Journal port Science Research
https://jpsr.uruk.edu.iq/index.php/jport
Volume 9, issue 1. 2026

Effectiveness of Myrrh in dentistry, A narrative review

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ARTICLE INFO

Keywords:

Myrrh; Oral mucosal lesions, anti-inflammatory; healing promoting; Dentistry;

ABSTRACT

Background: Myrrh is a natural plant with a long history of traditional use as analgesic, for treating inflammatory, infectious, and wound-related conditions. Recently, growing scientific interest has focused on its potential applications in dentistry and oral medicine. **Objective:** The objective of this narrative review is to summarize and critically evaluate published strength of evidence on the use of myrrh in dentistry and oral medicine. The review focuses on pharmacological properties, formulation methods, clinical applications, safety profile, and current research gaps **Methods:** A comprehensive literature search was conducted using electronic databases including PubMed, Scopus, and Google Scholar, from July to November 2025. Relevant in vitro studies, animal experiments, clinical trials, and review articles investigating the dental and oral applications of myrrh were included. Data were analyzed qualitatively, focusing on antimicrobial, anti-inflammatory, analgesic, antioxidant, and wound-healing effects relevant to oral health. **Results:** The reviewed studies indicate that myrrh demonstrates analgesia for certain oral condition, antimicrobial activity against several oral pathogens, along with anti-inflammatory and antioxidant effects that may support oral wound healing and symptom relief. Clinically, myrrh has been formulated as gels, mouthwashes, and topical preparations, showing potential benefits in managing oral ulcers, gingivitis, and other oral mucosal conditions. However, significant variability exists in extraction methods, formulations, dosages, and study designs. **Conclusion:** Myrrh appears to be a promising adjunctive therapeutic agent in dentistry and oral medicine. Nevertheless, the current evidence is limited by heterogeneity and a lack of standardized protocols. Further well-designed, randomized clinical trials using standardized myrrh formulations are required to establish its efficacy, safety, and clinical applicability.

1. INTRODUCTION

Commiphora myrrha is obtained from the bark of trees belonging to the family Burseraceae, used for centuries in the treatment of wounds, infections, and inflammatory conditions. In recent years, these biological effects suggest that myrrh may have potential applications in dentistry and oral medicine, particularly in the management of oral infections, inflammatory conditions, and mucosal lesions. This review highlights current evidence regarding the use of myrrh in dental practice and oral healthcare.

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Received 20 December 2024، Accepted 12 December 2025

10.36371/port.2026.1.5

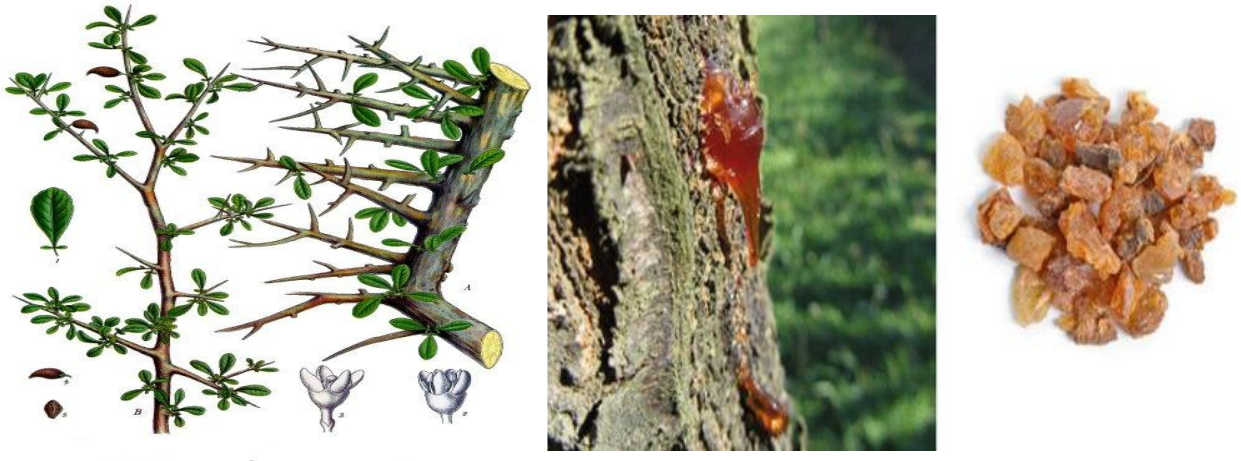

Fig1: *Commiphora myrrha* (Batiha et al., 2023; Shen et al., 2012)

Aim of this narrative Review:

This review aims to summarize and critically analyze existing animal, and clinical studies assessing the application of myrrh in dentistry and oral medicine, and its therapeutic effects, preparation methods, clinical indications, and the major limitations if presented.

What is myrrh?

Is aromatic gum resin, a yellowish-brown to reddish-brown with a bitter slightly pungent taste(https://www.merriam-webster.com/dictionary/myrrh, 2025). Obtained from a shrub or small tree growing up to three meters tall, especially *Commiphora myrrha* of the family Burseraceae with Small, often irregular, trifoliate leaves and yellowish orange, paniculate inflorescences appear on the twigs of the knotty shrub at the end of the rainy season (Dr.Hauschka, 2024). Which is commonly found in the southern part of Arabia, the northeastern part of Africa, in Somalia, and Kenya(Batiha et al., 2023).

The name reflects the resin's bitter taste, the word "myrrh" comes from a Semitic root that means "bitter." It entered English via the Old English term "myrra," which was borrowed from the Latin "myrrha." This Latin word originated from the Ancient Greek "múrrā," and its roots go back to the Arabic "murr" and Hebrew "mor," both of which also mean "bitter.", beside its aromatic fragrance (https://www.merriam-webster.com/dictionary/myrrh, 2025). 'molmol' is Somali for very bitter taste (Dr.Hauschka, 2024).

Myrrh has been utilized for thousands of years around the world as a perfume, incense, and medicinal remedy(Bhattacharjee & Alenezi, 2020). Since biblical times, myrrh has been used to treat wounds. Efforts to identify its chemical components began nearly a century ago (Hanus et al., 2005). The discovery and medical use of myrrh trace back to at least 1500 BCE in Egypt(Nunn, (1996).), Greek and Roman Medicine(Totelin, (2009)), Traditional Chinese Medicine and Ayurveda(China., 2015) and Modern Scientific Research.

History of using myrrh in dentistry

Myrrh is a popular herbal compound that has been commonly used in traditional Arabic medicine to treat a variety of inflammatory conditions for centuries(Hasan & Abbas, 2021; Obaid et al., 2024). It is orally biocompatible, effective in treating several oral conditions such as gum swelling, aphthous sore mouth, and intramucosal wounds(Taheri et al., 2011). Systematic reviews and various studies indicate that *myrrh* has been traditionally utilized for centuries to alleviate dental pain, attributed to its analgesic and anti-inflammatory effects. Contemporary evidence supports its therapeutic role in managing gingivitis, oral wounds, and post-surgical discomfort. Myrrh is typically applied topically or formulated into mouthwashes to calm gum inflammation and ease pain; however, further robust research is required to validate its efficacy as a standalone active compound (Batiha et al., 2023).

Methodology:

Study Design: Narrative review of the literature according to SANRA(Baethge et al., 2019).

Data Sources: Electronic databases will be searched, the exact search strategy: Keywords, Mesh terms, Boolean operators, language limits. And years covered by each database (**PubMed, Scopus, Google Scholar).**

Search Keywords used for this study

oral medicine", "oral mucosal lesions", "gingivitis", "aphthous stomatitis", "herbal medicine", "phytotherapy

Inclusion Criteria

1-Studies published in English.

2-In vitro, animal, human clinical trials, and review articles.

3-Studies evaluating myrrh in dental or oral applications.

Exclusion Criteria:

1-Non-scientific articles

2-Studies unrelated to oral or dental use (non-dental uses).

3-Incomplete or duplicate publications.

The table below summarized the articles included in this study

Review articles	Clinical humane studies	Animal invitro studies
E. M. A. (2011)	Abdallah, H.et al(2014)	Abed, A., & Al-Ghaban, N. (2023)
Batiha, G. E.,et al. (2023)	Alabdalall, A. (2024)	Ahmad, A.et al. (2015)
Nunn, J. F. (1996)	Albasyouni, S., et al. (2024).	Al-Ghaban NM, K. N. (2023)
Shen, T., et al. (2012)	Albishri, J. (2016)	Al-shibly, N. M, et al. (2022)
Tsuchiya, H. (2017)	Almaghlouth, A. A., . (2021)	Basil, D.et al. (2016)
word of dentistry M., N. C. (2024).	China., P. (2015)	Bhattacharjee, M. K., & Alenezi, T. (2020)
	Dolara, P.,et al, (1996).	Cao, B.,et al.(2019)
	Dr.Hauschka. (2024)	Cheng, Y. W.,et al. (2011)
	Eid, R. A. A. (2021)	El-Wakil, E. et al.. (2024).
	Germano, A.,et al. (2017)	Hameed, S. (2019).
	Ibraheem, W. I.,et al. (2022).	Hamm, S., et al.(2004).
	Lenka, B., et al. (2021).	Hanus, L. O.,et al. (2005)
	Sheriffdeen, K. (2024)	Kamil, N. B., & Al-Ghaban, N. M. (2019)
	Su, S., et al. (2011).	Khalil, R. M., Ghanem, N. B., & Khairy, H. (2025)
	Taheri, J. B., et al. (2011)	Obaid ZM, A. M. (2020).
	Zahid, T. M., & Alblowi, J. A. (2019)	Rahmani, A. H. et al. (2022).
	Zahid, T. M., & Khan, N. S. . (2022)	rzeciak, A., et al. ((2023))
		Shahin, N. S., et al. (2022).
		Suliman, R. S., et al. (2022).
		Sun, M., et al (2020)
		Tipton, D., et al. (2003)
		Younis, N. S., & Mohamed, M. E. (2021)
		Zhu, N., et al. (2001)
		Zina Hashem Shehab , T. H. M., Arwa A. Tawfiq. (2024)

Results:

The composition of myrrh:

Myrrh is 3–8% essential oil (Hamm et al., 2004), the chemical constituents of essential oils include monoterpenes (64–69), sesquiterpenes (70–80), and small molecular aromatic compounds. And 25–40% alcohol-soluble resin, constituents Chemically diterpenoids (81–85), triterpenoids (86–95), steroids (96–101), and lignans (101–107). And 30–60% water-soluble gum its main components of gum are sugar, protein, and ash.(Cao et al., 2019).

The effectiveness of using myrrh in all branches of dentistry:

Myrrh is a mixture of volatile oil, gum, and resin, it has anti-plaque, anti-inflammatory and the antibacterial inflammation of Myrrh oil on its topical intraoral application.(Lenka et al., 2021). The addition of myrrh to mouthwash and toothpaste increases the overall effectiveness of these products and provides a holistic and natural approach to oral care(WORD OF DENTISTRY M., 2024). In oral health offers freshen breath, and promote healing after dental procedures.

Phytochemistry of myrrh:

The main pharmacological effects of myrrh are anti-inflammatory, anticancer, analgesic, and antibacterial, among which the anticancer effect has been studied the most (Hassan et al., 2013).As anti-inflammatory myrrh reduces the effects of inflammation through reduces the production of cytokines (Cheng et al., 2011), beside that the Myrrh mediates haem oxygenase-1 expression to suppress the lipopolysaccharide-induced inflammatory response in macrophages(Cheah et al., 2011).

Myrrh suggested to produce an analgesic effect used to clean wounds and sores for more than 2000 years, until the discovery of morphine in Europe (Dolara et al., 1996; Su et al., 2011).

Myrrh may inhibit the proliferation and migration of gastric cancer cells, as well as induced their apoptosis (Sun et al., 2020). Myrrh produces cell damage and death in various cancer cell types (Shen et al., 2012)

Aqueous extracts exhibit a variety of antimicrobial compounds and promising antifungal effect against common Candida infections (Alabdalall, 2024; Mohsin et al., 2025).

Myrrh is suggesting hepaprotective action (Ahmad et al., 2015). myrrh resin extract can be used to therapy for various diseases linked with oxidative stress, due to its antioxidant effect (Sheriffdeen, 2024). Myrrh appears to decrease in heart rate and restoring blood pressure so acting as cardioprotective, in response to isoproterenol challenge (Al-Jeboory et al., 2021; Younis & Mohamed, 2021). Aqueous extract of (molmol) has a therapeutic influence to improves the glycemic status and improves insulin signaling via restoring the oxidation state in type 2 diabetes(Shahin et al., 2022).

The mechanism of action of myrrh:

Myrrha hydro-methanolic extract had higher phenolic and flavonoid content, strong antioxidant activity and inhibited nitric oxide (Zhu et al.) production. It showed membrane-stabilizing effects on human red blood cell membranes (El-Wakil et al., 2024). extract myrrh shows strong 2,2-diphenyl-1-picrylhydrazyl (DPPH) activity, which act as **radical scavengers**, neutralize reactive oxygen species (Zhu et al.) inside biological systems. As lower ROS led to less NF- κB activation and this reduced the release of cytokines (TNF-α, IL-1β, IL-6) by reduced neutrophil/macrophage activation, decreased tissue inflammation and damage by inflammation (rzeciak, (2023)).

Myrrh resin reduced cell death induced by IL-13 especially epithelial apoptosis through downregulated claudin-2, protein that forms pores tight junction by preserving barrier integrity, since barrier disruption can exacerbate inflammation (“leaky” barrier) (rzeciak, (2023)).Beside of that the myrrh methanolic extracted resin modulate macrophage function promoting both M1 (classically activated) and M2 (alternatively activated) phenotypes, and inducing apoptosis, suppressing, reprogramming macrophages in a way that helps resolve inflammation (Suliman et al., 2022).

Myrrh chemistry had several anti-inflammatory compounds, likes

Guggulsterone (GS), a steroid from myrrh, can inhibit Extracellular Signal-Regulated Kinase (ERK) which control inflammation, and Jun N-terminal Kinase (JNK) activation, which involved in cytokine production and apoptosis. Also the 4-furanodien-6-one, was shown to reduce NO production and levels of pro-inflammatory cytokines (IL-6, IL-23, IL-17, IFN-γ) in microglial cells, also restoring ROS control (Rahmani et al., 2022).

Myrrh reduces pain and act as analgesic substances, the main mechanism of action one of three ways by: Inhibiting COX-2 enzyme expression, Lowering PGE_2 levels in inflamed tissues, Reducing inflammatory mediators (IL-1β, TNF-α), myrrh constituents reduce PGE_2 formation and/or inhibit COX-2 expression or activity — providing a direct biochemical route to analgesia (less PGE_2 → less nociceptor sensitization) (Su et al., 2011; Tipton et al., 2003).

Myrrh produces analgesia when blocks inward sodium currents, Voltage-gated sodium channels (Navs) mediate the inward Na^+ current that initiates and propagates action potentials in nociceptors. Reducing or blocking these currents raises activation thresholds and prevents repetitive firing, producing analgesia (Al-Jeboory & Farid, 2021; Hameed, 2019).

Lipophilic sesquiterpenes found in Commiphora myrrha — e.g. furanoeudesma-1,3-diene, curzerene, furanodiene and related furanosesquiterpenoids — are the compounds linked to nerve-calming/local-anesthetic effects. These molecules are able to partition into neuronal membranes and interact with ion channels(Zhu et al., 2001). The lipophilic furanosesquiterpenes insert into the lipid bilayer and reach channel protein interfaces, interacting with channel gating, these compounds can stabilize closed or inactivated states of Nav channels, reducing the available inward Na^+ current and slowing depolarization of nociceptors. This mechanism is analogous to local anesthetics (e.g., lidocaine), Blocking inward Na^+ current in peripheral nociceptors → reduced excitable firing, increased pain threshold, less spontaneous firing and lower hypersensitivity (. 2011; Germano et al., 2017; Tsuchiya, 2017).

Antimicrobial and antiparasitic activity for myrrh, the multiple mechanisms of this activity like membrane disruption and loss of membrane integrity of microbes (Al-shibly et al., 2022), enzyme inhibition (Khalil et al., 2025), immune modulation (Albasyouni et al., 2024), oxidative damage, disruption of life-cycle stages(Albasyouni et al., 2024), synergy of multiple

constituents(Khalil et al., 2025) rather than a single, consistently proven molecular target.

Myrrh and oral lesions

Many studies conducted the effect of myrrh on oral tissue eighter on animals or on humans some of them showed its effect on wound healing (Almaghlouth, (2021); Kamil & Al-Ghaban, 2019). Other comparing study between the myrrh and chlorhexidine mouth wash and their effective over chlorhexidine in post operative pain reduction and wound healing improvement (Ibraheem et al., 2022; كنعان وحيد & صبار 2018 ،عبود). Postoperative edema, tenderness, and socket size in extraction sites (Eid, 2021). Myrrh effective in treating oral ulcers in Behçet's disease (Albishri, 2016);In recurrent aphthous ulcers, a 0.5% myrrh gel reduced pain (Abdallah, 2014; Abed & Al-Ghaban, 2023). Experimental work on oral ulcer model reporting that topical myrrh oil reduced inflammation, increased epithelialization and angiogenesis(Al-Ghaban NM, 2023). In periodontic studies of gingival inflammation decrease indices of plaque(Obaid ZM, 2020). It significantly reduced gingival inflammation, and by one week, it reduced gram-negative bacterial counts (Lenka et al., 2021). Myrrh to be as effective as CHX in reducing gingival inflammation and bleeding(Zahid, 2022)). This was improved in large clinical trial and small sample study as both showed myrrh mouthwash reduced plaque index and showed some gingival inflammation improvement compared to saline and CHX (Zahid, (2019). Other study showed that myrrh is significantly reduced gingival inflammation, and gram-negative bacterial counts in root planning procedure (Lenka et al., 2021) and growth inhibition of certain bacteria (Basil et al., 2016; Zina Hashem Shehab 2024,).

Conclusions

myrrh represents a biologically active natural agent with potential applications in both preventive and therapeutic dentistry. Despite these promising findings, most available studies are experimental or observational in nature, with relatively few well-designed randomized controlled clinical trials. Significant variability in extraction methods, concentrations, formulations, and outcome measures limits direct comparison between studies, so comprehensive safety assessments, standardized preparation protocols are necessary to establish optimal dosages, modes of application, and long-term effects. long-term safety, toxicity, and potential interactions with commonly used dental materials or medications remain insufficient.

Findings from the reviewed literature demonstrate that myrrh is effective against several oral pathogens associated with dental caries, periodontal diseases, and endodontic infections. Additionally, its anti-inflammatory and tissue-healing effects may improve clinical outcomes in gingival inflammation, post-extraction healing, and oral ulcerative conditions. Such properties support the rationale for investigating myrrh as a natural adjunct or alternative to conventional chemical agents in dental practice.

Suggestion for feathers study

Randomized controlled clinical trials with adequate sample sizes are needed to confirm the efficacy and safety of myrrh-based formulations in the management of oral mucosal lesions and periodontal diseases.

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