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Research Article

Pharmacoepidemiological study of potential drug interactions in heart and neurological outpatients

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ABSTRACT

Background: Drug-drug interaction (DDI) is a potential cause of adverse drug reactions. This study estimates the rate and factors associated with potential DDI in cardiac and neurological prescriptions from the out-patient department of various hospitals.
Methods: A cross-sectional study was conducted from February to April, 2014 in various outpatients department of different hospitals in Indore. Total 60 prescriptions of cardiac and 60 prescriptions of neuro patients were collected from different hospitals. All the prescriptions were analyzes by various pharmaceutical and medical books, drug interaction checker software, and journals, etc.
Results: Prescriptions having moderate drug interactions are more than that of severe and minor interactions and severity of the interaction found moderate in both type of prescriptions. Among cardiac patients 75% are male and 25% are females including all age groups, and in neuro patients, 58.33% are male, and 41.66% are females including all age groups. Types of drug interaction found in prescriptions are as follow, severe interaction (13% in cardiac, 8% in neuro), and moderate interaction (45% in cardiac, 37% in neuro), minor interaction (17% in cardiac, 25% in neuro), interaction not found (25% in cardiac, 30% in neuro patients).
Conclusion: The hazards of prescribing many drugs, including side-effects, DDI and difficulties of compliance have long been recognized as particular problems when prescribing. Proper emphasis should be given to drug information center and training of clinical pharmacy across the country, which can play an important role in minimizing DDIs.

Keywords: Drug-drug interaction, Polypharmacy, Cardiac patient, Neurological patients

INTRODUCTION

Prescription auditing studies are a part of drug utilization studies, are beneficial in clinical practice for rational prescribing of drugs and helpful for minimizing the medication errors. They are an important tool to promote rational prescribing.[1] Physicians/medical professionals are continuously exposed to newly introduced drugs that are claimed to be safer and more efficacious.[1] Their utilization and consequences on real-life effectiveness and safety in actual clinical practice need continuous study an interaction is said to occur when the effects of one drug are changed by the presence of another drug(s), food, drink or an environmental chemical. When a therapeutic combination could lead to an unexpected change in the condition of the patient, this would be described as an Interaction of potential clinical significance.[2] Drug interactions represent an important and widely under-recognized source of medication errors. The desirable and undesirable effects of a drug are generally related to its concentration at the sites of action, which in turn is related to the amount administered (dose) and to the drug's absorption, distribution, metabolism, and/or excretion, and also drug-drug interactions (DDI).[3,4] During the last decades in India, as elsewhere, the population has aged, causing an increase in the level of chronic diseases such as cardiovascular and degenerative diseases and a consequent increment in medication. Polypharmacy is now common and carries a high risk of DDI and drug-disease interactions. These may cause adverse effects, or the therapeutic effects of the combined medicines may change, with serious consequences for health. The very widespread practice of self-medication makes the situation more severe and difficult. The more medicines a person requires, the increased risk of a DDI. Unfortunately it is not possible to simply stop potentially offending medicines, but the medicines interactions need to be managed as safely as possible.[2-4]

Predisposing factors for drug interactions

There are various factors, contributing to the occurrence of DDIs. This includes multiple pharmacological agents, multiple prescribers, use of non-prescription drugs, drug abuse, and patient noncompliance. Various patient variables are also implicated for drug interactions, i.e., age, genetic factors, disease states, renal function, hepatic function, alcohol consumption, smoking, diet, environmental factors, individual variations, etc. Although in a limited number of cases, prescribers use known interactions to enhance efficacy in the treatment of several important conditions, patients are exposed to unnecessary risks by the concomitant prescription of agents that have been shown to interact adversely. Many interactions are predictable, i.e., they can be avoided, if the prescriber keeps himself updated with the clinical pharmacology of the medicines involved.[4]

METHODS

Study design and data collection

A cross-sectional study was conducted from February to April, 2014 in various outpatients department of different hospitals in Indore. Prescriptions of cardiac and neurological disorders were collected and prescriptions having two or more drugs were enrolled for the study. Total 60 prescriptions of cardiac patients and 60 prescriptions of neuro patients were collected from different hospitals of Indore. Prescriptions were provided by different surgeon and physician for various disorders. Patients of all age groups included in the study. Cause of disease and pathological history of patients was also observed to justify the DDIs. All the prescriptions were analyzes by various pharmacological and medical books, drug interaction checker software, and journals.

RESULTS

Prescriptions having moderate drug interactions are more than that of serves and minor interactions and severity of the interaction found moderate in both type of prescriptions. Among cardiac patients 75% are male and 25% are females including all age groups, and in neuro patients, 58.33% are male and 41.66% are females, including all age groups. Types of drug interaction found in prescriptions are as follow, severe interaction (13% in cardiac, 8% in neuro), and moderate interaction (45% in cardiac, 37% in neuro), minor interaction (17% in cardiac, 25% in neuro), interaction not found (25% in cardiac, 30% in neuro patients). All the results and characteristic of study population was shown in Tables 1-3 and Figures 1 and 2 respectively.

Characteristics of the study population

- Cardiac patients: Number of male patients were more compared to female patients. Majority were in the

Table 1: Characteristics of out-patients database.

Characteristics	Cardiac patients	Neuro patients
Total number of patients	60	60
Female	15	25
Male	45	35
Number of patients per age group		
<20	02	07
20-40	07	30
40-60	40	14
>60	11	09

Table 2: Distribution of some neurological potentially interacting drug pairs with their clinical significance and possible adverse outcomes.

Drugs (Neuro)	Clinical significance	Possible adverse out come
Folic acid-phenytoin	Moderate	Decrease phynetoin activity
Escitalopram-amitriptylin	Major	Both causes toxicity
Topiramate-amitriptylin	Moderate	Decrease amitriptylin level
Lorazepam-heloperidol	Moderate	Increase sedation
Phenobarbital-phenytoin	Moderate	Decrease level of phenytoin
Valproic acid-phenytoin	Moderate	Increase level of phenytoin
Ranitidin-phenytoin	Moderate	Increase level of phenytoin

Table 3: Distribution of some cardiac potentially interacting drug pairs with their clinical significance and possible adverse outcomes.

Drugs (cardiac)	Clinical significance	Possible adverse out come
Enalapril-furosemide	Moderate	Postural hypotention
Digoxin-furosemide	Moderate	Hypokalamia
Digoxin-spironolactone	Major	Digoxin toxicity
Atenolol-amlodipin	Moderate	Hypotention
Digoxin-doxycyclin	Moderate	Digoxin toxicity
Metoprolol-amlodipin	Moderate	Anti-hypertensive activity

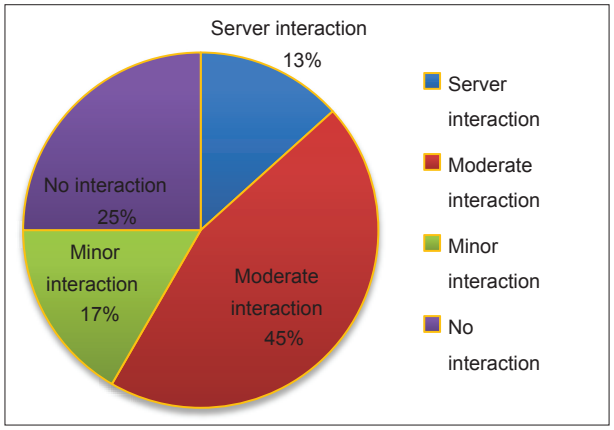

Figure 1: Drug interactions found in prescription of cardiac patients.

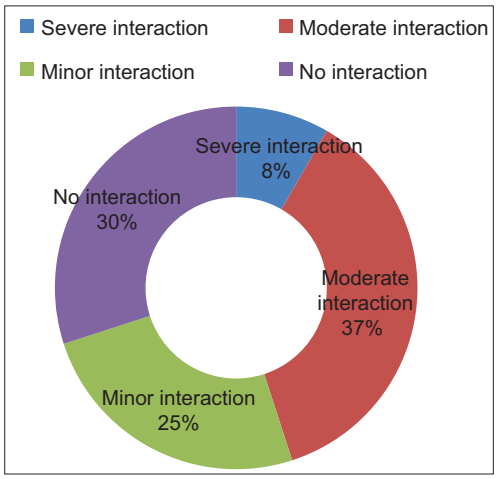

Figure 2: Drug interactions found in prescriptions of neuro patients.

age group of 50-70 years. Tobacco, smoking and dietary reasons were found more dominant to cause the disorder than other reasons, in male all the above three reasons were dominant where in females only tobacco and dietary habits found more dominant than others.

- Neuro patients: Number of male patients were more than that of female patients. Majority were in age group of 30-50 years. In male patient's brain injury, trauma and stress were dominant to cause disorders where in female patients stress and depression were dominant to cause disorders.

Based on the severity DDIs classified as major, moderate and minor as follows:[5,6]

- Major: Potentially life-threatening; requires medical intervention to minimize or prevent the serious adverse effects
- Moderate: Results in potential deterioration of patients' clinical condition and may require an alteration in therapy
- Minor: The effects are usually mild and may not require a change in therapy.

DISCUSSION

Various studies have shown that potential DDIs are frequent when patients receive multiple prescriptions.[6-10] This is true for both ambulatory and hospitalized patients, and, in many cases, causes adverse effects and changes in therapeutic efficacies of the combined medicines, with consequent poor control of the diseases under treatment. Patients with cardiovascular disorders and degenerative disorders are subjected to high risk of potential DDIs and the number of drugs prescribed and educational level of the prescribers has a high significantly associated with the occurrence of potential DDIs.[11-13] Therefore, it is imperative that further studies need to be conducted to identify reasons for and tackle the problem and provide appropriate mechanisms for management. The rate of occurrence of potential DDIs in case where residents prescribed the drugs were found to be less likely than when prescribed by the medical interns perhaps due to knowledge gaps between the two levels of training. Gender, sex and concomitantly existing diseases were identified as predictors of potential DDIs. Polypharmacy was seen in our study that requires reconsideration. Finally, proper emphasis should be given to drug information center and training of clinical pharmacy across the country, which can play an important role in minimizing DDIs in cardiovascular patients by providing DDI-related information to prescribers. We are also recommending developing a collaborative, patient-centered approach in the education of healthcare professionals to deliver effective drug therapy and hence the incidence of DDIs and drug therapy problems will be minimized.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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