may result in increased risk of gastrointestinal bleeding.
13.	Azithromycin – Ofloxacin	Concurrent use of azithromycin and ofloxacin may result in an increased risk of ot interval prolongation.
14.	Norfloxacin – Ondansetron	Concurrent use of norfloxacin and ondansetron may result in an increased risk ot interval prolongation.
15.	Aspirin – Ticagrelor	Concurrent use of aspirin and ticagrelor may result in an increased risk of bleeding and decreased ticagrelor efficacy with higher doses of aspirin.
16.	Alpha lipoic acid – Glimepiride	Concurrent use of alpha lipoic acid and glimepiride may result in increased risk of hypoglycemia.
17.	Aspirin – Clopidogrel	Concurrent use of aspirin and clopidogrel may result in an increased risk of bleeding.
18.	Cilostazol – Clopidogrel Hydrogen Sulfate	Concurrent use of cilostazol and selected antiplatelet agents may result in an increased risk of bleeding.

DISCUSSION

In the present study, we found that frequency of potential DDIs in prescriptions in community pharmacies was almost 47.14%.Polypharmacy is an important factor which leads to DDIs, the more the number of drugs per prescription, the more the likelihood of drug interactions occurrence. An association between the number of drugs prescribed and the occurrence of potential DDIs was observed. The majority of DDIs in our study had moderate, severity, and mild, accounting for 171.2% of all interactions observed. The prevalence of potential major DDIs was 33.33%. The physicians and pharmacists should monitor the patients who concurrently receive multiple drugs in order to decrease the incidence of DDIs.

Clinical relevance was defined according to the criteria used by the DDI-checker software programs, which considered the 'potential' of DDIs for both adverse even risk and lack of efficacy. All DDIs were classified as minor, significant and serious clinical relevance on the basis of potential clinical outcomes and type, based on gender, severity and disease etc., In serious type of DDIs, use of alternative drug is advocated. While in significant type of DDIs, pharmacotherapy is advised to monitor closely.

CONCLUSION

Our results indicate that patients had high risk of adverse drug reactions caused by medications due to potential DDIs in community pharmacies. Appropriate education for physicians about potentially harmful DDIs, as well as active participation of pharmacists in detection and prevention of drug-related injuries, could considerably prevent the consequence of DDIs among patients.

Potential drug interactions are frequent among patients prescribed multiple medications and the rate is directly related to the number of drugs prescribed. Safeguards need to be introduced to prevent patients from receiving medications that have the potential to cause adverse Drug interactions. Physicians should be aware of potentially harmful DDIs. Meanwhile Pharmacists can contribute to the detection and prevention of drug-related injuries. Appropriate education, collaborating drug selection and pharmaceutical care are strongly recommended for physicians and pharmacists.Clinical pharmacists can play a critical role in the prevention of drug-drug interactions in patients.

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