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Food -Drug Interaction-A Review

Dr.Sonia Kukreti[1], Shivani Rawat[2] , Ms. Ishita Singh[3] , Sheetal Mamgain[4] , Mr.Chandra Shekhar Sharma

[1]Assistant Professor, College of Paramedical Science's, Graphic Era Deemed University Dehradun Uttarakhand 248002.

[2]Assistant Professor, Department of Medical Laboratory Technology, Dev Bhoomi Uttarakhand University Dehradun Uttarakhand 248007

[3]Assistant Professor, Department of Applied Medical Sciences, Quantum University Roorkee Uttarakhand 247167.

[4]Assistant Professor, Department of Medical Microbiology PARAAJ Institute of Medical Sciences Pauri Garhwal Uttarakhand 246174.

[5]Assistant Professor, Department of Medical Laboratory Technology, Combined Institute of Medical Science and Research 248001.

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KEYWORDS

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ABSTRACT:

Introduction: A drug's effect on a person may differ from what is expected because it interacts with another drug the person is taking (drug-drug interaction), food, beverages, dietary supplements the person is consuming (drug-nutrient/food interaction), or another disease the person has. A drug interaction occurs when a substance influences the activity of a drug, resulting in enhanced or decreased effects or the creation of a new effect that neither causes on its own. These interactions may occur as a result of inadvertent abuse or a lack of information about the active chemicals contained in the relevant substances. Changes in pharmaceutical, pharmacokinetic, or pharmacodynamic qualities might cause clinically significant medication interactions with the potential to damage the patient. Some may be used to the benefit of patients; however, the majority of drug interactions result in adverse drug effects. As a result, it is recommended that patients follow their physician's instructions in order to reap the greatest benefits with the fewest food-drug interactions. This review provides information on the varied interactions between different foods and pharmaceuticals, assisting physicians and pharmacists in prescribing drugs with just appropriate food supplements to maximize patient benefit.

Introduction

Medicines are used to cure, treat, and prevent a wide range of medical disorders; however, all medications should be used with caution to guarantee their safety and efficacy. Medicaments should be carefully prepared so that their effects are the same for all types of patients, are unaffected by concurrent food or other medications with linear potency, are completely non-toxic in whatever dosage form, and require only a single dose to effect a long-term cure [1].

Many medicines contain potent chemicals that interact with the human body in various ways. Diet and lifestyle choices can have a substantial impact on drug use. A drug interaction occurs when a substance influences the activity of a drug, resulting in enhanced or decreased effects or the creation of a new effect that neither causes on its own. Typically, drug interactions come to mind. Drug-food interactions and drug-herb interactions, on the other hand, are also possible. Many medications are available that contain strong compounds that bind to drugs found in the human body in a unique way. Diet and lifestyle may also have a significant impact on medication effectiveness. A medicine interaction is a situation in which an interaction effects the activity of a drug, i.e., the efficacy of the medication might be enhanced or decreased, or they can develop a new impact that neither can perceive before. However, interactions between pharmaceuticals and foods, as well as drugs and plants, have been observed. Food and medicine interactions may unintentionally reduce or improve the effectiveness of prescriptions. Some commonly used vegetables, fruits, and alcohol may cause the impact to fail, resulting in major health problems for the patient. The majority of clinically important food-drug interactions occur from food-induced variations in medication bioavailability [2]. Bioavailability is a critical pharmacokinetic characteristic that is associated with the clinical efficacy of most medicines. However, in order to assess the clinical significance of a food-drug interaction, the impact of food consumption on the drug's clinical effect must also be assessed. Bioavailability is a critical pharmacokinetic characteristic that is associated with the

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clinical efficacy of most medicines. However, in order to assess the clinical significance of a food-drug interaction, the impact of food consumption on the drug's clinical effect must also be assessed [3]. Drug interactions can affect a drug's pharmacokinetics and/or pharmacodynamics. Drug pharmacodynamic interactions can be additive, synergistic, or antagonistic. Drug interactions (DIs) are a significant and widely underestimated source of pharmaceutical mistakes [4]. The concurrent use of multiple medications with a vast surface area on which the drug components can be slicked or bound. Changes in gastric pH, gastrointestinal motility activity, or problems with protein transportation, such as P-glycoprotein, can all have an impact on drug absorption in the gut. A decrease in the rate of drug absorption may have minimal clinical significance; nevertheless, a decrease in the amount of absorption is clinically beneficial if it results in subtherapeutic serum levels [5].

1. Drug-Food Interaction:

A food-drug interaction is the result of a physical, chemical, or biological relationship between a drug and a food product, or a nutrient found in a botanically derived food or nutritional supplement. Dietary substances' influence on medication effects is determined by a variety of factors, including the drug's physicochemical qualities and host factors such as enzymes and transporters in the gastrointestinal (GI) tract and throughout the body. Drug interactions can have an impact not only on blood levels through pharmacokinetic changes (absorption, distribution, metabolism, and excretion, pharmacokinetic interactions), but also on drug effects [6].

2. Pharmacodynamic Interaction.

Some foods reduce or enhance the effects and toxicity of drugs by interfering with their activities, mechanisms, and pharmacodynamic properties.

Warfarin, an anti-coagulant, inhibits vitamin K1 recycling, resulting in a decrease of active vitamin K1. Green leafy vegetables, also known as "greens," have high levels of vitamin K1, which can help to reverse depletion. Similarly, renin-angiotensin system inhibitors increase plasma potassium [K+] levels by decreasing aldosterone activity. However, meals high in [K+], such as oranges and bananas, can produce hyperkalaemia, culminating in cardiac arrest and death owing to myocardial arrhythmia. Furthermore, eating tyramine-rich meals (fermented foods like wine and cheese) while taking monoamine oxidase inhibitors (MAOIs) can cause a hypertensive crisis. MAOIs used to treat depression prevent the breakdown of endogenous and dietary amines [7].

3. Pharmacokinetic interactions

Pharmacokinetic interactions produce a rise or decrease in the blood levels of medications, resulting in their effects and toxicities.

Food's physiochemical qualities can alter drug pharmacokinetics by chemically attaching to the drug and turning it into an insoluble salt that is difficult to absorb. Proteins in food, for example, might bind to the antiepileptic drug phenytoin, resulting in diminished phenytoin absorption and perhaps poor seizure management. Some tetracyclines and fluoroquinolones can bind to divalent cation-containing foodstuffs (e.g., calcium in dairy), resulting in reduced medication absorption and possible therapeutic failure [8].

A food-drug interaction is the result of a physical, chemical, or biological relationship between a drug and a food product, or a nutrient found in a botanically derived food or nutritional supplement [9].

4. Physiological and physicochemical mechanisms. Dietary ingredients can influence drug absorption, distribution, metabolism, and/or excretion (ADME) through physiologic and physicochemical pathways. Physiologic/mechanical processes include delayed stomach emptying, stimulated/increased bile or splanchnic blood flow, and changes in GI pH or flora. Some medications (e.g., penicillin's, angiotensin-converting enzyme inhibitors) may be less well absorbed if these processes are altered [10].

5. Inhibition of intestinal biochemical processes. The intestine's clinical significance as a barrier to drug absorption and a location of drug-drug interactions (DDIs) is generally acknowledged. Successful oral drug delivery to the target site is a complicated multifactorial process that requires the identification of elements and mechanisms involved in optimal formulation design, as well as the effects of interactions with the GI environment [11].

6. Antibiotic effect: When taken with food, the absorption of azithromycin diminishes, resulting in a 43% drop in bioavailability [12].

7. Theophylline Effect: Consuming high-fat foods while taking sustained-release theophylline can cause dose dumping, which occurs when a large amount of medicine is suddenly released. This can result in elevated theophylline levels, increasing the risk of poisoning. Children and kids are more vulnerable to these types of medication interactions than adults [13].

8. Analgesics and Antipyretics

Acetaminophen co-administration with pectin causes a delay in absorption and ostensions such as ibuprofen, naproxen, ketoprofen, and others can cause stomach irritation and should therefore be taken with food or milk [14]. Chronic alcohol use can increase the risk of liver damage or stomach bleeding, so avoid or limit your use. When ibuprofen and oxycodone were combined in a tablet, their absorption was influenced by the presence of meals[15].

The Cmax and AUC0-alpha of ibuprofen increased considerably following single and several doses of Coca-Cola, showing that ibuprofen was absorbed more thoroughly. When administering ibuprofen with Coca-Cola, the daily dosage and frequency must be lowered [16].

9. Bronchodilators. Avoid consuming significant amounts of caffeine-containing foods and beverages (e.g.,

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chocolate, colas, coffee, and tea), as theophylline is a xanthine derivative and these items also contain xanthine [17]. Consuming excessive doses of these substances while taking theophylline raises the risk of medication poisoning. Furthermore, both oral bronchodilators and caffeine stimulate the central nervous system. Patients may be advised not to consume GFJ when taking theophylline, because it increases the bioavailability, and monitoring of plasma theophylline levels in patients consuming GFJ may be useful in better management of patient care [18].

10. Antihistamines include fexofenadine, loratadine, rupatadine, cimetidine, and cetirizine. Cimetidine is administered with food to help maintain therapeutic blood concentrations. A portion of cimetidine is absorbed in the presence of food, allowing the remainder to be dissolved once the gut is cleansed. Thus, therapeutic levels are sustained throughout the dosage time [19].

11. Antitubercular drugs. Antitubercular medicines such as isoniazid have been linked to tyramine and histamine interactions. Isoniazid can inhibit monoamine oxidase and histaminase, resulting in substantial drug-food interactions. Food significantly reduces isoniazid bioavailability.66 Oleanolic acid, a triterpenoid found in foods, medicinal herbs, and other plants, exhibits antimycobacterial activity against Mycobacterium TB and works synergistically with isoniazid [20].

12. Antitumor drugs. Mercaptopurine, a purine analogy, is used to treat acute lymphoblastic leukaemia and chronic myelogenous leukaemia. Because mercaptopurine is inactivated by xanthine oxidase (XO), using it concurrently with XO-containing drugs may impair its bioavailability. Cow's milk is reported to have a high concentration of XO. This interaction may be clinically significant. As a result, most patients should strive to time their mercaptopurine doses and milk intake separately [21].

Conclusion

Food and drugs are both essential for good health, but taking both at the same time can bring side effects and risks. Identifying and understanding these interactions is crucial for ensuring safe and effective medication use. In most cases, eating lowers a medicine's bioavailability, but it can also impact medication clearance. Furthermore, medications may have an effect on food intake, digestion, absorption, and excretion. Additional research is needed to better understand these interactions, and chemists play a key role in monitoring and educating patients about potential drug-food interactions. While some interactions can be harmful, others can be advantageous by improving drug absorption or lowering adverse effects. Recently, pharmaceutical interference with grapefruit juice has received a lot of attention. As new drugs are developed, recognizing these interactions remains critical to safe medication use.

Conflict of Interest: The authors are declaring no conflict of interest.

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