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Drug Utilization Study at Tertiary Care Hospitals in Punjab

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Abstract

Drug utilization (DU) or Drug use evaluation (DUE) studies is an ongoing, authorized and systematic quality improvement process. These studies designed to review drug use and prescribing patterns of drug with current recommendations or guidelines for the treatment of a certain disease. DUE provide feedback of drug utilization data to prescribers related to number of cases of adverse effects adverse drug reactions, specific drug-drug, drug-food interactions and medication errors. This study shows the evaluation of current prescribing pattern to identify different adverse drug reactions, specific drug –drug, drug -food interactions and medication errors at tertiary care hospitals in Punjab.

Abbreviations: DU: Drug Utilization; DUE: Drug Use Evaluation; ARD: Adverse Drug Reaction; DI: Drug Interactions; ME: Medication Error

Introduction

Drug utilization (DU) or Drug use evaluation (DUE) studies is an ongoing, authorized and systematic quality improvement process. These studies designed to review drug use and prescribing patterns of drug with current recommendations or guidelines for the treatment of a certain disease. DUE provide feedback of drug utilization data to prescribers related to number of cases of adverse effects adverse drug reactions, specific drug-drug, drug-food interactions and medication errors [1]. This study shows the evaluation of current prescribing pattern to identify different adverse drug reactions, specific drug-drug, drug-food interactions and medication errors at tertiary care hospitals in Punjab. Drug interaction is defined as the modification of the effects of a drug (object drug) by the prior and/or the concomitant administration of another drug (precipitant drug). Drug interaction may either increase or decrease the intended effect of one or both drugs. It may transform the diagnostic, preventive or therapeutic activity of any drug [2]. Drug interactions can be an extremely main contributory factor for the incidence and occurrence of adverse drug reactions and adverse drug events. This article contains one part of the study which is accompanying with the adverse drug reactions, drug interactions, medication error reported during study period.

Materials and Method

The study was carried out on after obtaining approval and clearance from the Institutional Ethics Committee. The study was conducted at Department of Medicine in three different hospitals setting in the Moga, District of Punjab, India. Based on the inclusion and exclusion criteria the patient's after signing the Informed Consent Form data was collected from the patient case file, case reports, and laboratory reports. The study included patients with both type1 and type2 diabetes and suffering from hypertension with diabetic and hypertensive complications. Sample size is calculated through Software "Statcal Epiinfo" which is designed by US Department of Health and Social Services Centre for Disease Control and Prevention (CDC) for prospective observational studies [3]. Population size of the study was found to be = 1613254 as per census (2011). Sample of the study was found to be=1098 Patients. Study was conducted for a period of one year. The aim of this study was to study the pattern, drugs involved, severity, outcomes and preventability of adverse drug reactions using intensive monitoring approach as well as to observe drug interactions and medication error.

Results

Total 1208 patients of both genders were enrolled in study who were under treatment of diabetes and hypertension with their comorbidities and complications. During the study following ADR's10 were detected and reported. The present study showed that females experienced higher incidence of ADRs when compared to males. In most of the ADR cases immediately drug responsible for the causes of reaction were stopped & management therapy were initiated as per guidance and guidelines. Type A reactions accounted for most of the ADRs. Using the Naranjo algorithm, (61.19%) ADRs were assessed as 'probable' whereas (37.86%) were assessed as 'possible' and 3 (1%) were classified as 'definite' in relation to the suspected drug. Gastro-intestinal system was the most common organ system affected.

(Table 1-4)[4-21].

Table 1: ADR's reported.

Brand Name	Drug	Effect on Patients	Action Taken
Inj. Emeset	Ondansetron	Vomiting, Itching over face and rashes	Immediately drug stopped & management therapy (i.e. Inj.Hydrocortisone, Inj. Avil & Inj. Rantac) initiated as per guidance
Inj. Metrogyl	Metronidazole	Difficulty in breathing, vomiting	Immediately drug stopped & management therapy (i.e Inj. Hydrocortisone, Inj. Avil) initiated as per guidance
Inj. Taxel	Ranitidine	Diarrhea, vomiting	Immediately drug stopped & management therapy (i.e Inj. Octreotide) initiated as per guidance
Inj. Monocef	Ceftriaxone	Vomiting, Nausea, Rashes & Redness	Immediately drug stopped & management therapy initiated as per guidance
Inj. Dynapar	Diclofenac	Rashes all over body	Immediately drug stopped & management therapy (i.e. Inj. Hydrocortisone, Inj. Avil & Inj. Rantac) initiated as per guidance
Inj. Rantac	Ranitidine	Rashes all over body	Immediately drug stopped & management therapy initiated as per guidance
Inj. Drotin	Drotaverine	Redness & Itching all over body	Immediately drug stopped & management therapy (i.e. Inj. Hydrocortisone, Inj. Avil) initiated as per guidance
Inj. Supacef	Cefuroxime	Itching & Urticarial Rashes	Immediately drug stopped & management therapy initiated as per guidance
Cap. Citrol	(Vit. D) Vitamin supplements	Cough, vomiting Difficulty in swallowing, dizziness	Immediately drug stopped & management therapy initiated as per guidance.
Tab Livogen	Folic acid and ferrous fumarate	Amenorrhea, fatigue and headache, vomiting.	Immediately drug stopped & management therapy initiated as per guidance

Table 2: Drug-drug interactions.

Object Drug	Interacting Drug	Effect And Action Taken
Carvedilol	Spironolactone	Hyperkalemia [2]
Telmisartan	Aspirin	Hyperkalemia, diminish Antihypertensive effect [4]
Telmisartan	Atorvastatin	Myopathy [5]
Amiodarone	Warfarin	Risk of bleeding [6]
Metoprolol	Aspirin	Diminish aspirin effect [7]
Amiodarone	Metoprolol	Bradycardia
Aspirin	Ramipril	Diminish antihypertensive effect [8]
Spironolactone	Aspirin	Hyperkalemia [9]
Diltiazem	Atorvastatin	Diltiazem increases level or effect of atorvastatin by affecting enzyme CYP3A4 metabolism. [10]
Prednisolone	Levofloxacin	Co-administration of quinolone antibiotics and corticosteroids may increase risk of tendon rupture. [11]
Phenytoin	Dexamethasone	Phenytoin will decrease the level or effect of dexamethasone by affecting hepatic/intestinal enzyme CYP3A4 metabolism. [12]
Fenofibrate	Rosuvastatin	Fenofibrate may increase the risk for rhabdomyolysis when added to optimal statin regimen. [13]
Furosemide	Amikacin	Increase the risk of nephrotoxicity, Renal function test should be performed during therapy if co-administration is necessary. [14]
Furosemide	Cefoperazone	Sr.Cr.=1.5mg/dL (Increased from 0.6mg/dL to 1.5mg/dL) and Sudden weight gain. Dose maintenance of Cefoperazone, 1.5gm IV suggested. [15]

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Furosemide	Omeprazole	Hypomagnesemia,Irregular heart rhythm & palpitation. Cap. Magnesium Sulphate added as supplement
Furosemide	Pyridoxine and Amlodipine	Dose of furosemide lead to decrease in potassium level, Hypokalemia was found. Spironolactone 100mg tablet added to therapy as suggested. [16]
Noradrenaline	Insulin	Decreases the effect of insulin, so Monitor blood sugar level is suggested. [17]
Insulin	Levosalbutamol & ipratropium bromide	Decreases the effect of insulin leading to increase in the blood glucose level, so Monitor blood glucose level is suggested. [18]
Carbamazepine	Toperamide	Stevens-Johnson Syndrome. Patient was previously taking toperamide for the indication of epilepsy. So drug stopped. [19]

Table 3: Drug-food interactions.

Drug	Food	Effect
Naproxen	Fatty food	Upset stomach [2]
Celecoxib	Milk	Upset stomach [2]
Benzodiazepine	Grapefruit	Inhibit the enzyme involve in BZD metabolism [2]
Warfarin	Vitamin K	Reduce the effect of drug [5]
Tetracycline	Calcium food	Reduce the absorption of drug [6]
Acetaminophen	Alcohol	Liver damage [20]
Digoxin	Oatmeal	Decrease the absorption of drug [21]

Table 4: Medication errors reported.

Incident	Type of Error	RCA	Preventive Action
Tab. Alprax 0.25mg prescribed, pharmacist dispense Alprax 0.5mg	Dispensing error [18]	Wrong dose	Pharmacist counselled
Inj. Novomix 30mg prescribed and Nursing staff indented Novaplus 75mg	Indenting error [19]	Wrong drug	Training provided to Nursing staff
Tab. Naxpro RD 40mg prescribed and available in hospital store but not dispensed	Dispensing error [18]	Not dispense	Pharmacist counselled
Tab. Arkamin prescribed and Amikacin dispensed	Dispensing error [18]	Wrong drug	Pharmacist counselled
Tb Acitrom prescribed but Acaitretin dispensed	Dispensing error [19]	Wrong drug	Double check process initiated.

Discussion

During the study it was found that dispensing type of error is the common followed by indenting error. It is important to understand that an analysis of medication errors can help healthcare professionals and pharmacist to identify why medication errors can occur and make improvements to prevent or reduce them. Future research into the development of a clinical framework to prevent clinical errors is required. More data in regards to medication and other clinical errors and what causes them is essential. In addition, data concerning potential solutions is also recommended and the articles could be analyzed further based on location of the medical error incident (e.g. hospital, primary care, etc).

In most of the ADR cases immediately drug responsible for the causes of reaction were stopped & management therapy were initiated as per guidance and guidelines. Type A reactions accounted for most of the ADRs. Using the Naranjo algorithm, (61.19%) ADRs were assessed as 'probable' whereas (37.86%) were assessed as 'possible' and 3(1%) were classified as 'definite' in relation to the suspected drug similar results were found in study conducted by [16]. Gastro-intestinal system was the most common organ system affected. Sign and symptoms related to gastro-intestinal system were vomiting, diarrhea, constipation, nausea, Gastritis, peptic ulcer, and gastric pain. When organ systems affected were studied, Gastro-intestinal system was the organ system most commonly affected by the ADRs with vomiting as the most common individual reaction. This study showed the level of gastric intolerance of patients to this class of drugs [22].

These findings substantiate previously reported studies on gastric ADRs [23]. In most of the ADRs cases drug were withdrawn instead of dose alteration or alternative therapy. The present study showed that females experienced higher incidence of ADRs when compared to males which is similar to the results of [24] Cardiovascular drugs were the second most common drug class with furosemide being the most commonly implicated drug. These findings are consistent with the findings of [25]. During the study it

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was found that percentage of the reactions was severe in nature and mostly skin reactions accounted for that. Preventable ADRs were less in this study compared to available reports [14].

Conclusion

With this study it was concluded that there is an alarming rate of prevalence and incident of adverse drug reactions, drug interactions, medication error which is much higher in patients receiving combinations of drugs or poly pharmacy or suffered from co-morbidity of diseases such as diabetes, hypertension which require prolong and multi treatments and the risk of drug interaction will increase as they are treated with multi-therapies. The intensive monitoring of ADRs in medicine wards helped to assess the incidence and pattern of ADRs.

It is well reported that diabetic patients are suffering because of higher risk of diabetic complications may encounter higher rate of drug interaction as they receive combination of therapies, and hence the rate of occurrence of drug interaction is rapidly increases. In this study, we have found that the patients receiving diabetic medication are at higher risk of drug-drug and drug-food interactions as they are receiving multi therapies for the treatment of diabetic complications and other related disorders. So that the physician and other medical staff should aware and guide the patient about the medication, drug related problems, interaction with food and other drugs or with medication.

This will help to avoid and stop the rate of the drug-drug and drug-food interactions associated to anti diabetic therapy. This study summarized and highlights the various drug interactions likely drug-drug and drug-food interactions as well as reports unwanted effects of other treatment associated with diabetic and hypertensive patients suffering with their complications.

Clinical pharmacists design pharmaceutical care plan, identify problems, establish outcome goals, provide patient counseling, monitor pharmacokinetics and therapeutic drug level, report adverse drug reaction (ADRs), evaluate treatment outcome, and drug information to health care professionals.

Limitations of the Study

Rechallenge was not performed for many ADR cases and this might alter the causality if such information is available for all the cases.

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