



Herbal medicine as adjunct in periodontal therapies- A review of clinical trials in past decade

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ABSTRACT

The aim of this paper was to analyze the literature published in the research related to herbal medicine as adjunct in periodontal therapies. An internet search using search engines- Google, Researchgate and PubMed was carried out. The keywords used for search were-periodontal therapy, adjunct, herbal, and periodontitis. Full text articles of the articles were collected from the year 2007–2017. The data available from the clinical trials the journal articles were analyzed and presented in both tabular and descriptive patterns.

1. Introduction

Herbal medicines and preparations comprise of plant constituents professed to have therapeutic benefits.¹ Herbal products are favored over conventional drugs owing to extensive natural activity, advanced safety margin, and inferior costs. Additionally, the modern drugs are known to cause several side effects. Continuous intake of modern drugs have sometimes caused in antibiotic resistance thereby herbal medicines are being used gradually as dietary add-ons to combat or avert common ailments affecting human body and oral cavity.¹

Gingival and periodontal infections have plagued humans since a very long time. Paleopathological studies have directed that critical periodontal disease as indicated by bone loss have affected early humans in varied cultures. The ancient Greeks, Hippocrates of Cos (460-377 B.C.) thought that inflammation of gum could be caused by buildup of pituita² or calculus with gingival haemorrhage.^{1,2}

These periodontal diseases ensue when bacteria in plaque contaminate the gums and the bones that sustain the teeth.³ There are two types of periodontal diseases -Chronic periodontitis and aggressive periodontitis. Chronic periodontitis occurs commonly whereas aggressive periodontitis ensues in population below the age of 30 years. Non-surgical treatment is valuable in mild to moderate periodontitis whereas surgical treatment is useful in progressive cases. Confined drug delivery systems-mouth rinses, irrigating solutions and sustained release devices are used for distribution of antimicrobial agents.³

It has been observed that artificial antimicrobial agents and antibiotics are identified to cause antimicrobial resistance. It has also been observed that appearance of formerly rare infections are on the rise perhaps due to the incorrect or prevalent overuse of antimicrobials. Natural phytochemicals have demonstrated to be worthy substitutes to synthetic agents.⁴ It is interesting fact to note that two of the most populated countries in the world China and India, have used herbal medicine for the managing of oral infections, comprising periodontal disease as well for more than a duration of 2000 years.⁵

It has been found that in adults with chronic periodontitis, scaling and root planning along with use of an adjunctive antimicrobial mediator increases patient outcomes over a period of time compared to scaling alone.⁶ Modern chemotherapeutic agents display significant efficacy in improving periodontal health but owing to undesirable side effects such as tooth discoloration, taste alteration, and price of these substances, the usage of herbal products has increased lately and could be especially of high benefit to lower socioeconomic populations around the world.⁷

The herbs frequently tested used for treatment of periodontitis are Acacia catechu, Aloe vera, Azadirachta indica, Glycyrrhiza glabra, Cinnamomum zeylanicum, Allium sativum, Propolis, Mikania laevigata, Mikania glomerata, Droserapeltata, Helichrysumitalicum, Coptidis rhizome, Piper cubeba, Azadirachta indica, Syzygium Aromaticum and Tea tree oil.⁸ Besides the above mentioned herbal remedies a number of other herbal based products are also undergoing

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clinical trials. The details of the trials have been discussed in tabular and descriptive forms in the later part of this review as per chronological order.

2. Materials and methods

An internet search using search engines- Google, Researchgate and PubMed, PubMed Central was carried out. The keywords used for search were-periodontal therapy, adjunct, herbal, and periodontitis. Articles ranging from duration of ten years from the year 2007–2017 were collected. Only full text articles were included for tabular review. Clinical trials were considered for the tabular review, case reports, case series and reviews were not included in the tabular analysis. In vitro studies were not included in the analysis. Clinical trials on experimental animal were not included in the review. Pilot studies pertaining to treatment of periodontitis using herbal medications on human subjects were not included in the analysis. Articles in English language were only considered for the review. The data available from the clinical trials the journal articles were analyzed and presented in both tabular and descriptive patterns.

3. Results

The results of the study are presented below in the tabular format under subheadings of details of researcher and year of research, brand name and composition of the herbal product used in the study, study design and number of study sample, results and conclusions drawn from the clinical trial (Table 1).

4. Discussion

Herbal medicines comprise natural phytochemicals and are highly effective substitute to antibiotics and signify an alternative approach in the preventive and therapeutic management of oral and periodontal infections.^{34,35}

Some of the most common herbal medications used in recent clinical trials for periodontal infections is Turmeric (*Curcuma longa*). Curcumin (diferulolymethane), the yellow coloured bioactive constituent of turmeric has been postulated to have a extensive spectrum of biological actions.²⁰ Curcumin has been used widely in ayurvedic medicine for long duration, as it is nontoxic and has a variety of therapeutic properties including antioxidant, analgesic, anti-inflammatory, antiseptic activity, and anticarcinogenic activity.³⁶ Topical drug delivery of 2% turmeric gel when used as an adjunct to scaling and root planning showed significant reduction in the enzymatic activity of microorganisms.³⁷ Several recent studies have shown that curcuma extract can be a good adjunct for scaling and root planning.^{19,20,26,27,32,33}

Commonly known Babul (*Acacia Arabica*) has cyanogenic glycosides and numerous enzymes like oxidases, peroxidases and pectinases. Its bark contains tanins which are known to have not just analgesic, anti-inflammatory properties but also antimicrobial properties.¹⁷ In a recent study researchers have tried using the gel and powder of this entity and found them to be equally effective.¹⁵ The *Acacia* bark catechuit has certain components that can be useful in management of oral mucosal inflammation and bleeding from the gums. The bark components are also believed to enhance pleasant taste.¹⁵ Studies have revealed that the clinical efficacy of *Acacia Arabica* in reducing gingivitis subjects was equivalent to that of chlorhexidine although it has been also stated that *acacia Arabica* is effective in inhibition of early plaque formation but its role in later stages is questionable.¹⁷

Neem commonly known as *Azadirachta indica* is a very popular herbal agent in India and some South East Asian countries for thousands of years. The plant itself is known to have a broad range wide of biological activity.^{38,39} Nimbodin and sodium nimbinate are the major components of neem responsible for most of its pharmacological

actions.³¹ It was observed that 5% of neem extract was effective against gram positive and gram negative bacteria in culture medium and 10% extract yielded better results in clinical studies.³¹ In one recent study conducted by a group of periodontist a 10% non-absorbable neem chip was placed in the gingiva.³¹ There was significant reduction of bacteria in the sites were these chips were installed.³¹

Green tea is widely consumed liquid refreshment throughout the world. It comprises of numerous substances such as flavonoids, carotenoids, tocopherols, ascorbic acid, minerals.¹³ Green tea has also displayed effective action against effects against Gram-negative anaerobic bacteria. The catechin present in green tea is believed to reduce tissue damage by reducing collagenase activity.¹³ A recently conducted Indian study demonstrated enhancement of the clinical status and inhibition of microbial growth subsequent the usage of green tea catechin chip along with procedures like scaling and root planning.¹³

The results of another Indian study revealed that local drug delivery to the periodontal tissues using green tea extract could be used as an aide in the treatment of chronic form of periodontitis especially in individuals with diabetes.¹⁷

Cymbopogon citratus commonly known to us as lemongrass is a herbal medicine known for its antiseptic, antiemetic, antirheumatic, analgesic, antispasmodic, and antipyretic properties.³⁵ The herb is particularly effective against the strains of strains of *Actinomyces lundii* and *Porphyromonas gingivalis*, which are known to be resistant against several modern therapies.⁴⁰ A recent trial with 0.25% of lemongrass mouth wash revealed that there was significant reduction in gingival and plaque index in the study subjects.²⁹

Tulsi (*Ocimum sanctum*) is one of India's most well-known herbal medication with strong links to several religious beliefs and customs.^{41,42} Tulsi is known to be very effective in countering the problem of halitosis. Its anti-inflammatory property is known to reduce periodontal and gingival inflammation. Tulsi is a good source of Vitamin A and C, calcium, zinc, iron chlorophyll and several phytonutrients. These micronutrients are believed to play a key role in maintenance of gingival health.⁴³ *Ocimum sanctum* has been used with different herbal formulations for the management disorders involving multiple organ system.²³ A recent study with *Ocimum sanctum* 6% showed that it was as effective as chlorhexidine in management of periodontitis.²³ The study also revealed that anti-gingivitis and anti-inflammatory influence of *Ocimum sanctum* extract mouthwash, prepared from the extract *Ocimum sanctum*.²³ The results of the study also revealed that was effective as an antibacterial agent against bacterial flora of the oral cavity. During the course of the study it was observed that a 4% concentration of *Ocimum sanctum* extract had optimum antibacterial action against oral bacterial microflora.²³

Coriandrum sativum a member of Umbelliferae family was an essential component of ancient Iranian medicinal practice employed for the treatment of flatulence.²⁵ *Coriandrum Sativum* was used in combination with *Quercus brantii* in the oral gel form in one recent Iranian study.²⁵ The herb *Quercus Brantii* is among plentiful species of plants growing in Western Iran belongs to the Fagacea family and is customarily used to treat ulcers of gastric mucosa.²⁵ Both *Coriandrum sativum* and *Quercus Brantii* had tannin contents which could reduce bacterial activity in the periodontium and hence was a combination of choice in the clinical study.²⁵

Meswak chewing stick very popular in Arab culture is obtained from Arak tree (*Salvadora persica*) that is found mainly in Saudi Arabia and several parts of Middle East. The Meswak extract has also is commonly used in several commercially available dentifrices for its strong anti-plaque and antimicrobial action.⁴⁴

Aloe barbadensis Miller commonly known as Aloe vera has been used natural remedy skin ailments. A recent clinical study revealed significant improvement in clinical factors such as plaque index, probing pocket depth, and gain in clinical attachment following an intra-pocket placement of aloe vera gel in type 2 diabetes mellitus.⁴⁵

Alternative medicine which includes acupuncture, acupuncture, and

Table 1

Sl no	Researcher and year	Herbal product used	Study design and sample size(n)	Results and conclusion
	Asokan S et al. 2008 ⁷	Oil pulling with sesame oil	A randomized, controlled, triple-blind study (n = 20)	Oil pulling can be used as an effective preventive adjunct in maintaining and improving oral health.
	George J et al. 2009 ¹⁰	Colgate herbal toothpaste (Colgate- Palmolive India Limited) containing calcium carbonate, chamomile, sage, myrrh eucalyptus and sodium monofluorophosphate	double-blinded controlled clinical trial (n = 30)	The researchers concluded that the herbal-based toothpaste was as effective as the conventionally formulated dentifrice in the control of plaque and gingivitis.
	Pradeep AR et al. 2010 ¹¹	Gumtone gel (Charak Pharma Pvt. Ltd, India) polyherbal formulation with Acacia arabica as its main ingredient.	randomized controlled clinical trial (n = 90)	Gumtone gel showed significant clinical improvement in gingival and plaque index scores as compared to a placebo gel. This improvement was comparable to 1% chlorhexidine gel. Unlike chlorhexidine gel, gumtone gel was not associated with any discoloration of teeth or unpleasant taste
	Kadam A et al. 2011 ¹²	UDM tooth powder containing Haritaki Churna 1.70 g Bibhitaki Churna 1.70 g Amalaki Churna 1.70 g Bakula Churna 1.02 g Babbula Churna 1.02 g Khadira Churna 1.02 g Kutaja Churna 1.02 g Nimba Twak Churna 0.57 g Sandhava Lavana 0.15 g Karpooora 0.05 g Peppermint 0.05 g Green tea catechin chip	A randomized controlled trial (n = 30)	The results of the study showed that both UDM toothpowder and standard control treatment group shows statistically noteworthy reduction in scores of gingival index and plaque. UDM powder also demonstrated a similar effect in treating gingivitis.
	Kuduva P et al. 2011 ¹³	Green tea catechin chip	A split mouth design (n = 14)	The results of the study showed clinical and microbiological improvements resulting the use of Green tea catechin chip as an adjunct to scaling and root planning
	Samani MK et al. 2011 ¹⁴	0.1 g of Frankincense extract	double blind randomized placebo controlled trial (n = 75)	Study of data showed that scaling and root planning in association with Frankincense application (either extract or powder) lead to notable decrease in inflammatory indices in comparison to the groups without scaling and drug therapy (p < 0.001).
	Pradeep AR et al. 2012 ¹⁵	Acacia arabica gel and Acacia arabica powder	randomized placebo controlled trial (n = 120)	Acacia arabica gel and powder showed noteworthy clinical enhancement in gingival and plaque index scores as compared to a placebo but comparable to 1% chlorhexidine gel.
	Nayak SS et al. 2012 ¹⁶	Ethanol extract of Terminalia chebula	Randomized clinical trial (n = 60)	The variation between gel and powder with respect to clinical and microbiological factors was not significant. The outcomes of this study direct that Terminalia chebula ethanol extract mouth rinse employs extended antimicrobial action on salivary Streptococcus mutans.
	Gadagi J et al. 2013 ¹⁷	Green tea catechin strips	A randomized, placebo-controlled, parallel-group, single-evaluator-blinded study with split-mouth design (n = 50)	The results of the study showed that Green tea catechin strip can be used as an adjunct to scaling and root planning in the treatment of chronic periodontitis both in diabetic and non-diabetic patients
	Sucheta A et al. 2013 ¹⁸	Periocare® Gum Massage powder containing Cinnamom zeylanicum, Piper nigrum, Eugenia caryophyllata, Glycyrrhiza glabra, and Rubia cordifolia,	Randomized clinical trial (n = 75)	Results of the study showed that oral prophylaxis alone also resulted in significant reduction of all the measured variables; however, it is conceivable to suggest that Periocare® along with scaling is more beneficial in the treatment of periodontitis, which is primarily caused by anaerobic microorganisms
	Varghese SK et al. 2014 ¹⁹	10 mg curcuma longa extract	Split mouth design (n = 15)	The results of the study revealed that curcumin when used with scaling and root planning is effective in reducing gingival inflammation and pocket depth
	Bhattia m et al. 2014 ²⁰	1% curcumin gel	Case control study (n = 25)	The results of the study showed that 1% curcumin gel when delivered locally was more effective in impeding the growth of oral bacteria when used as an adjunct to scaling in the treatment of chronic periodontitis.
	Aspalli S et al. 2014 ²¹	HiOra FNx01 mouthwash containing Piltu (Salvadora persica) - 5.0 mg, Bibhitaka (Terminalia bellerica) - 10 mg, Nagavalli (Piper betel) - 10 mg, Gandhapura taila - 1.2 mg, Ela - 0.2 mg, Peppermint satva - 1.6 mg, Yavamisatva - 0.4 mg	Randomized clinical trial (n = 100)	Results of the study showed a reduction in Plaque index scores, gingival index scores, and Gingival bleeding scores were seen in herbal mouthwash users compared with chlorhexidine mouthwash users

(continued on next page)

Table 1 (continued)

Sl no	Researcher and year	Herbal product used	Study design and sample size(n)	Results and conclusion
	Deore GD et al. 2014 ²²	Septilin containing (Powder Balsamodendron mukul 162 mg, Shankha bhasma 32 mg, Extract Maharashadi quath 65 mg, Tinospora cordifolia 49 mg, Rubia cordifolia 32, Emblica officinalis 16 mg, Moringa pterygosperma 16 mg, Glycyrrhiza glabra 6 mg) Ocimum sanctum 6% w/w.	Randomised, double-blind, placebo-controlled, clinical trial (n = 60)	The outcomes of this clinical-biochemical trial recommend that nutritive supplementation with herbal immunomodulatory agents like septilin may be a encouraging adjunct to scaling and root planning and may assist in improving periodontal treatment results The results of the study showed that Ocimum sanctum demonstrated comparable consequence on plaque and gingivitis when equated with the standard control chlorhexidine and is has no side effects of chlorhexidine. Results of the study showed that the topical application of herbal gel can be comparably used as chlorhexidine gel in the management of chronic periodontitis as an adjunct to mechanical periodontal treatment and can produce significant clinical benefits when compared with scaling and root planning alone.
	Gupta D et al. 2014 ²³	The Carbopol-based herbal gel formulated using the bark of Mimulus elengi, Acacia arabica and Punica granatum	Randomized, controlled, split mouth clinical study (n = 30)	The oral gel did not display any considerable advantages over scaling and root planning as an adjunct in periodontal therapy Results of the study showed that irradiation with light of 470 nm wavelength and a power intensity of 620 mW/cm ² potentiates the benefits of curcumin in periodontal tissues
	Yaghini J et al. 2014 ²⁵	Oral Gel containing extracts of Quercus brantii and Coriandrum sativum	Randomized, double-blinded controlled trial (n = 74)	The results of the study suggested that curcumin has inhibitory effects on periodontal bacteria hence it can be used as a prophylactic and therapeutic agent for inflammatory bone diseases such as periodontitis
	Sreedhar A et al. 2015 ²⁶	curcumin gel application for 5 min and irradiation with blue halogen curing light of wavelength 470 nm with intensity 620 mW/cm ² for 5 min	Split mouth clinical study (n = 15)	Results of the study showed significant reduction in plaque index in the group of irrigation with herbal extract. While evaluating sulcus bleeding index, irrigation with chlorhexidine showed a better result. Additional factors such as probing pocket depth and microbiological counting were alike for both group
	Nagasri M et al. 2015 ²⁷	Curcuma longa extract 10 gm gel	randomized split mouth, single-blinded study (n = 30)	Results of the study revealed that lemongrass oil mouthwash group showed highest, statistically significant (p ≤ 0.05) reduction in gingival index and plaque index at the end of both second and fourth week
21.	Dany SS et al. 2015 ²⁹	0.25% Lemongrass oil mouthwash	A Three Arm Prospective Parallel Clinical Study (n = 60)	The results of the study provides strong indication of the advantageous antiplaque and antigingivitis effects of the test herbal toothpaste Sudantha on patients with chronic gingivitis.
22.	J Howshigan et al. 2015 ³⁰	Ayurvedic medicinal tooth-paste containing Acacia chundra Willd. Adhatoda vasica Nees, Mimulus elengi L, Piper nigrum L, Pongamia pinnate L, Pterre, Quercus infectoria Olivier, Syzygium aromaticum L, Terminalia chebula Retz, Zingiber officinale Roscoe 10% non-absorbable neem chip	Double-blind, randomised, placebo-controlled, parallel allocation clinical trial (n = 80)	Results of the study showed that curcumin has inhibitory effects on periodontal bacteria hence it can be used as a prophylactic and therapeutic agent for inflammatory bone diseases such as periodontitis
23.	Vemilla K et al. 2016 ³¹		Clinical trial (n = 20)	Results of the study showed that the oral gel containing curcuma longa extract was effective in management of gingivitis as an anti-inflammatory agent as a local application adjunct to scaling
24.	Roopa DA et al. 2016 ³²	1% curcumin gel	Randomized controlled clinical trial (n = 30)	The results of the study revealed that oral gel containing Curcuma longa extract was efficient in treating initial infective inflammatory periodontal diseases not only when used as an adjunct to scaling and root planning but also when used alone
25.	Sharma V et al. 2016 ³³	10 mg/g C. longa extract	Split-mouth design (n = 20)	

aromatherapy is used world over for the not just for treatment of diseases but also for the maintenance of overall general health. In Acupuncture specialized needles are into trigger points (acupuncture points) that are situated along channels called “meridians” that run throughout the body.⁴⁶ It has been stated that the trigger points for severe gingival redness and inflammation of the mandibular region are located over the masseter muscle anterior to the angle of the mandible and the center of the depression of the lower margin of the zygomatic arch, anterior to the TMJ.⁴⁷

Essential oils such as clove oil, eucalyptus oil, lemongrass oil and orange oil are used the most in aromatherapy due to the immeasurable profits they have on the mind-body system.⁴⁸

Lemongrass oil is extracted from lemongrass belonging to the Germinae family.²⁹ It is often believed that antibacterial and antifungal properties of lemongrass oil are equivalent to that of penicillin and hence could be effective in controlling periodontal bacteria.²⁹ In one recent Indian study lemongrass oil was used in the 0.25% mouthwash. The results of the study showed considerable reduction in baseline plaque and gingival index. It is also hypothesized that the high viscosity of the lemongrass oil interferes with bacterial adhesion thus reducing plaque formation and periodontal destruction.²⁹ Another possible mechanism that has been stated is that lemongrass oil causes elevated Superoxide dismutase and thiol levels in the gingival crevicular fluid thus causing free radical induced periodontal tissue destruction.²⁹

Miswak or siwak is one of the most popular oral hygiene aid in most of the arab and African region. It is also popular in parts of India and Pakistan and occupies great important in Islamic tradition and culture.⁴⁹ A recent research revealed significant progress in plaque score and gingival health when miswak was used as an adjunct to tooth brushing.⁵⁰

5. Limitations of herbal medication research

There number of clinical trials to ascertain effectiveness and safety of traditional herbal medications are relatively less in number.⁵¹ However lack of evidence based research regarding use of herbal medications have not deterred the use of herbal medication since the concepts are embedded in our cultural traditions.⁵² A recent study that approximately 20% of herbal medications purchased over the internet contained detectable levels of heavy metals like lead and arsenic.⁵³

6. Conclusion

The purpose of this paper was to review the clinical trials of herbal medications used as adjuncts for scaling and root planning in past ten years. The conclusions from the review suggest that herbal medicine is proving to be potential effective competitor to modern medication as an adjunct to scaling and root planning procedures. However more evidence number of clinical trials are required to further establish herbal medication as a reliable treatment modality for periodontal therapies.

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