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DENTISTRY- TURNING TOWARDS HERBAL ALTERNATIVE: A REVIEW

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ABSTRACT

General usage of the term "herb" differs between culinary herbs and medicinal herbs. Herbal extracts have been successfully used in dentistry as tooth cleaning and antimicrobial plaque agents since ages. 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 medicine is an increasingly common form of alternative therapy throughout the world. Consequently herbal medicines are finding more and more usefulness in arena of dentistry and their armamentarium. Earlier they were limited in use as an important ingredient of tooth pastes, mouthwashes and as a pain reliever, but now days they are increasingly being used in all possible treatments in dentistry like root canals, surgeries, periodontal therapies, anti-plaque agents.

KEYWORDS: Dentistry, Dental Diseases, Herbs, Oral Health.

INTRODUCTION

Herbal plants are a local heritage with global importance because they provide an infinite source of drugs in terms of both variety and mechanism of action. Throughout the history of

mankind many disease have been treated with herbal remedies. A number of scientific investigations have highlighted the importance and the contribution of many plant families. Herbal medicine often complement the conventional treatment by providing safe, well tolerated remedies for many chronic disease, like liver disorder, asthma, rheumatoid arthritis, diabetes, obesity, cardiovascular & neurological disorders, cancer and also as analgesic & antimicrobial agents.[1]

The key of good health is hidden in nature. Natural herbs like aloevera, neem, tulsi, clove, meswak and many more has been used since ages either as a whole single herb or as a combination, against various oral health problems like bleeding gums, halitosis, mouth ulcers and preventing tooth decay.[2]

Natural products have been used for several years in folk medicine. Over the last decade herbal medications turned out to be popular form of therapy throughout the world when used as prophylaxis and treatment of various oral diseases. Many side effects associated with modern medicines have been averted by using herbal medicines, and thus they are safer to use.[3]

KEY BENEFITS OF ALOE VERA, TULSI, CLOVE, NEEM AND MESWAK IN DENTAL CARE

1. ALOE VERA

Among the various currently available herbal agents the most popular and currently receiving a lot of scientific attention is *Aloe vera.* The plant *Aloe vera* has a history dating back to biblical times. It is a perennial succulent xerophyte, which develops water storage tissue in the leaves to survive in dry areas of low or erratic rainfall. The plant has stiff *grey-green lance-shaped l*eaves containing clear gel in a central mucilaginous pulp. Benefits associated with *Aloe vera* have been attributed to the polysaccharides contained in the gel of the leaves.[4]

- **Botanical Name :** *Aloe Vera*
- **Family Name :** Liliaceae
- **Common Name :** Aloe, Barbados Aloe, Curacao Aloe, Indian Aloe, Ghi Kunvar
- **Part Used :** Leaves, Flowers, Roots
- **Active Ingredient :** Aloe vera contains 75 potentially active

- **Constituents:** Vitamins, Enzymes, Minerals, Sugars, Lignin, Saponins, Salicylic Acids and Amino Acids.
- **Habitat:** South and south western India.
- **Product offered:** Aloe Vera Leaves, Aloe Vera Gel, Aloe Vera Powder**.**

USES

- It is useful for X-ray burns, dermatitis& other cutaneous disorders.
- Drug from the juice is tonic and is used in jaundice, ameneorrhoea and piles.
- Aloe Vera Gel has the remarkable ability to heal wounds, ulcer and burns. It provides benefit in reducing triglycerides, total cholesterol, blood fat, lipid levels & helps in reducing extra fat. It also helps in healing blisters & also provides relief from itching.
- It is also used for sunburns, insect bites, scrapes, and scratches. Aloe Vera leaves gel stops the bleeding of minor cuts easily. It moisturizes the skin and adds to its elasticity.
- It compensates the lost collagen and repairs the damaged skin tissues. It fades away the white lines or the marks and gradually removes them.
- It fights against the skin allergies and heals all the wounds.
- It is an excellent choice to get rid of the wound & burn marks that are formed in around 5 years or so.[4]

CLINICAL APPLICATIONS OFALOE VERA IN DENTISTRY

Aphthous Ulcer - It has been reported that acemannan hydrogel obtained from accelerates the healing of aphthous ulcers and reduces the pain associated with them.

Oral Lichen Planus - The efficiency of Aloe Vera in treatment of oral lichen planus has been measured by many researchers. Aloe Vera gel is statistically significantly more effective than placebo in inducing clinical and symptomatological improvement of OLP. Therefore, Aloe Vera gel can be considered a safe alternative treatment for patients with OLP.

Gingivitis - Several studies have been conducted to test the efficacy of Aloe Vera in treating gingivitis. Aloe Vera is the oldest medicinal plant that has maintained its popularity over the course of time. It is widely known for its medicinal use in wound healing, as an analgesic, and for its anti-inflammatory properties.[4]

Alveolar Osteitis - Currently, special medical bandages (Sali Cept Patch) are available for intraoral use following extraction of teeth. The Sali Cept Patch is a freeze-dried pledget that

contains acemannan hydrogel (Carrington Laboratories) obtained from the clear inner gel of Aloe Vera.

Denture Adhesive - As previously discussed Acemannan, a complex mannose carbohydrate and one of the main ingredients of the Aloe Vera gel, has an inherent stickiness/viscosity. It is this property that led to the production of prototype acemannan denture adhesives. These new denture adhesive formulations were evaluated for pH changes, cytotoxicity to human gingival fibroblasts, and adhesive strength in both dry and wet conditions.

Other applications in dentistry

1. Applications directly at sites of periodontal surgery
2. As an adjunct to Scaling and root planning in periodontitis
3. Chemical burns caused by accidents with aspirin are quickly relieved
4. Extraction sites respond comfortably and empty purses do not develop when aloe vera is applied
5. Angular Chelitis
6. Burning Mouth Syndrome
7. Patients with sore gums and teeth with denture maladaptive may also benefit
8. Aloe Vera can also be used around dental implants to control inflammation caused by bacterial contamination.[4]

SIDE EFFECTS

Topical - It may cause redness, burning, stinging sensation and rarely generalized dermatitis in sensitive individuals. Allergic reactions are mostly due to anthraquinones, such as aloin and barbaloin. It is best to apply it to a small area first to test for possible allergic reaction.

Oral- Abdominal cramps, diarrhea, red urine, hepatitis, dependency or worsening of constipation. Prolonged use has been reported to increase the risk of colorectal cancer. Laxative effect may cause electrolyte imbalances (low potassium levels).

CONTRAINDICATION

Contraindicated in cases of known allergy to plants in the Liliaceae family.

Pregnancy and breastfeeding Oral aloe vera is not recommended during pregnancy due to theoretical stimulation of uterine contractions, and in breastfeeding mothers, it may sometime causes gastrointestinal distress in the nursing infant.[4]

INTERACTIONS

Application of aloe to skin may increase the absorption of steroid creams such as hydrocortisone. It reduces the effectiveness and may increases the adverse effects of digoxin and digitoxin, due to its potassium lowering effect. Combined use of Aloe vera and furosemide may increase the risk of potassium depletion. It decreases the blood sugar levels and thus may interact with oral hypoglycemic drugs and insulin.

Though Aloe vera has wide spectrum of the properties and uses, some of them could be myths and some of them could be real magic. In future, controlled studies are required to prove the effectiveness of Aloe vera under various conditions.[4]

2. TULSI

In ancient India, the traditional medicine practitioners observed Tulsi as greatest healing herb with high therapeutic potential. The Tulsi plant is an erect softy hairy aromatic herb or under shrub of labiatae family belonging to genus 'Ocimum' and is found throughout India. Tulsi has been proven for management of many medical disorders due to its properties like expectorant, analgesic, anticancer, antiasthmatic, antiemetic, diaphoretic, antidiabetic, antifertility, hepatoprotective, hypotensive, hyolipidimic and antistress agent by many research studies. Tulsi can be promising herb in treatment of many oral disorders due to its anti-inflamatory, antibacterial, antioxidant and immuno-modulatory properties however more research and studies are needed to establish this miraculous herb as treatment modality in dentistry. The present article focuses on dimension and scope of Tulsi in management of oral disease.[5]

- **Botanical Name** : *Ocimum Sanctum*
- **Family Name** : Lamiaceae
- **Common Name** : Basil, Sacred Basil, Holy Basil, Tulsi
- **Part Used** : Leaves, Seeds
- **Active Ingredient**: Urosolic acid and Eugenol
- **Habitat** : Found throughout India.
- **Product offered** : Leaves, Seeds, Wholeplant, Oil.

USES

- Basil herb is diaphoteric, anti-histaminic, stimulating, expectorant and anti-catarrhal.

- It is used in malaria, catarrh, bronchitis and gastric disorders.
- It also lowers blood sugar levels and its powder is used for mouth ulcers.
- Basil herb is widely worshiped in India.
- It is an aromatic herb and is often used in potpourri and sachets.
- The cosmetic industry uses basil oil in lotion, shampoo, perfume, and soap.
- It is also used in some skin ointments and promoted as a treatment for acne.
- Enhances taste in foods and drinks.

THE THERAPEUTIC USES OF TULSI IN DENTISTRY

Tulsi leaves are quite effective in treating common oral infections.

The tulsi leaves contains strong **antibacterials** like carracrol and tetpene & sesquiterpene b caryophylline. Chewing of tulsi leaves help in **maintenance of oral hygiene**. The antibacterials present in tulsi leaves are approved by FDA as food additive. Ocimum sanctum leaves contain 0.7% volatile oil comprising about 71% eugenol and 20% methyl eugenol. Due to significant amount of eugenol (1-hydroxyl-2 methoxy-4 allyl benzene) tulsi is a strong COX-2 inhibitor.

This **antianalgesic** property of tulsi is utilized in treatment of dental and mucosal pain. The powdered tulsi leaves mixed with mustard oil can be used as toothpaste for tooth brushing. The powdered tulsi leaves are used to encounter **halitosis and maintaining good oral health**.

Massage with tulsi powder have been reported to be highly effective in many **gingival and periodontal diseases**. The tulsi extract has high **antimicrobial** activity against streptococcus mutans. The streptococcus mutans has been reported to be key microorganism causing dental caries. In an in vitro study it was found that 4% concentration of tulsi extract has highest antimicrobial activity. The tulsi also possesses a great antifungal activity.[5]

The tulsi have property of **immunomodulation**. It also acts on skin and hemopoeitic tissues. So the tulsi can be used in treatment of **oral lichen planus**. However further studies are needed to evaluate efficacy of tulsi in treatment of oral lichen planus.

Tulsi can also be used as **antioxidant** therapy in both leukoplakia and oral submucous fibrosis. The polyphenol rosmarnic acid is a strong antioxidant present in tulsi. So it can be used in treatment of all other **oral precancerous lesions and conditions.**

Due to **immunomodulating** property, the ocimum sanctum can be used in treatment of **pemphigus**. The tulsi causes healing of sores and blisters. More studies are needed to evaluate the potential use of immunomodulatory effect of tulsi in immunologically mediated mucosal disorders like pemphigus.

The ocimum sanctum is a potent **antiulcerogenic** and have **ulcer healing properties.** Ocimum sanctum in dose of 100mg/kg was found to be effective against ulcers. The antiulcer effect of ocimum sanctum is reported to be due to cytoprotective effect rather than anti-secretory activity. Tulsi is effective in both oral ulcers and peptic ulcer.

The tulsi is a rich source of **vitamin A, Vitamin C, zinc and iron**. It is also a rich source of chlorophyll and other polynutrients. So it can be used as **dietary supplements in oral diseases** arising due to deficiency of these nutrients.[5]

SAFETY AND TOXICITY

Toxicity has been reported for the oil extract of Holy Basil which contains 70+/-3% eugenol content and toxic level has been found to be 42.5ml/kg body weight. Whereas the dry plant extract with a normal eugenol content has an LD of between 4600-6400mg/kg bodyweight in research animals.[5]

3. CLOVE

Clove is an herb. People use the oils, dried flower buds, leaves, and stems to make medicine.

- **Botanical Name :** Syzygium Aromaticum
- **Family Name :** Myrtaceae
- **Common Name :** Clove
- **Active components:** Volatile oïl, Non volatile ether, Crude fibre Carbohydrates, Mineral matter.
- **Habitat**: Asian, African and Middle East countries.

USES

Cloves may be used to give aromatic and flavor qualities to hot beverages, often combined with other ingredients such as lemon and sugar.

They are a common element in spice blends such as pumpkin pie spice and speculoos spices.

Non-culinary uses

The spice is used in a type of cigarette called *kretek* in Indonesia. Clove cigarettes have been smoked throughout Europe, Asia and the United States. Starting in 2009, clove cigarettes was be classified as cigars in the of United States.[6]

The bioactive chemicals of clove, the spice may be used as an ant repellent.

Traditional medicinal uses

Cloves are used in Indian Ayurvedic medicine, Chinese medicine, and western herbalism and dentistry, where the essential oil is used as an anodyne (painkiller) for dental emergencies.

Cloves are used as a carminative, to increase hydrochloric acid in the stomach and to improve peristalsis. Cloves are also said to be a natural anthelminthic.[7] The essential oil is used in aromatherapy when stimulation and warming are needed, especially for digestive problems. Topical application over the stomach or abdomen are said to warm the digestive tract. Applied to a cavity in a decayed tooth, it also relieves toothache.[8]

In Chinese medicine, cloves or *ding xiang* are considered acrid, warm, and aromatic, entering the kidney, spleen and stomach meridians, and are notable in their ability to warm the middle, direct stomach *qi* downward, to treat hiccup and to fortify the kidney *yang*.

The herb is so warming, it is contraindicated in any persons with fire symptoms and according to classical sources, should not be used for anything except cold from *yang* deficiency. As such, it is used in formulas for impotence or clear vaginal discharge from *yang* deficiency, for morning sickness together with ginseng and patchouli, or for vomiting and diarrhea due to spleen and stomach coldness.[9]

Potential medicinal uses

The U.S. Food and Drug Administration (FDA) has reclassified eugenol (one of the chemicals contained in clove oil), downgrading its effectiveness rating. The FDA now

believes not enough evidence indicates clove oil or eugenol is effective for toothache pain or a variety of other types of pain.

Studies to determine its effectiveness for fever reduction, as a mosquito repellent, and to prevent premature ejaculation have been inconclusive. It remains unproven whether clove may reduce blood sugar levels.

In addition, clove oil is used in preparation of some toothpastes and Clovacaine solution, which is a local anesthetic used in oral ulceration and inflammation. Eugenol (or clove oil generally) is mixed with zinc oxide to form a temporary tooth cavity filling.

Clove oil can be used for local anesthetize and prolonged exposure to higher doses (the recommended dose is 400 mg/l) is considered a humane means of euthanasia.[10]

Other Uses

- Pesticidal and Nematicidal
- Molluscicidal activity
- Enzyme activity
- Anti-platelet activity
- Anti-viral activity
- Anti-cancerous activity.

APPLICATIONS IN DENTISTRY

- In the past, clove oil was widely used to numb and disinfect a specific area of the gums before an anesthetic was injected to prepare a patient for a dental procedure.
- Clove oil was also combined with a temporary tooth filling resin in the past to disinfect nerve tissue and reduce pain before a permanent filling was added.
- Clove oil is also commonly suggested to be used after dental procedures to disinfect open wounds and temporarily relieve mild toothaches for short periods of time.
- The main current use of clove oil in dentistry is to add flavor to mouth rinses and numbing gels.[11]

Anti-Oxidant

Eugenol has a scavenging effect i.e., it helps to prevent cell and tissue damage that could lead to disease. It also acts an enzyme activator and this property is effectively used in treating toothaches.

Anti-Microbial Activity

Clove and clove bud oil were investigated by agar well diffusion method against five dental caries causing microorganisms namely Streptococcus mutans, Staphylococcus aureus, Lactobacillus acidophilus (bacteria), Candida albicans and Saccharomyces cerevisiae (yeast). It was finally concluded that clove oil emerged as the potent agent exhibiting even much higher antibacterial and anti-fungal activity than the standard anti-bacterial and anti-fungal drugs ciprofloxacin and amphotericin-B respectively.

SIDE EFFECTS

- Frequent and repeated application of clove oil in the mouth or on the gums can sometimes cause damage to the gums, tooth pulp, skin, and mucous membranes.
- Inhaling smoke from clove cigarettes or injecting clove oil into the veins is likely unsafe and can cause side effects such as breathing problems and lung infections.
- Dried clove can also cause mouth sensitivity and irritation, as well as damage to dental tissues.

Children: In children, clove oil is likely unsafe to take by mouth. It can cause severe side effects such as seizures, liver damage, and fluid imbalances.

Pregnancy and breast-feeding: Clove is likely safe when taken by mouth in food amounts. There is not enough reliable information about the safety of taking clove in medicinal doses if one is pregnant or breast-feeding. It is better to stay on the safe side and avoid use.

Bleeding disorders: Clove oil contains a chemical called eugenol that seems to slow blood clotting. There is a concern that taking clove oil might cause bleeding in people with bleeding disorders.

Surgery: Clove oil contains a chemical called eugenol that seems to slow blood clotting. There is a concern that it might cause bleeding during or after surgery. Hence clove use should be stopped at least 2 weeks before a scheduled surgery.[11]

4. NEEM

Azadirachta Indica also known as NEEM, has some medicinal property and is thus commercially exploitable. During the last five decades, apart from the chemistry of the Neem compounds, considerable progress has been achieved regarding the biological activity and medicinal applications of Neem. It is now considered as a valuable source of unique natural products for development of medicines against various diseases and also for the development of industrial products.[12]

- **Botanical Name:** Azadirachta Indica
- **Family Name:** Meliaceae
- **Common Name :** Lilac, Margosa Tree, Neem, Neem Chal
- **Part Used:** Leaves, Flower, Oil, Seed.
- **Active Ingredient:** Nimbidin, Azadirachtin & Nimbinin
- **Habitat:** It is evergreen and grows throughout India.
- **Product offered:** Bark, Leaves, Seeds, Fruit, Oil, Flower, Stem.

USES

- It acts as vermifuge, insecticide, astringent, tonic and antiseptic.
- It possess anti-diabetic, anti-bacterial and anti-viral properties and used successfully in cases of stomach, worms and ulcers.
- Root barks possess astringent, tonic and antiperiodic properties. It is also useful in malarial fever.
- The oil is used in making neem-based soaps, shampoos and toothpaste. Leaves are used to cure chicken pox.
- It is also used in the treatment of acne and has blood purifying property.
- Various dental applications.

DENTAL APPLICATIONS OF NEEM

Antibacterial Activity

Neem is a natural antibacterial agent. Various scientific studies have revealed its antibacterial activity. The antimicrobial effects of *Neem* have been reported against *Streptococcus mutans* and *Streptococcus faecalis*. Ethanolic extract of *Neem* leaves and sticks and bark exhibited significant antibacterial activity. Dried chewing sticks of *Neem* showed maximum

antibacterial activity against *Streptococcus mutans* compared to other dental caries-causing organisms, *Streptococcus salivarius, Streptococcus mitis, and Streptococcus sanguis.*

Anti-Candidial Activity

Ethanolic and aqueous extract of *Neem* leaf showed significant anti-candidial effect against *Candida albicans*. A clinical study demonstrated the effects of the leaf aqueous extract from *Azadirachta indica* (*Neem*) on adhesion, cell surface hydrophobicity and biofilm formation, which may affect the colonization by *Candida albicans*.

Anti-Cariogenic Activity

Mango *and* Neem *extract showed antimicrobial activity against* Streptococcus mutans, Streptococcus salivarius, Streptococcus sanguis *and* Streptococcus mitis. *A combination of chewing sticks is found to be beneficial in eradicating the dental caries-causing organism. Chloroform extract of* Neem *leaf inhibites* Streptococcus mutans *and* Streptococcus salivarius *and provides an aid for treating dental caries.*

Acetone extract from the bark of *Neem* is bactericidal against *Streptococcus sobrinus* hence indicates its anti-cariogenic activity.[13]

Anti-Plaque Activity

Aqueous extract of *Neem* stick and the gallotannin-enriched extract from *Melaphis chinensis* inhibited insoluble glucan synthesis and results in bacterial aggregation. It reduces the ability of *streptococci* to colonize tooth surfaces. *Neem* oil shows significant antibacterial activity and has been suggested for use in treating dental plaque. Mucoadhesive dental gel containing *Azadirachta indica* is found to be beneficial in reducing the plaque index and salivary bacterial count comparatively better than chlorhexidine gluconate mouthwash.

Efficacy of Neem Extract Against Acidogenic Oral Bacteria In Fixed Orthodontic Appliance Patients

The primary acid-tolerant bacteria associated with dental plaque including *Lactobacillus mutans, Streptococcus oralis, Streptococcus sobrinus, Lactobacillus acidophilus, Streptococcus salivarius, Streptococcus mitis, Streptococcus sangui, Streptococcus intermedius, and Streptococcus anginosus* that surround orthodontic appliances are a common problem in many patients undergoing orthodontic treatment. It has also been

reported that presence of fixed orthodontic appliance greatly inhibits oral hygiene and creates new retentive areas for plaque and debris.

Ethanolic leaf extract of *Azadirachta Indica* shows significant antibacterial activity against selected acidogenic oral bacteria causing dental plaque in fixed orthodontic appliance patients. In one of the study neem was found against *Streptococcus mutans, Streptococcus sanguis, and Streptococcus mitis*. However the extract did not inhibit *Lactobacillus acidophilus* when tested.[13]

Efficacy against Periodontal Pathogens

Brushing with *Neem* toothpaste after every meal and using a mouthwash with *Neem* extract is recommended treatment for preventing gingivitis. In a study, *Neem*-based mouth rinse was given to patients for assessing anti-plaque and anti-gingivitis activity was found to be effective.

The findings conclude that *Neem* mouth rinse is as effective as chlorhexidine in reducing periodontal indices. *Neem* stick is found to be effective as a toothbrush in reducing dental plaque and gingival inflammation.

Neem as Root Canal Irrigant

Sodium hypochlorite has been used as root canal irrigant for decades; it causes potential weakening of the tooth structure by decreasing the hardness and structural integrity of the dentin within the root canal. To overcome this disadvantage herbal drugs are used effectively to inhibit *Enterococcus faecalis* that causes root canal failure in patients undergoing endodontic treatment.

Aqueous and ethanolic extract of *Neem* leaf inhibits *Streptococcus mutans* and *Enterococcus faecalis* which cause root canal failure in endodontic procedure. Its antioxidant and antimicrobial properties makes it a potential agent for root canal irrigation as an alternative to sodium hypochlorite. Literature suggested that the *Neem* leaf extract has significant antimicrobial effect against *Enterococcus faecalis* derived from infected root canal samples. The extract was found to be efficacious compared with 2% sodium hypochlorite.

Neem in Dental Care Industry

Various parts of the *Neem* tree possess astringent and antiseptic activity. Leaf extracts have been widely used in both traditional and conventional times to manufacture toothpaste and

mouthwash in the oral care dentistry. Its antibacterial properties due to the presence of nimbidin, Azadirachtin, and nimbinin help to remove many oral aerobic and anaerobic pathogens existing in the oral cavity.

Neem bark and leaf extract is most effectively used in preventing cavities and gum disease. Mouthwash containing *Neem* is a remedy for tooth decay, oral infections, prevents bleeding and sore gums. Twigs of *Neem* tree are used as chewing sticks by people all over India.[13]

SAFETY ISSUES: Neem oil can cause some forms of toxic Encephalopathy and Ophthalmopathy if consumed in large quantities.

5. MESWAK

A traditional and natural alternative to the modern toothbrush, it has a long, well-documented history and is reputed for its medicinal benefits. It is reputed to have been used over 7000 years ago. Meswak is a chewing stick used by many people of different cultures and in many developing countries as a traditional toothbrush for oral hygiene. The religious and spiritual impact of Meswak probably is the principal reason for using it in Islamic countries and mostly by Muslim population. Meswak, is derived from Arak tree (*Salvadora persica*).

- **Botanical Name :** *Salvadora Persica*
- **Common Name :** Meswak, Miswaki, Siwak, Siwaki
- **Active Ingredient:** Anionic Component of S.Persica
- **Habitat :** Saudi Arabia and also in other parts of the Middle East

USES

The Meswak extract has found its way into the dentifrices in the recent years as anti-plaque and anti-gingivitis agent.

DENTAL APPLICATION IN DENTISTRY

- Strengthening the gums.
- Preventing tooth decay.
- Eliminating toothaches, To halt further decay that has already set in.
- To create a fragrance in the mouth, hence to Eliminate bad breath.
- Improve sensitivity of taste-buds and promote cleaner teeth.

Antimicrobial effects

An *in vitro* study showed that the aqueous extract of *Salvadora persica* (Meswak) had an inhibitory effect on the growth of *Candida albicans* that may be attributed to its high sulfate content (al-Bagieh et al., 1994).[4]

Almas (1999) showed that *Salvadora persica* (Meswak) extracts had antimicrobial effects on *Streptococcus mutans* and *Enterococcus faecalis*. Elvin-Lewis et al. (1980) and Almas (1999) suggested that this effect may be due to the interaction with bacteria, which prevents their attachment on the tooth surface. Almas and Al-Bagieh (1999) also noted significant differences in the antimicrobial activities of the pulp and bark extracts of *Salvadora persica* miswak.

Anticariogenic effects

Many epidemiological studies revealed that *Salvadora persica* miswak had strong anti-decay effects. In a dental health survey conducted in Sudan, Emslie (1966) reported a lower caries prevalence among Meswak users than among toothbrush users.

Olsson (1978) reported that chewing sticks reduced dental caries more effectively than did conventional toothbrushes. Despite the carbohydrate-rich diet traditionally consumed in Ghana, the incidence of caries and other dental diseases was low among Ghanaian chewing-meswak stick (Elvin-Lewis et al., 1980).

The pungent taste and chewing effects of Meswak may increase saliva secretion in the mouth, thereby increasing its buffering capacity (Hattab, 1997).[4]

Effects on dental plaque, gingival health, and periodontal status

Many reports have revealed that *Salvadora persica* (Meswak) effectively reduced gingivitis and dental plaque. Studies among Ethiopian school children (Olsson, 1978) and Saudi Arabian dental students (Char et al., 1987) showed that Meswak removed plaque more effectively than did toothbrushing.

Several toothpastes containing *Salvadora persica* (Meswak) extract are commercially available (Al Sadhan and Almas, 1999; Guile et al., 1996). One such toothpaste was found to be significantly more effective in removing dental plaque when compared with Oral-B toothpaste (Hattab, 1997). The combined effect of mechanical cleansing and enhanced

salivation achieved with the proper use of *Salvadora persica* (Meswak) was found to be more efficient than toothbrushes in removing dental plaque (Wu et al., 2001).[4]

Oral hygiene

In many developing countries, chewing sticks are often used as the sole oral cleaning device. Oral hygiene maintenance through the regular removal of dental plaque is an essential factor in the prevention of dental caries and periodontal disease. Several explanations for the cleansing effectiveness of *Salvadora persica* (Meswak) have been put forward, including

a) The mechanical effects of its fibers,
b) The release of favorable chemicals from the chewing stick while in use

However, the lack of studies reporting the time, duration, and frequency of *Salvadora persica* Meswak use prevents meaningful assessments of its mechanical cleaning effects on oral health (Hardie and Ahmed, 1995).[4]

DISADVANTAGES OF CHEWING STICKS

Although *Salvadora persica* (Meswak) is considered to be an essential aid in maintaining oral hygiene, certain disadvantages are associated with its use. Its bristles lie in the long axis of the stick, whereas those of a toothbrush are placed perpendicular to the handle. Thus, it is **difficult to reach the lingual surfaces** of the dentition with a Meswak.

Another disadvantage is related to the habitual use of Meswak for a prolonged period (Hollist, 1981). Khoory (1983) reported that chewing-stick users may excessively scrub the anterior teeth, which are located in the area of primary concern, while **ignoring the posterior teeth**.

Other studies have considered the use of Meswak to be one of the possible etiological factors in **gingival recession** (Eid et al., 1991). These disadvantages may be overcome with a dentist's provision of precise instructions on the acceptable methods and duration of Meswak use.

Mohammad and Turner (1983) evaluated the cytotoxic potential of the *Salvadora persica* plant and its diffusible components on oral tissues using the tissue culture agar overlay method. Their results demonstrated no cytotoxic effect of freshly cut *Salvadora persica* (Meswak), but showed that the same plants contained harmful components if used after 24 h. A study of the effect of the direct administration of high doses of *Salvadora*

persica (Meswak) extract to mice revealed some **minor side effects on male and female reproductive systems and fertility** (Darmani et al., 2003). However, an earlier study reported that neither aqueous nor ethanolic *Salvadora persica* Meswak extract was toxic to mice at doses of up to 1200 mg/kg (Ezmirly et al., 1979).[4]

CONCLUSION

The use of herbal extracts for the control of oral/dental diseases is considered an interesting alternative to synthetic antimicrobials due to their lower negative impact and to overcome intrinsic (primary) resistance or secondary resistance to the drug during therapy. There are the readily available resources in day today life, for healthier living. These provides considerable evidence that plant extracts, essential oils & purified phytochemicals have the potential to be developed into agents that can be used as preventive or curative agents for dental diseases.

Oral diseases are one of the most important problems in public health and are on the rise in developing countries. Most of the oral diseases are caused due to the bacterial infections. The anti-bacterial activity of medicinal plants are due to the presence of potential bioactive compounds, which help to reduce bacterial load in the oral cavity and thus prevent the formation of plaque, dental caries and ulcers. Hence, the use of the herbal alternative can go great milestones in dentistry when used properly and under supervised guidance.

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