

Emerging role of herbs as adjunct in dentistry

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ABSTRACT

The use of herbal medicinal products and supplements has increased tremendously over the past three decades with not less than 80% of people worldwide relying on them for some part of primary healthcare. Herbal extracts have been successfully used in dentistry as tooth cleaning and antimicrobial plaque agents. The use of herbal medicines continues to expand rapidly across the world. Many people take herbal medicines or herbal products now for their health care in different national healthcare settings. Herbal extracts have been used in dentistry for reducing inflammation, as antimicrobial plaque agents, for preventing release of histamine and as antiseptics, antioxidants, antimicrobials, antifungals, antibacterials, antivirals and analgesics. They also aid in healing and are effective in controlling microbial plaque in gingivitis and periodontitis, thereby improving immunity. This article discusses uses along with toxic effects of herbs being used in dentistry

INTRODUCTION

Oral diseases like dental caries and periodontal diseases continue to be a major health problem globally. In India, the prevalence of dental caries was reported to be 50-60% and periodontal diseases affecting more than 50% of the community. Oral health significantly affects the quality of life and general well-being. The link between oral diseases and the activities of oral microbial species that form part of the microbiota of the oral cavity is well established. All oral hygiene methods are aimed at reducing the pathogenic oral microflora.

Many techniques and products are designed to achieve improved oral health i.e., toothbrushes, rinses, floss and dentifrices. Herbs are one of remedial agents which God has created for afflicted humans. Herbal extracts have been used in traditional medicine for several thousand years, based on different medicinal systems such as Ayurveda, Unani and Siddha.

According to the World Health Organization (WHO), as many as 80% of the world's people depend on traditional medicine (herbal) for their primary healthcare needs. The medical system is truly Indian in origin and is developed in terms of "Ayurveda" which combines the Sanskrit word "Ayur" (life) and "Veda" (Science of knowledge). The purpose of Ayurvedic Medicines was to coordinate and maintain the body, mind, and spirit.

With the rise in bacterial resistance to various synthetic antimicrobial agents, there is a considerable interest and a growing trend in the field of phytotherapeutics. Phytotherapy is the medicinal use of plant extracts. In this quest many natural products such as garlic extract, cinnamon oil, thyme oil, tea tree oil, Aloe vera etc., have shown anti microbial properties. Herbal medicines and preparations comprise of plant constituents professed to have therapeutic benefits. Herbal products are favored over conventional drugs owing to extensive natural activity, advanced safety margin, and inferior costs.

Although some herbal medicines have promising potential and are widely used, many of them remain untested and their use also not monitored. This makes knowledge of their potential adverse effects very limited and identification of the safest and most effective therapies as well as the promotion of their rational use more difficult (WHO, 2002b). Discussion in this review is about herbal use in dentistry and its related toxicity.

Aloe vera – is a clear gel contains aloins and aloe emodin as main constituents. Has potent antibacterial, antifungal and antiviral properties.

Mechanism of action - inhibit protein synthesis in bacterial cells. It has inhibitory effects on streptococcus pyogenes and e faecalis due to anthraquinone and bactericidal against pseudomonas aeruginosa.

Uses- in aphthous ulcers, lichen planus, alveolar osteitis, site of periodontal surgery, gingivitis and periodontitis, denture pts with ill fitting dentures, control inflammation around dental implants, as cavity disinfectant.

With antiplatelet properties-

aloe was also found to interact with the general anesthetic, sevoflurane, and cause abnormal bleeding during surgery so if used it should be avoided at least for 2 weeks before surgery.

Another cause for concern is its potential to increase bleeding if antiplatelet analgesic drugs, such as aspirin and nonsteroidal anti-inflammatory drugs (NSAIDs) are used simultaneously; these drugs are commonly used in dental practice.

Green tea- has polyphenols, flavonoids and catechins.

Mechanism of action - polyphenol possess antioxidant, anti-inflammatory, probiotic and antimicrobial properties.

Uses- used as antiplaque agent to prevent biofilm formation. Has fluoride for its anticariogenic activity.

Interfere with blood clotting

In relation to blood clotting, green tea has been reported to contain some vitamin K as well as antiplatelet polyphenols. Due to the presence of vitamin K, it is implicated in counteracting the effects anticoagulant drugs, such as warfarin, under certain conditions. Supporting this assertion, in a 44-year-old man on warfarin, a relatively high dose of green tea was found to reduce the INR from 3.79 to 1.37. The antiplatelet polyphenols in green tea, particularly catechin, have been reported to reduce or stop blood clot formation as a result of inhibition of arachidonic acid formation and thus TXA₂ generation in platelets. It is advisable to be vigilant when patients on green tea supplement receive treatment with blood-thinning drugs (e.g., nonopioid analgesics) and/or undergo invasive procedures.

Garlic- has alliin, ajoens, and other sulphur containing essential oils.

Mechanism of action - alliin is converted to active ingredient allicin when garlic bulb is crushed. It has inhibitory effect upon the key enzyme involved in cholesterol synthesis. Garlic helps to prevent lipid implantation on the arterial wall. Allicin destroys cell wall and cell membrane of root canal bacteria.

Uses- hypocholesterolemic, used as irrigant alternative to NaOCl, prevention of age related cardiovascular disorders, lowers elevated blood pressure.

With antiplatelet properties

Alliin inhibit the production and/or release of chemical mediators such as platelet activating factor, adenosine, ADP and thromboxanes. Some of the compounds also act as antioxidants and cause reduction of mobilization of intracellular calcium. The mechanisms for the above effects have been suggested to include inhibition/blockade of COX and fibrinogen receptors on platelet membranes by some garlic compounds. Overall, these effects are implicated to be associated with inhibition of platelet aggregation and enhancement of bleeding by different garlic preparations. In a study involving an elderly man, the development of a spontaneous spinal epidural hematoma and postoperative bleeding were observed after ingestion of a large dose of garlic product. In a male patient who underwent transurethral resection of the prostate, hemorrhage was detected for a period of 4 h after surgery due to the use of garlic tablets. So, garlic augments is implicated to have the antiplatelet and anticoagulant activities of aspirin/NSAIDs and other blood-thinning medications, particularly warfarin in association with increased risk of bleeding.

Ginger- has zingiberene, bisabolene, shogal and gingerols.

Mechanism of action- inhibit arachidonic acid metabolism via the cyclooxygenase and lipoxygenase pathways.

Uses – anti-inflammatory can be used in pulpitis, prevent nausea, vomiting, cardiovascular disease, bronchitis, hyperlipidemia, diabetes.

With antiplatelet properties

extracts/oil, tablets, capsules and tea bags. The volatile oil of ginger is composed of zingiberene, bisabolene, shogaol, and gingerols, which all have been reported to inhibit platelet aggregation through inhibition of thromboxane A₂ (TXA₂) synthesis. Consistent with this, it was shown in one study that a relatively high dose of ginger inhibited platelet aggregation.

in patients with coronary artery disease. Ginger has been shown to increase bleeding in patients on warfarin/turmeric – has flavonoid curcumin and various volatile oils, including tumerone, atlantone and zingiberone.

Turmeric

Mechanism of action – the volatile oils have antispasmodic and antibacterial actions, while curcumin produces anti-inflammatory and antiplatelet effects. Curcumin in surfactant preparations showed its potential as a photosensitizer in antibacterial photodynamic therapy.

Uses – it has antimicrobial efficacy against *E. faecalis* and can be used in endodontics for root canal failures. It possesses antioxidant, analgesic, anti-inflammatory, antifungal, antiseptic and anticarcinogenic activity.

With antiplatelet properties

It is demonstrated that the antiplatelet effect of curcumin/turmeric is due to inhibition of arachidonic acid metabolism and TXA₂ synthesis. However, there are no reports regarding the effect of the compound on blood clotting/bleeding. Similarly, there are neither experimental nor clinical data indicating interactions between turmeric and antiplatelet drugs, such as aspirin and other NSAIDs. The risk for abnormal bleeding cannot, however, be ruled out with the use of turmeric, especially in the presence of blood-thinning drugs under certain circumstances, such as increased susceptibility of consumers and the use of large doses. Assuming these possibilities, caution needs to be applied when curcumin or turmeric is used either alone or in combination with antiplatelet medications.

Chamomile – contain 1-2% volatile oils, flavonoids, apigenin, luteolin, quercetin

Mechanism of action – it is taken three to four times daily between meals as a tea. Common alternatives are to use 2-3 g of the herbs in tablet or capsule form or 4-6 ml of tincture three times per day between meals. One to two capsules containing 300-400 mg may be taken three times daily. Topical creams or ointments can be applied to the affected area 3-4 times daily.

Uses – used as mouthwash in periodontal disease, antispasmodic and a sedative.

With anticoagulant properties

Despite the presence of coumarins, the effect of chamomile per se on the coagulation process has not been investigated. Thus, the effect of the herb alone on hemostasis (acting as anticoagulant or antiplatelet) is not clear. However, until more definite information is available, it is advisable to be vigilant of its potential effect on blood clotting.

Red clover – is one of the top 15 herbal supplements reported to be used by adult dental patients. Red clover contains several volatile oils (e.g., benzyl alcohol, methyl salicylate, and methyl anthranilate), isoflavonoids, cyanogenic glycosides, and coumarins.

Mechanism of action - As a dietary supplement, tablets, capsules, tea bags, and liquid extracts of the herb are available.

Uses - It has been widely claimed to alleviate the symptoms of menopause and to treat skin conditions and respiratory problems, among other conditions.

With anticoagulant action - Because of the presence of coumarins, red clover has been hypothesized to increase the risk of bleeding and potentiate the effects of other blood-thinners. Despite this uncertainty, however, it is advisable to be watchful when using this herbal supplement for any reason.

Propolis - active constituents in propolis are flavonoids, phenolics, and aromatics.

Mechanism of action - The anti-inflammatory property of propolis is due to the presence of caffeic acid and phenethyl ester in propolis. The antimicrobial activity of propolis with Ca (OH)₂ as intracanal medicament against *E. faecalis* found that propolis was effective in eliminating the microorganisms.

Uses

It exhibits various biologic activities, including antimicrobial, anti-inflammatory, antioxidant, anesthetic and cytotoxic properties. In dental practice it is used as a pulp capping agent, intracanal irrigant, mouth rinse, cariostatic agent, treatment of periodontitis and denture stomatitis, candidiasis, aphthous ulcers, pulpitis, acute necrotizing ulcerative gingivitis. Study showed less pain, less incidence of postoperative complications and less swelling in the honey treated wounds after surgical removal of impacted third molars than in the untreated control group. It has been reported in another study that natural honey showed antibacterial action against anaerobic bacteroides present in dental abscess and osteomyelitis. Furthermore, honey potentiated the antitumor activity of chemotherapeutic drugs such as 5-fluorouracil and

cyclophosphamide. Studies suggested that chewing “honey leather” can reduce inflammation of the gingiva. Candy made with honey may be useful for prevention of halitosis. It was found that the minimum inhibitory concentrations of honey for *Streptococcus mitis*, *Streptococcus sobrinus* and *Lactobacillus casei* were 7%, 7.5-8.5%, and 8-12%, respectively. The production of acid by these bacteria was also inhibited. Direct pulp capping with propolis in rats may delay dental pulp inflammation and stimulate reparative dentin. Another study conducted on premolars for direct pulp capping also showed that propolis is equally efficacious as calcium hydroxide.

Neem– contains nimbidin, nimbin, nimbolide, azadirachtin, gallic acid, epicatechin, catechin, margolone.

Mechanism of action- neem dental care products are neem leaf or bark extract. Neem leaf is rich in antioxidants and helps to boost the immune response in gum and tissues of the mouth.

Uses- it is used for curing mouth ulcers, tooth decay and acts as pain reliever in toothache problems.

Antibacterial activity – ethanolic extract of neem leaves and bark exhibited antibacterial activity. Dried chewing sticks of neem showed maximum antibacterial activity against *S. mutans*, compared to other dental caries causing organisms *S. salivarius*, *S. mitis* and *S. sanguis*.

Anti candidal activity- ethanolic and aqueous extract of neem leaf showed anti candidal effect against *C. albicans*.

Anti cariogenic activity- a combination of neem and mango showed antimicrobial activity against *S. mutans*, *S. salivarius*, *S. sanguis* and *S. Mitis*. Chloroform extract of neem leaf inhibit *S. mutans* and *S. salivarius* and provides an aid for treating dental caries. Acetone extract from the bark of neem is bactericidal against *S. sobrinus* indicates anti- cariogenic activity. Anti plaque activity- aqueous extract of neem stick and gallotannin enriched extract from *melaphischinensis* inhibited insoluble glucan synthesis and result in bacterial aggregation. It reduces ability of streptococcus to colonize tooth surfaces. Ethanolic leaf extract of neem shows significant antibacterial activity against acidogenic oral bacteria causing dental plaque in fixed orthodontic appliances patients.

Tulsi

Mechanism of action- acts as a COX-2 inhibitor hence have significant effect on toothache, periodontal disorders, candidiasis, lichen planus, leukoplakia and oral submucous fibrosis, pemphigus, aphthous ulcerations.

Triphala – consists of three medicinal herbs in equal parts, namely, *terminalia bellirica*, *terminalia chebula* and *emblica officinalis*. It contains tannins, quinones, flavonoids, gallic acid, vit c.

Mechanism of action and uses- effectively inhibits biofilm formation it has free radical scavenging property and antimicrobial activity. It has a better antioxidant activity, antiplaque activity as it protect gum cells from free radicals.

Liquorice- is a dried, peeled or unpeeled, roots, rhizome or stolon of *glycyrrhiza glabra*

It contains saponin, flavonoids, iso- flavonoids, chalcones, coumarins, aurones, phenols, pterocarpens

Mechanism of action – liquorice and dental caries – it inhibits glucosyltransferase activity of *mutans streptococci*. it has anti adhesive property it inhibit or reduce acid production and stimulate salivary flow, increases buffering capacity, increases pH. Uses used in gingivitis, aphthous ulcers, anti inflammatory, candidiasis, oral cancer (it is inhibitor of tumor angiogenesis, induces apoptic cell death.

Contraindications- in patient taking anticoagulant medications, do not take liquorice during renal problems. it can store water in body thus causing congestive heart failure

Miswak – is a chewing stick used by many people of different cultures, used as dentifrices as antiplaque and antigingivitis agent.

Pomegranate- contains hydrolysable tannins and polyphenols specifically gallic acid.

Uses it has bactericidal, antifungal, antiviral, immune modulation, stimulant, refrigerant, astringent, stomachic, styptic, laxative, diuretic and antihelminthic, anti gingivitis (as flavonoids possess direct antioxidant properties), aphthous ulcers. It has ability to scavenge free radicals and decrease macrophage oxidative stress and lipid peroxidation.

Toxicity

Peppermint	Burning and gitupset . do not apply on face
Garlic	Burning sensation in git, nausea, diaphoresis, lightheaded, excess consumption causes dermatitis, morbid spontaneous spinal epidural hematoma
Aontine containing herbs(aconitum species- aconitum carmichaeli, aconitumkusnezoffii)	Cardiovascular toxicity Ventricular tachycardia, ventricular fibrillation, bradycardia, hypotension
Liquorice	Water and salt retention, hypokalaemia, hypertension, cardiac dysfunction, disturbances in cortisol level, anticoagulant and antiplatelet effect
Ginkgo biloba	Headache, dizziness, restlessness, nausea, vomiting, diarrhoea, dermal sensitivity increases Carcinogenic effect in liver, thyroid, nasal cavity, hypertension, insomnia, agitation, mastalgia and vaginal bleeding is observed at recommended level
Ginseng	

REFERENCES

- [1]. Chandrashekar Janakiram1, Ramanarayanan Venkitachalam, Paul Fontelo, Timothy Iafolla and Bruce A. Dye. Effectiveness of herbal oral care products in reducing dental plaque gingivitis – a systematic review and meta-analysis. Janakiram et al. BMC Complementary Medicine and Therapies.2020; 20:43:1-12.
- [2]. Worku Abebe. Review of herbal medications with the potential to cause bleeding: dental implications, and risk prediction and prevention avenues. European Association for Predictive, Preventive and Personalised Medicine (EPMA) 2019; 10:51–64.
- [3]. Fahsai Kantawong, Supawatchara Singhatong, Aomjai Srilamay, Kantarose Boonyuen, Nirroot Mooti. Properties of macerated herbal oil. BioImpacts: 2017, 7(1), 13-23
- [4]. Adele Boyd, Chris Bleakley, Deirdre A Hurley, Chris Gill, Mary Hannon-Fletcher, Pamela Bell, Suzanne McDonough. Herbal medicinal products or preparations for neuropathic pain. The Cochrane Collaboration.2020(1);1-39.
- [5]. P. P. S. Ossei, A. Appiah-Kubi, F. Ankobea-Kokroe, G. Owusu-Asubonteng, W. G. Ayibor, O. K. Aninkora, J. Taylor et al. The Culture of Herbal Preparations Among Pregnant Women: A Remedy or a Suicide Potion? A Case Report and Mini Review. Hindawi;2020:1-6.
- [6]. Zaira F. Kharaeva , Magomet Sh. Mustafaev , Anzor V. Khazhmetov , Ismail H. Gazeaev ,Larisa Z. Blieva , Lukas Steiner , Wolfgang Mayer , Chiara De Luca and Liudmila G. Korkina. Anti-Bacterial and Anti-Inflammatory Effects of Toothpaste with Swiss Medicinal Herbs towards Patients Suffering from Gingivitis and Initial Stage of Periodontitis: From Clinical Efficacy to Mechanisms. Dent. J; 2020; 8(10):1-20.
- [7]. Martins Ekor. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. frontiers in pharmacology;2014:4(9):1-10.
- [8]. Jijo Mon, Sharath Asokan, Pollachi RG Priya, Thoppe DY Kumar, Mythili G Balasubramaniam. Effect of Herbal Water, Ozonated Water, Water, and Chlorhexidine Mouth rinses on Oral Health Status of Children: A Randomized Controlled Trial. International Journal of Clinical Pediatric Dentistry;2019: 12(6):514-19.
- [9]. Marzena Wyganowska-Swiatkowska , Michal Nohawica , Katarzyna Grocholewicz and Gerard Nowak. Influence of Herbal Medicines on HMGB1 Release,SARS-CoV-2 Viral Attachment, Acute Respiratory Failure, and Sepsis. A Literature Review. Int. J. Mol. Sci.;2020:21(4639):1-20.
- [10]. Cindy Cruz Mar ineza, Martha Diaz Gomez and Myung Sook. Oh Use of traditional herbal medicine as an alternative in dental treatment in Mexican dentistry: a review. PHARMACEUTICAL BIOLOGY; 2017:55(1):1992–1998.
- [11]. Gunjan Kumar, Md. Jalaluddin, Purnendu Rout, Rajat Mohanty, C.L. Dileep. Emerging Trends of Herbal Care in Dentistry. Journal of Clinical and Diagnostic Research; 2013 :7(8): 1827-1829
- [12]. S. Sabiha Shaheen, Padma Reddy, Hemalatha, Srikanth Reddy, Dolar Doshi, Suhas Kulkarni et al. Antimicrobial Efficacy of Ten Commercially Available Herbal Dentifrices against Specific Oral Microflora – In Vitro Study. Journal of Clinical and Diagnostic Research;2015 :9(4): 42-46.
- [13]. Sunayana Manipal, Sajjidhussain, Umesh Wadgave, Prabu Duraiswamy, K. Ravi. The Mouthwash War - Chlorhexidine vs. Herbal Mouth Rinses: A Meta-Analysis. Journal of Clinical and Diagnostic Research;2016 :10(5): 81-83

- [14]. Gauravpatri, alivasahu. Role of Herbal Agents - Tea Tree Oil and Aloe vera as Cavity Disinfectant Adjuncts in Minimally Invasive Dentistry An In vivo Comparative Study. Journal of Clinical and Diagnostic Research; 2017;11(7):5-9.
- [15]. Roopali Gupta, Navin Anand Ingle, Navpreet Kaur, Pramod Yadav, Ekta Ingle, Zohara Charania. Ayurveda in Dentistry: A Review. Journal of International Oral Health ;2015; 7(8):141-143
- [16]. Hossam Abdelatty Eid Abdelmagyda, Dr. Shishir Ram Shetty, Dr. Manea Musa Musleh Al-Ahmarid. Herbal medicine as adjunct in periodontal therapies- A review of clinical trials in past decade. Journal of Oral Biology and Craniofacial Research; 9 (2019): 212–217
- [17]. Evaluation of antimicrobial activity and efficacy of herbal oils and extract in disinfection of guttapercha cones before obturation. Chetana S. Makade, Pratima R. Shenoi, Elakshi Morey, Ameya V. Paralika. Restor Dent Endod; 2017; 42(4):264-272
- [18]. Dakshita J. Sinha, Ashish A. Sinha. Natural medicaments in dentistry; 2014: 35(2) ;113-8.