



REVIEW ARTICLE

TURMERIC- FROM AN ANCIENT SPICE TO MODERN MEDICINE IN PERIODONTICS

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ABSTRACT

Various ayurvedic products are used in medicine due to their vivid use. These products include herbs, roots, leaves etc. Phytotherapy is the term that refers to the use of herbs as medicines. Turmeric is a yellow component produced from a herb *Curcuma longa* which has been used as a medicine since ancient times. Curcumin (diferuloylmethane) is the main component of *Curcuma longa*. *C. longa* has a long history as a curative in Ayurvedic medicine. Numerous pharmacological activities, including antioxidant, antimicrobial, anti-inflammatory and anti-cancerous properties have been attributed to curcumin following oral or topical administration, so it can be useful for both systemic and local disease treatment. It can also be used as a plaque disclosing agent, mouthwash and subgingival irrigant in treatment of periodontal disease. In gel form, it is a component in local drugs delivery system. Due to the varied use of this herb, this review focuses on the use of Curcumin in periodontal diseases.

Key words: Ayurveda, *Curcuma longa*, Periodontitis, Turmeric

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INTRODUCTION:

Turmeric is traditionally used in Asian countries as a spice. Apart from its excellent properties in dietary use, it is also known for its Phytotherapeutic use. Turmeric is a rhizome of *Curcuma longa* which is a herb. *Curcuma longa* comes from Zingiberaceae family and is called "Haridra" in Sanskrit which means "the yellow one". The active ingredient in turmeric is called "Curcumin" which is responsible for the biologic activity of turmeric.^[1]

Curcumin is a symmetric molecule, also known as diferuloyl methane. The IUPAC name of curcumin is (1*E*,6*E*)-1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione, with chemical formula C₂₁H₂₀O₆, and molecular weight of 368.38. It has three chemical entities in its structure: two aromatic ring systems containing o-methoxy phenolic groups, connected by a seven carbon linker consisting of an α,β -unsaturated β -diketone moiety.^[2]

In Ayurveda, it is used in the treatment of many medical problems ranging from constipation to skin disease and in both Ayurvedic and Chinese medicines, it is considered to be a bitter digestive and carminative. In Unani, turmeric is considered as blood purifier and safest herb of choice. It is an excellent anti inflammatory herb, used in treatment of arthritis, rheumatoid arthritis, injuries, and trauma. It also plays important

role in dentistry in treating periodontal disease, to maintain good oral hygiene. Topical application is commonly used to treat bruises, pains, sprains, boils, swellings, sinusitis, and various skin disorders.^[3]

There are various in-vitro and in-vivo studies which have reported that turmeric has antioxidant, anti-inflammatory, anti-carcinogenic, anti-microbial, anti-parasitic properties. Thus various properties of turmeric, its safety and therapeutic uses in periodontics are explained in this review.

History:

The use of turmeric started nearly about 4000 years ago where it was used as a culinary spice. The principal pigment of turmeric was first isolated by Pelletier in 1815. It was obtained in crystalline form in 1870 by Daube and its structure was determined in 1910 by Lampe.^[4]

Pharmacological effects of curcumin:

Anti-oxidant effects

The water-and fat-soluble extracts of turmeric and its curcumin component exhibit strong antioxidant activity as compared to vitamins C and E. According to an *in vitro* study done by **Motterlini et al in 2000**, on endothelial heme oxygenase-1, which is an inducible stress protein, incubation (18 hrs) with curcumin resulted in increased cellular resistance to oxidative damage. The data indicated that curcumin is a potent inducer of HO-1 in

vascular endothelial cells and it increased heme oxygenase activity is an important component in curcumin-mediated cytoprotection against oxidative stress.^[5]

Anti-inflammatory effects

The volatile oils of curcumin show anti-inflammatory effects. According to an invitro study done by **Mukhopadhyay et al in 1982**, orally delivered curcumin in cases of acute inflammation was found to be similar in efficacy as phenylbutazone or cortisone and half as potent in cases of chronic inflammation. *Curcuma longa* obtains its anti-inflammatory activity by its potential to inhibit the production of prostaglandins from arachidonic acid and neutrophil function during inflammation. Curcumin when applied topically prevents inflammation which is caused due to inflammatory skin conditions and allergies.^[6]

Anti-microbial effects

Turmeric extracts and the essential oils of *C. longa* hamper the growth of bacteria, parasites, and pathogenic fungi. In a study done by **Nagasri et al in 2015**, Microbiologic assessment with polymerase chain reaction was done for *Porphyromonas gingivalis*, *Tannerella forsythia*, and *Treponema denticola* by collection of plaque samples. The results revealed that there was a reduction in plaque index (PI), gingival index (GI), probing depth, clinical attachment loss (CAL), and

microbiologic parameters in test sites following SRP and curcumin gel application, when compared with SRP alone in control group.^[7] **Bhatia et al in 2014** stated that 1% curcumin gel appeared to provide significant improvements in clinical parameters. Microbiological counts of *Porphyromonas gingivalis*, *Prevotella intermedia*, *Fusobacterium nucleatum* and *capnocytophaga* showed significant reduction in periopathogens at the test sites after six months when compared with that of control sites.^[8]

Periodontal implications:

Dental problems can be relieved with the help of turmeric in the following ways. Dental pain-ground, roasted turmeric eliminates pain and swelling of the aching teeth by massaging. Periodontal problems- ½ tsp of mustard oil, 1 tsp of turmeric and ½ tsp of salt can be used to prepare a paste and utilized to treat gingivitis and periodontitis. This paste is used to rub gums and teeth twice a day.^[1]

Dental-plaque detection system

Removal of dental plaques is highly important for oral health. However, it is very difficult to identify dental plaque by naked eyes and it is difficult to confirm their attachment site and extent precisely. So, dental plaques are generally stained with dental-plaque staining agents, which contain dyes, to reveal their locations in order to uncover the attached

dental plaques. The dental-plaque detection system includes a dental-plaque staining agent, which contains at least one selected from the yellow pigment of beni-koji, turmeric extracts, and curcumin; and a light-emitting apparatus, which outputs light having a wavelength within a range of 250 to 500 nm to an object in the oral cavity where the dental-plaque staining agent is attached. A yellow pigment of beni-koji and turmeric are known as staining agents also used for other purposes.^[9]

Prevention of plaque and gingivitis

Anti inflammatory property of turmeric has been studied and demonstrated significant reduction of inflammation. Curcumin oil is used as a treatment modality in Recurrent Aphthous Stomatitis. A bio-adhesive formulation comprising of curcuminoids as an active agent has been described in the literature for the prevention of periodontal diseases.^[5]

Mouth wash

Turmeric mouth wash can be effectively used as an adjunct to mechanical plaque control methods. 10 mg of curcumin can be dissolved in 100 mL distilled water. The flavor may be enhanced by using peppermint oil. The pHs of these mouthwashes have been adjusted to 4 and a study has shown that this mouthwash is as effective as a chlorhexidine mouth wash.^[10] According to a study done by **Muglikar et al in**

2013, Curcumin is comparable to chlorhexidine as an anti-inflammatory mouthwash. Thus, it can be considered as an effective adjunct to mechanical periodontal therapy.^[11]

Local drug delivery system

Local drug delivery system containing 2 % whole turmeric gel form as an adjunct to scaling and root planning treatment showed significant reduction in PI , GI, sulcus bleeding index (SBI), probing pocket depth and CAL. There was significant reduction in trypsin – like enzyme activity of “red complex “micro organisms, namely *Bacteroides forsythus*, *Porphyromonas gingivalis* and *Treponema denticola*.^[12]

As a subgingival irrigant in periodontics

Curcumin 1% as sub gingival irrigant resulted in significant reduction in bleeding on probing and redness, when compared with chlorhexidine and saline group as an adjunctive therapy in periodontitis patients. They can cause better resolution of inflammatory signs than chlorhexidine and saline irrigation, by selectively reducing the inflammatory mediators and causing shrinkage by reducing inflammatory edema and vascular engorgement of connective tissues.^[13]

Photodynamic effects

Curcumin has potential as a photo sensitizer for photo dynamic treatment of localized superficial infection in the mouth or skin. In

vitro studies reveal that aqueous preparations of curcumin have phototoxic effects against certain bacteria's like *Enterococcus faecalis*, *Streptococcus intermedius*, *E.coli*.^[14,15]

Influence on Gingival Fibroblasts

Various studies have been done to evaluate the effects of turmeric on gingival fibroblasts. In an in-vitro study done by **Niyomploy et al in 2010**, two main polysaccharide fractions of rhizome of *Curcuma Longa* were evaluated using high performance liquid chromatography (HPLC). One fraction of polysaccharide (P11) of curcumin significantly induced human gingival fibroblasts cells proliferation by 30 % while the other fraction (P21) inhibits gingival fibroblast cells proliferation by 92%.^[16] According to **Shishodia et al in 2005**, hPGF cells was treated by curcumin, which exhibit significant and maximum apoptosis at 75 μ M and showed a decrease in cell population and shrinkage of cell size and morphologic alterations in basal cell carcinoma cells after treatment with 50 nM curcumin and found cell shrinkage, disappearance of microvilli and appearance of membrane blebbing.^[17]

In precancerous lesions

Curcumin has its role in the treatment of various pre-cancerous conditions like Oral sub mucous fibrosis, leukoplakia, and oral lichen planus. Turmeric extract and oil have demonstrated onco-preventive activity in vitro and in vivo animal experiments. Curcuminoids

at doses of 6000 mg/d in 3 divided doses were well tolerated and may prove efficacy in controlling signs and symptoms of oral Lichen planus. Curcumin also holds a promising future in the treatment of oral sub-mucous fibrosis.

Das et al in 2010 performed a comparative study to evaluate the efficacy of curcumin and turmeric oil as a chemo preventive agent in oral sub mucous fibrosis.^[18]

Healing:

Turmeric has also been studied for its role in healing of periodontium. **Varghese et al in 2014** stated that turmeric reduces the inflammatory mediators generated via arachidonic acid pathway and causes shrinkage by reducing inflammatory edema and vascular engorgement of connective tissue. It also helps in promoting the migration of fibroblasts in wound bed and thus resulting in fibrosis of connective tissue. It also enhances migration of epithelial cells to wounded sites by promoting the Transforming growth factor β -1 thus helping in re-epithelization.^[19]

Safety of Turmeric

A phase 1 human trial with 25 subjects using up to 8000 mg of curcumin per day for 3 months found no toxicity from curcumin. Five other human trials using 1125-2500 mg of curcumin per day have also found it to be safe.^[20]

Patents on Curcuma Longa in Periodontal Disease:

Till date, various patents have been issued for the use of Curcuma longa in periodontal disease. U.S. Pat. No. 6,007,795(Thomas Masterman, Jean Spencer) discloses a method for inhibiting bacteria in the mouth of a patient that includes placing a particle containing a degradable material and an anti-microbial agent in the mouth of the patient as a toothpaste and mouth rinse. U.S. Pat. No 5,061,106(Steven Kent) discloses capsules or microspheres in the tuft holes in which the bristles of a toothbrush are mounted. These capsules or microspheres includes medicament that is released during use. U.S. Pat. No. 4,780,320(Richard Baker) discloses a controlled release drug delivery system for placement in the periodontal pocket. Patent WO 2008001325 A2 (Swati Piramal) discloses a bioadhesive composition for oral application, which comprises a curcuminoid substance as an active ingredient.

CONCLUSION:

Curcumin is a specially gifted molecule provided by Mother-Nature to protect humans from chronic health problems. Curcumin is considered a safe, non-toxic and effective alternative for many conventional drugs due to its distinguished therapeutic properties and multiple effects on various systems on the human body. Future research is required to

determine the optimal dosage, bioavailability and bio-efficacy of curcumin-based drugs. As the number of research studies on therapeutic effects of Curcumin keeps on increasing across the globe, it appears that Curcumin truly holds a promising future in therapeutic applications including periodontal diseases.

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