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Review Article

Dentistry

Phytoextracts in Dentistry from Prevention to Therapy - A Review

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Dental diseases are major public health problems and are the most common cause of tooth loss in adults. However, every disease is preventable if diagnosed at the earliest and there are many ways for prevention of dental diseases like use of drugs, invasive and noninvasive techniques. The field of dentistry also has begun to exploit herbs as one of the cost-effective ways of prevention.

Phytomedicine may be defined as a medicine derived from plants in their original state and standardized for use in a dosage regimen. Some of the commonly available herbs are clove oil, green tea, turmeric, aloe-Vera, Triphala, neem, peppermint and oregano which exhibit excellent biological properties like- Antimicrobial agents, Anti-inflammatory agents, antioxidant and sedative. Plant extracts have the potential to act as prophylactic or therapeutic agents for soft tissue and hard tissue conditions. This review article explores the application of phytoextracts for dental disease prevention and emphasizes their integration within the framework of Evidence-Based Dentistry (EBD). Through a comprehensive literature search conducted on the PubMed database, this review synthesizes findings from various studies on phytoextracts, highlighting their potential in primary prevention methods in dentistry. It underscores the importance of EBD in validating the efficacy and safety of phytoextracts, ensuring that clinical practices are grounded in robust scientific evidence. This bird's eye view of the current literature reveals a significant need for more rigorous and detailed research to fully harness the benefits of phytoextracts in dental care.

Keywords: Phytomedicine, Herbal extracts, Dentistry, Evidence Based Dentistry

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Introduction

Phytomedicine can be defined as the herbal medicine with therapeutic and healing properties. Since the beginning of human society, it has existed. Dating back to approximately 3000 BC, the Sheng Nongs Herbal Book is regarded as one of the earliest collections of traditional folk knowledge in China pertaining to the usage of herbs. It includes information on about 365 different types of plants, animals, and minerals that are used in medicine. There are around 420,000 different species of plants on Earth, but little is known about them and their many applications.**[1]** Herbal preparations and products find extensive use in three main fields: food (foodstuffs), medicine (traditional and folk remedies), and research (phytochemical analysis). Currently, exploration and application of phyto-medicine in dentistry have resumed due to increased interest in natural and holistic approaches to healthcare. They are used for both prevention and treatment of several oral health issues like canker sores, gum inflammation, and tooth decay due to their various effect like anti-inflammatory, anticariogenic, antiseptics, antibacterial, anti-microbial, anti-fungal, antioxidant, antiviral, and analgesic Additionally, they promote sustainability in healthcare practices because they are more environmentally friendly and have least side effect. Despite these benefits, integration of phytomedicine into traditional dentistry faces several challenges like efficacy, interactions, variations in the quantities of bioactive ingredients, and standardization of plant extracts. The goal of this review is to present a thorough summary of current uses of phytomedicine in dentistry. It summarizes research results on preventative, analgesic, antibacterial, and anti-inflammatory properties of substances derived from plants in treatment of oral health. The review also addresses future prospects and possible obstacles for this field of study. This review aims to encourage additional research and use of natural substances in dentistry by showcasing therapeutic potential of phytomedicine. This will ultimately lead to development of safer and more efficient oral healthcare solutions.

Methodology

A comprehensive literature search was conducted to gather relevant studies on the application of phytomedicine in dentistry.

PubMed database were used and the search terms used included "phytomedicine," "dentistry," "herbal medicine," "oral health," "natural compounds" The search strategy involved combining these keywords using Boolean operators (AND, OR) to ensure a thorough and comprehensive search. The search was limited to articles published in English which was available as free full article and only meta-analysis and systematic review were considered within the last 10 years (from 2014 to 2024) to capture the most recent advancements in the field.

Results

Resurgence of Phytomedicine use in Dentistry

As new, mostly viral diseases emerge that are resistant to conventional antibiotics, mainstream medicine is becoming more and more open to the use of antimicrobials and other medications derived from plants. The quick extinction of (plant) species has been another factor in the past 20 years that has sparked interest in plant antimicrobials.**[2]** Natural-products chemists and microbiologists sometimes believe that a large number of potentially valuable phytochemical structures that may be chemically synthesized could be lost forever.**[3]** Finally, the human immunodeficiency virus (HIV) has prompted extensive research on plant derivatives that may be useful, particularly for usage in developing and underdeveloped countries with limited access to pricy western medications.

Classification of Phytochemicals

Useful antimicrobial phytochemicals can be divided into several classes**[4]**

Table 1: Classification of phytoextracts

Category	Properties
Simple Phenols & Phenolic Acids	Phenolic ring with substitutions.
Quinones	Aromatic rings with two ketone substitutions
Flavones, Flavonoids & Flavonols	Phenolic compounds with one carbonyl group (flavones); addition of a 3-hydroxyl group produces flavonols. Flavonoids have an aromatic ring attached to C6–C3 unit.
Tannins & Coumarins	Phenolic substances; tannins are polymeric, while coumarins consist of fused benzene and pyrone rings
Terpenoids/Essential Oils	High concentration of molecules with isoprene structure. Terpenoids are terpenes with additional components, typically oxygen.
Alkaloids	Heterocyclic nitrogen compounds.
Lectins/Antimicrobial Peptides	Often positively charged and contain disulphide bridges.

Plant-Derived Substances in Oral Care Products

Nowadays, there is interest in using natural antibacterial compounds as effective antimicrobials in a variety of oral health care products. To improve their antibacterial qualities, extracts from plants such as miswak, tea tree oil, peppermint, green tea, and manuka honey have lately been added to these kinds of goods. Table 2 describes various herbal products which are commonly used in dentistry for prevention and therapy

Table 2: Various herbal products commonly used in dentistry for prevention and therapy

Herbal Product	Source	Dental Use	Mode of Action
Aloe Vera	Aloe barbadensis	Treatment of oral ulcers, gingivitis, periodontitis	Anti-inflammatory, antibacterial, promotes wound healing[5]
Neem	Azadirachta indica	Antiplaque agent, treatment of gingivitis	Antibacterial, antifungal, anti-inflammatory[6]
Green Tea	Camellia sinensis	Prevention of dental caries, periodontal disease	Antioxidant, anti-inflammatory, inhibits bacterial growth[7,8]
Clove Oil	Syzygium aromaticum	Relief of dental pain, treatment of dry socket	Analgesic, antiseptic, anti-inflammatory[8]
Licorice Root	Glycyrrhiza glabra	Prevention of caries, gingivitis	Antimicrobial, anti-inflammatory
Turmeric	Curcuma longa	Treatment of periodontitis, oral cancer prevention	Anti-inflammatory, antioxidant, antimicrobial[10]
Tea Tree Oil	Melaleuca alternifolia	Treatment of gingivitis, bad breath	Antimicrobial, anti-inflammatory[11]
Peppermint	Mentha piperita	Relief of toothache, freshening breath	Analgesic, antiseptic, mild antibacterial[12]
Myrrh	Commiphora myrrha	Treatment of mouth ulcers, gingivitis	Antimicrobial, astringent, anti-inflammatory[13]
Sage	Salvia officinalis	Treatment of gingivitis, sore throat	Antibacterial, antifungal, anti-inflammatory[14]
Cranberry	Vaccinium macrocarpon	Prevention of plaque formation, periodontal disease	Inhibits bacterial adhesion to teeth and gums[15]
Ginger	Zingiber officinale	Treatment of dental pain, inflammation	Anti-inflammatory, antioxidant, antimicrobial[16]
Propolis	Bee resin	Treatment of oral ulcers, periodontitis	Antimicrobial, anti-inflammatory, promotes healing[17]
Eucalyptus	Eucalyptus globulus	Relief of dental pain, treatment of ging	Antimicrobial, Antibacterial[8]
Honey	Apis mellifera	Wound healing, treatment of oral ulcers, burns	Antibacterial, anti-inflammatory, promotes tissue regeneration[18]
Chewing Stick	Salvadora persica (Miswak)	Mechanical plaque control, gingivitis prevention	Antibacterial, antifungal, antioxidant, mechanical cleaning action[19,20,21]
Triphala	Emblica officinalis, Terminalia chebula, Terminalia bellirica	Treatment of gingivitis, prevention of dental caries	Antibacterial, antioxidant, anti-inflammatory[22-24]

Side Effects and Safety Issues Related to Phytomedicines Used in Dentistry

Table 3: Side Effects of Some Phytomedicines

Phytomedicine	Side Effect
Green tea	Restlessness, irritability, sleeping problems, tremor, heart palpitations, loss of appetite, upset stomach, nausea, frequent urination, and skin rash.
Curcuma longa	Nausea and diarrhoea. When applied to the skin, turmeric can cause irritation and allergic contact dermatitis reactions.
Azadirachta indica	Dermatitis
Aloe vera	Allergic contact dermatitis, oral mucositis

Table 4: Toxicities of Some Phytomedicines

Phytomedicine	Toxicities
Jin bu huan poisoning	Bradycardia
Ginkgo Bilbo	Epileptic seizures
Melaleuca alternifolia (Myrtaceae)	Ataxia, unresponsiveness, drowsiness, hypersensitivity reactions and allergic contact dermatitis

The majority of the research discussed above evaluated the effectiveness of goods made from plant-derived ingredients.

However, it's also important to consider the items' safety and any drawbacks. Several investigations have found some side effects, including lung toxicities, dermatitis, hypersensitivity, and cardiovascular toxicities. It is advised to use caution when utilizing phytomedicines due to the potential for negative interactions between their formulations and conventional pharmaceuticals. Additional clinical research is also necessary. Table 2 and 3shows the adverse effects and toxicities of few Phytomedicines.**[25]**

Conclusion

Worldwide, the use of plant-based medicine is rapidly expanding. Nowadays, a large number of people in many national health care systems use phytomedicines for their medical needs. There is strong evidence that plant extracts, essential oils, and purified phytochemicals have the potential to be employed in different forms as therapeutic or preventative therapies for oral disorders, as shown by the examples in this study.

Although the number of clinical trials for these products is encouraging, more research on the effectiveness and side effects of these agents is necessary to determine their therapeutic benefits, either on their own or in conjunction with traditional therapies, which can help to lower the overall burden of oral diseases globally. As a result, these might be regarded as miracle plants that help alleviate human suffering.

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