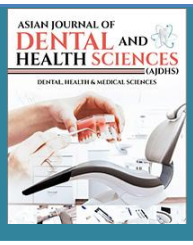

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Asian Journal of Dental and Health Sciences

Open Access to Dental and Medical Research

Open Access Review Article

Herbal Medicine for Pain Management in Dentistry

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Article Info:

Article History:

Received 03 Sep 2025
Reviewed 24 Oct 2025
Accepted 19 Nov 2025
Published 15 Dec 2025

Cite this article as:

Prajapati SK, Jain D, Verma KK, Arya RKK, Dhakar RC, Porwal O, Tilak VK, Maurya SD, Herbal Medicine for Pain Management in Dentistry, Asian Journal of Dental and Health Sciences. 2025; 5(4):1-6

DOI: http://dx.doi.org/10.22270/ajdhs.v5i4.146

Abstract

Dental Pain is one of the most prevalent conditions across the globe that is managed through various methods. Allopathic medicines, i.e. Analgesics, Opioids, Steroids, and Local anaesthetics, are used for the treatment or management of chronic/acute Pain. But due to the adverse effects associated with these allopathic medicines, Herbal Medicine should be considered as an alternative therapy for Pain Management in Dentistry. Various Medicinal plants, such as Garlic, Cloves, Turmeric, Neem, Peppermint, and babul, possess significant analgesic activity; therefore, well-designed clinical studies are required to establish and improve the efficacy of herbal medicine for dental pain. Thus, the use and implementation of natural treatments will be highly beneficial to the field of dentistry. The present review highlights Herbal Medicine, which plays a crucial role in treating pain, particularly in post-maintenance periodontal therapies, without side effects.

Keywords: Dental Pain, Herbal Medicine, Clove, Turmeric, Neem, Ginger

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Introduction

Oral health is an integral component of general health. Oral health problems such as dental caries, periodontal diseases, and oral cancers are global concerns restricting and confining the day-to-day errands and chores. [1]. Oral diseases remain a significant global health issue, with dental caries and periodontal diseases being among the most critical challenges in oral health. [2] Dental Pain is one of the most prevalent conditions across the globe that is managed through various methods. Allopathic medicines like NSAIDs and opioids are used for the treatment or management of chronic/acute Pain. But due to the adverse effects associated with these allopathic medicines, Herbs have long been a popular self-medication option due to their accessibility, trusted efficacy, and safety in relieving oral/dental problems. Therefore, herbal Medicine should be considered as an alternative therapy for Pain Management in Dentistry [1].

Natural products contain a wide range of bioactive compounds, including flavonoids, terpenoids, alkaloids, and phenolic compounds, which have demonstrated antimicrobial, wound-healing, anti-inflammatory, and antioxidant activities. [2] Herbal medicines like clove oil, Turmeric, Ginger, Peppermint, Moringa and garlic have shown significant promise for pain management in dentistry, offering anti-inflammatory and analgesic properties with fewer side effects than some conventional drugs. Clinical studies suggest that, in some cases, certain herbal extracts can be as effective as standard over-the-counter pain medications for specific types of dental pain. Herbal medicine has long been used as an alternative treatment because it is less likely to cause allergic reactions or other adverse effects, as it comes from natural sources. Therefore, it is essential to

analyse and test the efficacy of herbal medicine to establish and promote its use as an alternative therapy for Pain Management in Dentistry. New medical professionals must be able to assimilate popular knowledge, update it, and place it in the arsenal of modern medicine for the general benefit of society. [3] Thus, the use and implementation of natural medicines like neem, cloves, ginger, Turmeric etc will be highly beneficial to the field of dentistry. [4] This review provides insights into some medicinal plants, elucidating their medicinal attributes and applications in dentistry.

Herbal Medicine for Pain Management in Dentistry

Herbal medicines like Clove Oil [5-13], Turmeric, Peppermint, Moringa [14], Neem [15-23], Ginger [11, 24-30], Garlic [31-35], Cacao Beans [3, 36-42], Green Tea [43-46] etc. have shown significant promise for pain management in dentistry, offering anti-inflammatory and analgesic properties with fewer side effects than some conventional drugs. In this review, we highlight some herbal medicine that plays a crucial role in treating pain, particularly in post-maintenance periodontal therapies.

Syzygium aromaticum (Clove oil)

Contains eugenol, which has pain-relieving and antibacterial properties. It can be diluted with a carrier oil and applied to the affected area with a cotton ball, or used as a mouthwash.

Clove offers the following advantages;

1. Immediate Pain Relief: The numbing effects of eugenol can provide quick relief from sharp, throbbing toothaches, making it ideal for temporary relief until you can see a dentist.
2. Anti-inflammatory Effects: Cloves reduce swelling and inflammation around the gums and affected teeth, which can help speed up the healing process and reduce discomfort.[5,6]
3. Antiseptic Properties: By fighting harmful bacteria, cloves can help prevent infections, particularly after dental procedures like extractions or fillings. [7]
4. Natural and Chemical-Free: Unlike pharmaceutical pain relievers, cloves are a natural option, making them an excellent choice for those seeking a holistic solution to dental pain.
5. Affordable and Accessible: Cloves are easy to find in most kitchens or health stores, and they're cost-effective compared to many other dental pain treatments.

Clove, particularly its active compound eugenol, has been traditionally employed in various cultures for the management of pain and inflammation [5]. Eugenol, the primary bioactive component of clove, exhibits significant analgesic and anti-inflammatory effects. Research has indicated that eugenol can inhibit cyclooxygenase (COX) enzymes, which are crucial in the inflammatory process. This inhibition helps mitigate inflammation and pain; therefore, clove is a promising candidate for post-surgical pain management [6]. Clinical studies support cloves' efficacy in relieving pain. For example, one study found that clove oil effectively reduced pain during intraoral injections in children, which was comparable to the pain relief provided by ice [7]. Esmaeili et al. reported that clove has been used in dental emergencies as an effective reliever for toothache and as an anti-inflammatory agent for the mouth and throat [8]. Additionally, Havale et al. demonstrated that clove oil was more effective than a commonly used local anaesthetic, lignocaine gel. These findings suggest that clove could serve as a valuable adjunct to conventional postoperative pain management strategies [9]. Chandran et al. found in their in vivo study that a higher dose (200mg/kg) of the extract was effective in reducing pain and inflammation [10].

A study by Alipour et al concluded that a combination of cloves and ginger as analgesic agents can serve as a non-narcotic treatment option for managing mild-to-moderate postoperative pain. [11] In another study, Jesudasan et al. (2015) examined the efficacy of a clove-derived eugenol paste in 270 patients with alveolar osteitis. Patients treated with eugenol experienced significantly greater relief in postoperative pain, inflammation, infection, and wound healing than those treated with 0.2% chlorhexidine gel. Results of this study concluded that eugenol was the better of the 2 interventions. [12, 13]

Azadirachta indica (Neem)

Used in dentistry for its antimicrobial and anti-inflammatory effects, it can help with gum tissue and is found in products like toothpaste. Neem chewing sticks exhibit anti-plaque activity attributed to their fibrous nature. The neem plant, rich in chemotherapeutic antiplaque agents such as gallotannins, aids plaque removal by promoting aggregate formation. Anti-plaque activity of gallotanin effectively inhibits glucosyltransferase activity and reduces bacterial adhesion.[15] Unlike antibiotics, neem extracts do not cause gingival allergies, preserving their effectiveness.[16]

In a study assessing analgesic effects, 2 ml/kg body weight of neem seed oil (NSO) is comparable to a 1 mg/kg body weight dose of morphine. Notably, NSO demonstrates superior analgesic efficacy compared to morphine within 45 min.[17] Excessive use of neem in the form of mouth rinses and gels can temporarily stain the teeth and tongue.[18] Kumar et al observed that the oil of seeds of neem in a dose of 2 ml/kg body weight was appropriate in comparison with morphine with a dose of 1 mg/kg body weight. Neem Seed oil yields a more potent analgesic effect than morphine within 45 minutes. Srinivasa et al. found that neem resembles indomethacin in a study done using albino rats [19].

In a recent investigation, Ofiri et al. evaluated the effectiveness of Neem. 48 patients were randomly assigned to the control and neem groups. Results of this study concluded that Neem mouthwash was more effective in controlling pain, facial swelling, trismus, and poor wound healing than chlorhexidine mouthwash. Still, they had the same effect as chlorhexidine mouthwash in controlling localised alveolitis, acute

alveolar infection, and adverse effects. [20]. Also, it has been reported that neem contains limonoids [21], which show anti-inflammatory activity. Neem is reported to remarkably reduce the release of monocyte chemotactic protein-1 (MCP-1) [22]. Extracts of neem leaves mitigate the release of pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1β. On the other hand, it enhances the release of anti-inflammatory cytokines such as IL-10[21, 22, 23]. Despite the well-documented anti-inflammatory and analgesic effects of neem, these effects have not been reported following third molar surgery.

Zingiber officinale (Ginger)

Contains anti-inflammatory compounds called gingerols. The combination of cloves and ginger as analgesic agents can be used as a non-narcotic treatment option for managing mild-to-moderate pain after surgery [11]. It contains 80-90 non-volatile compounds that contribute to its anti-inflammatory, antioxidant, and antiemetic properties. Ginger also reduces pain by inhibiting prostaglandins via the COX and LOX pathways, exhibiting antioxidant activity, inhibiting the transcription factor NF-κB, and acting as an agonist of vanilloid nociceptors [24]. The active constituents present in ginger, including gingerols and shogaols, have been extensively studied for their ability to alleviate pain and reduce inflammation. These properties suggest that ginger is a promising option for postsurgical pain relief [25]. Ginger is used for its anti-inflammatory, antioxidant, antiemetic, and pain-reducing effects, and can modulate pain through various mechanisms [26]. Martins et al. reported that ginger significantly reduced migraine headache frequency and symptom severity compared with sumatriptan [27]. In another study, Kashefi et al. [28] and Rahnama et al. [29] found that ginger significantly alleviated primary dysmenorrhea in patients treated with ginger for five days, starting two days before the onset of menstruation. Another study demonstrated that ginger extract was effective in reducing pain and improving functional outcomes in patients with osteoarthritis, suggesting its potential benefits in the postoperative setting [30]

Allium sativum (Garlic)

Garlic is not only a potent antibacterial agent but also a natural, safe dental pain reliever. The compound allicin has antimicrobial properties. A crushed garlic clove can be applied to the tooth for temporary relief. Results from the study of Maribao et al suggest that Aqueous Garlic Extract (AqGE) and Ethanolic Garlic Extract (EtGE), at specific concentrations and dosages, may be effective for pain relief. Results of this study hint at the potential of garlic extracts as natural pain management solutions, but further investigation is essential for practical applications. [31] Aged garlic extract (AGE) has been reported to exert anti-inflammatory effects. AGE has recently been found to reduce inflammatory symptoms in periodontitis, a widespread chronic inflammatory disease caused by oral bacterial infection. [32] A clinical trial assessed the efficacy of aged garlic extract (AGE) in reducing probing pocket depth (PPD) and improving gingival health over 18 months. The average PPD for the AGE group dramatically declined from 1.89±0.74 mm at baseline to 1.06±0.49 mm at 18 months (p<0.001) [33]. AGE comprises sulfur compounds, including *S*-allylcysteine, *S*-1-propenylcysteine, and *S*-allylmercaptocysteine, which exhibit antioxidant properties that enhance the efficacy of AGE in addressing periodontitis. It also improves peripheral circulation, diminishes inflammation, and augments immunological abilities [34, 35].

Theobroma cacao L (Cacao Beans)

Even more surprising are the investigations conducted by different authors in different countries on the antimicrobial effect of cacao beans (Theobroma cacao L. [Sterculiaceae]), the plant from which chocolate is derived. It is a potential substitute for chlorhexidine as a mouth rinse, with powerful anticariogenic, antibacterial, and antiplaque activities (Ooshima et al. 2000; Matsumoto et al. 2004; Srikanth et al. 2008; Venkatesh Babu et al. 2011) [36-39]. It would be especially useful in paediatric dentistry because it would be acceptable to children without hypersensitivity and coloration of the teeth and tongue that chlorhexidine can have on children (Al-Tannir and Goodman 1994) [40]. Moreover, it has been shown that its bioactive compounds, such as catechins and theobromine, possess strong anti-oxidant activity (Lee et al. 2003; Ramiro-Puig and Castell 2009) [41-42]. Thus, T. cacao is a natural source of an agent with potent anticariogenic and antimicrobial activity that has potential in dentistry [3].

Camellia sinensis (Green Tea)

Green tea has been suggested to promote periodontal health by reducing inflammation, preventing bone resorption, and restricting the growth of certain periodontal-related bacteria. [43] Green tea has antioxidant, carcinogenic, antimicrobial and non-inflammatory properties. Several *in vitro* studies have shown that the development of *Porphyromonas gingivalis, Prevotella intermedia and Prevotella nigrescens* on human buccal epithelial cells is inhibited by the green tea component Epigallocatechin 3 Gallate (EGCG). [44,45] Another investigation attempted to evaluate the effectiveness of a neem by Shahakbari et al. (2014), the pain associated with pericoronitis was notably reduced in 97 patients treated with green tea compared with that in those treated with 0.12% chlorhexidine. [46]

Important considerations

Professional Consultation: These are for temporary relief only. Herbal medicines are not a replacement for professional dental care. It is crucial to visit a dentist for proper diagnosis and definitive treatment of the underlying cause of pain (e.g., a cavity or infection). A dentist should suggest a readily available option for immediate pain relief during indirect communication.

Safety and Side Effects: Although often considered safe, herbs can have side effects or interact with other medications. Clove oil, for instance, can cause local irritation if overused [17, 20, 21, 22]. Essential oils should always be diluted with a carrier oil before applying to the skin or gums to avoid irritation. A dental

professional can advise on the most appropriate and safe options for your specific condition. A dentist should review the patient's medical and dental history to assess the patient's psychological and physical condition through voice modulation [1].

Formulations: Herbal extracts are available in various forms, including oils, gels, mouthwashes, and tablets, some of which are specifically formulated for dental use and are backed by clinical testing. These formulations should be cost-effective compared to allopathic medicines and have desirable organoleptic properties.

Conclusion and future directions

Use of herbal medicine is on the rise. In India, more than 70% of the population uses herbal drugs, and this constitutes primarily the rural population, who depend solely upon herbal-based products [47,48]. Various Medicinal plants, such as Ginger, Cloves, Turmeric, Neem, Peppermint, Babul, Garlic, Cacao Beans, and Green tea, have been used for a long time. Still, some of them have reported their adverse effects. Eugenol have local irritation and some cytotoxic effects. It is considered safe when used correctly in small amounts; however, it can cause liver and respiratory problems when ingested in large quantities.[49,50] Turmeric is generally regarded as safe; however, at higher doses, it may cause gastric irritation, nausea, diarrhoea, allergic skin reaction, and antithrombotic events.[51] Therefore, well-designed clinical studies are required to establish and improve the efficacy of herbal medicine for dental pain.

Most available studies are small-scale clinical trials, and further research is needed to establish herbal medicine as a part of standard care. The optimal timing, dosage, and long-term effects of herbal medications require further investigation. More effective perioperative management may be achieved when combined with preoperative lifestyle modifications. Herbal medicines are well tolerated and widely accepted, and interestingly, they also have cultural and psychological acceptance, especially among the Indian population [52]. Thus, the field of dentistry stands to gain immense benefit from the implementation and use of herbal drugs. In conclusion, both clinical and basic research are essential to advance the role of herbal medicine in dentistry. Further research should be conducted to evaluate the efficacy and safety of medicinal plants and to promote their use as an alternative therapy for Pain Management in Dentistry.

Conflict of Interest: The authors declare no potential conflict of interest concerning the contents, authorship, and/or publication of this article.

Author Contributions: All authors have equal contributions in the preparation of the manuscript and compilation.

Source of Support: Nil

Funding: The authors declared that this study has received no financial support.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data supporting this paper are available in the cited references.

Ethical approval: Not applicable

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