

REVIEW ARTICLE

Food-Herbal Interactions: A Comprehensive Review

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ABSTRACT

The increasing use of herbal supplements alongside conventional diets poses potential health risks and benefits due to food-herbal interactions. This review synthesizes current knowledge on the mechanisms, clinical implications, and recommendations for the safe use of herbal supplements in conjunction with various foods globally, with a particular focus on Saudi Arabia. Understanding these interactions is crucial for healthcare providers and patients to ensure the efficacy and safety of both dietary and herbal regimens.

KEYWORDS: Food-herbal interactions, herbal supplements, traditional medicine, Saudi Arabia, pharmacokinetics, pharmacodynamics, drug-herb interactions, dietary supplements.

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INTRODUCTION

The use of herbal supplements and natural products has surged in recent decades, fueled by a growing interest in alternative and complementary medicine worldwide. As the consumption of these supplements becomes more widespread, it is essential to understand their interactions with various foods [1]. These interactions can significantly impact the therapeutic outcomes and safety of both dietary and herbal interventions [2]. This review aims to provide an in-depth analysis of food-herbal interactions, highlighting the underlying mechanisms, clinical implications, and guidelines for safe use. Special attention is given to the context of Saudi Arabia, where traditional herbal medicine is widely practiced and intertwined with the local diet.

MATERIAL AND METHODS

Literature Search Strategy

Databases and Sources

The literature search was meticulously designed to encompass a broad spectrum of high-quality studies on food-herbal interactions, with a particular focus on the context of Saudi Arabia. Multiple authoritative databases were utilized to ensure the inclusion of robust and diverse sources. The databases included:

PubMed: An essential resource for accessing biomedical literature, including clinical studies and research articles pertinent to medicine and health.

IEEE Xplore: A comprehensive digital library providing access to research in engineering, computer science, and health informatics.

Google Scholar: An extensive search engine that indexes scholarly articles, theses, books, and conference papers across various disciplines and formats.

To effectively capture relevant literature, the keywords employed were "food-herbal interactions," "herbal supplements," "Saudi Arabian traditional medicine," "pharmacokinetics," "pharmacodynamics," "drug-herb interactions," and "dietary supplements."

Inclusion Criteria

To ensure the review included high-quality and pertinent studies, strict inclusion and exclusion criteria were applied. The inclusion criteria specified that only studies published within the last five years (2019-2024) were included to ensure the review reflects the latest advancements and trends in the field. Additionally, the studies had to focus on the interactions between food and herbal supplements, encompassing the mechanisms of interaction, clinical implications, and recommendations for safe use. The relevance of the studies was also crucial; they had to be directly related to the context of Saudi Arabia, traditional herbal medicine, or widely used herbal supplements in the region.

Exclusion Criteria

The exclusion criteria were designed to maintain consistency and accuracy in the review. Studies not available in English were excluded, as were papers solely addressing non-interaction aspects of herbal supplements, such as general health benefits or uses without discussing interactions with food. This rigorous approach ensured a focused scope on food-herbal interactions.

RESULTS

Current State of Weight Management Medications

Overview of Common WMMs

Mechanisms of Interaction

Food-herbal interactions can be categorized into pharmacokinetic and pharmacodynamic interactions, each affecting the absorption, metabolism, and overall efficacy of herbal compounds.

Pharmacokinetic Interactions

Pharmacokinetic interactions involve changes in the absorption, distribution, metabolism, or excretion of herbal compounds due to food intake. These interactions can significantly alter the bioavailability and effectiveness of herbal supplements.

Globally, the absorption of certain herbal compounds can be significantly influenced by food. The bioavailability of curcumin, a bioactive compound in turmeric, is notably enhanced when consumed with piperine, a component of black pepper [1]. Similarly, grapefruit juice inhibits cytochrome P450 3A4 (CYP3A4) enzymes, leading to increased plasma levels of various herbal constituents [2]. This interaction can enhance or inhibit the metabolism of these compounds, potentially altering their therapeutic effects [3].

In Saudi Arabia, a study conducted in Al-Kharj found that the most-used herbs among patients with chronic diseases included ginger, mint, and cumin, which are commonly used in local cuisine [4]. These herbs can interact with medications through various pharmacokinetic mechanisms, affecting drug absorption and metabolism. Foods can also impact drug absorption by affecting gastrointestinal conditions such as pH and motility. For instance, dietary fats can enhance the absorption of fat-soluble vitamins and certain herbal constituents by altering the lipid environment in the intestines [5]. Additionally, changes in the activity of transport proteins, such as P-glycoprotein, which actively transports drugs and metabolites across cell membranes, can be modulated by food intake, further influencing the pharmacokinetics of herbal compounds [6].

Pharmacodynamic Interactions

Pharmacodynamic interactions involve additive, synergistic, or antagonistic effects between foods and herbal products, affecting the overall pharmacological action without changing the concentration of the herbal compounds in the body.

Globally, green tea and ginseng both have stimulant properties and, when taken together, can enhance alertness and energy levels due to their combined pharmacodynamic effects [7]. Conversely, certain herbs like St. John's Wort may counteract the effects of anticoagulant foods like garlic and ginger, which can affect blood clotting mechanisms and potentially reduce the efficacy of the herbal treatment [8].

In Saudi Arabia, the concurrent use of herbal and conventional anti-diabetic medications is common, posing significant pharmacodynamic interaction risks. A study revealed that black tea, peppermint, and ginger were frequently used by diabetic patients, often without consulting healthcare providers, increasing the risk of adverse interactions [9]. Some important pharmacodynamic interactions of herbal products with drugs include garlic, cranberry, and red yeast rice, which affect the activity of statins [10]. For instance, garlic has been shown to increase the clotting time and international normalized ratio (INR) of warfarin, cause hypoglycemia when taken with chlorpropamide, and reduce the bioavailability of saquinavir [11].

Clinical Implications

The clinical implications of food-herbal interactions are significant, especially for individuals with chronic conditions or those taking multiple medications.

Patients on anticoagulant therapy need to be cautious about consuming herbs like ginkgo biloba and foods rich in vitamin K, such as leafy greens, which can affect bleeding risk [12]. In Saudi Arabia, healthcare providers should be particularly aware of local dietary habits that may involve these herbs.

Herbs like fenugreek and bitter melon have hypoglycemic effects, which can interact with dietary intake and prescribed antidiabetic medications, potentially leading to hypoglycemia [13]. In Saudi Arabia, a high prevalence of herbal use among diabetic patients has been reported, necessitating better patient education and monitoring [14].

Licorice root, commonly used in herbal teas, can increase blood pressure and counteract the effects of antihypertensive foods like bananas (rich in potassium) [15].

Additional Studies and Findings

Further studies have highlighted additional interactions and their implications. St. John's Wort significantly reduces plasma concentrations of drugs such as cyclosporine, tacrolimus, and warfarin, potentially leading to treatment failures [16]. Ginkgo biloba has been reported to cause spontaneous bleeding, especially when taken with anticoagulants and antiplatelet agents [17]. Garlic can interact with anticoagulants, increasing the risk of bleeding, and with chlorpropamide, potentially causing hypoglycemia [18]. Ginseng may decrease the effectiveness of warfarin and induce mania when taken with phenelzine [19]. Grapefruit juice affects the bioavailability of numerous drugs, leading to significant clinical implications [20].

Cultural Context in Saudi Arabia

Saudi Arabian culture has a rich tradition of using herbal remedies, often integrated with local cuisine. This cultural context adds an additional layer of complexity to understanding food-herbal interactions. Traditional herbs like black cumin (*Nigella sativa*), fenugreek, and saffron are commonly used both as food ingredients and medicinal remedies [21].

Black cumin (*Nigella sativa*) is widely used in Saudi cuisine and traditional medicine. It has been studied for its potential interactions with antihypertensive and antidiabetic medications [22]. Fenugreek, another commonly consumed herb in Saudi Arabia, is reputed for its benefits on blood sugar control. However, it can interact with insulin and other hypoglycemic agents [23]. Saffron is used both as a spice and a medicinal herb. Its bioactive compounds may interact with antidepressants and blood pressure medications, adding another layer of consideration for those using these substances concurrently [24].

Dietary Patterns and Herbal Use

Saudi dietary patterns, characterized by a high intake of dates, dairy products, and spices, can influence the pharmacokinetics and pharmacodynamics of herbal supplements. For instance, dates are rich in natural sugars and can affect the metabolism of hypoglycemic herbs [25-31].

Recommendations for Safe Use

To mitigate the risks associated with food-herbal interactions, several recommendations can be made. First, individuals should discuss their use of herbal supplements with healthcare providers to assess potential interactions with their diet and medications. Second, healthcare professionals

should educate patients about common food-herbal interactions and encourage them to monitor for adverse effects. Third, the development of standardized guidelines for the concurrent use of foods and herbal supplements can help minimize interaction risks. Lastly, ongoing research and post-marketing surveillance of herbal products are essential to identify and understand new interactions.

CONCLUSION

Food-herbal interactions represent a complex and clinically significant area of study. Understanding the mechanisms behind these interactions, their clinical implications, and adopting preventive strategies are crucial for the safe use of herbal supplements. As the popularity of herbal products continues to rise, further research is needed to provide comprehensive guidelines and ensure patient safety, particularly in regions like Saudi Arabia, where traditional herbal medicine is widely practiced.

INFORMED CONSENT

Not Applicable

ETHICAL CONSIDERATION

Not Applicable

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AUTHOR CONTRIBUTIONS

All the authors contributed evenly with regards to data collecting, analysis, drafting and proofreading the final draft.

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CONFLICT OF INTEREST

There are no conflicts of interest.

DATA AND MATERIALS AVAILABILITY

All data associated with this study are present in the paper.

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