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Nutraceuticals and Oral Health: A Review

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Abstract: Maintaining good oral health is crucial for general well-being and life satisfaction. The mouth is a window into the body's health, and oral as well as systemic health are significantly influenced by diet. A balanced diet combines the beneficial effects of several nutraceuticals, which may offer protective effects against certain inflammatory and chronic degenerative diseases. Nutraceuticals offer several possible clinical, preventative, and therapeutic benefits. They are mostly found in products produced from plants. The information that is now available indicates that plant extracts are more beneficial for oral health than individual elements since they contain a variety of phytochemicals with a variety of pharmacological targets as well as additive and synergistic effects. Furthermore, dietary guidelines for dental health ought to be customised and consistent with sound advice for general well-being.

Keywords: Dietary supplements, Oral health, Vitamins, Pharmacological, Nutraceuticals, Phytochemicals

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Introduction

Nutraceuticals are foods or dietary ingredients that have health or medical benefits, such as the ability to prevent or treat disease. Stephen De Felice first used the term "nutraceutical" in 1989 to describe any item that may be regarded as food or a component of food that has health or medicinal benefits, including the prevention and treatment of disease (Brower, 1998). As they do not have adverse effects and are natural dietary supplements, nutraceuticals have advantages over

medications. Nutraceuticals are classified into four main categories: nutrients, herbals, dietary supplements, dietary fibre, etc., based on their natural source and chemical grouping. Nutraceuticals, a portmanteau of "nutrition" and "pharmaceuticals," refer to products that provide health benefits beyond basic nutrition (Trottier *et al.*, 2010). Let food be your medicine," advised Greek physician Hippocrates, who is regarded as the founder of medicine. The "focus on

prevention" tenet underlies this. Additional terms that are used in this context include multi-functional food, dietary supplements, and functional food. Functional foods are regular foods that have been enhanced with special medical or therapeutic benefits in addition to their nutritional value (Kalra, 1999). The term is commonly associated with foods and supplements.

Nutraceuticals are food products (as dietary supplements or fortified foods) that have positive effects on health. It can also be relevant to dentistry. Nutraceuticals in dentistry typically involve the use of certain nutrients and bioactive compounds to promote oral health, health management and preventive care. These bioactive compounds, often derived from natural sources, offer a unique amalgamation of nutritional and therapeutic benefits. One of the key functions of nutraceuticals in dentistry is their ability to support optimal gum health. Periodontal diseases, such as gingivitis and periodontitis, are prevalent oral health issues that can lead to tooth loss if left untreated. Nutraceuticals containing antioxidants like vitamin C and coenzyme Q10 possess anti-inflammatory properties, aiding in the reduction of gum inflammation and promoting tissue repair. Additionally, they support collagen synthesis, which is crucial for maintaining the structural integrity of the gums (Fageeh *et al.*, 2021).

Calcium and vitamin D, commonly found in nutraceuticals, are essential for maintaining strong teeth and bones (Nastri *et al.*, 2020). These elements play a fundamental role in preventing tooth decay and osteoporosis, conditions that can compromise oral health. Nutraceutical supplementation becomes particularly significant in regions with insufficient exposure to sunlight, where vitamin D synthesis is limited, as it ensures the adequate mineralization of teeth (Javed *et al.*, 2016).

Probiotics, another category of nutraceuticals, contribute to oral health by fostering a balanced microbial environment in the mouth. The oral microbiome plays a crucial role in preventing the overgrowth of harmful bacteria that can lead to

cavities and other dental issues. Probiotics, often found in yogurt or supplements, promote the growth of beneficial bacteria, helping to maintain a healthy microbial balance and mitigate the risk of dental caries (Pietri *et al.*, 2020).

The role of nutraceuticals in dentistry extends beyond mere supplementation, encompassing a holistic approach to oral health. These bioactive compounds offer a spectrum of benefits, ranging from supporting gum health and preventing tooth decay to contributing to the management of TMJ disorders. The field of dentistry continues to evolve, nutraceuticals stand as promising allies in the pursuit of comprehensive oral well-being (Tables 1, 2).

Global demand of nutraceuticals

Three basic categories comprise the nutraceutical sectors segments which include functional foods, dietary supplements, and herbal/natural products (Das *et al.*, 2012). Global nutraceutical market is estimated as USD 117 billion (INR 5148 billion) (Rishi, 2006). In 2007, nutraceuticals sale was projected to reach \$74.7 billion at an AAGR of 9.9%. This assumes a world economic recovery in 2003 and an end to price competition. A recent analysis claims that the Indian market as a whole for nutraceuticals is expanding at a rate of 21% annually. It is currently valued at INR 44 billion (€621 million), but in four years it can be worth INR 95 billion.

In India, the idea of "nutraceuticals" is still relatively new. However, during the last three years, it has grown at a CAGR of 18%, substantially higher than the global average, driven by the functional food and beverage categories. Natural/herbal goods (11.6 per cent year) and dietary supplements (19.5% annually) were the two industries with the fastest growth rates (FICCI, 2007)

Government Regulations – Nutrition Labelling and Education Act of 1990 (NLEA)

The FDA created guidelines for nutrition labelling, and the Nutrition Labelling and Education Act of 1990 (NLEA) allows claims to be made concerning

Table 1: Essential Nutraceuticals for good Oral Health

Nutrient	Function in Oral Health	Sources
Calcium	Supports tooth structure and jaw bone health	Dairy products, leafy greens, almonds
Vitamin D	Facilitates calcium absorption for tooth strength	Fatty fish, fortified dairy, sunlight
Vitamin C	Promotes gum health and collagen production	Citrus fruits, strawberries, bell peppers
Vitamin A	Maintains mucous membranes and supports healing	Sweet potatoes, carrots, spinach
Vitamin K	Assists in blood clotting for gum health	Leafy greens, broccoli, Brussels sprouts
Phosphorus	Works with calcium for tooth structure	Meat, dairy, nuts, whole grains
Magnesium	Aids in enamel formation and bone health	Nuts, seeds, whole grains, leafy greens
Fluoride	Strengthens tooth enamel and prevents decay	Fluoridated water, tea, seafood
Potassium	Supports bone density and helps neutralize acids	Bananas, oranges, potatoes, tomatoes
Omega-3 fatty acids	Reduce inflammation and support gum health	Fatty fish (salmon, mackerel), flaxseeds
Iron	Helps prevent tongue inflammation and sores	Red meat, poultry, lentils, spinach

Table 2: Essential herbal Nutraceuticals for good Oral Health

Herbal Nutraceutical	Potential Benefits for Oral Health	Recommended Form	Usage Instructions
Green Tea Extract	Antioxidant properties, may reduce inflammation and inhibit bacteria	Capsules, Extract, or Green Tea	Follow recommended dosage on the product label.
Echinacea	Immune-boosting and anti-inflammatory properties	Capsules, Extract, or Echinacea Tea	Follow recommended dosage; avoid long-term use.
Chamomile	Anti-inflammatory and soothing properties	Chamomile Tea or Chamomile-infused Mouthwash	Use as a mouthwash or drink chamomile tea regularly.
Turmeric	Anti-inflammatory and antioxidant properties	Capsules or Turmeric-based Toothpaste	Follow recommended dosage; may stain teeth.
Myrrh	Anti-inflammatory and antimicrobial properties	Myrrh Oil, Tincture, or Myrrh-based Toothpaste	Use as directed; avoid if pregnant or breastfeeding.
Propolis	Antimicrobial and anti-inflammatory properties	Tincture, Capsules, or Propolis-based Toothpaste	Follow recommended dosage on the product label.
Licorice Root	Anti-inflammatory and antimicrobial properties	Capsules, Powder, or Licorice Tea	Use as directed; consult a healthcare professional if pregnant.
Neem	Antimicrobial and anti-inflammatory properties	Neem Oil, Powder, or Neem-based Toothpaste	Use as directed; avoid excessive use due to potency.
Cranberry Extract	May help prevent bacteria from adhering to teeth and gums	Capsules or Unsweetened Juice	Follow recommended dosage; limit juice due to sugar content.
Aloe Vera	Anti-inflammatory, may promote healing of gum tissue	Gel, Juice, or Capsules	Use aloe vera gel as a mouthwash or apply it to gums.

the connection between certain nutrients and certain diseases or health conditions

Benefits of Regulation

1. Permits a more predictable atmosphere and increased level of legal security.
2. Supports innovation (food and drink products).
3. If positive claims cannot be made, the regulation does not oblige anyone to make negative claims about the product

Role of Nutraceuticals in Dental Treatment

The root cause of gum disease lies in poor nutritional support due to an overall weakened immune system. Hence, there is a greater need to meet the nutritional requirement of the oral cavity when recovering from dental treatment. One of the primary contributions of nutraceuticals in dental treatment lies in their ability to promote overall oral health. Essential vitamins and minerals, such as vitamin D, calcium, and phosphorus, are crucial for maintaining the structural integrity of teeth and supporting bone health. Nutraceuticals containing these components can aid in preventing conditions like osteoporosis, which can affect the jawbone and compromise dental health. Additionally, antioxidants like vitamin C and E found in certain nutraceuticals help combat oxidative stress, reducing inflammation and contributing to gum health.

The management of periodontal diseases, a prevalent dental concern, has also seen notable advancements with the incorporation of nutraceuticals. Polyphenols, found in green tea and cranberries, exhibit anti-inflammatory and antimicrobial properties, contributing to the prevention of gum disease. Moreover, omega-3 fatty acids, commonly found in fish oil supplements, have demonstrated anti-inflammatory effects, potentially mitigating the severity of periodontitis. Integrating these nutraceuticals into treatment plans can enhance traditional periodontal therapies, offering a

multifaceted approach to address the complex nature of these diseases.

In the realm of restorative dentistry, nutraceuticals have shown promise in supporting the maintenance of dental implants. Substances like bioactive peptides and collagen, often found in bone broth supplements, play a crucial role in promoting bone regeneration and osseointegration around dental implants. This not only improves the longevity of the implant but also accelerates the healing process, showcasing the potential of nutraceuticals in optimizing the outcomes of restorative dental procedures.

Conclusion

Nutraceuticals, a fusion of "nutrition" and "pharmaceuticals," have emerged as a promising adjunct in dental treatment, revolutionizing oral healthcare. These bioactive compounds, found in food or formulated as supplements, play a pivotal role in preventing and managing various dental conditions. The integration of nutraceuticals into dental practice signifies a paradigm shift towards a holistic approach, recognizing the intricate connection between nutrition and oral health.

Furthermore, nutraceuticals contribute significantly to the prevention of dental caries, a widespread oral health issue. Xylitol, a natural sweetener found in certain nutraceuticals, disrupts the growth of harmful bacteria in the mouth, reducing the risk of cavities. Probiotics, another category of nutraceuticals, promote a healthy balance of oral microbiota, creating an environment that hinders the proliferation of cavity-causing bacteria. These preventive measures, when combined with traditional oral hygiene practices, offer a comprehensive approach to cavity prevention and maintenance of optimal oral health.

The role of nutraceuticals in dental treatment extends beyond mere supplementation, evolving into a fundamental component of holistic oral healthcare. From preventing periodontal diseases to supporting bone health and aiding in the longevity of dental implants, nutraceuticals have

diversified applications in dentistry. As oral healthcare continues to advance, the integration of nutraceuticals into treatment protocols not only addresses existing dental issues but also paves the way for a proactive approach to oral health, emphasizing the inseparable link between nutrition and a healthy smile. Dentists and patients alike stand to benefit from this synergistic integration of traditional dental practices and the therapeutic potential of nutraceuticals

Ethical Statement

This is a review article hence no Ethical Approval needed.

Author Contributions

Each author has contributed equally to the study's planning, writing, and editing. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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