



Curcumin's Role in Dentistry: A Review of Herbal Drugs

Sakshi Pramod Nathani^{1*}, Dr. Ravikant Sune², Dr Vidya Lohe³, and Dr Priyanka Paul Madhu⁴^{1*} Sharad Pawar dental college and hospital, DMIMSU (Deemed to be university), Sawangi (Meghe), Wardha 442001, Maharashtra India.^{2,3}Department of Oral Medicine and Radiology, Sharad Pawar dental college and hospital, DMIMSU (Deemed to be university) Sawangi Meghe, Wardha 442001, Maharashtra, India.⁴Department of Public Health Dentistry, Sharad Pawar Dental college and hospital DMIMSU (Deemed to be university) Sawangi Meghe, Wardha 442001, Maharashtra, India.

Abstract: Before antiquated duration, seasonings had been a substantial wellspring of medication. Turmeric (diferuloylmethane) is a tangerine-brown part of Curcumin (*Curcuma aromatica*), a flavor frequently originated in powdered curry. Generally remembered for its calming impacts, Curcumin longa possess extended past of therapeutic usage in Ayurveda and frameworks of medication from China. Curcumin can be used as a mouthwash, pit and gap filler, and subgingival irritant in various combinations. It has also been connected to a variety of pharmacological actions such as cancer prevention, antimicrobial properties, and soothing effects. Haldi is the local drug delivery system in clotting structure. The following article presents with an elevated perspective mostly on the organic exercises of the miswak and conceivable restorative and dental applications. Turmeric is one of the most well-known spices that has been used for a long time and is an important component of ancient medicine. It's harmless and has a variety of restorative applications, including dental use. The purpose of this essay is to look at the other oral cavity uses of turmeric because of lack of data and study of the area. The motive of the following write-up is to assess the potency of Curcumin longa spice for maintaining dental wellbeing specifically, as well as overall wellbeing. Haldi or Indian saffron, is a spice with therapeutic characteristics and is reliable and reasonable choice. It also shown cancer-prevention, antibacterial, germ-free activities. It is also highly useful in dentistry because of these qualities. It aids in the treatment of periodontal disease and other dental illnesses. Turmeric can be used in a variety of ways, including as a pit and crevice sealer, mouthwash, and subgingival irritant. It can be additionally used a topical application in a coagulant format. Turmeric (Curcumin) is a well-known spice with ancient medicinal uses, particularly in Ayurveda and Chinese medicine. Its tangerine-brown component, Curcumin longa, has been extensively utilized for its anti-inflammatory properties. In dentistry, Curcumin has found various applications, including as a mouthwash, pit and gap filler, and subgingival irritant in different combinations. Additionally, it exhibits pharmacological actions such as cancer prevention, antimicrobial effects, and soothing properties. The present article provides an overview of the organic activities of Curcumin, particularly its potential therapeutic and dental applications. Turmeric has a long history of safe use and has been a crucial component of traditional medicine. However, research on its oral cavity uses is limited, warranting further investigation in this area. The focus of this essay is to evaluate the efficacy of Curcumin in maintaining dental and overall wellbeing. As Haldi or Indian saffron, it offers reliable and affordable therapeutic benefits. Its demonstrated cancer-preventive, antibacterial, and germicidal activities make it highly valuable in dentistry, aiding in the treatment of periodontal diseases and other dental ailments. Turmeric can be utilized in various forms, such as a pit and crevice sealer, mouthwash, and subgingival irritant. Moreover, it can be applied topically in a coagulant format to address dental issues effectively. Given its extensive historical use and promising medicinal properties, Curcumin remains a valuable asset in the realm of dentistry.

Keywords: Curcumin Longa, polyphenols, Ayurveda, therapeutic, tangerine-brown, subgingival irritant.

*Corresponding Author

Sakshi Pramod Nathani, Sharad Pawar dental college and hospital, DMIMSU (Deemed to be university), Sawangi (Meghe), Wardha 442001, Maharashtra India.

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I. INTRODUCTION

In many regions of the world, medicinal plants have been used as a kind of traditional healing since ancient times. They are still the main source of healthcare in rural areas of underdeveloped countries¹. Due to its characteristic feature of flavor and color, turmeric has been utilized in Asian cuisine for a long time. Turmeric has been used for many years as a treatment for icterus, several female issues, blood in the urine, and cramps. In addition to those of other Asian nations like Japan and Korea, it is true in the Chinese pharmacopoeia, and its usage is covered by a wide range of medical purposes². In regional spaces of the creating nations, they keep on being utilized as the essential source of medication. Turmeric has long been used in Asian cookery because of its distinct flavor

and color. It is also known that in the thirteenth century the Arab merchants brought turmeric to Europe with them. On his multiple famous Marco Polo was taken by turmeric during his voyages to India via silk route that he described it as a vegetable with saffron like qualities³. The polyphenol turmeric is obtained from the roots of *Curcuma longa* plant. Turmeric is a spice that is frequently utilized in Asian population⁴. Turmeric is a flavorful yellow orange zest made from the rhizome of *Curcuma longa*, it is a 3-foot-long plant with lance shaped leaves and golden bloom spikes that fill up plump rhizome or subterranean stem. Turmeric medicinal powder is derived from an orange mash contained within the rhizome⁵. The constituents of haldi includes Curcumin, desmethoxycurcumin and bisdemethoxycurcumin⁶.



Fig 1: Turmeric³⁰

Figure 1 Business accessible structure where curcumin is utilized as the principle fixing:

- Capsules
- Mouth wash
- Sub gingival irritant
- Pit and crevice sealant⁶.

As a function item, turmeric (curcumin) is secure what is more, has improved affects in distinctive oral infections. At around 80% percent of Turmeric is taken orally passes within the intestinal tract undamaged, with the vast majority of water soluble phenolic compound remaining being used. Curcumin is frequently combined with bromelain because of its slow rate of digestion.^{7,8} Helpful utilizations of turmeric- Curcumin, a dynamic component of turmeric, has been shown to offer a wide range of therapeutic properties.⁹ Historical use- India is the country of origin for the plant *Curcuma longa* L. (Family

Zingiberaceae). The plant is widely dispersed throughout the world's tropical and subtropical climates.²³ Turmeric is a spice that is grown in the southeast. It is mostly used as a spice and coloring agent in many types of curry powder and sauces. For more than 2000 years, Asians have employed turmeric's rhizome in food, medicine, cosmetics, and fabric dyeing. In the 14th century, early European travelers to Asia brought this significant spice to the Western world. Curcumin is still used as a traditional treatment today. A cataplasm of turmeric paste is used in the antiquated Indian medicinal system Ayurveda to cure common eye infections and bandage wounds.²³ Chemistry of Curcumin-The most potent polyphenolic component, curcumin (1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione) is a key component in conventional herbal remedies.¹ Pharmacological and Therapeutic Actions- Various roles of curcumin are as follows-

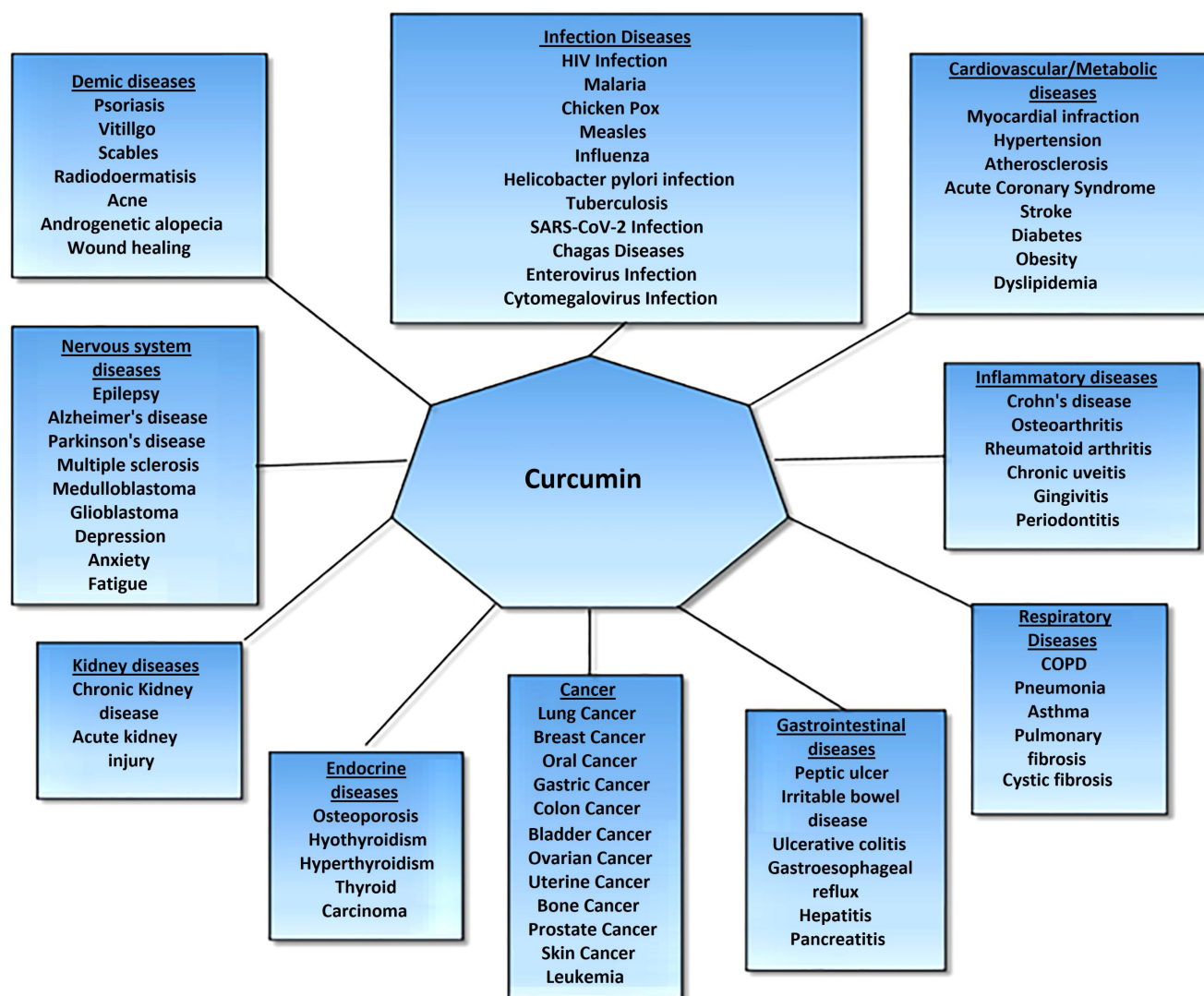


Fig 2: Curcumin's effects on various ailments ²⁹

1.1 Anti-oxidant effects

Given that it is a reliable antioxidant, curcumin promises protection against unrestrained severe harm.¹⁰ Similar to vitamin C and E, turmeric's water and fat soluble concentrations as well as its curcumin content have demonstrated to be useful against a number of cancers¹¹. Cow-like aortic endothelial cells were used in an artificial study to estimate the effect of curcumin heme oxygenase-I, an analytical pressure polypeptide¹².

1.2 Anti-inflammatory effects

Curcumin and erratic oils have soothing effects. When taken orally, curcumin was found to be roughly as effective as phenylbutazone or steroids in cases of severe aggravation and half as effective in cases of ongoing irritation. Curcuma longs' irritative effects may be attributed to its capacity to prevent the formation of a group of lipids from arachidonic corrosive and granulocyte work during irrigation. Curcumin is effective at preventing irritation brought on by sensitivities and diseases of the skin.¹³

1.3 Anti-carcinogenic effects

Rodents and mice are among the creatures studied and artificial studies using immortalized cells have revealed

curcumin's latent ability to stop oncogenesis at three stages: Apoptosis, cancer genesis, and cancer progression⁶. Turmeric shows cell multiplication with cancer development which were examined in colon what's more, endocrine gland malignancy. In vitro and in situ concentrates on Turmeric and curcumin have the potential of quelling the motion of different mutagens and cancer-causing agents in a combination of molecular types⁶.

1.4 Cardiovascular effects

The masking effect at turmeric on the cardiovascular framework brings down the fatty substance and levels of cholesterol lower the powerlessness of minimal thickness bad cholesterol (LDL) to lipid oxidation products, and to stop platelet accumulation. Indeed, despite minimal quantities of Indian saffron impacts are noticeable. Fatty substance and coffee level decrease had been noticed, but raised element failed to decay lipid peroxidation of LDL.⁶

1.5 Gastrointestinal influences

On the gastrointestinal plot the component of Curcumin Longa has some treasured affects. Bicarbonate, pancreatic compound, secretin, furthermore, gastrin, emission upgraded through poly methyl carbinol, a turmeric part and gastrointestinal healthy faded with aid of using sodium

curcumin. Turmeric inhibits ulcers caused by alcohol indomethacin, reserpine, stress, and pyloric ligation in rats, thereby increasing and enhancing the stomach wall mucus exposed to those gastrointestinal shocks¹⁴

1.6 Microbial Biofilm Detection System

Caries is believed to be an irresistible illness brought about by microbes or germs existing in oral biofilm, it is also recognized that removing tooth plaque is quite important for the strength of oral depression. Notwithstanding, bacterial plaque biofilm are not simple to differentiated by unaided eye⁹. Subsequently, biofilm is by and large tinged with dental oral biofilm location framework that incorporates a microbial biofilm tinged specialist, which has a content of haldi separate light emitting contraption, that radiates beam with frequency inside scope of approximately five hundred millimeters to item in mouth to the microbial biofilm dye specialist is joined⁹

1.7 Dental Applications of Curcumin

1.7.1 Curcumin on Human Gingival Fibroblasts

Several studies have demonstrated that human primary gingival fibroblasts (hPGF) cells undergo apoptosis at lower doses of curcumin, such as 1, 10, and 25 μ M, but not at larger dosages such as high apoptosis was seen at 50, 60, 75, and 100 μ M, which was statistically significant. Additionally, they discovered that curcumin's effects on normal human fibroblasts and microvascular endothelial cells (hMVEC) were studied using the MTT assay. They discovered that lower dosages of curcumin promoted while larger doses reduced the proliferation of normal human fibroblasts and hMVEC. 16 Other authors claim that basal cell carcinoma cells treated with 50 μ M curcumin demonstrated cell shrinkage, a drop in cell population, and shrinking of cell size, with maximum and substantial apoptosis occurring at 75 μ M in curcumin-treated hPGF cells²⁴

1.7.2 Curcumin on sealed pit and fissures

Colored pit and crevice sealant has been discovered to be effective for preventing dental cavities when applied to tooth surfaces. Here the bond may also be created by an arrangement including a polymerizable gum framework containing acrylic copolymer what's more, no less than one stain cLAUSE from the gathering comprising of Annatto extricate, turmeric separate, and β - Apo-8.- Carotenol.¹⁵

1.8 Subgingival water system

One percentage of curcumin arrangement can cause superior goal of incendiary signs than chlorhexidine and saline water system as in delivery of irrigation in sulcus or pocket¹⁶.

1.9 Curcumin as Mouthwash

Around 150 subjects were chosen randomly in a concentrate by Waghmare et al. Both gingival file and plaque file were recorded at one to three weeks. It was closed that Betasept, chorostat just as curcumin gargling fluid can be successfully utilized the way assistant to machinary oral biofilm check strategies in avoidance of biofilm and gum disease. Haldi gargling fluid arranged by liquifying ten milligram of haldi in less than hundred milligram of distilled water and some percent of seasoning specialist oil with pH acclimated up to 4 is observed

to be as powerful as most generally utilized chlorhexidine mouthwash, however, Betasept mouthwash have observed to be extra powerful when it was used against plaque. This impact of haldi is noticed might be in view of its mitigating activity. Decrease in all out microbial include was seen in both the gatherings¹⁷.

1.10 Premalignant Conditions

Turmeric plays an important role in the medication of in various premalignant like Lichenoid Keratoses, Jutra epithelial fibrosis and Leukokeratosis. In situ creature tests exercises of turmeric concentrate with turmeric lubricant has been illustrated. Manifestations of agony along with consuming impact was decay and mouth opening were likewise turned around partly.¹⁸

Role of Curcumin in Oral Submucous Fibrosis

The potentially cancerous condition known as oral submucous fibrosis (OSMF) is characterized by the mucosa's rigidity and a limited range of motion in the mouth. The fibrosis causes mouth mucosa to become rigid and deeper tissues with gradual mouth opening restriction and tongue protrusion, which makes it difficult to eat, swallow, and speak²⁵ A wide range of treatment modalities have been proposed for OSMF, but none have been proved to be curative, so the search for effective treatment modality still continues. Plants have been a major source of medicine since the time immemorial. Various studies have been conducted worldwide to show the therapeutic effect of curcumin on OSMF. A study was carried out by Agarwal N et al. to evaluate the effectiveness of turmeric in 30 individuals with OSMF. The burning feeling and mouth opening both improved. There was a theory that curcumin inhibits a variety of molecules involved in the inflammation process, which causes it to exert anti-inflammatory effects. Due to their capacity to suppress lipid peroxidation and restrain cellular proliferation, they also possess fibrinolytic properties, which slow down the pace of collagen formation²² In a research comparing the effects of curcumin and intralesional steroid injections on individuals with OSMF done by Yadav M showed improvements in tongue protrusion, interincisal distance, and burning feeling which was assessed on a weekly basis, and it was discovered that the burning sensation, the space between the teeth, and the protrusion of the tongue had all significantly improved by use of curcumin²⁶ Using curcumin significantly reduce connective tissue growth factor, which is linked to the beginning and progression of OSMF. Numerous research that have been completed over time demonstrate the effectiveness of curcumin in treating OSMF sufferers. Curcumin's pharmacological properties led to a significant improvement in OSMF patients with continuous use.²⁷

1.11 Role of Curcumin in Oral Lichen Planus

An oral mucosa-related chronic inflammatory illness called oral lichen planus (OLP) can cause white stripes, erosion, atrophy, ulcers, and erythema, along with a burning sensation.²⁸ Local administration of curcumin was just as effective in treating lesions and symptoms of OLP patients, such as burning, erythema, and ulceration, as traditional local administration of corticosteroids.²⁸ Kia et al. (2015) investigated the effectiveness of 0.1% triamcinolone topically and 5% curcumin oral paste in a randomized controlled clinical experiment. By measuring the appearance score and level of

pain throughout a four-week period of administration three times daily, it was determined that curcumin had equivalent therapeutic effects to topical corticosteroids. A recent case-control research by Nosratzahi, Arbabi-Kalati, Hamishehkar, and Bagheri supports this idea (2018). In this trial, participants received three daily doses of either local corticosteroids or mucoadhesive pates of curcumin.²⁸

1.12 Role of Curcumin in Oral Squamous Cell Carcinoma

Oral squamous cell carcinoma is the most prevalent type of oral cancer. Curcumin has been proven to have properties for preventing and treating oral squamous cell carcinoma due to its anti-tumor capabilities, which control different signaling pathways in malignant tumors (Liczbinski et al., 2020). Oral squamous cell carcinoma is the most prevalent type of oral cancer (Rivera, 2015). Epidermal growth factor receptor (EGFR) overexpression is a common and early genetic change in oral squamous cell carcinoma. This shift activates downstream signaling pathways like PI3K-AKT-mTOR and RAS/MAPK, boosting angiogenesis, proliferation, metastasis, and invasion (Pysrri, Seiwert, & Jimeno, 2013). Curcumin was discovered to have anticancer action that was AKT/mTOR dependent (C et al., 2020).²⁸ Numerous studies have shown that curcumin prevents the overexpression and activation of proteins linked to these pathways, including cyclin, Bcl-2, and all other oncogenic proteins (Aggarwal, Takada, Singh, Myers, & Aggarwal, 2004; Ip et al., 2011; Khafif et al., 2009; Liao et al., 2011; Shin, Kim, Lee, & Kim, 2010).²⁸ Curcumin's regulatory function in multi-drug resistance (MDR), in addition to its own anticancer benefits, has drawn attention. MDR is a significant barrier to successful cancer treatment, and this is mostly due to the NF-B signaling pathway (Siveen et al., 2014). There is proof that curcumin improves drug sensitivity by suppressing ATPase activity, ATP-binding cassette transporter expression and function, and NF-B activity (Xue et al., 2013). As a result, giving cancer patients treatment that is more effective by mixing curcumin with traditional anticancer drugs.²⁸

1.13 Local drug conveyance framework

In a review directed by Behal et al., 30 subjects with ongoing restricted or summed up inflammation of periodontal tissues

including pocket profundity of five to seven mm were tried out a split-oral cavity concentrate on plan.¹⁹ Jurisdictional destinations got Conventional periodontal therapy solitary, while exploratory destinations got non-surgical periodontal therapy in addition to 2% entire haldi paste. The two gatherings showed measurably huge decrease in plaque list, gingival file, sulcus draining list, testing pocket profundity, with increase in comparable connection misfortune.¹⁹ There occurred a huge decrease in the 'red complex' microbes in the trypsin like movement of protein. There has been significant reduction in taking trial bunch boundaries all together in comparison with the once with benchmark group. Consequently, the regional medication conveyance framework including less than two percentages entire curcumin paste can be utilized as a subordinate to non-surgical periodontal therapy.¹⁹ Recurrent Aphthous Stomatitis (RAS) Aphthous is a provocative state with obscure etiology influencing the oral epithelium. Roughly around twenty percent of the populace experiences Aphthous at some point in their life. This sickness principally includes un keratinized mucosa plane which was portrayed by itself or various agonizing inflammation along with occasional repeat together with mending. They encountered of course not before time decreased during torment instead recurrence with repeat. A sick person saw decrease in aggravation together with furthermore oil of Curcumin started mending consequences for ulcers at a prior phase of implementation. A development of less than two years has signified no repeat.¹⁸

1.14 Dosage

Dosages of five hundred powdered turmeric every day had been applied in living being investigations. Normalized extricates are often utilized in decreased range.¹⁴

1.15 Wellbeing Facets

Haldi (Turmeric) is known to put forward numerous medical advantages, cost-effective and has been viewed as pharmacologically protected. Albeit human utilization of curcuma aromatics as an edible zest runs up to 100 mg/day, it's also demonstrated as - people may endure some portion of turmeric with minimum quantity of more than 10gm/day, with no harmful adverse effects.²⁰

1.16 Clinical trials with curcumin with respect to different oral diseases²⁸

Table 1: Clinical trials with curcumin in respect to different oral diseases²⁸

Diseases	Dose	Study Duration	Outcome	Authors
Oral Submucous Fibrosis	Curcumin Tab (300mg)	3 months	The test groups showed better result by improvement in burning sensation and mouth opening.	26
	Curcumin Lozenges (2g/day; oral)	9 months		6
Oral Lichen Planus	Curcumin oral paste (5%, three times a day, topical)	4 weeks	Participants showed improvement in pain reduction and reduction in clinical signs and symptoms.	27
	Curcumin mucoadhesive pates (three times daily; topical)	12 weeks		31
Gingivitis	Turmeric mouthwash (10ml, 1 min twice a day)	21 days	Significant reduction in Plaque index and gingival index was noticed.	19
Periodontitis	Curcumin gel (1% topical)	6 months	Significant reduction in plaque index, gingival index, periodontal pocket depth and clinical attachment loss was identified in the test group.	32

1.17 After effects and Harmful factors

At ordinary dosages, no critical poisonousness was observed nor was intense or constant organization of turmeric separates at standard dosages. At extensively high doses, curcumin may cause ulcers in animals, according to one mouse research (100 mg/kg body weight)¹⁴

1.18 Future difficulties

Some vast issues of growing turmeric or haldi for medical viability is low oral digestibility may be ascribed to its helpless ingestion, excessive tempo of digestion within side the digestive organs, and short disposal from the body. Likewise, less information is available to regulate its health in better portions. Micro engineering primarily on totally novel structures are in impact forcefully investigated global to enhance curcumin's bioavailability a diminished obvious poisonousness.²¹

2. CONCLUSION

Curcumin is viewed as a protected, nonpoisonous, and

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Curcumin is viewed as a protected, nonpoisonous, and successful elective for some customary remedy because of its perceive remedial qualities and various effects on varied frameworks of the body. Its job in the treatment of diseases is exceptionally encouraging. Indian saffron is the maximum valuable and excessive herb all over world and is being applied as a feature surprise typically in Bharat (India). Indian saffron also known as haldi performs a preposition lot component to provide in dental practice. Notwithstanding, there is less information and studies on this topic. Subsequently, in addition exploration is wanted as turmeric appears to maintain a promising destiny in dentistry.

3. AUTHORS CONTRIBUTION STATEMENT

Dr. Ravikant Sune and Dr. Vidhya Lohe drafted the manuscript and approved the final version of the manuscript. All authors have read and agreed to the published version of the manuscript.

4. CONFLCT OF INTEREST

Conflict of interest declared none

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