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Efficacy Of Herbal Mouthwashes In Plaque-Induced Gingivitis And Periodontitis – An Overview

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Abstract

The importance of maintaining oral and dental hygiene has been acknowledged since ancient civilizations and continues to hold great significance in the 21st century. Mouthwashes play a significant role in maintaining propermoral hygiene. Among the various mouthwashes, herbal mouthwashes have gained notable attention as natural alternatives to conventional chemical-based formulations for promoting oral health.[1-3]

These natural mouthwashes are primarily derived from medicinal plants such as Aloe vera, Camellia sinensis (green tea), Curcuma longa (turmeric), Azadirachta indica (neem), Propolis, pomegranate, guava, tulsi, cranberry, grapefruit, clove oil, eucalyptus oil, ginger, and through oil pulling techniques. These ingredients possess antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties.[4-6]

Herbal mouthwashes are generally associated with fewer side effects such as tooth staining, taste alteration, and mucosal irritation compared to chemical-based formulations.[7] Numerous clinical studies have demonstrated their effectiveness in reducing dental plaque, gingival inflammation, halitosis, and cariogenic bacteria.[8-11]

This review aims to highlight various natural substances that can serve as effective components of herbal mouthwashes for maintaining optimal oral hygiene.

Introduction

The ancient Egyptians are credited with producing some of the earliest artistic depictions highlighting the importance of beauty and personal hygiene, as they believed that an unclean body symbolized impurity. Pedanius Dioscorides, a Greek physician and surgeon (40–90 AD) whose writings served as a cornerstone of ancient medical knowledge, recommended a mouthwash for treating bad breath. His formulation included a decoction made from olive leaves, milk, pickled olive juice, gum myrrh with wine and oil, pomegranate peels, nutgalls, and vinegar.[1,2]

Similarly, the ancient Romans placed great emphasis on oral hygiene, incorporating teeth cleaning into their religious rituals. It was common practice for slaves to clean their masters' teeth. Interestingly, Roman mouthwashes contained a unique ingredient—human urine—which they believed had powerful cleansing properties. Urine imported from Portugal was especially prized for its supposed superior potency. Remarkably, urine remained a common component in toothpaste and mouthwash formulations until the 18th century, owing to the cleaning action of ammonia.[3,5]

In modern dentistry, maintaining oral hygiene relies on both mechanical and chemical control of dental plaque. Mouthwash, a water-based topical preparation, functions through rinsing and gargling to manage various oral conditions such as halitosis, gingivitis, periodontitis, oral malodor, and plaque accumulation. Although brushing and flossing serve as the primary preventive methods, mouthwashes are frequently recommended as adjunctive aids.

While chemical mouthwashes are effective, their potential side effects have led to growing interest in natural and safer alternatives. Herbal formulations, derived from plants such as Azadirachta indica (Neem), Curcuma longa (Turmeric), Camellia sinensis (Green Tea), and Salvadora persica (Miswak), have gained prominence due to their bioactive compounds and minimal adverse effects.

Mechanisms of action of herbal mouthwashes:

1. Antimicrobial activity – Disrupt bacterial cell walls and inhibit essential enzyme functions.

2. Anti-inflammatory effects – Suppress pro-inflammatory cytokines and reduce oxidative stress.

3. Antioxidant properties – Neutralize free radicals contributing to periodontal tissue damage.

4. Plaque control – Prevent bacterial adhesion and inhibit biofilm formation.[6,7]

Overall, the evolution from ancient practices to modern herbal formulations underscores humanity's enduring pursuit of effective and natural methods to maintain oral health and hygiene.[8]

USE OF NEEM (AZADIRACHTA INDICA, A. INDICA) AS A MOUTHWASH

The earliest recorded use of neem (Azadirachta indica) dates back over 4,500 years to the Harappan civilization of ancient India. The history of the neem tree is deeply intertwined with the cultural and traditional practices of Indian life. Even today, neem extracts are widely utilized for their therapeutic and medicinal benefits—as treatments for various skin ailments, antiseptic agents, and natural remedies against both internal and external parasites. Neem is also commonly employed as a herbal mouthwash.[9] Beyond its medicinal value, neem functions as an effective non-toxic repellent, insecticide, and pesticide.

Scientific studies have shown that extracts from neem sticks and bark inhibit the growth of Streptococcus mutans by preventing bacterial aggregation, adhesion to hydroxyapatite surfaces, and production of insoluble glucans, which collectively contribute to the reduction of dental plaque formation in vitro.[9] Neem stick extracts also reduce the ability of certain streptococcal species to colonize tooth surfaces.

In dentistry, Azadirachta indica has demonstrated promising efficacy in managing periodontal diseases. The primary active compound, azadirachtin, disrupts microbial cell membranes, thereby exerting antibacterial and analgesic effects that help relieve odontogenic pain.

Neem possesses a wide spectrum of therapeutic properties, including analgesic, anti-inflammatory, antibacterial, antimicrobial, and anti-gingivitis actions. Its key phytoconstituents—azadirachtin, nimbidin, and quercetin—inhibit the growth of major oral pathogens such as Streptococcus mutans, Porphyromonas gingivalis, and Lactobacillus acidophilus. Neem also suppresses the production of prostaglandins and cytokines, thereby reducing gingival inflammation.

Additionally, neem extracts exhibit antifungal activity against Candida albicans, helping prevent oral thrush. The presence of tannins and flavonoids in neem contributes to its astringent properties, promoting gum tightening and faster healing of oral ulcers. By interfering with bacterial glucosyltransferase enzyme activity, neem reduces plaque matrix formation, limits acid production, and thus helps prevent dental caries.[9]

USE OF TULSI (OCIMUM SANCTUM) AS A MOUTH WASH

Tulsi (Ocimum sanctum) is a small aromatic sub-shrub with diverse therapeutic applications, highly revered in Ayurveda for its extensive medicinal properties. The principal bioactive component of tulsi is eugenol, which inhibits the COX-2 enzyme and prevents the conversion of arachidonic acid to prostaglandin H_2, thereby providing relief from toothache, throat pain, and inflammation.[10]

Tulsi leaves are particularly effective in treating oral ulcers and mouth infections. Chewing a few fresh leaves can help alleviate these conditions. When the leaves are sun-dried and powdered, they can be used as a natural tooth-cleaning agent. Mixing this powder with mustard oil to form a paste serves as an excellent herbal toothpaste, beneficial for maintaining oral hygiene, preventing bad breath, and massaging the gums. It is also effective in managing pyorrhea and other periodontal disorders.[13]

Tulsi contains several active phytochemicals, including eugenol, ursolic acid, carvacrol, and linalool, which exhibit strong bactericidal and fungicidal properties. Additionally, rosmarinic acid in tulsi inhibits cyclooxygenase (COX) and lipoxygenase (LOX) pathways, reducing the synthesis of prostaglandins and leukotrienes, thereby lowering gingival inflammation.The essential oils and eugenol in tulsi also prevent bacterial adhesion to tooth enamel, inhibit biofilm

formation, and reduce plaque accumulation, effectively controlling the progression of dental caries. Moreover, tulsi promotes collagen synthesis and angiogenesis, enhancing the healing of oral ulcers and supporting overall periodontal health.[10,13]

USE OF GREEN TEA (CAMELLIA SINENSIS) AS A MOUTHWASH

Green tea can be effectively used as a gargle or mouthwash to manage various oral conditions, including dental decay, halitosis, laryngitis, mouth ulcers, plaque formation, sore throat, oral thrush, and tonsillitis. The development and assessment of green tea mouthwash as a safe, natural, and non-toxic alternative—particularly suitable for children and pregnant women—have shown promising results.[6,1]

Clinical studies indicate that green tea mouthwash significantly reduces plaque accumulation while avoiding the common side effects associated with chemical-based formulations.[6] Green tea is rich in polyphenols, especially epigallocatechin gallate (EGCG), which exhibits potent antimicrobial and anti-inflammatory effects. These compounds inhibit the growth of Streptococcus mutans and Porphyromonas gingivalis, key bacteria responsible for dental caries and periodontal disease. EGCG also suppresses the production of pro-inflammatory mediators, thereby helping to reduce gingival inflammation.

By inhibiting the glucosyltransferase enzyme, green tea reduces bacterial adhesion, biofilm formation, and acid production, contributing to effective

plaque control. Furthermore, it neutralizes volatile sulfur compounds produced by anaerobic bacteria—the primary cause of bad breath. The natural fluoride content in green tea also aids in enamel remineralization, enhancing tooth strength and resistance to acid attacks.[6]

USE OF EUCALYPTUS OIL AS A MOUTHWASH :

Eucalyptus oil, obtained by distilling the fresh leaves of Eucalyptus globulus (family Myrtaceae), contains at least 65% cineole (1,8-cineole) as its main active component. Traditionally used as an antiseptic, expectorant, and counter-irritant, it is also a common ingredient in liniments, ointments, and inhalations for respiratory relief.[1]

In dentistry, eucalyptus oil helps combat gingivitis, plaque, and tooth decay, while also freshening breath and soothing gingival discomfort. The compound eucalyptol inhibits the cyclooxygenase pathway, reducing prostaglandin synthesis, gingival inflammation, and bleeding gums. With strong antibacterial, antifungal, and antioxidant properties, eucalyptus oil protects oral tissues from oxidative stress, promotes wound healing, and neutralizes sulfur compounds responsible for halitosis.[15]

USE OF CLOVE OIL AS A MOUTHWASH :

Clove consists of the dried flower buds of Eugenia caryophyllus (family Myrtaceae) and contains at least 15% clove oil. It is widely used as a dental analgesic, antiseptic, carminative, and flavoring agent.[14]

The main active compound, eugenol, inhibits prostaglandin synthesis by suppressing cyclooxygenase enzymes, thereby reducing gingival` inflammation and soothing oral tissues.[14,5] Eugenol also acts as a local anesthetic by blocking voltage-gated sodium channels, and possesses antifungal and antioxidant properties. By scavenging free radicals, it protects oral tissues from oxidative damage, promotes healing, and neutralizes sulfur compounds, helping to prevent bad breath.[3]

USE OF TURMERIC AS A MOUTHWASH :

Turmeric (Curcuma longa), commonly known as "Indian Saffron," has long been valued in traditional medicine and is now gaining recognition in modern dentistry. It exhibits strong antioxidant, anti-inflammatory, antimicrobial, and wound-healing properties.[7]

Its active compound, curcumin, disrupts bacterial membranes, inhibits bacterial enzymes, and is effective against Streptococcus mutans and Porphyromonas gingivalis, reducing plaque formation and periodontal infections. Curcumin also blocks cyclooxygenase and lipoxygenase pathways, lowering prostaglandin and leukotriene production, thereby decreasing gingival inflammation.[7,13]

By scavenging free radicals, turmeric protects periodontal tissues from oxidative damage. It also enhances fibroblast activity and collagen formation, promoting oral wound healing. Additionally, it inhibits bacterial

glucosyltransferase, reducing acid production and dental caries. Turmeric is also used as a natural colorant in dental materials such as plaque detectors and sealants.

USE OF OIL PULLING THERAPY :

Oil pulling, an ancient Indian practice, involves swishing about a tablespoon of sesame, sunflower, or coconut oil in the mouth for 15–20 minutes on an empty stomach, then spitting it out.[15] This process mixes oil with saliva, creating an emulsifying, detergent-like effect that helps remove plaque and surface stains.

The lauric acid and other fatty acids in these oils have antimicrobial and anti-inflammatory properties, disrupting bacterial cell membranes and preventing their adhesion to teeth and gums. This reduces plaque, gingival inflammation, and caries risk. Additionally, natural antioxidants such as sesamin, sesamol, and vitamin E help neutralize free radicals and lower oxidative stress in the oral cavity.[15]

CONCLUSION :

Herbal mouthwashes offer a natural, safe, and effective alternative to conventional chemical formulations for managing plaque-induced gingivitis and periodontitis. Various studies have confirmed that plant-based ingredients such as Neem, Tulsi, Green Tea, Turmeric, Clove, and Eucalyptus possess potent antimicrobial, anti-inflammatory, antioxidant, and healing properties that help reduce plaque buildup, gingival bleeding, and inflammation.[1-3]

Compared to chemical mouthwashes, herbal preparations are generally non-toxic, biocompatible, and free from side effects like tooth staining or taste alteration, making them suitable for prolonged use. Their bioactive compounds not only suppress harmful oral bacteria but also promote tissue repair and overall oral health.[5-6]

In conclusion, herbal mouthwashes can serve as effective adjuncts to routine mechanical plaque control, providing a holistic and sustainable approach to periodontal care. Nonetheless, further standardized clinical research is essential to determine their ideal formulations, concentrations, and long-term effectiveness.[3]

REFERENCE :

1. Pradeep AR, Agarwal E, Naik SB, Bajaj P, Kalra N. Clinical and microbiological effects of commercially available herbal mouthwash on plaque and gingivitis: A randomized controlled clinical trial. J Indian Soc Periodontol. 2016;20(5):488–493.

2. Balappanavar AY, Sardana V, Singh M. Comparison of the effectiveness of herbal and chlorhexidine mouthrinses on dental plaque and gingivitis: A randomized controlled clinical trial. J Indian Assoc Public Health Dent. 2013;11(3):357–363.

3. Anuradha BR, Katta S, Bhavana SM, Reddy MR, Suhasini GP. The efficacy of herbal mouthwashes in the treatment of gingivitis: A systematic review. J Clin Diagn Res. 2017;11(7):ZE01–ZE07.

4. Mali AM, Behal R, Gilda SS. Comparative evaluation of 0.2% chlorhexidine, herbal mouthwash, and probiotics on plaque and gingival inflammation: A randomized clinical trial. J Indian Soc Periodontol. 2012;16(4):484–488.

5. Gupta D, Gupta RK, Aggarwal S, Kaur A. Efficacy of herbal mouthwashes compared to chlorhexidine in gingivitis management: A systematic review and meta-analysis. J Ayurveda Integr Med. 2021;12(4):657–663.

6. Sharma S, Saimbi CS, Koirala B, Shukla R. Efficacy of green tea-based mouthwash in controlling dental plaque and gingivitis: A randomized clinical study. J Indian Soc Periodontol. 2016;20(5):496–499.

7. Hegde RJ, Shetty S, Salian S, et al. The effectiveness of turmeric mouthwash in the management of plaque and gingivitis: A clinical study. J Indian Soc Periodontol. 2013;17(3):327–331.

8. Sastravaha G, Gassmann G, Sangtherapitikul P, Grimm WD. Adjunctive periodontal treatment with Centella asiatica and Punica granatum extracts: A randomized controlled clinical trial. J Int Acad Periodontol. 2005;7(3):70–79.

9. Prashant GM, Chandu GN, Murulikrishna KS, Shafiulla MD. The effect of neem extract on plaque and gingivitis: A clinical study. J Indian Soc Periodontol. 2007;11(1):15–18.

10. Bhateja S, Arora G. The role of tulsi (Ocimum sanctum) in oral health – A review. Int J Ayurveda Pharma Res. 2015;3(8):1–3.

11. Chatterjee A, Saluja M, Singh N, Kandwal A. To evaluate the antigingivitis and antipalque effect of an Azadirachta indica (neem) mouthrinse on plaque-induced gingivitis: A double-blind, randomized, controlled trial. J Indian Soc Periodontol. 2011;15(4):398–401.

12. Amruthesh S. Dentistry and Ayurveda – IV: Classification and management of common oral diseases. Indian J Dent Res. 2011;22(5):713–721.

13. Mehta FS, Asnani PJ, Bhat M, Satyamoorthy K, Manjunath K. Comparative evaluation of 0.2% chlorhexidine, 0.1% turmeric, and 0.1% green tea mouthwashes on plaque and gingivitis: A randomized clinical trial. J Indian Soc Periodontol. 2018;22(5):408–412.

14. Varghese J, Thomas B, Patil A. Efficacy of clove oil mouthwash on plaque, gingivitis, and salivary bacterial count: A randomized controlled trial. J Indian Soc Periodontol. 2020;24(3):224–230.

15. Nagappan N, John J. Antimicrobial efficacy of herbal and chlorhexidine mouthrinses against Streptococcus mutans: An in vitro study. Indian J Dent Res. 2012;23(4):480–483.

16. Asokan S, Emmadi P, Chamundeswari R. Effect of oil pulling on plaque-induced gingivitis: A randomized, controlled, triple-blind study. Indian J Dent Res. 2009;20(1):47–51.