

Phytodentistry– A Boon???**Avineet Kaur¹, Daljit Kapoor², Nitin Soni³, Sanjeet Gill³**

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ABSTRACT:

Periodontal diseases are multifactorial in nature and are caused by microorganisms that colonize the tooth surface at or below the gingival margin. Adjunctive use of antibiotics is reviewed and indicated in many situations. After considering the side effects of allopathic medicines nowadays there is sudden increase and preference in the use of herbal extracts or plant products as an alternative. Various species of medicinal plants are being used traditionally to control and cure a variety of dental problems by the Indian population. Recently usage of herbal product has increased, due to the side effects and complications which are being caused by chemical and synthetic medicines. It is being documented that Tribal people used various species to cure ear mouth diseases and snakebites. The literature is documented that several plants have anti-inflammatory, antioxidant, antibacterial, astringent and other useful properties. Various parts of plants like leaves, roots, seeds, nuts, fruits, bark, stems, gum, latex etc are being used for medicinal purposes.

Keywords: Antibiotics, Medicinal Herbs, Periodontal disease, Phytodentistry.

INTRODUCTION

Periodontal diseases are multifactorial in nature and are caused by microorganisms that colonize the tooth surface at or below the gingival margin.¹ Although periodontal diseases are associated with dental plaque, various other intrinsic and extrinsic factors like stress, tobacco use, antibiotic drugs etc have the tendency to aggravate the disease.² The polymicrobial nature of the disease, results in making the detection and treatment a challenging task.³ The aim of current periodontal therapy is to remove the bacterial deposits from tooth surface and to shift the pathogenic microbiota to one compatible with periodontal health.⁴ The conventional therapy or subgingival instrumentation often leaves behind number of periodontal pathogenic bacteria. The use of chemotherapy as an adjunct in the treatment of periodontitis has received considerable attention during past decade.⁵ A number of systemic antimicrobials, used alone or occasionally in combinations,

have been employed in the treatment of chronic periodontal diseases (Slots & Rams, 1990; Goodson, 1994).⁶ Ideally, systemic antimicrobials should eradicate pathogens from the periodontal lesion and possibly from the oral cavity.⁶ However, unwanted side-effects of systemic chemotherapy such as gastrointestinal disturbances and development of antibiotic resistance cannot be totally ruled out.⁷

Traditional medicine is deep rooted and grounded deep in India and is being used here since times immemorial.⁸ Ayurvedic medicine (Ayurveda = the science of life) is a system used by Indians and is native to the Indian subcontinent as a form of alternative medicine. It has also attracted much attention in developed countries such as Europe, United States and Japan.⁸ Charaka samhita and sushutra samhita have been the basis of ayurvedic medicine since a long time.⁹ During past two decades reliability and usage of herbal products has assumed increasing

importance, due to the side effects and complications of many chemical and synthetic medicines. About 25 % of drugs are derived from plants and many other are formed from prototype compounds isolated from plant species.¹⁰ These medicines contain natural phytochemicals in them and offer an effective alternative to antibiotics and represent a promising approach in the prevention and therapeutic strategies for oral infections too.⁸ Because of relatively safe nature of herbal extracts, many herbal products and their component are being used for treating periodontitis in the form of local drug delivery as well.¹¹ There are many herbs which can be used in periodontal diseases such as Aloevera, Eucalyptus extract, Bloodroot, Neem Leaf, Chamomile, Green Tea etc .¹²

According to WHO guidelines, herbal medicines can be categorized into four categories based on their evolution, origin, and forms of current usage as under:-

-Category 1: These Indigenous herbal medicines are used by local community or region and are very well-known by the local population through ages in context to composition, treatment, and dosage.

-Category 2: This group consists of herbal medicines in systems and is well-documented and based on long time usage on theories and concepts that are duly accepted by the respective countries. Example - Ayurveda, Siddha, and Unani.

-Category 3: This consists of Modified herbal medicines which have been modified in relation to their shape, dose, administration mode and composition. These medicines have to meet the national regulatory requirements in terms of their safety and efficacy.

-Category 4: Imported products with a herbal medicine base includes all the imported herbal medicines (raw materials and products). The

national authority of the importing country should have a safety and efficacy data.⁹

VARIOUS HERBAL PRODUCTS

Aloe vera (Aloe Barbadosis):- Aloe vera is a cactus plant that belongs to the Liliaceae family. More than 300 species of aloe plants exist, but only 2 species have been studied, which are Aloe barbadensis Miller and Aloe aborescens. Aloe vera leaf consists of different parts: central mucilaginous part and peripheral bundle sheath cells. The parenchymal tissue makes up the inner portion of aloe leaves and produces a clear, thin tasteless jelly like material called **Aloe vera gel**. Dental uses of Aloe vera are multiple. It reduces bleeding, inflammation and swelling of gums. It is a powerful antiseptic in pockets where normal cleaning is difficult, and its antifungal properties help greatly in problems of denture stomatitis, aphthous ulcers, cracked and split corners of mouth.¹³ Bhat G et al in 2011 conducted a study for evaluation of clinical effects of subgingival application of Aloevera gel in periodontal pockets of adult periodontitis after mechanical debridement and reported in improvement of periodontal condition.¹³

Oak (Quercus Brantii):- Oak is a species from Fagaceae family which is grown in Western Iran and has been traditionally used for the treatment of gastric ulcers, superficial injuries and local inflammation with hemostatic, anti-bacterial, anti-inflammatory, anti-nociceptive and anti-oxidant effects.¹⁴

Coriander (Coriandrum sativum):- C.Sativum is from the Umbelliferae family was used in Iranian folk medicine as a carminative and spasmolytic agent. It has anti-inflammatory, analgesic, anti-bacterial and anti-oxidant activities. C. sativum extract has tannins also.¹⁴ Yaghini et al in 2015 conducted a randomized double blinded controlled trial to evaluate the clinical effects of subgingival application of herbal gel(extracts of oak and coriander) in periodontal pockets. Results showed statistically significant improvements in periodontal indices.¹⁴

Green Tea (*Camellia sinensis*):- Tea is the most common drink in the world after water. Over last few decades, green tea has been subjected to many scientific and medical studies.¹⁵ Green tea contains a number of bioactive chemicals. It is particularly rich in flavonoids, including catechins, and their derivatives, such as (-) epigallocatechin -3-gallate (EGCG), (-) epigallocatechin (ECG), (-) epicatechin -3-gallate (ECG), (-) epicatechin. It has various therapeutic effects such as antioxidant, anti-collagenase, anti-inflammatory, anticaries, antifungal, antiviral and antibacterial effects.¹⁶ Since ancient times, green tea has been considered by the traditional Chinese medicine as a healthful beverage.¹⁵ Another study showed an inhibitory effect of green tea catechins on the adherence of *Porphyromonas gingivalis* onto the buccal epithelial cells. Kudva et al in 2011 evaluated the therapeutic effect of locally delivered green tea catechin in management of chronic periodontitis and it was found more effective than scaling and root planning alone.¹⁷ Hattarki SA et al in 2013 conducted a randomized and placebo controlled split mouth study and compared the effect of scaling and root planning alone or in combination with green tea catechins as local drug delivery into periodontal pockets and found that green tea was more effective than scaling and root planning alone.¹⁵

Turmeric (*Curcuma longa*):- Turmeric (haldi) is a rhizome of *Curcuma longa* and may be more acceptable and viable option for the common man. Turmeric has been used in Indian systems of medicine for long time. It is listed in an Assyrian herbal dating from about 600 BC. Herbaceous perennial plant belongs to Zingiberaceous family. The use of turmeric was described in traditional Chinese and Indian medicine as early as 7th century AD and is used as a food preservative and colouring material. Curcumin (diferulolymethane), the main yellow bioactive component of turmeric has been shown in the literature to have a wide spectrum of biological actions.¹¹ Behal et al in

2011 conducted a split mouth study to compare the effect of experimental local drug delivery system containing 2% whole turmeric gel as an adjunct to scaling and root planning and it was found that scaling and root planing was more effective in the treatment of periodontal pockets.¹⁸ Jaswal R et al in 2014 conducted a study to evaluate and compare the clinical effects of topical subgingival application of 2% whole turmeric gel and 1% chlorhexidine gel as an adjunct to scaling and root planing in patients suffering from chronic periodontitis. It was found that effective usage of turmeric gel could aid in treatment of periodontal disease.¹⁹

Bhatia et al in 2014 conducted a split mouth study to evaluate clinical and microbiological efficacy of locally delivered 1% curcumin gel as an adjunct to scaling and root planing and it was found that curcumin can be used as an effective alternative to local drug delivery agent.¹¹

Babul (*Aracia Arabica*):- Babul has cyanogenic glycosides in addition to several enzymes such as oxidases, peroxidases and pectinases that have shown to inhibit antimicrobial properties. Its bark contains tanins (24-42%) which has analgesic, anti-inflammatory properties.²⁰

Bakul (*Minusops elengi*):- Bakul has Lupeol which is one of the major pharmacologically active ingredients. It has anti-inflammatory and anti-microbial properties.²⁰

Pomegranate (*Punica granatum*):- Pomegranate has active compounds containing polyphenolic flavonoids (eg Punicalagins and ellagic acid), are believed to prevent gingivitis through a number of mechanisms including reduction of oxidative stress in the oral cavity, antioxidant activity, anti-inflammatory effects and anti-bacterial effects, so rinsing with pomegranate lowers the activity of alfa-glucuronidase, an enzyme that breaks down sucrose while it increased the activities of ceruloplasmin, an antioxidant enzyme.²⁰ Phogat et al in 2014 conducted a randomized, controlled split mouth clinical study to

evaluate the efficacy of a xanthan based chlorhexidine versus herbal gel as an adjunct to periodontal therapy and it was found that there were significant clinical benefits when compared with scaling and root planing alone.²⁰

Neem (*Azadirachta Indica*):- It belongs to Meliaceae family and widely distributed in Asia and Africa. Almost every part of the plant was used in indigenous systems for medicine for treatment of variety of human ailments, particularly against disease of bacterial and fungal origin. Patel and Venkantakrishna (1988) studied the therapeutic use of neem in periodontal disease.²¹ Mehta PW et al in 2015 conducted a comparative clinico-microbiological study to evaluate the efficacy of neem and tetracycline when used as a local drug delivery agent as an adjunct to scaling and root planing and found that the results were marginally better though not statistically significant.²¹

Peppermint (*Mentha piperita*):- It grows in moist areas with dark green, lance-shaped leaves and purple flowers. Peppermint contains menthol, methyl acetate, tannic acid, and vitamin C. Peppermint oil is used for curing toothache. Soaked cotton ball in the peppermint oil and placing in cavity helps to relieve pain. Using peppermint mouthwash helps in relieving periodontal pain.²²

Lemongrass (*Cymbopogon citratus*):- It is a popular medicinal plant. This plant is commonly used in teas, cosmetics, and folk medicine for its antiseptic, antiemetic, antirheumatic, analgesic, antispasmodic, and antipyretic properties. Its chemical components like phenol and flavanoid substances were reported to show many in vitro and in vivo biological activities such as antioxidant, anti-inflammatory and anti-mutagenic activities. At a concentration of $\leq 2\%$, lemongrass essential oil inhibits the growth of several kinds of microorganisms including periodontal pathogens, especially the reference strains of *Actinomyces lundii* and *Porphyromonas gingivalis*, which were

resistant to tetracycline hydrochloride.²³ Warad SB et al in 2013 conducted a study to evaluate locally delivered 2% lemongrass oil in gel form and it was found that 2% lemongrass oil offers a new choice of safe and effective adjunct to scaling and root planing.²³

Tulsi (*Ocimum Sanctum*):- It is widely used grown, sacred plant of India and belongs to Labiateae family. Leaf contains eugenol volatile oil, ursolic acid (triterpenoid) and rosmarinic acid (phenylpropanoid). It has long history of use in ayurvedic system of medicine to treat various ailments.²⁴ Hoadurga et al in 2015 conducted a study to evaluate the anti-inflammatory activity and to assess the duration of action and efficacy of 2% tulsi gel in treatment of periodontitis in Wistar Albino rat model. It was found that 2% tulsi was effective in the treatment of experimental periodontitis.^{24,25}

Meswak (*Salvadora persica*):- The most common type of chewing stick, Meswak, is derived from Arak tree (*Salvadora persica*) that grows mainly in Saudi Arabia and also in other parts of the Middle East. Meswak is a chewing stick which is used as a traditional toothbrush for oral hygiene. The Meswak extract has also found its way into the dentifrices in the recent years as antiplaque and antigingivitis agent.⁸

Myrrh (*Commiphora myrrha*):- It is obtained in the form from the trees and shrubs of the genus *Commiphora* and was brought to Infant Jesus as a nature's best gift by Wise man. It is a powerful antiseptic. Myrrh is documented to promote healing in cases of pyorrhea. Rinsing with myrrh tea and brushing with powder helps in curing periodontal disease.⁸

Tea tree oil (*Melaleuca alternifolia*):- The local delivery of tea tree oil (TTO) gel can be used in case of chronic periodontitis which have proved some beneficial effects to augment the results of the conventional periodontal therapy. It is effective in adjunctive treatment of TTO on the clinical parameters and the level of PTX3 (pentraxin-3) in chronic periodontitis.⁸

Triphala:- It has a free radical scavenging property and the antimicrobial activity of Triphala (means three fruits), herbal product, which was made from equal proportions of Terminalia chebula, Terminalia bellirica and Emblica officinalis, have been evaluated. Triphala is effective in inhibition of bio-film formation and acts as an antioxidant which is exhibited by this extract could protect the gum cells effectively from free radicals than the commercial toothpastes. Thus, *Triphala* could be used as an effective antiplaque agent.⁸ Triphala helps in detoxification and rejuvenation, (Gaiind *et al.*, 1963; Rege *et al.*, 1999; Jagetia *et al.*, 2002). It is used in various conditions such as headache, dyspepsia, constipation, liver conditions, fatigue, infections and assimilation, and it is being reported to have biological activities including antidiabetic (Sabu and Kuttan, 2002), antimutagenic (Kaur *et al.*, 2002), antimicrobial (Mehta *et al.*, 1993), radioprotective (Jagetia *et al.*, 2002), hypocholesterolaemic (Thakur *et al.*, 1988), antiviral (El-Mekkawy and Merelhy, 1995), immunomodulatory (Srikumaret *et al.*, 2005), and anticancer (Kauret *et al.*, 2005), etc.^{8,26}

Clove (*Syzygium aromaticum*):- The germicidal and anaesthetizing properties of the oil make it very effective for relieving toothache, sore gums and mouth ulcers. Clove oil contains the compound eugenol, which has been used in dentistry for many years. The peculiar smell of clove oil which if used as mouthwash helps to eliminate bad breath.⁸

Cinnamon (*Cinnamomum verum*):- *Streptococcus mutans*, the etiological agents of dental caries, are highly sensitive to Cinnamon therefore ensuring it as antiseptic toothpaste, mouthwash or chewing gum for prevention of dental caries and other oral infections.⁸

Curry-leaf-tree (*Murraya koenigii*):- Although green leafy vegetable used in Indian Kitchens grown by natives of India and other countries known for its aromatic leaves, and is most oftenly used daily as an ingredient in Indian cuisine. The fresh curry leaves

contain 2.65 volatile essential oils such as sesquiterpenes and monoterpenes, presenting with broad antimicrobial effects on *S. mutans*, *Streptococcus sanguinis*. Thus containing chlorophyll (green pigment) proposed as an anticariogenic agent and also helps to mask halitosis.⁸

Garlic (*Allium sativum*):- Garlic has been used for centuries to treat a variety of illnesses. It is a natural antibiotic that is good against infections caused by fungi or bacteria. It is also used to increase immunity and helps in lowering blood pressure. Garlic contains calcium, copper, germanium, iron, magnesium, manganese, phosphorus, vitamins A, B1, B2, and C, and a variety of other chemicals. Raw cloves are considered the most effective forms. Odorless garlic extract, is sold under the name **Kyolic**.⁸

Eucalyptus (*Globulus labill*):- Eucalyptus is beneficial against some microorganisms such as *Vibrio cholerae*, *Aspergillus flavus* and *S.aureus*. So eucalyptus extract is used for prevention of tooth decay as it inhibits biofilm formation. Various studies have reported that chewing gum containing eucalyptus extract helps in improving gingival health, decreasing bleeding during probing and reduces periodontal diseases.⁸

Licorice Root (*Glycyrrhiza glabra*):- Licorice root is used as digestive stimulant and also soothing expectorant for lung disease. It is used in various allergies or as an anti-inflammatory agent. As it has antibiotic properties so it is used for in the treatment of ulcers. Sweet and flavorful licorice added to toothpaste and mouthwash inhibit plaque growth and also reduce halitosis.⁸

Chamomile (*Matricaria recutita*):- It belongs to Asteraceae family. It is herbaceous in nature and mainly naturalized in Europe, Western Asia, Australia, Britain, United States and in several other countries. Flower is hollow bright gold with disc or tubular florets and ringed with ~15 white rays or ligulate florets. The dried flower consists of mainly apigenin-7-glucoside, luteolin, terpene compounds,

chamazulene, a-bisabolol, patuletin, quercetin, myricetin, and rutin with anti-inflammatory activities. Guimaraes M V et al in 2016 conducted a study to check the inhibition of proinflammatory cytokines and its influence on bone resorption in Wistar rats using dried extract of chamomile and it was reported that chamomile prevented the inflammation and alveolar bone resorption by reducing TNF- α and IL-1 β , thus preventing the osteoclast activity.²⁷

CONCLUSION

Various countries use herbal medicines to cure various ailments. Various communities take herbal medicines or herbal products nowadays for their health care in different national healthcare settings. Herbal extracts have variety of uses as they can be helpful for various systemic and dental problems. They can act as anti-inflammatory, antimicrobials, antihistaminics, antiseptics, antioxidants, antifungal, antiviral and analgesics. Herbal products also aid in healing and are effective against microbial plaque in gingivitis and periodontitis thereby improving immunity. Our ancestors used to have wider knowledge about these herbal remedies known till date which were used to cure various ailments. In this article a brief review has been presented which highlights the importance of this alternative method of medicine by reviewing the literature. However, long term studies are required for using these products in near future.

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