

Essential Oils in Treatment and Management of Dental Diseases

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Received: 20.09.2021; Revised: 20.10.2021; Accepted: 24.10.2021; Published: 24.11.2021

Abstract: Essential oils have considerable potential as a preventive and therapeutic agent against various oral diseases and, in particular dental diseases. Wider potential of essential oils as an antimicrobial and anti-inflammatory agent is mainly responsible for their use in dental diseases. In the present review article, commonly used essential oils in dentistry have been explained systematically. The therapeutic efficacies of different essential oils in different dental diseases, viz. periodontitis, dental erosion, dental caries, dental pain, gingivitis, and plaque, have been discussed extensively. Finally, patents filed by various innovators on essential oils-based formulations and their applications in dental care have been well tabulated. In conclusion, essential oils have significant the potential for the management and treatment of various dental diseases. However, various preclinical and clinical studies supporting the safety and efficacy of essential oils must be performed for regulatory compliance and commercial exploitation of essential oil-based formulations.

Keywords: essential oil; antimicrobial; anti-inflammatory; dental diseases.

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1. Introduction

Essential oils include volatile aromatic solvents synthesized by delicate frameworks in plant parts such as leaves, fruits, seeds, resins, woods, barks, and berries. The term “essential” was given to these oils since they were assumed to trap the essence of a plant, that is, its taste and odor. They offer their distinctive scent to plants. Essential oils are raw, intensely reactive, condensed, water-insoluble fluids found in various plant parts. These are also known as aetherolea, ethereal oils, or volatile oils. They seem to be less viscous than oil, despite the word “oil,” and have more of a watery appearance [1].

Essential oils consist of a diverse combination of elements, often comprising thousands of essential oils. The unique percentage of all the ingredients yields the oil its special well-being and medicinal properties. Frequently known group of essential oil components including monoterpenes, diterpenes, sesquiterpenes, aldehydes, ketones, esters, alcohols, phenols, and oxides because of the health-boosting and purifying qualities which separate several elements, certain essential oils are antiseptic, and some of whom have anti-fungal, antibacterial, and anti-viral properties [2,3].

The presence of the essential oils varies from either colorless to further some color of the spectrum, and most of the color of the oil relates to its medicinal properties. For example, being blue, Chamomile Oil is generally useful for the aromatherapy massage undergoing “red hot” emotions since blue reflects its typical “cooling and soothing” action and stimulates both

physical and emotional feelings. Oils like Patchouli, Citrus, and Lemongrass are yellow or amber. Their vibrant, cheerful colors will quickly help individuals decide that these are often considered a potential mood enhancer. Fairly young plants produce a greater number of essential oils than mature plants, but because of the constant evaporation of the lighter fractions of the oil, the latter creates oils that are far more resinous and dark in color. Often their colors are the outcome of the extraction process, and the color of the plant part influences the color of the finished material. Although Chamomile is not blue, it produces an ingredient named Chamazulene, that during the distillation process, it transforms the oil to an inky blue color [4].

One of two methods, namely extraction or distillation, is used to manufacture the essential oils, and it tends to depend on the source from which it is extracted. All essential oils are obtained from a plant source—whether it be from the bark, fruit, leaf, flower, or root. To extract a relatively small quantity of essential oil, the technique of refining pure essential oils also takes many pounds from the plant's natural source. The pure therapeutic-quality oils produced, in general, are often expensive. The bulk of pure essential oils are so intense that they have to be processed for effective use.

The first technique is a topical treatment, i.e., applying essential oils on the body's nails, skin, teeth, mouth, hair, or mucous membranes. This requires direct implementation, massage, hot compresses, and the incorporation of oils into bathwater. The process of oil pulling is one method of topical application; oils are scooped for 5-20 minutes in the mouth. When essential oils are introduced into the methods of oil-pulling, they are applied to some other oil, such as olive oil or coconut [5].

The next technique is the scented process, which includes fine oil mist or a cloud of volatile aromatic compounds vaporized from the oil is inhaled. Aromatherapy, by the olfactory system, regulates memory, nerves, and feelings. By diffusion, direct inhalation, hot water vapor, jets, windows, humidifiers, perfumes, or hair gel, essential oils may be used in aromatic form [6]. The final application process is subjective; the oil is absorbed or otherwise internalized into the body. The internal use of essential oils involves the incorporation of oils underneath the tongue, the addition of oils to liquids or foods during preparation, and the placement of oil-filled capsules for consumption. They recognize that for internal usage, only pure oils can be utilized. Most essential oils are classified as GRAS by the US FDA, which means they are widely accepted as suitable for human utilization.

Fortune business insight "Essential oil market size, growth and share" The worldwide consumer demand for essential oils was projected at 247.08 kilotons in 2020 and is projected to rise from 2020 to 2027 at a compound annual growth rate (CAGR) of 7.5 percent. Rising demand from large end-use sectors, such as food and drink, personal care and cosmetics, oral care, and aromatherapy, is expected to boost the market. The food and beverage industry is the major supplier of essential oils serving as natural antimicrobials. Many beneficial effects related to essential oils are expected to boost their market in medicinal and therapeutic uses. Essential oils have no significant adverse effects, despite other traditional medications and products [7].

The efficacy of several essential oils has been studied extensively for oral hygiene. Spearmint oil is the most widely used essential oil in oral care treatments. Lavender oil also contributes to oral diseases, followed by cinnamon oil. Coconut oil and Eucalyptus oil are also used for this purpose. Lemon, Clove, and tea tree oils are less widely used as compared to others.

1.1. Potential applications of essential oils.

Anxiolytic/Relieves anxiety–The fragrance of basic lavender oils can adjust mental states and alleviate moderate anxiety. When used in waiting rooms, it has been reported to help decrease anxiety and stress in dental patients [8]. It also decreases needle injection pain. Aromatherapy with natural orange essential oil has been shown to help reduce salivary cortisol hormone and pulse rate caused by childhood stress [9].

Oral hygiene–In inhibiting plaque, essential oil rinses have been found to be equally effective. Essential oil rinses are found to be equally efficient. As chlorhexidine induces long-term staining of the teeth, essential oils are used as an alternative to rinsing with chlorhexidine [10]. Subgingival peri pathogens have often been found to exhibit antimicrobial activity against essential oils [11]. Even so, a review carried out with and without ethanol on the effectiveness of essential oils found that essential oils only aren't that beneficial.

In dental implants–It has therefore been observed that certain essential oils exhibit antibiofilm efficacy. It's possible to use them for dental implants. The use of essential oils on dental implant surfaces has been found to prevent the development of biofilms [12].

Wound dressing is possible to derive stronger healing results from wound dressings containing essential oils. Hence, during oral surgical operations, they may be used to achieve faster recovery. This can improve therapeutic effects and healing time [13].

As preservative–Essential oils demonstrated greater inhibitory activity than extracts and methyl paraben against the measured microorganism strain. Essential oils are used to replace methyl paraben in cosmetic emulsions, often used as a preservative in different dental products, specifically in patients who are allergic to methyl paraben [14]. It could be used in LA allergy, although this involves more clinical testing to evaluate its usefulness as a preservative and whether or not it can be administered into the human body; as far as the best of our understanding is concerned, no experiments have been carried out so far in which essential oils are administered into the human body.

2. Commonly Used Essential Oils in Dentistry

2.1. Clove oil.

Clove oil is an essential oil obtained from the leaves of clove trees (Family: Myrtaceae). The primary constituents of the essential oil are phenylpropanoids such as eugenol, carvacrol, thymol, and cinnamaldehyde. Clove oil can be used to improve tooth pain and poor breath, help prevent gum disease, and even found used in the fragrance and flavoring industries. Clove oil also has the innate potential to limit the growth of bacteria and can help control diseases of the mouth and throat [15].

2.2. Lavender oil.

Lavender oil can be obtained by steam distillation through the flowers of *Lavandula angustifolia* (Family: Lamiaceae) by steam distillation [8,16]. The key constituents of lavender are camphor, linalyl acetate, terpinen-4-ol, 1,8-cineole B-ocimene, and linalool. In dental hospitals, it can be used to reduce the pain and suffering of patients. When used in hospital waiting rooms, it is considered effective as an anxiolytic tool and can be used as well for periodontal medical treatments [9].

2.3. Cinnamon oil.

Cinnamon oil is obtained either from the bark or leaves of different trees, such as the *Cinnamomum verum* tree and the *Cinnamomum cassia* tree (Family: Lauraceae). The main components are caryophyllene, cinnamaldehyde, eugenol, camphor, cinnamyl acetate, and linalool. Cinnamon is antibacterial, antiseptic, and anti-fungal, making it an important cleanser for the need for oral health treatment, such as calming a sore throat. One of the greatest antimicrobial properties is protection against bacteria which is responsible for tooth decay is also found in cinnamon oil [17].

2.4. Eucalyptus oil.

Eucalyptus globulus (Family: Myrtaceae), also called Blue Gum, is the main source of eucalyptus oil. The primary constituents are α -pinene, 1,8-cineole, cryptone, α -terpineol, trans-pinocarveol, globulol, terpinene-4-ol, cuminal, limonene, and aromadendrene. Eucalyptus oil has a potent cytotoxic and antibacterial activity against *Staphylococcus pneumonia*, *Staphylococcus aureus*, *Haemophilus influenzae*, *Staphylococcus pyogenes*[18]. Essential oil can activate the immune response affected by the innate cell, triggering its use as an adjuvant in infectious disease, immunosuppression, and tumor chemotherapy [19].

2.5. Lemon oil.

The lemon essential oil is derived from the Rutaceae family of *Citrus limonum* (also known as Citrus Limon). Lemon oil contains aldehydes, terpenes, esters, and sesquiterpenes. By killing bacteria, lemon oil help to avoid dental cavity and receding gums. Other characteristics of lemon oil are believed to promote the growth of tissue and can encourage healthier gums. It serves as a natural treatment for many oral disorders, such as oral thrush and bad breath, because lemon essential oil has antibacterial and anti-fungal properties. It could also be used to naturally whiten the teeth and avoid dental decay [20].

2.6. Tea tree oil.

Tea tree oil arises from the *Melaleuca alternifolia* leaves (Family: Myrtaceae). Tea tree oil contains α -terpinene, terpinen-4-ol, terpinolene, γ -terpinene, α -pinene, and p-cymene. Due to its ability to kill off bacteria, decrease tooth decay and alleviate bleeding gums, this oil is an ideal component for a DIY toothpaste or mouthwash. In treating herpes simplex virus, aphthous ulcers, dental pain, periodontitis, refractory oral candida infections, and herpes simplex virus, tea tree oil is useful. In toothpaste, mouth rinses, toothpicks, coated floss, and gels, Tea Tree Oil can be included [21].

2.7. Ylang-ylang oil.

Ylang-ylang oil is extracted from freshly harvested flowers of *Cananga odorata* tree (Family: Annonaceae). The key constituents of ylang-ylang oil are benzyl benzoate, methyl benzoate, geranyl acetate, geraniol, benzyl acetate, cinnamyl acetate, and linalool. Inhibiting biofilm, Ylang-ylang destroys bacteria and has anti-inflammatory effects. While ylang-ylang is possibly known to be widely used in cosmetics or aromatherapy, research reveals that it has a multitude of beneficial substances [22].

2.8. Coconut oil.

Coconut oil is manufactured by crushing dried coconut meat or fresh coconut meat called copra (Family: Arecaceae). Coconut oil is comprised of oleic acid, fatty acids, capric acid, palmitic acid, caprylic acid, lauric acid, stearic acid, myristic acid, and linoleic acid. Coconut oil is effective in avoiding cavities and gum disease. It removes and even decreases plaque adherence and build-up. It has some antimicrobial effects that can help keep gums clean, keeping them productive towards cavity-causing bacteria, a significant health benefit for those with dry mouth [23].

2.9. Spearmint oil.

Spearmint Oil is separated by the bright green *Mentha spicata* herb (Family: Lamiaceae). The primary constituents are carvyl acetate, carvone, 1,8 cineol, cis-carveol, cis-sabinene hydrate limonene, and cis-dihydrocarvone. Because of its good, minty flavor and potential to encourage fresh breath, spearmint is being commonly used for sweets, gums, and oral hygiene products. Spearmint oil is a moderately severe substitute to some of the more strong mint oils, but it also supplies the mouth with effective soothing and relaxing properties [24]. Table 1 lists various essential oil constituents, along with their botanical names and plant parts used.

Table 1. Plant source, constituents, and uses of essential oils in dentistry.

S. No.	Essential Oil	Plant Source	Constituents	Uses in dentistry
1	Clove oil	<i>Eugenia caryophyllata</i> Part -Leaves	Eugenol, carvacrol, eugenyl acetate, thymol, cinnamaldehyde, caryophyllene, and 2-heptanone.	To treat toothaches, clove oil has long been added directly to the gums.
2	Lavender oil	<i>Lavandula angustifolia</i> Part -Flower spikes	Linalool, linalyl acetate, 1,8-cineole, B-ocimene, terpinen-4-ol, 1-fenchone, viridiflorol, and camphor.	Used to reduce bacteria, relieve pain, soothe inflammation.
3	Cinnamon oil	<i>Cinnamomum verum</i> Part - Bark or leaves of <i>Cinnamomum verum</i> tree and the <i>Cinnamomum cassia</i> .	Trans-cinnamaldehyde, eugenol, and linalool	In treating oral candidiasis. Used against the action of oral pathogens involved in dental carries.
4	Eucalyptus oil	<i>Eucalyptus citriodora</i> Part - Dried eucalyptus leaf	1,8-cineole, cryptone, α -pinene, p-cymene, α -terpineol, trans-pinocarveol, phellandral, cuminal, globulol, limonene, aromadendrene, spathulenol, and terpinene-4-ol.	Control of gum disease as an anti-plaque component for gum bleeding.
5	Lemon oil	<i>Citrus limon</i> Part -Lemon grass oil	Terpenes, d-limonene and l-limonene	Lemon oil can help prevent receding gums and tooth decay by fighting against bacteria.
6	Tea tree oil	<i>Melaleuca alternifolia</i> Part -Leaves	Terpinen-4-ol, γ -terpinene, p-cymene, α -terpinene, 1, 8-cineole, α -terpineol, and α -pinene.	Appropriate for use in oral hygiene and oral candidiasis prophylactic drugs
7	Ylang-Ylang	<i>Cananga odorata</i> Hook. F. & Thomson Part -Flowers	Geranyl acetate, linalol, geraniol, farnesol, benzyl acetate, geranial, methyl chavicol, beta-caryophyllene, eugenol, pinene.	Useful in periodontal disease
8	Coconut oil	<i>Cocos Nucifera</i> Part – coconut meat	Fatty acids, caprylic acid, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid and linoleic acid.	It can decrease plaque build-up, avoid tooth loss and prevent gum disease.
9	Spearmint oil	<i>Mentha Viridis</i> Part -Leaves	Carvone, cis-carveol limonene, 1,8 cineol, cis-dihydrocarvone, carvyl acetate, and cis-sabinene hydrate.	It can help soothe toothaches

3. Introduction to Oral Health

Such decent oral hygiene wasn't ever practiced by individuals. 87percent of people seem to retain a little natural tooth, yet only a 13 percent of the total individuals have lost all remaining teeth. A good mouth does make a significant contribution to the standard of life of an individual. Individual who are not capable to manage their oral health and may consult to the physician. Mouth care is a major measure of the level of care received by a patient. Bad dental hygiene can lead to severe health complications like pneumonia in vulnerable aged people [25,26]. There is a higher chance of tooth decay in people who have poor oral hygiene [27].

3.1. Oral cavity.

The lips, laterally by the fauces, laterally by the cheeks, superiorly by the palate, and inferiorly by the muscular floor, form the oral cavity or mouth, which is the first component of the digestive tract. The tongue occupies the available space in the arch of the lower teeth on the floor of the mouth. It is possible to split the oral cavity into 2 parts: (1) Vestibule, which is the space between lips or cheeks and the teeth; (2) Oral cavity, which is the region between the teeth and the lips or cheeks. The oral cavity is lined with a moist stratified epithelium that varies in appearance depending on the location. The oropharynx is the part just below the mouth of the throat. It comprises the tongue base, the soft palate, the tonsils, and the throat side and back wall [28].

The oral mucosal is lined with a mucous layer with an epithelial layer and hence interconnected tissue underneath it. Protection, taste perception, and biting are only a few roles of the ocular surface. The coating of the mucosal surface must be as resilient as possible to be beneficial. To survive adequate feed crushing, it has a highly vascularized epithelium coating and connective tissues closely bound to the surface [29].

3.2. Teeth.

The teeth are comprised of superficially mineralized, inactive, even acellular fibers (enamel, an absolute strong tissue extracted by ectodermal epithelial recognized as ameloblasts). However, this one is also accompanied by lesser mineralized, quite reliable. Yet, necessary strong tissue, through the rich vascularized as well as vascular elastic fibers had been constructed or even maintained.

Anatomically, a tooth is made up of a crown or even a base, and also the cervical edge seems to be the point where the two meet. Teeth play an integral character in nutrition production due to the different actions done by their enamel surface throughout chewing. Further, the teeth's potential is determined through the abundant hydrated biological apatite crystals mostly in organic substance, the proportion of teeth, the whole basal area, structured from occlusal layers, even the accompanying structures [30,31].

A basic examination throughout the humanoid tooth's exterior anatomy exposes 3 distinguishing sections: The crown seems to be the component in the teeth coated by enamel material on the outside. Whenever anybody smiles, it is usually one other aspect visible, but the gums may obscure a minor amount of it. Each role of the teeth is affected by the characteristics, including its crown. For mostly carving, only the incisors and canines are extremely strong or even chisel-shaped, while primary teeth and incisors include 2 or 3 cusps.

The gumline is the border region of the teeth among each peak, and even the base is recognized as the gumline. Because of the color contrast amongst pigment & cementum, such a pattern is apparent only visually. The root of a teeth seems to be the segment within the teeth that was lodged inside the joint; it contributes nearly two-thirds of its tooth's total composition and is coated by cementum.

3.3. Gums.

This is what dentists call gingiva. It protects the teeth covering the bone. Such tissues are maintained preserved by cleaning teeth following meals as well as flossing every day. That is significant, although bone deterioration can be caused by gum disease. The tooth root may also become vulnerable to rotting through gum disease. Whenever root degradation affects the pulp, a specialized fitting labeled a root filling may also be required for the patient.

3.4. Salivary glands.

Three paired collections of the main salivary gland and around 1,000 small glands distributed across the buccal cavity, including the oropharynx, produce saliva, which maintains the mouth hydrated and helps with mastication, chewing, and absorption [32,33]. The small salivary glands often exist in the mouth tongues, mucous membrane, and palette, and they're often situated in sinuses, supraglottis, and laryngeal cavities. Each minimal salivary gland has a standard duct that absorbs serous, mucosal, combined saliva effectively further into the oral compartment [34,35].

Mastication muscles are elongated muscles that assist through munching, grinding jaws, moving the mandible across different directions, offering the throat, including talking. Both muscle fibers operate in tandem through a working muscle for munching, throat shifting, face displacement from sideways, including bottom jaw displacement [36,37].

4. Dental Diseases

According to the World Health Survey [World Health Survey 2003 India] conducted in India in 2003 by the World Health Organisation (WHO), 28 percent of respondents had an oral health problem, with a maximum of 42 percent coming from West Bengal. The survey published by Khan *et al.*, 2008 indicates that the rate of dental caries is as significant as 60-65 percent in some parts of the world, while the relative risk is 35 percent globally [38]. To assess the health condition and proliferation of dental diseases in relevant age groups, a systematic and comprehensive national health investigation was carried in India in 2004 [39,40]. Overall severity of dental caries (coronal and root surfaces) for different age groups, regional distribution. Various types of dental diseases are there, as shown in Figure 1.

To avoid tooth decay and gum infections, oral health is a process of maintaining the teeth clean, safe by brushing and flossing. Oral hygiene can even be regarded as the overall cleanliness of the mouth, and to keep it hygienic, there are effective cleaning tools. Oral hygiene aims to keep teeth free of plaque-related issues, including gum infections and tooth loss (a major cause of cavities). Plaque is the sticky substance that forms on the teeth many hours after eating and is mainly bacteria that has not been washed away. When bacteria expand, they generate acid that eats through the tooth's enamel, permitting the typical cavity to build. As the tooth is eroded by more acids, it becomes unbearable. As plaque sticks to the crevices and fissures of the teeth, it destroys the protective enamel surface of the teeth when it is not

regularly cleaned, causing the development of cavities (holes). Gum disorders known as periodontal disease and tooth decay can also contribute to plaque. It's called tartar, as plaque is deposited on the tooth [41].

Diseases are any deviation from or disruption of any aspect of the body's natural configuration and operation. In most cases, aetiology, pathology, and prognosis are understood because oral relates to the mouth, so oral diseases are disturbances involving the oral cavity of human beings caused by inadequate oral hygiene. It is expressed by a distinctive collection of clinical symptoms. Oral floss is the invasion of the oral cavity by pathogens that are non-pathogenic in most situations but that can become pathogenic in specific circumstances. In the oral cavity, various microorganisms are present, but only several microbes can be known as real oral pathogens or odontopathogens. The most common bacterial infection in humans is caused by these odontopathogens: plaque, tartar, gingivitis, periodontitis, tooth decay [42].

Both caries and gingivitis begin in childhood, but caries become more active during puberty as the teeth become more fragile, and the process is accelerated by sweets or the use of syrup-soaked conformers. It is very difficult to handle caries and their variants or, ideally, to eliminate them from the vast majority of dentistry for infants. Gingivitis is reversible at this stage or fully preventable if the teeth are effectively cleaned. The prerequisite for orthodontic therapy is to deal with both conditions in many infants. Teeth abnormalities will produce extra areas of stagnation and make it more difficult to manage plaque. Early tooth loss (usually due to decay) would necessitate orthodontic treatment for the permanent successors to erupt into the arch. Orthodontic instruments, on the other hand, promote stagnation, making plaque control more difficult.

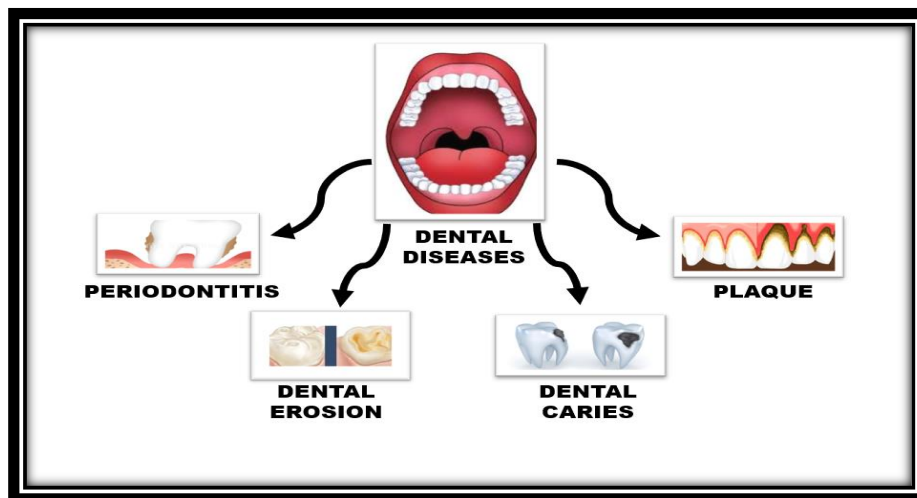


Figure 1. Commonly existing dental diseases.

4.1. Tooth decay (dental caries).

Tooth deterioration is most typically known as tooth decay. This stems from such a significant interaction amongst the pathogenic microorganisms, the material of the teeth, as well as the beverages contaminants. The specific causes are still unproven, but perhaps the acidogenic hypothesis is widely understood in the etiology of dental decay. This indicates that somehow oral microbiota (such as streptococci, lactobacilli, and actinomycetes) create acids in drinks and snacks from processed carbohydrates. Therefore, the acids strike the tooth surface, adding to decay.

Dental caries is the most common and long-lasting oral disease, particularly in children [13,43]. Dental caries with a multifactorial etiology is a progressive infectious process. Dietary patterns, oral toxins that ferment sugars, and host susceptibility must all coexist for dental caries to begin and spread. It was, thus, the primary priority of the practitioners in dental health. Dental caries are induced by the dental plaques on the tooth surface [44,- 45]. It causes discomfort in the mouth, inflammation, poor chewing, weakening of tooth and impaired learning of language. WHO concluded that impaired oral health can have a tremendous influence on overall life quality and that chronic diseases are associated with many oral diseases. Dental caries relates mostly to localized degradation by acidified metabolic end of the microbial digestion of nutritional carbs of prone dental hard tissues. It is a chronic condition that develops steadily in several individuals, arising with an environmental difference in the equilibration of tooth nutrients and oral biofilm formation (plaque). The biofilm is characterized by bacterial growth leading to plaque pH variation. This is a function of either the producing bacteria acid and the stabilizing effect of saliva or the composition of the underlying tooth [46-47].

Bohra Kouidhi *et al.* stated that oral microorganisms, mainly cariogenic bacteria, are responsible for dental caries. In reference to the study conducted, it was found that the essential oil *Eugenia caryophyllata* (Clove) was investigated in vitro among a significant range of oral pathogenic organisms (46 strains of yeast and 114 streptococci) utilizing the process of disc diffusion [48]. Anand *et al.* studied the oil-pulling effect and was concluded that there was a considerable decrease in the total bacterial count. The oil-pulling process reduced the sensitivity of a host to dental caries. During 40 days of oil-pulling, the rate of decrease in the gross bacterial count reached 20 percent. Furthermore, in suppressing the growth of bacteria and adhesion, *sesame oil* is proven to be successful [49]. Aneja *et al.* described that acetone cinnamon concentrate risen as an effective agent showing far greater anti-fungal activity than the typical anti-fungal drug amphotericin-B. Most phytochemical analysis studies could open up the possibility of discovering new biologically beneficial bacteriostatic and bactericidal compounds against dental caries pathogenic organisms and sensitive bacterial and fungal strains; the need of the hour is to conduct ever more testing of natural products or plant sections [50]. Parisa Moghadam *et al.*, Considered the detection of organic antibacterial compounds & medicinal plants. One of Iran's indigenous trees, the *Sumac (Rhus coriaria)*, is being utilized as a flavor enhancer. This was reported that Sumac essential oil has an adequate antimicrobial property that could be employed in the pharma companies against oral bacterial infections and dental caries to develop antimicrobial drugs and mouthwash [51]. Shetty *et al.* reported the extracts of *Citrus sinensis* peels to be good against microbes of dental caries and include potential beneficial substances. However, before promoting large treatment, clinical research on the effects of such plants are necessary [52]—application of essential oil in the management of dental caries in Table 2.

Table 2. Application of essential oil in the management of dental caries.

S. No.	Title	Interpretation	Reference
1	Anticariogenic and cytotoxic activity of clove essential oil (<i>Eugenia caryophyllata</i>)	<i>Eugenia caryophyllata</i> was found to be effective, anti-fungal as well as antibacterial action against oral <i>streptococci</i> and cariogenic bacteria.	[48]
2	Effect of oil-pulling on dental caries causing bacteria.	Oil-pulling effect of <i>sesame oil</i> was studied. It was concluded that <i>sesame oil</i> acts as antibacterial against <i>S. mutans</i> . It also possesses antiadhesion properties.	[49]
3	Antimicrobial activity of Dalchini (<i>Cinnamomum zeylanicum</i> bark) extracts.	As per the research, various extracts of cinnamon oils were prepared and acetone extract was considered to be potent anti-fungal against oral pathogens.	[50]
4	Antibacterial Activities of Sumac Fruit (<i>Rhus coriaria</i>) Essential Oil	The study showed that EOs effect against various oral microbes as well as oral infections.	[51]

4.2. Periodontal diseases.

Periodontal disorder is a progressive disease that is only noticeable in midlife. There is no proof of a link between diet and periodontal disease, in addition to extreme vitamin C deficiency, which contributes to scurvy-related periodontitis, while current attention focuses on the possible preventive function of oxidative compounds. The existence of plaque seems to be the major important aspect in the etiology of periodontal disease, and preventive efforts are based on dental hygiene. There must be some confirmation that periodontal disease occurs more quickly in malnourished groups, and this finding can be clarified by the essential role of diet in sustaining an effective host defense. Overgrowth was found in underfed Kids in Africa of periodontopathic species and leaves. Due to the development of extracellular glucans, excessive consumption of sucrose is related to elevated plaque content, and there is a significant correlation between plaque density and gingivitis. In contrast to lower sucrose intakes, clinical intervention trials have reported greater plaque levels and elevated gingivitis with high glucose diets. Moynihan and Petersen, however, found out that ‘the maximal decrease of dietary sugar beyond the boundaries of practicability is not able to prevent gingivitis from progressing [53].

Sharma *et al.* stated that the adjunctive utilization of an EO-containing mouth rinse offers a therapeutically important and relevant additional potential to lower plaque accumulation for patient populations with gingivitis who brush and floss regularly [54]. Pulikottil and Nath focused on a review of contemporary science and technical literature on the characteristics of cloves to investigate the possibilities for its use in the management of plaque-induced periodontal diseases. It was concluded that cloves have antibacterial, general anesthesia, and analgesic characteristics bactericidal, antioxidant, anti-viral, anti-mycotic, anti-carcinogenic. Clove oil has a particular anti-inflammatory potential since it blocks the enzyme cyclo-oxygenase-2 and lipo-oxygenase [55]. Pramod *et al.* concluded that various ancient medicinal herbs exist to care for and mitigate teeth, gums, and oral hygiene-related diseases. Through the use of clove oil for periodontium disorders is an old treatment now practiced. The goal is to provide an overall view of the latest methods implemented to devise and apply conventional herbal remedies [56]. Gursoya *et al.* analyzed the inhibitory and anti-biofilm bacterial growth effects of *Saturejahortensis* L (summer savory), *Salvia fruticosa* M(sage), *Lavandula stoechas* L. (lavender), essential oils, *Myrtus communis* L., and *Juniperus communis* (juniper). The present study demonstrated that Shortensis essential oil prevents the proliferation of microorganisms at keratinocyte-safe concentrations but that its anti-biofilm effect is reduced at sub-inhibitory concentrations [57]. Applications of essential oils in the management of periodontal diseases are in Table 3.

4.3. Gingivitis and plaque.

There are several gingival disorders threatening children which can develop to endanger the human periodontium. The symptoms of periodontal disorders occurring in adults typically originate earlier in life. Tooth eruption-associated gingivitis is abundant. The tooth eruption, though, does not induce gingivitis. It can be triggered by an elevated risk of plaque build-up in areas of principal teeth losing and permanent teeth erupting, as it can be impossible or even painful to practice oral hygiene. The inflammation modifications magnify the gingival margin’s usual prominence and produce the appearance of a pronounced gingival broadening.

Table 3. Applications of essential oils in the management of periodontal diseases.

S. No.	Title	Interpretation	References
1	Potential of Clove of <i>Syzygium aromaticum</i> in development of a therapeutic agent for periodontal disease: A review	There is a distinct possibility for utilization of Clove as well as its components as effective and anti-inflammatory therapies of periodontal disease. Additional researches must focus on the production of novel clove-based medicines within the category of a localized drug carrier or topical agent for the prevention of chronic periodontitis.	[55]
2	Anti-biofilm properties of <i>Satureja hortensis</i> L. essential oil against periodontal pathogens	The latest results indicate that <i>S. hortensis</i> L. The essential oil prevents the development of periodontium pathogens at keratinocyte-safe concentrations, but its anti-biofilm activity is reduced at sublethal doses.	[57]
3	Herbs as an antioxidant arsenal for periodontal diseases	Findings have demonstrated a strong link amongst elevated tissue disruption biomarker ratios causing oxidative (ROS) and periodontitis severity. Therefore, owing to its wide variety of biological and therapeutic practices, lower prices, and particular asset margin, the focal point has stemmed back to herbal remedies.	[58]
4	Lemongrass essential oil gel as a local drug delivery agent for the treatment of periodontitis	Phytoscience study has discovered a modern alternative of optional antimicrobial therapy provided by different medicinal plants. <i>Staph. Cymbopogon citratus</i> . A traditional medicine plant is (lemongrass). Lemongrass natural oil prevents the production of many forms of microbes, namely periodontal bacteria, at a concentration of about 2 percent.	[59]

The plaque is a tenaciously intact coating on the teeth. The matrix is primarily microbial, composed of polysaccharides and collagen, but part of it is taken out from saliva. The plaque is colorless and forms on the tooth's strong and uneven surfaces. In these various locations, plaque may be supra or subgingival and varies in structure and in its performance. Plaque is implicated with either the origin of dental caries or periodontal disease, but variables that influence the impact of a plaque on specimens are the existence of the microbial community and, to some degree, the location.

Marco Antonio Botelho concluded antibacterial activities toward pathogenic bacteria, and for gingivitis decline, several diverse species extracts were assessed. The goal of this work was to evaluate the brief effectiveness and safety of mouth rinse essential oil based on *Lippiasidoides* ('alecrimpimenta') on gingival bleeding and bacterial plaque. Especially in comparison to the mean, the findings revealed reduced plaque level, gingival level, and gingival bleed index ratings at seven days. There were slight and transient risk factors. The study results indicated that mouth rinse, relying on *L.sidoides*, was reliable and safe in lowering plaque and gingival inflammation [60].

Baurothd concluded that dental floss is also found to be effective in gingivitis and plaque control. Rinsing two times every day with an essential oil mouthwash has been equally as effective as flossing regularly in minimizing interproximal plaque accumulation in tandem with clinical treatment (prophylaxis) and dental cleanings for 6 months [61]. Kothiwale *et al.*, reported anti-plaque and antigingivitis tools, the freshly developed natural mouth rinse containing various essential oils like tea tree oil, Clove oil, etc., and are widely viable mouth rinse are scientifically helpful. A substantial decrease in microbiota CFU at three weeks was demonstrated by freshly formulated mouth rinses. Our results also endorse the routine usage for greater effectiveness of herbal mouthwashes as both an anti-plaque, antigingivitis, and antibacterial rinse [62]. Allakera and Ian Douglas proposed the study to compare the entire situation concerning innovative therapies. Oral care management also requires the use of synthetic chemicals. Upwards of 25percent of a total of pharmaceutical and over-the-counter formulations are derived from plants, and the ability of biological substances for oral

maintenance therapy will thus be recognized. Targeted therapies can be aimed at periodontitis-associated black-pigmented anaerobic bacteria. Selective destruction of Porphyromonasgingivalis and Prevotella intermedia in biofilms has been seen in studies to date. For the treatment of periodontal diseases, functional reduction techniques involving protease antagonists have also been studied. Rajiv M Patel & Zainab Malaki described essential oils' effect on plaque and gingivitis in mouthwash. Despite the assessment index used, there has been a substantial decrease in gingivitis for EO mouth rinses relative to test groups [63]. Uses of essential oils in gingivitis and plaque in Table 4.

4.4. Dental pain.

Dental discomfort is accompanied by the stimulus of intense noxious pain, such as microbial infection chemicals or mechanical enamel erosion and gingiva depletion. The first system in dentinal sensation signal transduction, post-dental insult, is patent dentinal tubules. Fluid displacement inside the tooth structure causes damage by pain fibers situated across the odontoblast cycle and at the pulp dentine boundary, however, according to hydrodynamic theory. In pain delivery, a dense matrix of trigeminal sensory axons strongly linked to odontoblasts can also be concerned [64]. Uses of essential oils in dental pain in Table 5.

Table 4. Uses of essential oils in gingivitis and plaque.

S. No.	Title	Interpretation	References
1	Comparative effect of an essential oil mouth rinse on plaque, gingivitis, and salivary <i>Streptococcus mutans</i> levels: a double-blind, randomized study	The findings show that Chlorhexidine mouth rinse decreased more effectively the plaque level, gingival recession, and the amount of CFUs (colony forming units) than <i>L. Sidoides</i> did not produce statistical power, however. This research showed that in minimizing microbiota plaque & gingival inflammation, <i>Lippiasidoide</i> s EO mouth rinse is successful.	[60]
2	The effect of a mouth rinse containing essential oils on dental plaque and gingivitis. Evidence-Based Dentistry	Essential oils' effect was studied on plaque and gingivitis in mouthwash. Despite the assessment index used, there has been a substantial decrease in gingivitis for EO mouth rinses relative to test groups.	[63]
3	A comparative study of anti-plaque and antigingivitis effects of an herbal mouth rinse containing tea tree oil, Clove, and basil with commercially available essential oil mouth rinse	As anti-plaque as well as antigingivitis agents, the freshly developed natural mouth rinse and a widely viable mouth rinse are scientifically helpful. A substantial decrease in bacterial at 21 days was demonstrated by freshly developed mouth rinses. Our results also endorse the routine usage for greater effectiveness of herbal mouthwashes as either an anti-plaque, antigingivitis, or antimicrobial drain.	[62]
4	The adjunctive benefit of an essential oil-containing mouth rinse reduces plaque and gingivitis in patients who brush and floss regularly.	The mouthwash formulation has essential oils found to be significantly effective against gingivitis as well as plaque.	[54]

Table 5. Uses of essential oils in dental pain.

S.No.	Title	Interpretation	References
1	Analgesic-Like Activity of Essential Oil Constituents: An Update	Therapeutic trials show the medicinal ability for the prevention and successful application of various disorders as analgesic-like chemicals. This research relies on recent research of the active compounds of essential oils, including analgesic-like efficacy, including a summary of their modes of action and chemical implications, recognizing that pain impacts a large portion of the worldwide inhabitants and, with that, the invention of novel analgesics.	[65]
2	Therapeutic uses of <i>Ocimum Sanctum</i> linn (tulsi) with a note of Eugenol and its pharmacological actions: A SHORT REVIEW	A specific herb seen here in India, <i>Ocimum sanctum</i> Linn (known as Tulsi in Hindi), was being utilized to manage chest infections, dysentery, skin infections, asthma, severe eye infections, constant fever, insect bites, etc. The <i>Sanctum Ocimum</i> L. The possession of antimicrobial, antibacterial, cardioprotective, analgesic was further reported.	[66]
3	Evaluation of <i>lavender oil</i> as a topical analgesic agent before dental anesthesia through pain rating scales – An in vivo study	During local penetration anesthesia, lavender oil demonstrated greater effectiveness than benzocaine gel in reducing pain tolerance. It could be efficiently seen as a supplement for finding significant correlation analgesia with biologically derived general anesthesia.	[67]

Table 6. Recent literature update on the use of essential oil for dental diseases.

S.No.	Oil/source	Description	References
1.	Clove, Cinnamon, and Thyme <i>Eugenia caryophyllata</i> , <i>Cinnamomum verum</i> , and <i>Thymus vulgaris</i>	Due to its antimicrobial activities against many bacterial species in the mouth, it is widely used in medicine as an antiseptic against infectious illnesses such as infectious periodontal pathologies.	[68]
2.	Mexican mint oil, eugenol, and terpinen-4-ol <i>Coleus amboinicus</i> , <i>Syzygium aromaticum</i>	demonstrated excellent antibacterial properties and sensory qualities	[69]
3.	Manuka oil and Tea tree oil <i>Leptospermum scoparium</i> and <i>Melaleuca alternifolia</i>	showed strong antibacterial action against <i>P.gingivalis</i>	[70]
4.	Thyme oil and Black sesame <i>Thymus vulgaris</i> and <i>Hyptisspicigera</i>	The essential oil inhibited cariogenic species and decreased bacterial adhesion to dental enamel.	[71]
5.	oregano, thyme, and cinnamon <i>Origanum vulgare</i> , <i>Thymus vulgaris</i> , and <i>Cinnamomum verum</i>	added to fluoride-free toothpaste to boost inhibitory effects against bacteria linked with cavities and periodontal disease; also improves the efficacy of chlorhexidine-containing dentifrices	[72]
6.	<i>Mentha</i> spp. <i>Mentha piperita</i> (<i>M.spicata</i> L., <i>M. xpiperita</i> L. and <i>M.pulegium</i> L.)	<i>Mentha</i> spp. essential oil is a promising agent for maintaining and promoting healthcare due to its antimicrobial qualities and ability to function as an antibacterial agent against caries.	[73]
7.	Myrtle oil <i>Myrtus communis</i>	Myrtle oil has potent antimicrobial activity against a variety of oral pathogens.	[74]
8.	Lime <i>Citrus aurantifolia</i>	At a concentration of 2% essential oils, a mouth rinse formulation based on essential oils of lime (<i>C. aurantifolia</i>) peel begins to inhibit the growth of <i>S. mutans</i> bacteria.	[75]
9.	Thyme and oregano <i>Origanum vulgare</i> and <i>Thymus vulgaris</i>	Essential oils of thyme and oregano showed potential antibacterial properties in both growth inhibition and cell death in planktonic and biofilm stages.	[76]
10.	Orange flower <i>Citrus aurantium</i> L.	The effects of this essential oil on human gingival epithelial cell adhesion and growth were studied utilizing cell adhesion and proliferation assays.	[77]

5. Dental formulations

5.1. Toothpastes.

These are popular oral care products whose chemical composition is constantly changing due to the producer's competition. Toothpaste is commonly regarded as the most powerful source of fluoride for preserving the deciduous and permanent teeth from caries [60]. Fluorides, on the other hand, aren't the only major components in toothpaste. Essential oils such as Clove, oregano, thyme, and cinnamon can be added to fluoride-free toothpaste to boost inhibitory effects against microorganisms linked to cavities and periodontal disease. Dentifrices containing chlorhexidine may benefit from the use of thyme essential oil [72]. A variety of substances with different properties to prevent the growth of microbes in the oral cavity, as well as a variety of ingredients with specific purposes to solve specific problems, are also essential in the cleaning abilities of toothpaste provided by abrasives, as well as the antibacterial abilities that are provided by the antibacterial abilities of toothpaste. On the other hand, Goerge et al. the herbal-based toothpaste was found to be just as effective as the normally formulated dentifrice in preventing plaque and gingivitis [78]. Bardellini *et al.* Bioxtra toothpaste has no impact on the quality of life of children undergoing chemotherapy, and it can be recommended as a clinically effective way to improve oral hygiene standards [79]. Ulusoyetal, the authors concluded that herbal toothpaste showed statistically strong antibacterial activity against *Streptococcus mutans* (p<0.05) than its initial type after incorporation of essential oils [80].

5.2. Mouthwash.

Oral rinse, mouth rinse is a liquid that is passively retained in the mouth, which can be gargled with the head hanging back and the liquid bubbling at the corner of the mouth, or it can be held in the mouth by contracting the perioral muscles and moving the head. Mouthwashes are antimicrobial solutions that are used to reduce the number of bacteria in the mouth. Contracting of the perioral muscles and movement of the head, or may be gargled with the head hanging back and the liquid bubbling at the corner of the mouth. Mouthwashes are usually antimicrobial solutions used to reduce the bacterial count in the oral cavity, but they can also be used for other purposes such as anti-fungal, anti-inflammatory, or analgesic properties. Alshehri, LISTERINE, an essential-oil-containing mouth rinse, has been shown to have anti-gingivitis and anti-plaque benefits when used with normal brushing teeth and interdental cleaning [81]. Neely came to the conclusion that CHX is still the first option when plaque prevention is the objective of care [82]. Myung-Haeng *et al.* an essential oil mixture of diluted tea tree, peppermint, and lemon, can be an efficient way to reduce malodor and VSC (volatile sulfur compounds) in intensive care units [83].

5.3. Gels.

Tooth gel is a smooth oral care substance with a high silica content that is often transparent or translucent in appearance [84]. To avoid tooth decay, Sodium Fluoride gel is used. It also assists in the reduction of tooth sensitivity, e.g., Fluorident, Dentagel, Neutracare. Santamaria *et al.* The natural oil of *Melaleuca alternifolia*, developed as a dental gel, is effective in controlling microbial biofilms after clinical declaration and categorization of *Streptococcus mutans* in the saliva of patients treated [21]. Soukoulis *et al.* Although further research is needed, the anti-inflammatory properties of TTO-containing gel applied topically to swollen gingival tissues may appear to be a useful non-toxic complement to chemotherapeutic periodontal therapy [88].

Table 7. Clinical study.

S.No	Oil/ Source	Clinical study outcome	Reference
1.	Lemongrass oil <i>Cymbopogon flexuosus</i>	Lemongrass oil was compared with that of chlorhexidine mouthwash and showed better efficacy in gingivitis and plaque reduction.	[86]
2.	Orange flower <i>Citrus aurantium</i> L	Bitter orange flower oil has shown a reduction in oral infections as well as the <i>S. mutans</i> growth.	[77]
3.	Pepper-rosmarin <i>Lippia sidoides</i>	The denture cleanser solution was tested and showed antimicrobial activity, also, in the treatment of denture-induced infections.	[87]
4.	Oregano oil <i>Origanum vulgare</i>	Without the use of oregano oil, the findings indicate substantial bacterium contamination in all plates. Oregano is a natural antibiotic that could be as powerful as modern medication towards pathogenic germs, particularly gram-positive and gram-negative bacteria found in dental aerosols.	[88]
5.	Cinnamon essential oil <i>Cinnamomum verum</i>	The antibacterial and antibiofilm effects of cinnamon essential oil nanoemulsion (CEON) towards oral biofilms produced in a micro biofilm model were investigated. The development of multi-species oral biofilms and the proliferation of oral pathogens in biofilms, particularly aciduric bacteria that cause tooth caries, were both suppressed by nanoemulsified CEO, according to this analysis.	[89]
6.	Myrrh <i>Commiphora myrrha</i>	The discoveries concerning <i>C. Myrrha</i> were discussed in this review. It appears to have appropriate anti-inflammatory and antibacterial actions in oral and dental tissues, according to accumulating data. Still, the data is limited, and further research	[90]

S.No	Oil/ Source	Clinical study outcome	Reference
		is needed to fully understand its antimicrobial properties on various periodontal infections.	
7.	Lippia <i>Lippia Thymoides</i>	The antibacterial activity of <i>L. thymoides</i> , via the chemical Thymol, is tremendous potential towards gram-negative periodontopathogenic microorganisms, which have a limited treatment armament.	[91]
8.	Ajwain <i>Trachyperrum ammi</i>	From the study, it was found that For two months, the herbal mouthwash remained steady, with no physical changes or microbiological contamination (0.05). The anti-inflammatory activity of T. ammi oil was equivalent to chlorhexidine, whereas chlorhexidine decreased the probability of plaque index, bleeding index, and modified gingival index more than the herbal mouthwash.	[92]
9.	Tea Tree Oil <i>Melaleuca alternifolia</i>	According to the findings, a mouth rinse containing TTO has a significant influence on plaque and gingival grades as Chlorhexidine. As a result, the TTO can be suggested as a mouth rinse because it is a natural substance that is also inexpensive.	[93]
10.	Chamomile <i>Matricaria chamomilla</i>	The findings show that chamomile essential oil can prevent <i>A. actinomycetemcomitans</i> and <i>T. denticola</i> biofilms from forming. As a result, it might be used as a therapeutic option to block the biofilms formed by the bacteria studied in periodontal disease patients. However, additional study is needed to understand the processes behind this impactfully.	[94]

Table 8 represents some of the patents that are filed in context to the use of essential oils in dental care.

Table 8. Patents on essential oils and their formulations for the management of dental diseases.

S.No.	Patent No.	Title	Inventors	Claims
1.	ES2693756T3	Mouthwash emulsions	Douglas Craig Scott Niranjan Ramji Bruce Ernest Tepper	A mouthwash concentration of dental hygiene seems to have bioactivity containing at minimum 50percent of the total of its quaternary ammonium component as evaluated by a Disk Maintenance Assessment in the laboratory, relative to either of statements 1 to 8. A mouthwash formulation for dental care that controls the expression of adenosine triphosphate (ATP) mostly in biofilm by at minimum 30%, if calculated in a Specimen Dependent Biofilm microarray <i>in vitro</i> , compared to either of claimants 1 to 9. Formulation for application of a procedure for managing tooth enamel and measurements in a participant truly needy thereof, which includes applying a mouthwash for dental treatment in either one among statements 1 to 10 to the patient's ocular cavity [95].
2.	RU2347608C2	Incapsulated essential oils	Ari MARKUS (IL) Ari MARCUS Charles LINDER (IL) Charles LINDER	Inventor proposes a method for producing microcapsules of essential oil. The method entails dissolving a di- or polyisocyanate in essential oil and emulsifying the resulting mixture in water [96].
3.	RU2435566C2	Compositions for personal hygiene containing antimicrobial mixtures of essential oils or their components	Douglas Craig SKOTT (US) Douglas Craig Scott Lavell Alan SENKER (US) Lavell Alan SANKER Eric Altman Jr. GULBURN (US) Eric Altman Jr. GULBURN	The present invention relates to personal care compositions, such as oral, throat, and skincare compositions. The compositions of the present invention effectively kill, inhibit the growth and/or alter the metabolism of microorganisms, causing undesirable conditions in the oral cavity. Oral, nasal, and throat care products include products in the form of a powder, paste, or liquid. Such products include mouthwashes, lozenges, gargles, chewing gums, toothpaste, throat sprays, and cough syrups [97].
4.	AU2004236057B2	Encapsulated essential oils	Charles Linder Arie Markus	The procedure for making essential oil microcapsules, adding a di- or polyisocyanate to essential oil to dissolve it. In an aqueous solution, emulsify the resulting mixture. An interfacial polymerization is a form of polymerization that occurs between two surfaces [98].
5.	CN1236754C	Systems for delivering a cosmetic and/or therapeutic active to oral surfaces	J Rajaia L.C.Ernst A.M.Keys W.M.Grundorf T.N.Ha	The innovation relates to using a monoblock carrier to provide a tooth and oral delivery system for a cosmetic or therapeutically active portion. Dental calculus preventing agent, fluoride sources, stannous ion source, brightening agent, antimicrobial, and as coxal are all included in the

S.No.	Patent No.	Title	Inventors	Claims
		using an integral carrier	C.R.Meyer	product. The present innovation also includes a system for providing oral surfaces with a pure and fresh sensation. Oral surfaces delivering compositions are represented by the monoblock carrier of bar [99].
6.	ES2402786T5	Flavoring oils with reduced sulfur content for use in oral care compositions	Steven Hamilton HOKE II. Marc Alan Hester Niranjan Ramji	Combining the flavoring oil with an aqueous phase that is water or a mixture of water/solvent with a neutral pH, subjecting the aqueous and oily phases to mixing conditions, allowing the phases to be separated and the washed oil phase to be collected, Where the precursor species selected from dimethyl sulfoxide, dimethyl sulfide, dimethyl disulfide, and dimethyl sulfone make up less than 20 parts per million (ppm) by weight per volume of oil in the washed oil [100].
7.	KR20100063124A	Sustained release dosage forms for delivery of agents to an oral cavity of a user.	Benjamin froth Jerry B. Jean	A slow-release lozenge containing a progressively dissolving matrix containing a, whereby the matrix dissolves significantly in an aqueous phase over a long period [101].

6. Conclusion

Oral health plays a significant role in the overall well-being of humans. According to the latest WHO study, oral diseases are the most commonly existing diseases in society, which cause discomfort, pain, loss of teeth, and even death in a few cases. Dental diseases are classified as dental caries, periodontal diseases, gingivitis, plaque, dental pain. Essential oils obtained from Clove, lavender, cinnamon, eucalyptus, lemon, tea tree, ylang-ylang, coconut, spearmint has been reported to possess significant therapeutic efficacy in dental diseases. Essential oils are frequently used for the treatment of oral diseases because of their antimicrobial and anti-inflammatory properties.

Funding

This research received no external funding.

Acknowledgments

The authors thankfully acknowledge the support and facilities provided by Chitkara College of Pharmacy, Chitkara University, Punjab, India.

Conflicts of Interest

The authors declare no conflict of interest.

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