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Herbal Approaches in Periodontics

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ABSTRACT

Periodontal disease is one of the major public health problems in the world and is most common cause of tooth loss in population. Periodontal disease is a general term used to describe various pathological conditions which affects the supporting tissues of dentition. Over the last decade, herbal and Ayurvedic drugs has become a subject of world importance, as they possess both medicinal and economic implications. Herbal excipients are non-toxic and compatible; they have a major role to play in pharmaceutical formulation. Herbal medicines have been widely used all over the world since ancient times and have been recognized by physicians and patients for their better therapeutic value as they have fewer adverse effects as compared to modern medicines. The aim of the present article is to present review of the current strategies adopted for the formulation and application of traditional herbal remedies. This review article summarizes the current data on the effect of natural products like Aloe Vera, Acacia catechu Wild, Turmeric (Curcuma Longa), Azadirachata indica, Ocimum sanctum, Punica granatum & other important herbs in management of various periodontal diseases together with their biological activities.

Key words: Herbal drugs, periodontitis, gingivitis, dental plaque

INTRODUCTION

Periodontal disease is major public health problem in the world and is most common cause of tooth loss in population. Periodontal disease is a general term used to describe various pathological conditions which affects the supporting tissues of dentition. [1] Successful periodontal therapy depends upon dealing with the negative environmental and behavioural factors and elimination or reduction of pathogenic bacteria causing periodontal disease. [2] Scaling root planing and surgery are aimed at improving clinical conditions by lowering microbiota either by physical removal of plaque or by alteration of the sub gingival microbiota habitat. Subgingival habitat alteration is achieved by administration of antimicrobial systemically or locally which directly targets sub-gingival organisms residing in the biofilm. [3] A wide range of anti-microbial agents have been evolved in recent years. There has been a rise in the awareness and interest in alternative natural preparations among population; specially to avoid the rising dilemma of harmful effects caused by synthetic allopathic medications. [3] Deployment of natural substances for use in dentistry is just gaining momentum. Medicinal and ayurvedic herbs are part and parcel of humans since the dawn of civilization. [4] The screening of these herbs extract and plant products for antimicrobial activity has shown that plants represent a new potential source of anti-infective agents. [4] Different studies have proven to show excellent medicinal properties of different herbal products in various medical and dental diseases. This review in brief is about various herbal products their medicinal properties and their uses in the field of dentistry.

Benefits of Herbal Drugs: [5]

Herbal drugs have long era of use and good patient tolerance as well as better public acceptance. Herbal drugs are renewable source which is our only hope for

sustainable supplies of cheaper medicines for the worlds growing population.

Availability of medicinal plants is easy in developing countries like India having rich agro-climatic, cultural and ethnic biodiversity. Throughout the world herbal medicine has provided many of the useful and vast variety of drugs to the modern medical science.

1. Aloe Vera:

Aloe, which is native to Africa, is also called as "lily of the desert", the "plant of immortality" and the "medicine plant". This name was derived from the Arabic alloeh means "bitter" because of the bitter liquid found in the leaves, while vera in latin means "true". There are various species of Aloe vera known, but the main medicinal one *i*s Aloe vera barbadensis. [5]

Parts of Plant Used: [6]

The Aloe vera leaf has 2 different parts:

1. Central mucilaginous part; and
2. Peripheral bundle sheath cells.

The parenchymal tissue makes up the inner portion of the leaves and produces a clear, thin tasteless jelly-like material known as Aloe vera gel. [6] This gel in vivo enhances the wound healing process by eliminating the bacteria that are involved to cause inflammation. [7] It was proposed that a glycoprotein, aloctin a which was isolated from *Aloe arborescens* significantly inhibits arthritis in rats and carrageenan-induced edema in rat models. [8] Hutter isolated an anti-inflammatory agent as C-glucosyl chromone from *Aloe barbadensi* species. [9] It is recently reported that aloe vera leaf pulp extract was effective in decreasing blood sugar suggesting that it might be useful in the scavenging free radicals. [10] The aloe vera plant also contains anthraquinone glycosides (especially in the form of latex, different from the gel), polysaccharides, aloeresins, glucomannans, and bsitosterol. [11] Antioxidative phenolic compounds were recently identified from *Aloe barbadensis* species and identified as aloeresin derivatives. [12] Along with these properties and the ease of availability no known side effects and cost effectiveness make aloe vera an ideal candidate for plaque control thereby reducing gingivitis and most likely periodontitis. [13] Treating the inflammation is still the key effect for most types of healing and immunomodulatory properties of the gel polysaccharides especially the Acetylated mannans from aloe vera seems to play a key role in this process. Antidiabetic, anticancer and antibiotic activities of aloe vera have also been reported by various authors indicating wide range of use of aloe vera gel. [14] Studies observed a significant reduction in plaque and gingivitis after a 30-day use of mouth rinse containing aloe vera with toothbrushing. [15] From various studies it was concluded that both dentifrice containing aloe vera and fluoride resulted in significant decrease in plaque score and gingivitis but no statistically significant difference was observed between them that inactivates bradykinin in vitro salicylates and a substance that inhibits thromboxane formation. [16]

The treatment with aloe vera extract has also resulted in a significant increase in reduced *glutathione, superoxide dismutase, catalase, glutathione peroxidase, and glutathione S transferase* activity in the liver and kidney of diabetic rats showing the antioxidant property of aloe vera gel extract. [17] Thus it can be concluded that aloe vera species extracts can be useful in the control and treatment of periodontal diseases by their antioxidant properties as well.

2. Acacia catechu Wild:

Acacia catechu Wild belongs to Family: Fabaceae and subfamily: Mimosoideae also knew as Black Khair. Which is commercially used to obtain Katha (a concentrated filtered extract) in Northen parts of India? This plant is used as mouthwash for gingival and throat infection like gingivitis stomatitis. The extracts of this plant reported to have various pharmacological effects like antipyretic, anti-inflammatory, anti-diarrhoeal, hypoglycaemic, hepatoprotective, antioxidant and antimicrobial activities. [17-22]

Role of Acacia catechu in the Management of Periodontal disease:

Herbal tooth powder formulation which removed plaque stain or patches and cleaned and polished tooth surfaces without any abrasive action comprised the powder of *Acacia catechu*, menthol and camphor in the proportion of 91%, 2.7% and 6.3% respectively. The powders of menthol and camphor were used as a flavouring agent in above formulation. A clinical study on this dentifrice herbal tooth powder reported that 87-95%, 70-72% and 80-95% reductions in plaque scores gingivitis and dental calculus scores respectively after 15 days of treatment. [23]

3. Turmeric (Curcuma Longa):

Turmeric is rhizomatous herbaceous perennial plant belongs to family Zingiberaceae. It is native plant of tropical South Asia and needs temperatures between 20 °C and 30 °C for growth. Turmeric is a perennial plant with orange oblong tubers 2 or 3 inches in length and one inch in diameter pointed or tapering at one end. When it is dried it is made into a yellow powder with a bitter slightly acrid yet sweet taste. As turmeric has antimicrobial, antioxidant, astringent, and other useful properties it is quite useful in dentistry. [24, 25]

The different active constituents of turmeric are the lavonoid curcumin (diferuloylmethane) and various volatile oils including tumerone, atlantone, and zingiberone. Other constituents comprise of sugars, proteins, and resins. The best researched active constituent is - curcumin, which contains 0.3-5.4% of raw turmeric. Curcumin has been used extensively in ancient ayurvedic medicine since ages, as it is non-toxic and has a variety of therapeutic properties including anti-oxidant, analgesic, anti-inflammatory, anti-septic activity, and anti-carcinogenic activity. [26]

Its role in the treatment of different precancerous conditions like oral submucous fibrosis, leukoplakia, and lichen planus has also been investigated. Turmeric extract and turmeric oil have demonstrated onco-preventive activity in vitro and in vivo animal experimental studies. [27]

Role in the management of periodontal disease:

Massaging the teeth with roasted ground turmeric eliminates pain and swelling. A study concluded that chlorhexidine gluconate as well as turmeric mouthwash can be effectively used as an adjunct to mechanical plaque control methods in prevention of plaque accumulation and gingivitis. The effect of turmeric observed is because of its anti-inflammatory properties. Reduction in total microbial count was observed in both the groups. It is reported that the local drug delivery system containing 2% whole turmeric gel can be used as an adjunct to scaling and root planing. There was a significant reduction in the trypsin-like enzyme activity of “red complex” species. [28]

In one of the study it was seen that+ 1% curcumin solution can cause better resolution of inflammatory signs than chlorhexidine and saline irrigation as a subgingival irrigant. Mean Probing pocket depth reduction was significantly greater for the curcumin group than all other groups on all post-treatment days. [29]

4. Neem (Azadirachta indica):

Azadirachta indica synonym Melia azadirachta is well known in India and its subcontinent for more than 2000 years as one of the most versatile medicinal plants having a wide spectrum of micro biological activity. Almost every part of the tree has been used as traditional medicine for household remedy against various human diseases. [30-35]

A neem-extract dental gel reduced microbial species present in plaque i.e. Streptococcus mutans and Lactobacilli significantly. [36] Biological activity of Neem plant is reported with the crude extracts and their different fractions from leaf, bark, root, seed and oil. Neem also shows antiulcer, anti-inflammatory, anti-fungal, antibacterial, anti-viral, anti-carcinogenic, antiarrhythmic, antiviral,

antioxidant, antidiabetic activity and antioxidant properties. [37-39]

Role of Neem in management of periodontal disease:

The ancient Ayurvedic practise of using Neem plant parts to heal and rejuvenate gum tissue and to prevent dental caries and gum disease is verified in modern clinical studies. [40]

Some of the observed anti-plaque activity of neem chewing sticks is attributed to the fibrous nature of sticks resulting in mechanical plaque removal however neem plant also contains chemotherapeutic antiplaque agents. The presence of Gallo tannins during the early stages of plaque formation could effectively reduce the number of pathogenic microbes from binding to the tooth surface by increasing their physical removal from the oral cavity through aggregate formation. Additionally, the effective inhibition of glucosyl transferase activity and the reduced bacterial adhesion to SHA as seen with the presence of gallotannin extracts suggest some potential anti-plaque activity. [41] The microorganisms found in inflamed gums are resistant to penicillin and tetracycline but are not resistant to antibacterial plant extracts like neem. Unlike antibiotics antibacterial plant extracts produced no allergy in the gingiva that could inhibit their effectiveness. [42]

A synergistic herbal formulation comprising of active fractions from Azadirachta indica, Citrullus colocynthis and Cucumissativus extract and a carrier or additive was developed. The composition was found to be useful for teeth and gums as mouthwash or mouth rinse. This herbal formulation was described to be useful for preventing dental plaque and gingivitis in humans and also as an antimicrobial agent for preventing periodontal diseases. [43]

5. Tulsi (Ocimum sanctum):

Ocimum sanctum linn plant with a common name Tulsi belongs to the family Labiatae characterized by square stem and specific aroma. It is found on large scale in India, Malaysia, Australia, West Africa and some of the Arab countries. Even though different parts of Tulsi e.g. leaves, flowers, stem, root seeds etc. are known to have many medicinal potentials most of therapeutic properties are present in the leaves. Tulsi leaves contain 0.7% volatile oil comprising about 71% eugenol and 20% methyl eugenol. [44] It has been seen that fixed oil and linolenic acid of Tulsi possess anti-inflammatory activity against prostaglandin E2 (PGE2) as well as leukotriene and arachidonic acid-induced edema. [45] Tulsi acts as anti-bacterial especially E. coli, S. Mutans and S.aureus. [46] It also has anti-fungal, anti-viral, ant cariogenic and anti-ulcerogenic properties.

Role in the management of periodontal disease:

Tulsi leaves are quite effective in treating common oral infections. Also few leaves when chewed raw help in maintaining oral hygiene. Carracrol and Tetpene are the antibacterial agents present in this plant. Sesquiterpene bcaryophyllene also serves as the antibacterial agents. This constituent is FDA approved food additive which is naturally present in Tulsi. [47]

Tulsi leaves which are dried in sun and powdered can be used for brushing teeth. [48]

It can also be mixed with mustard oil to make a paste and used as toothpaste. Tulsi has also proven to be effective in counteracting halitosis. Its anti-inflammatory property makes it a suitable remedy for gingivitis and periodontitis, and it can be used for massaging the gingiva in these periodontal conditions. [49]

Tulsi contains vitamin A and vitamin C, calcium, zinc and other metals. It also has chlorophyll and many other phytonutrients. Deficiency of these nutrient has been associated with variety of oral diseases. [50]

6. Pomegranate (Punica granatum):

Punica granatum (family Punicaceae) generally known as "pomegranate," is a shrub or small tree native to Asia where several of its parts have been used as astringent and for

hemostatic as well as diabetic control. The fruit pomegranate of this tree is used for the treatment of throat infections, coughs, and fever due to its anti-inflammatory properties. [51] Pomegranate fruit extract contains anthocyanins, glucose, ascorbic acid, ellagic acid, gallic acid, caffeic acid, catechin, epigallocatechin, quercetin, rutin, iron and amino acids which has got excellent anti-inflammatory, anti-oxidant, anti-inflammatory, anti-proliferative, apoptotic effects and possibly immuno-regulatory action on macrophages and T and B lymphocytes. [52-53] Pomegranate fruit extract gel was active against S. sanguis, S. mutans and S. mitis by inhibiting their adhesion on to the glass surface and that it could be used to prevent adherence of various microorganisms in the oral cavity. [54]

Role in the management of periodontal disease:

Research showed that pomegranate extract was more effective against the adherence of biofilm species than a pharmaceutical antifungal when three or four microorganisms were involved. [52] Investigators noted that pomegranate active components including polyphenolic flavonoids (e.g., punicalagins and ellagic acid), are believed to prevent gingivitis through a number of mechanisms including reduction of oxidative stress in the oral cavity direct antioxidant activity; anti-inflammatory effects; antibacterial activity; and direct removal of plaque from the teeth. [53-59]

In a study evaluating the effects of pomegranate on gingivitis results showed a significant reduction in gingival bleeding after using a dentifrice containing the pomegranate extract. [60] Rinsing with Pomegranate extract also lowered saliva activities of alpha-glucosidase, an enzyme that breaks down sucrose (sugar), while it increased activities of ceruloplasmin, an antioxidant enzyme. [61,62] "The pomegranate extract induced increase in ceruloplasmin activity can be expected to strengthen antioxidant defences," was noted by some investigators. Subjects who rinsed with placebo solution did not experience any of these changes as seen above. [63]

Other herbs which can be used:

Eucalyptus globulus (Eucalyptus), Melaleuca alternifolia (Tea Tree), Cymbopogon Citratus (Lemon grass), Murraya koenigii (Curry leaves), Allium sativum (Garlic), Salvadora persica (Meswak), Emblica officinalis (Indian Goose berry) etc can also be used.

CONCLUSION

Active phytochemicals are useful for the prevention, treatment and maintenance of periodontal diseases. Herbal and ayurvedic drugs have been widely acclaimed worldwide since several years in terms of both medicinal and economic implications. Herbal extracts in the form of dentifrice, medicated gel, ointment, solution etc. have been proved effective in preventing and treating periodontal disease. Thus, this review on herbal approaches in periodontics is useful for dentists, healthcare professionals and general public in terms of prevention, treatment and maintenance of various periodontal and dental diseases.

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