

**Review Article****THE MAGIC OF AYURVEDA IN DENTISTRY: A REVIEW****Shriya Khera¹, Sunita Gupta^{2*}**¹Senior Research Associate, ^{2*}Head of the Department, Maulana Azad Institute of Dental Sciences, New Delhi, India.**ABSTRACT**

Ayurveda is about 3000 years old and is increasingly becoming popular. It is a holistic treatment modality which has been successfully used to cure various oral and systemic diseases. The role of Ayurveda and its beneficial effects have also been extensively seen in the maintenance of oral health. Numerous Ayurvedic herbs have been listed in different manuscripts along with their beneficial effects. The present review focuses on various Ayurvedic herbs used in dentistry with their promising effects on oral cavity i.e., strengthening the gingival and periodontal health, preventing tooth decay, eliminating halitosis and in management of various oral mucosal lesions. The numerous beneficial effects of these phytochemicals have been listed in detail. However, many of these Ayurvedic herbs are still under study and their beneficial roles are yet to be stated.

KEYWORDS: Dentistry, *Gandusha*, Ayurvedic herbs, *Tulsi*, *Triphala*, *Pomegranate*, *Neem*, *Miswak*.

INTRODUCTION

The prevalence of oral diseases is major problem worldwide. [1] Therefore treatment strategies should be aimed at finding a path of treatment which is safe, derived from mother earth, practical and economical. Other treatment modalities such as using antibiotics, chemotherapeutics and opportunistic infections leads to side effects like, vomiting, diarrhoea, staining of tooth, candidiasis. [2, 3]

Ayurveda is a holistic ethnic medical care system evolved in India 3000-5000 year ago. Ayurveda is a treatment option in which the medicine is derived from medicinal plants which has various antibacterial properties against various microorganisms and help in healing. [4-11] The earliest literature on the practice of Indian system of medicine appeared during the Vedic period in India. The *Sushruta samhita* and *Charak samhita* are its earliest authoritative text. [12] The traditional system advocates predominantly life style approach to good health and disease prevention.

When treating a disease, herbal mineral preparations are added to the latter approach after assessing an individual's constitution traits called as *Prakriti* in Ayurveda. [13] With the passage of time, Ayurvedic practitioners developed large numbers of medicinal preparations and surgical procedures for the treatment of various ailments and diseases. Dentistry was included in the *Shalya-chikitsa* section of Ayurveda. [14] Varieties of Ayurvedic and herbal preparation such as chewing sticks, herbal brushes

(*Babool*, *Miswak*, *Neem* and *Mango*), *Tulsi*, *Triphala*, *Neem*, *Amla*, *Pomegranate*, *Licorice*, *Aloe vera* and *Ajwain* are used for various oral hygiene procedures as well as for treatment of various gum and oral diseases. [15]

The article is aimed to review the different Ayurvedic practices and herbs used that are beneficial for the maintenance of oral cavity.

Oil Pulling (*Gandusha*)

It is utmost important to maintain the basic patient care and for this, preventive dentistry remains the foundation of oral health care. Oil pulling or oil swishing is an ancient natural healing practice originated in India and has been described as *Kavalagraha* or *Gandhoosha* in the Ayurvedic texts of *Charaka Samhita* and *Sushruta Samhita*. [16] Oil pulling or oil swishing is a procedure that involves swishing oil in the mouth for oral and systemic benefits. It is the act of simply holding or swishing comfortable quantity (10ml) of oil in the mouth for 10-20 min before breakfast on an empty stomach and spitting it out without swallowing.

The oil is 'pulled' and swished in between the teeth. If the procedure is done correctly, the oil which was viscous at the start becomes thin and milky white. Following thorough pulling, the oil is spat out and the oral cavity is cleaned with warm water followed by the act of tooth brushing.

It is believed that the act of swishing oil draws out microbes from various parts of the mouth and detoxifies the toxins. [17-20]

Various oils like avocado, black cumin seed, canola, cedar nut, and olive oil can be used for oil pulling. [21-22] However in India, coconut oil and sesame oil are easily available, inexpensive and have in numerous health benefits. [23] Root of Sesame (*Sesamum indicum*) contains chlorosesamone which has antifungal activity. Also polyunsaturated fatty acids present in sesame oil reduce free radical injury occurring in oral cavity. [24] Coconut oil has lauric acid which has antimicrobial, anti-inflammatory properties and prevents dental caries. [25] Olive oil has 70% monounsaturated fatty acids with oleic acid as predominant constituent. It contains plant phenolic compounds, squalene, phytosterols; vitamin A, E and K- which has an antimicrobial, immunomodulatory and antioxidative effect.

The mechanism of action of oil pulling is forming antioxidants which disrupt the cell wall of the microorganisms and thereby, killing them. The oil leads to attraction of the bacterial cell membranes which causes them to stick and get 'pulled' towards the oil. The oil gets lubricates the entire oral cavity and also limits the aggregation of bacteria and formation of plaque. This leads to better gingival, periodontal health, decrease in dental decay, eliminating bad odour from the oral cavity. [26, 27]

Various studies have shown the beneficial effect of oil pulling showing 20% reduction in bacterial count after sesame oil pulling, equal effectiveness of sesame oil pulling was seen as compared to chlorhexidine mouthwash by Dani N et al, equal effectiveness of oil pulling and chlorhexidine mouthwash in eliminating mal odour was also seen. [28-31]

Tulsi (*Ocimum sanctum* Linn)

Tulsi, commonly known as the Queen of herbs, the legendary 'Incomparable one' of India, is the holiest for healing. This sacred basil, *Tulsi*, is well known for its religious and spiritual sanctity, as well as for its important role in the traditional Ayurvedic and Unani system of holistic health and herbal medicine of the East.

It aids in treating:

- a) Oral infections and maintaining Oral Hygiene.** The antibacterial components like carvacrol, terpinene and caryophyllene help to fight the infections in the oral cavity and maintain a healthy oral environment. [32]
- b) Anticariogenic Property:** Extracts of *Tulsi* have been seen to act against *Streptococcus mutans* which is the causative factor for dental caries. [32]

c) Candidiasis: The antifungal property of *Ocimum sanctum* Linn contains Eugenol and Linalol and it has been concluded that linalol is highly active against *C. albicans* and *C. Tropicalis* which are known to cause Candidiasis. [32]

d) Lichen planus, Pemphigus, Leukoplakia and Oral Submucous Fibrosis: *Ocimum sanctum* Linn has antioxidant and immunomodulating properties that help in the improvement of these diseases. [32]

e) Periodontal Infections: Chewing the leaves of *Tulsi* clears the ulcers and infections in the oral cavity. It prevents from bad breath and maintains the gingival health. The *Tulsi* seed oil has been seen to inhibit *cyclooxygenase* and *lipooxygenase* pathway thereby inhibiting the inflammation of the gingival and periodontal tissues. In a study conducted by Gupta et al, it was found that the effectiveness of *Ocimum sanctum* mouthrinse was equally effective in reducing plaque and gingivitis as Chlorhexidine mouthwash. [33]

Triphala

Triphala comes from combining the Sanskrit words "tri" meaning three, "phala" meaning fruit and "Churha," which means powder. It consists of equal parts of the *Embllica officinalis*, *Terminalia chebula*, and *Terminalia belerica*. It contains tannins which has anti infective property, quinines, flavons, flavanoids and flavanols, garlic acid and Vitamin C that has antioxidant property.

Embllica officinalis (*Amalaki*) contains Vitamin C, Carotene, Nicotinic acid, Riboflavin and tannins possess anti ageing properties. *Terminalia chebula* contains tannins, anthraquinones, and polyphenolic compounds. *Terminalia belerica* contains Gallic acid, tannic acid, and glycosides. *Triphala* is marketed as *Triphala choorna*, *Triphala* tablet.

Uses in Dentistry

- a) Anti-Caries Activity:** The extract of *T. chebula* may be an effective agent in the treatment of carious teeth, owing to its ability to inhibit the growth and accumulation of *S. mutans* on the surface of the tooth. This would prevent the accumulation of acids on the surface of the tooth, and thus the further demineralization and the breakdown of the tooth enamel. [34]
- b) As a Root Canal Irrigant:** The use of *Triphala* as a root canal irrigant has proven to be effective in eliminating *Enterococcus faecalis*, anaerobic cocci which is present in non healing endodontic cases. [35]
- c) As an Anti Collagensae Activity:** *Triphala* has strong inhibitory activity against PMN-type collagenase, especially MMP-9 at a 1500 µg/ml concentration. [36]

d) Anti microbial and anti oxidant effect : It has been shown to inhibit *Streptococcus mutans* at concentrations as low as 50µg/ml. The presence of these active ingredients of phenolic nature may be responsible to scavenge the free radicals.^[37]

e) As a Mouth Rinse: 0.6% *Triphala* mouthwash has shown to have significant anti-caries activity, which is comparable to that of chlorhexidine without possessing disadvantages as staining of teeth and at much less cost although there was no evidence of re-mineralization of tooth structure.^[38]

Pomegranate (*Punica granatum*)

Pomegranates consist of *polyphenols, tannins, ellagic acid* and *anthocyanins* which are considered as powerful antioxidants. The fruits *anthocyanidins* (red pigment) possess antioxidant activity.^[39] Pomegranate contains *tannins, punicalagins, punicalin, strictinin A* and *Granitin B* which inhibits nitric oxide production and suppress inflammatory cytokine expression. It has been seen that pomegranates support oral health, strengthens gums and prevents loosening of teeth.

Studies have shown improved clinical signs of chronic periodontitis with the use of *Punica granatum* extract.^[40,41] Anti bacterial and anti candidal activity was seen in pomegranate seed extract.^[42]

Neem (*Azadirachta indica*)

Neem has been used in Ayurveda, Unani and Homoeopathic medicine and is a wonder tree of modern medicine.^[43] It has been used in many cases of inflammation, infections, fever, skin diseases and dental problems. Neem alters the effect of tumour suppressor genes (*e.g., p53, pTEN*), angiogenesis (*VEGF*), transcription factors (*e.g., NF-κB*) and apoptosis (*e.g., bcl2, bax*).

Nimbidin is a most active isolate from seeds of *A. indica*. *Nimbidin* consists of *Nimbin, nimbinin, nimbolide, nimbidic acid* and *quercitin* which are responsible for its biological activities.^[44]

Dental care products of neem contains *Neem* leaf or bark extract. Leaf of *Neem* is rich in antioxidants.^[45] *Neem, in general* acts as a good remedy for curing mouth ulcers, tooth decay and acts as a pain reliever in toothache problems

Uses in Dentistry

a) Antibacterial Activity- *Neem* has natural antibacterial activity and has antimicrobial effects against *S. mutans* and *S. faecalis*.^[46] Chewing of dried *Neem* sticks has showed antibacterial activity against *S. mutans*.^[47]

b) Anti Candidal Activity- A study conducted by **Kumar and Sidhu**, the aqueous extracts of neem

showed anticandidal activity by affecting the adhesion, cell surface hydrophobicity and biofilm formation that inhibits candidal colonization.^[48]

c) Anti-Plaque Activity- *Neem* stick reduces the ability of streptococci to colonize tooth surfaces.^[49]

d) Inhibiting the Bacterial Load In Orthodontic Patients: A study conducted by Lakshami and Aravind evaluated the anti-plaque activity of the extract against *S. mutans, S. sanguis, and S. mitis* which is found in patients undergoing orthodontic treatment.^[50]

e) Periodontal Health: A study conducted by Bhambal et al,^[51] it was assessed that *neem* mouth rinse was equally effective as chlorhexidine mouthwash in improving periodontal pathogens.

f) Root Canal Irrigant : The antioxidant and antimicrobial properties of *neem*, shows its high effectiveness as a root canal irrigant and as an alternate to using sodium hypochlorite.^[52]

Miswak (*Salvadora persica*)

The conventional meaning of *Miswak* (scientifically known as *Salvadora persica*) is "stick used on teeth and gums to clean them". It consists of fluorides, silica, tannic acid, resins, alkaloids (*salvadorine*), volatile oils (*simgrins*), sulfur, vitamin C, sodium bicarbonate, chlorides, calcium, benzyl isothiocyanate, salicylic acids, sterols, trimethylamine, saponins and flavenoids.

Uses in Dentistry

a) Toothpaste, Mouthwash- A study conducted by **Mustafa et al**, reported a reduction in plaque formation by miswak based mouthwash.^[53]

b) Plaque Reduction- Regular users of miswak have shown decreased gingival bleeding on probing compared with non-miswak users.^[54] Studies showed that miswak users showed decreased plaque retention.^[53,55]

c) Anti Microbial Effect- Studies have shown pronounced anti bacterial effect of miswak on *Porphyromonasgingivalis, Actinobacillusactinomy cetemcomitans, and Haemophilus influenza*.^[56] An effective antifungal and antibacterial activity against *C. albicans* and *Enterococcus faecalis* is also seen with the use of 20% *miswak*.^[57]

Disadvantage: The continuous use of *miswak* toothpaste has been seen to cause local gingival recession in young adults.^[58]

Mango (*Mangifera indica*)

Mangifera indica contains tannins, bitter gum, and resins. Antimicrobial property is seen at a concentration of more than 5%. The presence of tannins and resins has an astringent effect on the

mucous membrane forming a layer over enamel which provides protection against dental caries.

Another study conducted by Prashant et al, the effect of Mango (50%) and neem extract was assessed on different *Streptococcus mutans*, *Streptococcus salivarius*, *Streptococcus mitis*, and *Streptococcus sanguis*. It was concluded that *Neem* extract produced the maximum zone of inhibition on *Streptococcus mutans* at 50% concentration. Even at 5% concentration *Neem* extract showed some inhibition of growth for all the four species of organisms. [59]

Licorice

Liquorice root has an integral part of Chinese medicine and Ayurveda for centuries. Liquorice is a sweet, moist, soothing herb that belongs to the glycyrrhiza species native to Mediterranean countries and Asia. The term *Glycyrrhizais* derived from ancient Greek words; *glycos* which means sweet and *rhiza* which means root. [60]

Uses in Dentistry

- a) **Anti-Caries:** Pterocarpenes namely glycyrrhizol A and glycyrrhizol B along with four known isoflavonoids, 5-O-methylglycyrol, isoglycyrol, 6,8-diisoprenyl-5,7,40-trihydroxyisoflavone and gancaonin G from the roots of *Glycyrrhiza uralensis* have been extracted and these metabolites have an anti caries activity. [61-63]
- b) **Gingivitis:** Raw polysaccharides have shown strong anti adhesive effects against *P.gingivalis*. Licoricidin and Licorisoflavan are present in Chinese liquorice extract and have been found to have an inhibitory effect on the production of volatile sulphur compounds (VSC's) and protease activity of *P.gingivalis* therefore reducing halitosis. [64]
- c) **Apthous Ulceration:** An in vivo study was performed to assess the effects of licorice bioadhesive hydrogel patches in controlling pain and reducing the healing time of recurrent apthous ulcer. It was concluded that it was effective in reducing the pain and inflammatory components of apthous ulcer. [65]
- d) **Anti Cancer Activity:** *Liquorice* has been investigated as a chemotherapeutic agent for its beneficial role in management of oral squamous cell carcinoma. An isolated flavanoid, *Isoliquiritigenin* (ISL), from liquorice is a novel inhibitor of tumor angiogenesis and possesses great therapeutic potential for Adenoid cystic carcinoma and can be a potential cancer chemotherapeutic agent. [66,67]

Honey (Propolis)

Propolis, which is also as bee glue, is a natural nontoxic resinous sticky substance that is produced by honeybees. [68] The term propolis comes from the Greek "pro", in front, "polis" means town or city and relates to the protective properties of the substance. [69]

Uses in Dentistry

- a) **Desensitising Toothpaste:** It has been used to decrease dentinal hypersensitivity and permeability of dentin and occlude dentinal tubules. [70,71]
- b) **Anti Caries:** it has been found to be beneficial in many aspects, including prevention of dental caries. [72]
- c) **Radiation Induced Mucositis:** Reduction of oral mucositis which resulted from chemotherapy. [73]
- d) **Anti Viral Agent:** It delays growth and progression of skin changes in an early stage of infection with Herpes simplex without any cytotoxic effect. [74]
- e) **Recurrent Aphthous Stomatitis:** 500 mg of propolis capsule taken daily significantly reduced outbreaks of RAS ulcers. [75,76]

Green Tea (Epigallocatechin-3-Gallate)

The ingredients of green tea like epicatechin (EC), epigallocatechin (EGC), epigallocatechin gallate (EGCG) and epicatechingallate (ECG) have also been studied for their preventive effects on cancer development and cardiovascular diseases. [77]

Studies have the anti growth effects of *Porphyromonas gingivalis*, *Prevotella intermedia*, and *Prevotella nigrescens* on green catechin intake, thereby promoting gingival health. [78,79] The antioxidants have been shown to have beneficial effects on various inflammatory diseases including periodontal diseases by inhibiting the collagenase activity. [80] Oxidative stress plays an important role in the pathogenesis of periodontal disease as well as many other disorders, and it is believed that antioxidants can defend against inflammatory diseases. [81]

Lodhia et al, [82] concluded that green tea strongly inhibited VSCs production in a saliva-putrefaction system and prevents halitosis.

Clove (Syzygium Aromaticum)

Clove is a rich source of compound like eugenol, eugenol acetate and gallic acid which contains many pharmaceuticals, cosmetic, food and agricultural applications.

Uses in Dentistry

Antioxidant: The United States Department of Agriculture has recently found that clove has the

highest content of polyphenols and antioxidant compounds.^[83]

Antinociceptive: Eugenol is the main compound, that leads to activation of calcium and chloride channels in ganglionar cells. ^[83]According to Hosseini et al, Eugenol depresses the action potential of A and C delta fibres and also inhibits Na⁺ currents in the dorsal nerve root ganglion. ^[84]

Aloe Vera (Aloe Barbadensis)

Aloe vera is the medicinal herb from the family "Asphodelaceae" genus 'Aloe'. Aloe vera has numerous beneficial properties.

Uses In dentistry

a) Antiseptic & Antibiotic Property: Geetha Bhatt et al., have proven that the use of aloe vera gel can be used as subgingival administrator in the treatment of periodontal pockets. ^[85]

b) Anti Viral: It is reported that Aloe vera gel inhibits the growth of candida albicans, which is the most common candida species in the oral cavity. ^[86]Anti microbial effect is seen on *S.viscosus*, *S. mutans*, *S.sanguis* and *C.albicans*. Its constituents like Aloe emodin, aloetic acid, aloin, anthracene, anthranol, barbaloin, chrysophanic acid, ethereal oil, ester of cinnamonic acid, isobarbaloin and resistannol are responsible for its anti microbial action. ^[87,88]

c) Wound Healing & Anti Inflammatory: Poor MR et al., has shown decrease in the incidence of alveolar osteitis in patients who received an aloe vera gel post extraction. ^[89]

d) Autoimmune Diseases: Sanchez N et al concluded that aloe vera gel has shown successful outcome in patients with oral lichen planus. ^[90]

Ajwain (Trachyspermumammi)

Ajwain exhibits antibacterial activity against *K. pneumoniae*, *E. aerogenes* and *S. aureus*. The constituent responsible for its anti bacterial effect is thymol (35-60%) present in *Ajwain* seeds. ^[91] The use of *Ajwain* has been successfully applied in dentistry as antiseptic, antioxidants and analgesic.

Turmeric

Turmeric, also known as "Indian Saffron." is the most common ingredient found in the Indian kitchen. It possesses antioxidant, anti-inflammatory, antimicrobial, anticarcinogenic, and antimutagenic properties.^[92] It is composed of fats, proteins, minerals, carbohydrates, and moisture. The colour yellow is due to curcumin (diferuloylmethane) (3-4%). It comprises curcumin I (94%), curcumin II (6%), and curcumin III (0.3%). ^[93]

Uses in Dentistry

a) Gingivitis & Periodontitis: Various studies have assessed that reduction in Plaque Index, Gingival Index, probing depth and microbiologic parameters in test sites following Scaling and root planning after curcumin gel application as compared with control group.^[94, 95]The use of curcumin has also been seen as a good subgingival irrigant because of its anti inflammatory effect. ^[96,97]

b) Potentially Malignant Disorders: It is a lesion/condition which has a risk of transforming into malignancy either at initial or later diagnosis. ^[98,99] Leukoplakia, erythroplakia, lichen planus (LP), and oral submucous fibrosis (OSMF) are the most commonly occurring PMD and most likely to transform into malignancy. Curcumin interrupts cell cycle by disrupting mitotic structures and exhibiting antiproliferative, antineoplastic and antimutagenic properties. ^[100] Numerous studies have shown that turmeric has shown exceptional role in the treatment of PMD's, thereby decreasing the progression of malignancy. ^[101-106]

CONCLUSION

These phytochemicals have an alternative role to antibiotics, improves the immunity and aids in healing of oral infections. These nutraceuticals are very effective and can be used as a treatment modality for oral diseases; however, controlled clinical trials are still required to assess the efficacy of these traditional therapeutic modalities in the field of dentistry.

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