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Drug Interactions – Causes & Implications

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Short Commentary

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ABSTRACT

Drug interaction is a condition in which a substance alters the activity of another drug when both are concurrently administered. This altered action can be synergistic (action of the drug is elevated) or antagonistic (action of the drug is decreased).

There are different types of interactions between drugs and other substances such as food, dietary supplements, herbs, alcohol, tobacco etc...Drug interactions usually occur accidentally or due to lack of knowledge about the drugs being used.

The field of drug interactions has received a great deal of attention in recent times from the health care professionals. In drug interactions the therapeutic efficacy of a drug is altered by another drug which is simultaneously administered to the patient.

INTRODUCTION

The field of drug interactions has received a great deal of attention in recent times from the health care professionals. In drug interactions the therapeutic efficacy [1] of a drug is altered by another drug which is simultaneously administered [2] to the patient [3,4].

Certain drug interactions can lead to enhanced toxicity and can affect the patient psychologically [5] and can be fatal [6].

Interactions play a Key role in patients who use drugs which may interact with biologicals [7].

MECHANISMS OF DRUG INTERACTIONS

There are several mechanisms through which drugs interact and they can be divided into two categories: pharmacokinetic and pharmacodynamic interactions.

1. Pharmacokinetic drug interactions
 - a. Drug absorption interactions - Alteration in gastric absorption
 - b. Drug distribution interactions
 - c. Drug metabolism interactions - Enzyme induction and Enzyme inhibition
 - d. Drug excretion interactions - Alteration in clearance of the drug from the body
2. Pharmacodynamic drug interactions

CAUSES OF DRUG INTERACTIONS

Narrow therapeutic index drugs are the major objects for drug interactions.

Ex: warfarin, fluoroquinolones, antiepileptic drugs, oral contraceptives

Drug interactions are more to occur in patients suffering with chronic non-curable illness like diabetes mellitus, hypertension, and in such cases use of multiple-dose treatment [8] becomes a major cause for drug interactions [9,10].

- Improper usage of OTC drugs is responsible for lack of adherence and severe drug interactions leading to adverse effects [11].
- Alterations in pharmacological variables in elderly patients [12]
- Certain chemical modifiers interact with certain drugs and cause modification in the chemical structure of the drug and result in adverse drug reactions [13,14].

PERSON TO PERSON VARIATIONS

Variations from person to person are seen due to several factors like:

- Allergies
- Body mass
- Genes
- Gender
- Physiology
- Pregnancy
- Age
- Lifestyle
- Diseases
- Drug doses
- Combined therapy and
- Administration timing of two substances

SERIOUS RESULTS OF DRUG INTERACTIONS

- ✓ Death
- ✓ Life-threatening
- ✓ Hospitalization
- ✓ Disability
- ✓ Congenital anomaly
- ✓ Permanent impairment of organs

COMMON DRUG INTERACTIONS

- Drug – Food interactions – Grape juice, Licorice, Chocolate, No aspirin on empty stomach

Grapefruit juice inhibits the activity of cytochrome P450 3A4 (CYP3A4) enzymes which is responsible for metabolism of drugs and toxins

- Drugs – Alcohol interactions
- Tobacco – drug interactions
- Drug – Drug interactions

- Herb – Drug interactions – Ginseng, Licorice, Black cohosh, Green tea, Kava, Saw palmett, Chinese herbal medicines
- Drug – vitamin supplements - Vitamin E, Iron and calcium pills

MANAGEMENT OF DRUG INTERACTIONS

- Avoiding combination therapy
- Dose adjustment of main drug
- Adjusting the time of intake of two drugs
- Monitoring of combination therapy when used
- Educating the patient on potential interactions is essential
- Advanced screening techniques need to be used to identify interactions

EXAMPLES

- Many drug interactions are reported during the treatment of HIV infected patients as the dosage regimen for their treatment contains antiretroviral drugs along with several other drugs for treating infections which affect the patient due to decreased immunity [15]
- Hypoglycemia in patients with diabetes mellitus is a common outcome of drug interactions seen due to use of prescription drugs along with other alternative medicines such as herbal drugs [16-18] and certain nutrient supplements [19-21].
- Drug interactions in diabetic patient is common due to prescription containing anti diabetic drugs and also certain anti infective drugs due to more incidence of infections in diabetic patients [22].
- The Acetaldehyde Syndrome is a very harmful and fatal drug interaction caused upon the ingestion of alcohol and aldehyde dehydrogenase inhibitors leading to the toxic accumulation of aldehyde [23].
- Complementary and Alternative medicine usage by patients due to improper knowledge of drug interactions is now becoming a major cause for adverse drug reactions [24].
- Grape juice interactions with drugs is a major type of food drug interactions as it acts as a potent CYP3A4 inhibitor and thus prevents metabolism of drugs resulting in increased levels of the drug in the blood [25].
- Interaction of warfarin with dietary supplements.
- Serum levels of propranolol, an anti hypertensive drug increases with the intake of high protein diet.
- Certain antibiotics interact with milk and milk products.
- Intake of acetaminophen with alcohol increases the risk of liver damage
- Corticosteroids along with antidiabetics reduce the efficacy of antidiabetic drugs.
- Corticosteroids along with NSAIDS increase the chances of gastric ulcers.

DANGEROUS DRUG INTERACTIONS

- ❖ Antihistamines and Alcohol - Causes severe drowsiness
- ❖ Bronchodilators and Alcohol - CNS stimulator
- ❖ NSAIDS and Alcohol - exaggerate gastric irritation
- ❖ Grape juice and citrus fruits with Drugs - Causes severe adverse effects

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