Research Article

Assessment of Potential Drug Interactions among Hospitalized Patients in the Pulmonology Wards in Tertiary Care Hospital

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ABSTRACT

The aim of the study is to assess the potential drug interactions (pDDIs) among hospitalized pulmonology patients in tertiary care Hospitals. It is a prospective observational study conducted at tertiary care hospitals, Erode, for a period of 6 months. The data was collected from 290 case sheets of hospitalized patients and direct patient interview from pulmonology wards. Then the drug interactions were identified by using drug interactions data base Micromedex® drug checker software - 2 and drugs.com. The results showed that a total of 290 prescriptions were taken for the study. Out of this, 265 pulmonary cases with interactions, 18 interacting pair were identified and 20.5% were pharmacokinetic interactions. In the present study male patients were higher in number than female patients. Most of the patients were in the age group between 60 – 70 yrs. The drug interaction was found to increase with increased length of hospital stay and the highest number of hospital stay was between 4-6 days. 52.4% of cases have more than 5 - 6 drugs prescribed in the pulmonology department. The most common interacting pair was found to be between Tab. Ranitidine and Tab. Theophylline. Out of 265 pulmonary cases with interactions, 18 interacting pairs were identified and 20.5% were pharmacokinetic interactions. The most common food interaction was found to be theophylline – tea/ coffee interaction. The most common drug disease interactions found in pulmonology ward are Diazepam – COPD, Chlorpheniramine – COPD interactions. The study concluded that the incidence of pDDIs was associated with old age, male gender, number of medications and increased length of hospital stays. The pDDIs can be reduced by eliminating polypharmacy and by eliminating all medications without therapeutic benefit. All potential food – drug interactions (FDIs) may affect the safety and efficacy of drug therapy. Such food – drug interactions can be avoided by taking 1 hour before or 2 hours after food intake.

Keywords: Potential drug-drug interactions, pulmonology, interacting pair, food-drug interactions.

INTRODUCTION

Drug interaction is desirable or undesirable pharmacological effect of drugs interacting with other drugs, with endogenous physiologic chemical agents, with components of the diet, and with chemicals used in diagnostic tests or the results of such tests. The probability of interactions increases with the number of drugs taken.[1,2] The high rate of prescribed drugs in elderly patients (65-year-old patients take an average of 5 drugs) increases the likelihood of drug interactions and thus the risk that drugs itself can be the cause of hospitalization.[3] The study of drug-drug, food-drug(FDIs), and disease-drug interactions and of genetic factors affecting pharmacokinetics and pharmacodynamics is expected to improve drug safety and will enable individualized drug therapy.[4] DDI is said to account for a number of severe adverse drug reaction(ADR) resulting in hospitalizations and emergency department visits. It is estimated that, in 2011 DDI contribute to about 56.4% of all ADR.[1] Furthermore, ADR due to DDI accounts to about 2.8% hospital admission every year. Many adverse events can be prevented by identifying potential drug interactions.[5] however certain conditions such as multiple disorders, chronic diseases and polypharmacy may increase the risk of pDDIs. Diet and lifestyle can sometimes have a significant impact on drugs.[5,6] The aim of the study is to assess the Potential Drug Interactions among Hospitalized patients in pulmonary wards in tertiary care Hospitals.[7]

MATERIALS AND METHODS

The proposed work was designed as mentioned below:

Phase I

Literature survey was conducted, institutional ethical committee clearance was obtained, and consent from Hospital authorities were obtained, data entry form, patient consent form was designed.

Phase II

Data's from hospitalized pulmonary patients was collected**.**

Phase III

The prevalence and types of DDIs was identified, the prescriptions associated with DDIs was categorized, according to various disease specialties, to categorize the severities of DDIs and submission of Report.

It is a prospective observational study was conducted at tertiary care hospital, Erode, Erode district, Tamil Nadu for a period of 6 months. The inclusion criteria of the study were hospitalized pulmonary patients, age groups

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> 18 years. The exclusion criteria were out patients, ayurveda, siddha, and other prescriptions involving alternative system of medicine, age group < 18 years. 190 prescriptions were collected from hospitalized patients during study period. Consent form was obtained from Hospital authority and hospitalized patients.

The data collection included age, gender, data prescriptions, diagnosis, specialty of the physicians, name of the each medication, dosage, frequency, quantity dispensed, co-morbidity, and types of food taken by the patients. The drug interactions were identified by using drug interactions data base **Micromedex® drug checker software-2.7** and **drugs.com.**

RESULTS AND DISCUSSION

Table 1: In gender-wise distribution of drug-drug interactions and DFIs the male patients are higher in number when compared to female patients. One of the main reason behind this outcome is that male patients are mostly affected with cardiac diseases.

Table 1: Gender wise distribution of drug- drug interactions and drug – food interactions

		Drug – drug interactions		Drug – food interactions	
S.no	Gender	Frequency (n = 290)	Percentage (%)	Frequency (n = 290)	Percentage (%)
1	Male	212	73.10%	224	77.2%
2	Female	78	26.89%	66	22.7%

Table 2: shows number of prescribed drugs per day. In this most of the patients are taking 5-6 drugs per day. As the number of drugs increases the drug interactions may also increases frequently.

Table 2: No of prescribed drugs per day

Sl.No.	Number of drugs prescribed/day	Pulmonary patients	
		Frequency (n=290)	Percentage (%)
1	<4	90	31.03%
2	5-6	152	52.41%
3	>7	48	16.55%

The types of drug-drug interactions found in the prescriptions of pulmonary patients are described in table 3. There are mainly pharmacokinetic and pharmacodynamic type drug interactions based on their interactive effect.

Table 3: Type of drug-drug interactions found in the prescriptions of pulmonary patients

Sl	pDDI combinations	Mechanism	Interactive Effect	Type of DDI
1	Inj, Ranitidine + Inj. Theophylline	Theophylline toxicity (nausea, vomiting, palpitations, seizures).	Decrease Metabolism	PK
2	Inj.Furosemide + Inj.Hydrocortisone	Result in hypokalemia	Antagonistic Effect; Additive Effect	PD
3	Inj.Ciprofloxacin + Inj.Theophylline	Theophylline toxicity (nausea, vomiting, palpitations, seizures).	Decreased metabolism	PK

Drug food interactions found in pulmonology patients are illustrated in the table 4. In this the main interacting pair was found to be theophylline – tea / coffee and theophylline – protein rich foods.

Pulmonary diseases distribution was found in Table 5. In this the COPD patients are higher in number. So there is a chance of increase in interactions in COPD patients.

Drug – disease interaction is illustrated in table 6. Diazepam – COPD Interaction and chlorpheniramine – COPD Interaction was found to be the major drug – disease interacting pair.

Fig. 1 & **Fig. 2** show the type of pharmacokinetic and pharmacodynamic interactions. The pharmacodynamic types of interactions are mainly synergism, antagonism and additive effect. In the present study most of the patients are having synergistic effect of pharmacodynamic interaction.

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Table 4: Drug food interactions found in pulmonology prescriptions

Drug-food	Interactive Effect	Type of DDI	Severity	Frequency (n=290)
Theophylline – Coffee / Tea (Caffeine)	Increased plasma concentration by inhibiting metabolism	PK	Moderate	210(72.4%)
Theophylline –Protein Rich Foods (Fish, Milk, Egg, Meat)	Increased clearance of the drug.	Unknown	Moderate	210(72.4%)
Paracetamol - Cabbage	Decrease effectiveness of the drug.	PK	Moderate	89(30.6%)

Table 5: Disease wise distribution

S. no	Pulmonary diseases	Frequency (n = 290)
1	COPD	128
2	Asthma	52
3	Tuberculosis	48
4	Pneumonia	34
5	Bronchitis	28

Table 6: Drug disease interaction in pulmonology

Drug- disease	Interactive effect	Severity	Frequency (n = 290)
Diazepam - COPD	Risk of respiratory depression	Moderate	22
Chlorpheniramine- COPD	Reduce the volume and cause thickening of bronchial secretions, resulting in obstruction of respiratory tract.	Moderate	8

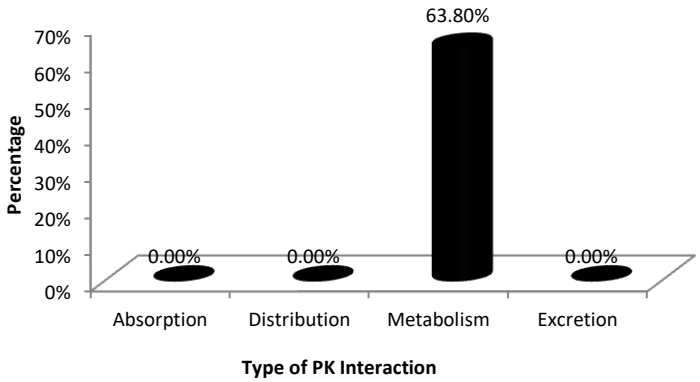

Figure 1: Type of pharmacokinetic interactions in pulmonary patients

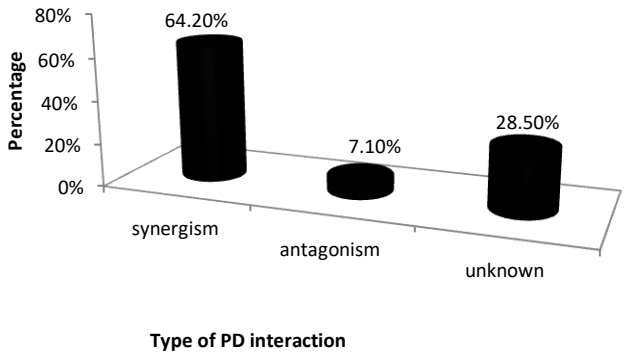

Figure 2: Type of pharmacodynamic interaction in pulmonary patients

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The pharmacokinetic types of interactions are the interaction which affects the drug absorption, distribution, metabolism and elimination and here most of the interactive type is due to metabolism and its associated changes.

Our study shows that male patients were higher in number when compared to female patients in pulmonary departments which are similar to the study conducted by Sharma et. al.[8] Another study conducted by Murtaza et. al., also reports that male patients are higher (55.1%). 52.4% cases were reported to prescribe 5-6 drugs in the study conducted in the pulmonology department. Study conducted by Ismail et. al., showed that 54% cases had more than 7 drugs prescribed. The more the medications that were prescribed, the more the possibility of polypharmacy.[9] Out of 265 pulmonary cases with interactions, there were 18 interacting pair identified during the study. Among 14 pharmacodynamic interaction 9(64.2%) were synergistic which is comparable with the study by Chavda et.al, were 67.44% were synergistic followed by 30.7% antagonistic. Among 36 pharmacokinetic drug interactions in pulmonary department, 63.8 % were due to metabolism. From pDDIs detected in study by Chavda et al., the majority were of pharmacodynamic (58.83%) in nature, followed by pharmacokinetic (38.53%) interactions.[10,11] These findings are in contrast to the study reported by Vonbach et al., and Aparasu et al., who reported 76% of pharmacokinetic and 22% of pharmacodynamic interactions.[12,13] Diet and lifestyle can sometimes have a significant impact on drugs. These may occur out of accidental misuse or due to lack of knowledge about the active ingredients involved in the relevant substances.[14,15] Interactions between food and drugs may inadvertently reduce or increase the drug effect. Out of 290 pulmonary cases, 210 cases reported theophylline interacting with caffeine (Coffee/Tea). Tse et al., conducted a study that suggested that interactions between theophylline and caffeine may be attributed to changes in drug distribution and drug elimination characteristics.[16]

CONCLUSION

It may be concluded that incidence of PDDIs were associated with old age, male gender, number of medication given and increased length of hospital stays. To reduce PDDIs, the number of medications for the patients should be properly controlled and it is recommended to eliminate all medications without therapeutic benefit, goal and indication. Food – drug interactions can produce negative effects in safety and efficacy of drug therapy as well as nutritional status of patients. Often such interactions can be avoided by taking 1 hour before or 2 hours after eating. Therefore, providing information regarding the different food and drug interactions will help the physicians to prescribe drugs cautiously with only suitable food supplement to get maximum benefit for the patient.

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