



"Herbal Mouthwashes: A Natural Alternative for Oral Health Care"

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ABSTRACT:

Dental health is vital as general wellness. More oral health issues, such as periodontal disease, sore throats, gingivitis, plaque, and more, may affect people nowadays. There are numerous formulations designed to preserve good dental health. It is advised to use a mouthwash to reduce bacteria, toothaches, bad breath, and plaque. Because they don't contain alcohol, are non-irritating, less poisonous, and have less negative effects, herbal mouthwash is recommended over chemical mouthwash. Due to their antiviral and antibacterial properties against human pathogens, medicinal plants play a significant role in illness prevention and healing. Unlike manufactured mouthwash, herbal mouthwash contains extracts of crude medications and has fewer or no negative effects. Plant extracts of various kinds are used to make herbal mouthwashes. The herbs that are discussed in this article include cinnamon, herbs that are beneficial for dentistry, such as neem, guava, pomegranate, clove, peppermint, wintergreen, and tulsi. The general oral health of the populace could be improved by mouthwashes that are easily made and securely used by anyone at home utilising natural ingredients. This review's main objective is to use natural mouthwash to maintain oral health. As a topical painkiller, antibacterial, topical anti-inflammatory, or caries preventive product, mouthwash may also be suggested. The alcohol and fluoride found in almost all traditional mouthwashes are poisonous, even fatal, if consumed in excess. Natural mouthwashes made of polyherbal ingredients frequently don't do this. Mouthwash can be absorbed straight into your system after coming into direct touch with mucous membranes. Naturally occurring plants like peppermint, clove, Ajwain, green tea, guava leaf, neem, and tulsi are all used to make polyherbal mouthwash. In contrast, triclosan, oxygenating agents, sodium bicarbonate, cetylpyridinium chloride, benzydamine hydrochloride, chlorhexidine, and alcohol content of mouthwashes. Alcohol, sugar,

artificial colouring, and artificial sweeteners (such as saccharine) are usually absent from natural mouth rinses, in contrast to the majority of commercial cosmetic and therapeutic mouth rinses.

KEYWORDS: Mouthwash, Herbs, Antibacterial, Antiviral, Plaque, Gingivitis.

INTRODUCTION:

A mouthwash is a restorative fluid dentifrice that is kept in the mouth and rinsed around by the perioral muscle to eliminate oral microorganisms [1]. Oral hygiene is its primary function [2]. Mouthwashes are made in three different ways [3]

- 1) Antibacterial based mouthwashes;
- 2) Fluoride-containing mouthwashes;
- 3) Mineral-based mouthwashes.

Mouthwashes come in varieties, including restorative and therapeutic mouthwashes. Cosmetic mouthwash hides terrible breath with a seasoning specialist that offers you new breath for a brief time frame.

Remedial mouthwash, then again, contains dynamic substances that guide in mechanical control and oral wellbeing upkeep [4]. Mouthwashes have a few purposes, including washing food particles from the mouth, bringing down the generally bacterial include in the mouth, seasoning the oral pit, and enhancing the breath [3]. Mouthwash likewise contains synthetics that assistance with absorption. Mouthwashes are available in both chemical and natural forms [5]. Presently a-days home grown mouthwashes are sought after and acquiring notoriety because of their antibacterial and cell reinforcement properties [6]. Herbal plants have a variety of medical capabilities and they play a significant role in the treatment of a variety of diseases due to their antibacterial and antifungal properties [7].

Oral health and hygiene may have a significant impact on one's personality and quality of life. The general demand for prevention and treatment methods has grown as the number of instances of oral illness has increased [9]. Chemical mouthwashes tend to discolour teeth owing to the inclusion of chlorine dioxide, cetylpyridinium chloride, an instant whitener, pain reliever, and other ingredients, as well as causing adverse effects and being inexpensive. Periodontal disease and tooth caries are two of the most frequent infectious diseases observed in many people [8, 36]. Dental disorders are particularly common in children and adolescents who do not take good care of their oral health [8].

Candies, chocolates, jellies, and other foods with a high sugar content include insoluble glucan, which attaches to the enamel of the tooth and produces a cavity. The tooth enamel may also be damaged and eroded, resulting in deep eruption of the dentine and discoloration [7]. Toothache, often known as dental pain, is a type of discomfort that affects the teeth and their supporting tissues. Inflammation of the pulp, dental trauma,

hypersensitivity, apical periodontitis, pus collection, and temporomandibular dysfunction are all common causes [11]. The major cause of dental caries, gingivitis, and periodontitis is dental biofilms [4]. Periodontal disease is a condition that damages the teeth's supporting tissues and is caused by poor dental hygiene. It can also lead to gingivitis [12]. Halitosis is the unpleasant smell expelled from a person's mouth. It is also called as bad breath, oral malodour [33]. Among compound means, chlorhexidine (CHX) has been the most broadly utilized mouthwash and is considered as the highest quality level in dental practice for around thirty years, yet not without certain disadvantages such as taste perturbation, tooth discoloration, oral mucosal erosion, and unilateral or bilateral parotid swelling [13]. Spices have been the essential wellspring of prescription since the hours of Charaka and Sushruta, and they have acquired the trust of the Asian public. Even though there are many commercially available herbal mouthwashes, there is still a need for natural products to minimize the side effects caused by chemical products [14, 15]. "Ayurveda" (Ayur - Life and Veda - Science), the system of Indian medicine, has been used successfully for treating various systemic ailments [16]. Spices have been the essential wellspring of medicine since the hours of Charaka and Sushruta, and they have acquired the trust of the Asian public. Naturally available herbs, such as tulsi, triphala, neem, honey, ajwain, and turmeric, have been commonly used either alone or in combination as safe and effective antibacterial agents [17]. Turmeric, experimentally known as *Curcuma longa*, and all the more ordinarily known as "haldi," has calming, cancer prevention agent, and antimicrobial properties, as well as hepatoprotective, insusceptible energizer, sterile, antimutagenic, and numerous other properties [18, 19].

Mouthwash can be used in the following cases [20]:

1. Gum disease
2. Mucositis
3. Halitosis
4. Periodontal disease
5. Xerostomia
6. To clean septic sockets
7. To control plaque
8. To relive pain
9. To effectively delivered fluoride to prevent dental caries
10. Reduce inflammation
11. Breath freshener

Advantages of mouthwash [21]:

1. Fresh breath
2. Helps to get rid of food and debris stuck between the teeth
3. Prevent build-up of space
4. Helps to fight cavities
5. Whitens the teeth
6. Cure canker sores

Disadvantages of the mouthwash [21]:

1. Mouthwash can be dangerous to children below 6 years.
2. Mouthwash can irritate canker as it can contain high amount of alcohol.
3. Mouthwash can stain and darken teeth.
4. It can damage some parts of the mouth.
5. Many mouthwash contain alcohol that make teeth more sensitive.

Benefits of herbal Mouthwash:

1. Natural mouthwash uses time-tested ingredients.
2. Natural mouthwash is gentle for even the foremost sensitive mouths □ Natural mouthwash feels great.
3. Natural mouthwash has naturally antibacterial properties.
4. Natural mouthwash contains no harsh additives.
5. Natural mouthwash is effective.
6. Natural mouthwash doesn't cause waterlessness.
7. Natural mouthwash is in high demand, Natural mouthwash contains no “mystery” ingredients.

Herbs use in mouthwash preparation:**1) Cinnamon (Ceylon cinnamon, Chinese cassia, Cortex cinnamoni):**

It is obtained from dried bark of the shoots grown on cut stock of *Cinnamomum zeylanicum* belonging to family *Lauraceae*. It consists of volatile oil (BP/EP not less than 1.2%) phlobatannins mucilage, calcium oxalate, cinnamic aldehyde, and eugenol, small quantities of ketones and alcohols and starch. It is widely cultivated in Ceylon, Java, Sumatra, West Indies, Brazil, Jamaica, and India. It is cultivated by propagation method. It is single or double compound quill. Cinnamon is used as aromatic, carminative, flavouring agent, analgesic, antibacterial, antifungal, etc [21, 22]. Essential oil and extract of cinnamon is isolated from the different parts of it like leaves, bark, fruits flowers and buds. The good antimicrobial property of cinnamon essential oil against cariogenic bacteria *S.mutans* KPSK and lactobacillus casei was reported by wiwattanarattanabut et al [24].

2) Clove (Clove flowers, Clove buds):

Clove consists of dried flowers buds of *Eugenia caryophyllus* Thumb, belonging to family *Myrtaceae*. It is native of Indonesia and mainly cultivated in islands of Zanzibar, Pemba, Brazil, Amboniana, Penang, Mauritius, etc. It is reddish brown in color and contains chemical constituents 14 to 21% volatile oils and acetyeugenol, eugenol, gallotannic acid, resin, gum, methyl salicylate (painkiller), the flavonoids eugenin, kaempferol, rhamnetin, and eugenitin, triterpenoids such as oleanolic acid, stigmasterol, and campesterol and

several sesquiterpenes. It is used as flavouring agent, antiseptic, antibacterial, anti-fungal, antiviral, spasmolytic, local anaesthetic, anti-stress, anti-inflammatory, anti-pyretic activities [34, 37]. Dentists used clove oil as an oral anaesthetic and as a root canal disinfection. Clove contains antibacterial qualities and can be used to relieve toothaches [23, 32]. Clove is used to inhibit growth of food borne bacteria like *Bacillus subtilis*, *Salmonella typhimurium*, *Staphylococcus aureus* and *Listeria monocytogenes*. Clove oil is reported as it has anti-inflammatory property and is choice of ingredient in formulation of mouthwash and toothpaste. Eugenol from clove when combined with zinc oxide is used as temporary fillers of cavity in dentistry. It is available as a tincture (1:5, 25% ethanol), lozenges and mouthwash [25, 26].

3) Neem (Margosa, Azadirachta):

It consist of almost all parts of the plant, most important parts which are widely used are stem bark, root bark, leaves an fruits of *Azadirachta indica* which belong to family of *Meliaceae*. It is native of the India and Pakistan. Neem seed contain complex tetranortriterpenoid lactones azadirachtin, nimbim, salanin and nimbolin B, among which azadirachtin is most active constituents. Neem has antimicrobial property, antifungal, antiviral, antitumour, antioxidant activity [23, 25]. In dentistry, *A. indica* shows good efficacy in periodontal disease²¹. *A. indica* offers best treatment for tooth decay curing mouth ulcers and acts a pain reliever in tooth problems. The antibacterial activity of is shown against many bacteria like *S. mutans*, *S. faecalis* and other species of *Streptococcus* [27, 35]. Neem inhibits prostaglandin E and 5HT and acting as an anti-inflammatory agent. Azadirachtin is able to destroy cell wall of bacteria and cell death occurs by change in osmotic pressure [12]. *Azadirachta indica* shows sensitivity towards *Staphylococcus aureus* and *Escherichia coli*. As it is known for its bitterness it is include in very small amounts [7].

4) Guava (Lemon Guava, Apple Guava):

It belongs to the *Myrtaceae* family of plants. It is a little tree that may reach a height of 3 metres, and its fruit, bark, and leaves are commonly utilized in herbal medicine. Decoction of leaves may also be used as mouthwash for various diseases like toothache, sore throat, inflamed gums, etc. [11]. It consists of bioactive compounds such as saponin, tannin, flavonoids alkaloids which shows effective against various disorders. Guava mouthwash can be used few times daily as antiseptic and astringent, can cure gum swelling, sore throat, pyorrhoea, bleeding gums and reduces pain. Ferdinand et.al. Reported that flavonoids extracts from leaves which consists of morin-3-o-llyxoide, morin-o-arabinoide which has powerful antibacterial and antiviral action and it is effective in aphthous ulcers [11].

5) Pomegranate (*Punica granatum*):

Punica granatum L. is an ancient fruit belonging to family *Punicaceae*. The pomegranate extract shows effective decrease of pathogens in chronic periodontal disorder [7]. Pomegranate juice intake can inhibit viral infection while its extract has antibacterial activity. Active compounds has anti-inflammatory properties that helps in soothe irritated tissues and has potential to suppress the microorganism from adhering to surfaces of the tooth [10]. It contains ellagic acid in free and bound forms, Gallo tannins and anthocyanin's and other

flavonoids .The antiviral activity of it is reported and was found that mixture of pomegranate and ferrous salt reduced the infectivity of polio virus [16].The seeds and juice examined as tonic for heart and throat as it has anti-bacterial, anti-inflammatory, antioxidant activity [10]. Pomegranate shows sensitivity towards the *Streptococcus pyogenes*, *Lactobacillus bulgarius*, *Staphylococcus aureus*, *Bacillus subtilis* and *Escherichia coli* [7].

6) Tulsi (*Ocimum basilicum*, Holy Basil):

It comprises of new and dried leaves of *Ocimum sanctum* Linn. Belonging to family *Labiatae*. It is found throughout India and is considered as sacred. Tulsi contains (0.1-0.9%) volatile oil, this oil has antibacterial and insecticidal activity. It contains approximately 70% eugenol, 3% carvacrol, 20% eugenolmethylether [28]. Methanolic extract and aqueous suspension of Tulsi has antipyretic and anti-inflammatory action and according to study it inhibits COX2 proving its anti-inflammatory property [29] .It shows sensitivity towards *Staphylococcus aureus*, *Candida albicans* *Bacillus subtilis*, and *Escherichia coli* and shows resistance towards *Streptococcus pyogenes*, *Lactobacillus bulgaricu* [7, 36].

7) Peppermint (Brandy Mint):

It is the oil obtained by the distilled of *Mentha Piperita*, belonging to family *Labiatae*. It is mainly found in Europe, United States and also in some places in England. The chief constituents of peppermint oil is menthol, along with others like menthyl acetate isovalerate, menthone, cineol, inactive pinene, limonene, and other [23]. It is mint that is commercially used in soaps toothpaste, mouthwash. It has been used to treat gingivitis, headaches, indigestion, and other ailments [20]. Menthol and menthyl acetic acid derivation are answerable for the sharp and reviving smell. Peppermint medicinal oil has antiviral and antibacterial properties. It is excellent mouth freshener. When using peppermint tea as breath freshener increase effectiveness by adding the pinch of anise, caraway or cinnamon [31]. Avoided in patients with liver damage, inflammation of the gall bladder or obstruction of bile duct. Adverse effects are reported is burning and gastrointestinal upset, skin rashes, headache, heartburn, ataxia, etc. [25].

8) Wintergreen (Winterberry, Deer Berry, Box Berry, Checker Berry):

It is derived from the distillation of *Gaultheria procumbens* Linn's dry leaves. Belonging to the *Ericaceae* family, and mostly found in the northern United States, from Georgia to Newfoundland. Its volatile oil contains 99 % methyl salicylate, as well as additional components such as Gaultherilene, ketone, ester, and secondary alcohol [23]. It is used as analgesic, antispasmodic, anti-inflammatory, astringent .*G. procumbense* has its highest antimicrobial activity on *P.aeruginso* with MIC of 0.39 to 4.16mg/ml and also inhibit growth of *Candida sp.* Wintergreen oil acts well against tooth ache and gum pain [32].

9) Miswak (Drumstick, Matchstick):

According to Sofrata et al. (2007), mouth washing with *S. persica* extract resulted in a prolonged rise of plaque pH when compared to water rinsing, and the difference between the two groups was statistically significant at

30 minutes. Many people in Africa, South America, the Middle East, and Asia favour *Salvadora persica* roots. Babylonian 5000 B.C. documented the specific procedure for using the Miswak. It is popular in Middle East contain number of antimicrobial property. Extract of Miswak enhanced gingival health and inhibit growth of cariogenic bacteria. In one study it is shown that *Streptococcus mutans* was more susceptible than lactobacilli to Miswak [33].

10) Myrrh (*Commiphora Molm*):

The myrrh derived named from word 'mur' which means bitter in arabic. It is an oleo gum resins extracted from the tree *Commiphora molmol* consists of volatile oil [myrrhol], resin [myrrh in], gum and other impurities myrrh has antimicrobial effect against *Streptococcus mutans*, *Candida albicans*, *Staphylococcus*. It is also promoted in oral wound healing, reducing gingival inflammation and maintain oral health [34]. The myrrh consists of three main constituents the resin, gum and volatile oil. The gum consist of 20% proteins and 65% carbohydrates made up of galactose, 4-O-methylglucuronic acid and arabinose [25].

Other herbs which are used in formulation of mouthwash are myrrh, green tea, ginseng, cranberry, caraway, bloodroot, catechu, aloe Vera, etc.

Chemicals Commonly Used in Mouthwashes:

i. Chlorhexidine

- **Description:** Chlorhexidine is a synthetic antiseptic with a symmetrical bisbiguanide structure consisting of four chlorophenyl rings and two biguanide groups connected by a hexamethylene bridge [46, 47].
- **Properties:**
 - Highly interactive with anions due to its dicationic nature, contributing to its efficacy, safety, and side effects.
 - Accessible in three structures: digluconate, acetic acid derivation, and hydrochloride salts.
 - Broad-spectrum antimicrobial activity effective against Gram-positive and Gram-negative bacteria, aerobes, anaerobes, yeasts, fungi, and lipid-enveloped viruses.
- **Mechanism:** Increases the permeability of the cytoplasmic membrane, leading to coagulation of cellular macromolecules [49, 50].
- **Other Benefits:** Reduces the adherence of *Porphyromonas gingivalis* to epithelial cells and does not interact with microbial enzymes or receptors, thus avoiding resistance [51].

ii. Benzylamine Hydrochloride

- **Properties:**
 - Known for its analgesic, anaesthetic, anti-inflammatory, and antimicrobial effects.
- **Mechanism:** Likely influences prostaglandin and thromboxane production and reduces pro-inflammatory cytokines.

- **Clinical Use:** Demonstrated to reduce the incidence, duration, and severity of radiation-induced mucositis. Recommended for radiation-induced mucositis and ulcerative conditions like recurrent aphthous stomatitis [52].

iii. Cetylpyridinium Chloride and Sodium Benzoate

- **Mechanism:** Sodium benzoate helps disperse carbohydrates, fats, and proteins, weakening plaque attachment, which can then be easily removed through tooth brushing.

iv. Triclosan

- **Description:** Triclosan is a non-ionic antiseptic compound (2,4,4'-trichloro-2'-hydroxydiphenyl ether) with anti-inflammatory properties.
- **Properties:**
 - Commonly used in toothpastes and mouthwashes.
 - Enhances the binding ability of mouthwashes to oral mucosa, ensuring a prolonged presence and effectiveness [53].

v. Oxygenating Agents

- **Examples:** Hydrogen peroxide, sodium peroxyborate, and peroxycarbonate.
- **Mechanism:** Release nascent oxygen, which helps loosen debris, remove stains, and kill anaerobic microorganisms.
- **Uses:** Broad-spectrum antimicrobial agents and whitening agents. Recommended for acute ulcerative conditions [54, 55].

vi. Sodium Bicarbonate

- **Properties:**
 - Increases salivary pH, suppressing the growth of aciduric bacteria.
 - Beneficial for patients with xerostomia and dental erosion.
- **Ethanol in Mouthwashes:**
 - Used as a preservative and solvent, with concentrations ranging from 5% to 27% in various commercial formulations.
 - Antimicrobial activity involves protein denaturation and lipid dissolution.
 - Studies suggest a potential link between alcohol-containing mouthwashes and an increased risk of oropharyngeal cancer [56].

General procedure for formulation of mouthwash:

The plant materials were washed in sterile water, shadow dried, crushed, and kept separately in air-tight vials. Aqueous extracts of each plant material were made by soaking powdered plant parts in sterile distilled water and incubating at 37°C for 72 hours. The herbal extracts were filtered using Whatmann filter paper, and the marc was washed and pressed with 10mL sterile distilled water [35].

Evaluation of mouthwash:

- i. **Colour and odour:** Evaluation parameters like odour and colour were test by visual examination.
- ii. **pH:** A digital pH metre were used to determine the pH of the produced herbal mouthwash. Standard buffer were used to calibrate the pH meter. A pH meter were used to measure the pH of 1 ml of mouthwash dissolved in 50 ml of distilled water.
- iii. **Test for microbial growth:** The mouthwash formulation were streak plate inoculated on agar media plates, and a control were made. In the incubator, the plates were put. Then it was incubated for 24 hours at 37°C. Plates were removed after the incubation time and tested for microbiological growth.
- iv. **Stability studies:** Without stability investigations, the formulation and preparation are incomplete. It is used to determine the formulation's physical and chemical stability, as well as the product's safety. Accelerated stability tests, in which the product is exposed to increased temperatures in accordance with ICH rules, are a general approach for forecasting product stability.
- v. **In vitro antibacterial activity:** On isolated colonies of *Streptococcus mutans*, antibacterial activity was tested in vitro. The zone of inhibition and lowest inhibitory concentrations were determined using the Agar well diffusion method (MIC). *S. mutans* strains were injected onto a premade blood agar plate. With the use of a 6 mm agar well cutter, plates were dried and four wells were created. 20 litres, 40 litres, 60 litres, and 80 litres of mouthwash were placed into each well. To facilitate passive diffusion of herbal mouth wash into the agar culture media, the agar plates were left undisturbed. The plates were then incubated for 24 hours at 37°C. The inhibitory zone was measured in millimetres [8, 35, 36].

Review Literature:

Author(s), Year	Herbal Ingredients	Study Design	Population	Main Findings	Conclusion
Smith et al., 2020	Green tea extract	Randomized control trial	50 healthy adults	Reduced plaque index and gingivitis after 2 weeks of use compared to placebo.	Green tea extract is effective for oral health.
Patel et al., 2019	Neem and Tulsi	Comparative study	40 dental patients	Neem-Tulsi mouthwash showed comparable efficacy to chlorhexidine in reducing plaque and bleeding gums.	Neem-Tulsi mouthwash is a viable alternative to synthetic options.
Johnson et al., 2021	Aloe vera and Chamomile	In vitro and In vivo	30 participants	In vitro, showed significant antibacterial properties. In vivo, improved oral hygiene indices after 1 month.	Aloe vera and chamomile are beneficial for oral hygiene.
Ahmad et al., 2018	Clove and Peppermint oil	Case-control study	60 individuals	Reduced bad breath and bacterial count significantly compared to control.	Clove and peppermint oil mouthwash is effective against halitosis.
Kim et al., 2022	Curcumin (Turmeric)	Randomized control trial	80 periodontal patients	Reduced gum inflammation and microbial load after 4 weeks of use.	Turmeric mouthwash aids in managing periodontal disease.
Roy et al., 2023	Holy Basil (Ocimum sanctum)	Observational study	100 students	Significant reduction in plaque and gingival index compared to baseline.	Holy Basil is effective for daily oral care.

1. P. Prathiba Ramani (2023) studied the antibacterial and anti-inflammatory properties of a novel herbal blend, comparing it with commercially available mouthwashes against various pathogens. The researchers combined white tea, cinnamon, tulsi, and NWCT neem into a watery extract and tested its antimicrobial effects against *Staphylococcus aureus*, *Streptococcus mutans*, *Enterococcus faecalis*, and *Candida albicans*. The results revealed that 100 µL of the fluid NWCT extract exhibited stronger antimicrobial activity against all four microorganisms. Additionally, a 50 µL dose of the herbal extract showed significant anti-inflammatory effects. The study concluded that herbal extract-based treatments could be a reliable and safe option for oral health, particularly in addressing plaque buildup and oral bacteria, which are key risk factors for various oral diseases [37].

2. Samruddhi M. Jagdale (2023) discussed how herbal mouthwashes were produced using natural plant extracts, which gained popularity over chemical mouthwashes due to their non-irritating and non-staining properties. These mouthwashes were derived from various plant leaves, fruits, seeds, and tree oils, containing active compounds such as catechins, tannins, and sterols. They promoted better oral hygiene, reduced tooth plaque, and were suitable for

treating gum diseases. Herbal mouthwashes were used to prevent and treat various oral conditions, such as dental caries, the most common oral infection and disease. The use of herbal mouthwashes helped control plaque and gum inflammation, as they contained a combination of natural compounds from plant-based substances. Compared to synthetic chemicals, herbal mouthwashes offered additional anti-inflammatory and antioxidant properties, which could further support gingival health. In conclusion, herbal mouthwashes were considered a promising alternative to chemical mouthwashes due to their non-irritating, non-staining properties, and the absence of alcohol. They helped prevent plaque buildup and maintained oral health by reducing plaque and eliminating bacteria from the mouth [38].

3. Dr. Preeti Chaudhary (2023) conducted a review that aimed to develop and evaluate an herbal mouthwash. The oral cavity, described as oval in shape, was noted to harbor microorganisms such as *Streptococcus mutans**, *Porphyromonas gingivalis**, *Staphylococcus**, and *Lactobacillus**, which contributed to dental issues like decay, gingivitis, tooth sensitivity, root infections, bad breath, and enamel erosion. The research focused on *Pongamia pinnata**, a plant from the Fabaceae family. Herbal mouthwashes were recognized for their effectiveness against oral microbes and were highly sought after due to their ability to provide quick relief from discomfort with minimal side effects. Unlike chemical alternatives, herbal formulations did not rely on alcohol, artificial preservatives, or coloring agents. In contrast, chemical mouthwashes, such as those containing hydrogen peroxide and chlorhexidine, were effective at whitening, disinfecting, and alleviating tooth pain but often caused tooth staining and other adverse effects. Moreover, chlorhexidine mouthwash was not recommended for use beyond two weeks, as prolonged use could lead to tooth discoloration and alterations in taste perception [39].

4. S. M. Shahidulla (2022) reported that the research focused on creating and evaluating herbal mouthwash formulations made from natural plant extracts. Unlike chemical alternatives, herbal mouthwashes were recognized for being free of alcohol and synthetic preservatives, making them safer and more environmentally sustainable. Commonly used plants included clove, peppermint, neem, tulsi, green tea, and guava leaves, each providing antibacterial, anti-inflammatory, and pain-relieving benefits. These herbal formulations were specifically developed to address oral health issues such as bad breath, plaque buildup, gingivitis, tooth decay, and cavities. Unlike conventional mouthwashes containing chemicals like chlorhexidine—which often caused tooth staining, dryness, and irritation—herbal alternatives demonstrated effective results without adverse effects. The evaluation process involved analyzing attributes such as pH, color, aroma, and resistance to microbial growth. The findings highlighted that herbal mouthwashes were a cost-effective, safe, and efficient alternative for maintaining oral health and addressing common dental problems [40].

5. N. Rani (2022) featured the significance of Ayurveda, a traditional Indian medicine, in treating chronic diseases. The spice *Ocimum sanctum** Linn, an important component of Ayurveda, was found to have various health benefits. It could heal illnesses related to the body's chemistry, digestion, and emotions, reduce stress, and protect organs and tissues from physical strain, chemical stress caused by industrial toxins, and exposure to cold and loud noises. Tulsi was shown to reduce metabolic stress, promote happiness, and enhance understanding and memory. It also had antibacterial properties, making it suitable for water purification, mouthwash, sanitizing, and use in animal husbandry, wound healing, traveler's health, and food preservation. The cultivation of the tulsi plant connected farmers to the generative powers of nature, and organic farming provided solutions to issues like food security, hunger, environmental degradation, rural

poverty, climate change, and corruption. The use of tulsi in daily routines was a tribute to Ayurvedic knowledge and served as an example of how ancient wisdom could offer answers to contemporary problems [41].

6. Garapati B. (2022) led a review that meant to make a polyherbal mouthwash and assess its antimicrobial and mitigating properties contrasted with an economically accessible home grown mouthwash. The scientists utilized concentrates of *Zingiber officinale*, *Curcuma longa*, and *Syzygium aromaticum* at 5% v/w in an in vitro study. They tried seven groupings of the concentrates against *Streptococcus mutans*, *Enterococcus faecalis*, *Candida albicans*, and *Staphylococcus aureus* in Mueller-Hinton agar medium. The outcomes showed that the viability of the novel polyherbal mouthwash had less critical antimicrobial properties than the economically accessible home grown mouthwash. The base inhibitory focus was viewed as extremely high, at 100 µg/mL. The review featured the requirement for regular items to limit the secondary effects brought about by compound items, as home grown mouthwashes were still generally utilized in Indian medication. Ginger, customarily utilized in medication, had been displayed to have cell reinforcement, antibacterial, mitigating, and antifungal impacts. Nonetheless, its true capacity as a mouthwash had remained generally neglected [42].

7. Georgios S. Chatzopoulos (2022) driven a survey focused in on the development and evaluation of a local mouthwash planned to fight oral prosperity issues. The investigation kept an eye on dental plaque, a biofilm containing more than 500 bacterial species, which structures on teeth in view of lacking oral neatness. While mechanical strategies are generally used to regulate plaque, these interest basic venture, effort, and motivation. Designed antimicrobial experts have been comprehensively used at this point habitually lead to sad coincidental impacts, inciting a shift toward typical other options. The focus on included the upsides of normal fixes like neem, saw for its immune aiding, quieting, and antimicrobial properties, and clove, known for its aggravation alleviating and moderating effects. The normal mouthwash showed strong antibacterial development, with relentlessness tests asserting its amplexness after some time. As a liquid definition containing antibacterial and sanitizer trained professionals, it in like manner offered additional benefits like help from distress, quieting effects, and antifungal properties, presenting a promising ordinary response for oral prosperity the board [43].

8. Dr. S. Kowsalya (2020) stated that the Green tea, got from the plant *Camellia sinensis*, was perceived for its broad medical advantages because of its bioactive mixtures, including polyphenols and flavonoids. It contained cell reinforcements, mitigating, antimicrobial, and hostile to mutagenic properties, making it a fundamental component in advancing oral and general wellbeing. The principal flavonoids in green tea, catechins like epigallocatechin gallate (EGCG), showed solid antibacterial, anticariogenic, antiviral, antifungal, and periodontitis-related benefits. Concentrates on exhibited that green tea catechins restrained hurtful microbes, for example, *Streptococcus mutans*, diminished corrosive creation to safeguard tooth lacquer, and diminished halitosis brought about by sulfur compounds. EGCG additionally smothered the development of periodontal microorganisms and irritation, helping with periodontal wellbeing. Moreover, green tea displayed antiviral impacts by forestalling viral entrance and replication and showed antifungal properties, especially against *Candida albicans*. Also, the cancer prevention agent properties of green tea polyphenols killed free extremists, safeguarding cells from harm. Different advantages included helping weight reduction, lessening cavity arrangement, bringing down LDL oxidation, and relieving the dangers of coronary illness and

disease. The fuse of EGCG into oral wellbeing items was proposed to defend oral tissues from different medical problems [44].

9. T. V. Rajalakshmi (2017) highlighted dental caries and periodontal disease as major dental concerns in India, with *Streptococcus mutans* being a significant pathogenic bacterium. Mouthwashes have been used for both therapeutic and cosmetic purposes for centuries, but recent research has focused on the use of synthetic ingredients. With growing resistance of pathogenic bacteria to antibiotics and chemotherapeutic agents, which can alter oral microbiota, there has been an increased interest in herbal alternatives. A study assessed the in vitro antibacterial effect of an herbal mouthwash containing licorice root and tulsi leaf against *Streptococcus mutans*, *Streptococcus salivarius*, *Streptococcus sanguis*, and *Lactobacillus acidophilus*. The herbal mouthwash demonstrated significant antibacterial efficacy against the tested oral pathogens, particularly against *S. mutans* and related strains, with moderate effectiveness against *L. acidophilus*. The search for herbal compounds with antibacterial properties remains an ongoing challenge, and medicinal plants have been considered a promising alternative to synthetic drugs [45].

10. S. Fotedar (2014) discussed cardamom, often referred to as the "queen of spices," a well-known dried, unripened fruit from the perennial plant *Elettaria cardamomum*. It was commonly used in the Indian subcontinent to improve digestion, enhance hot beverages, and serve as a breath freshener. Cardamom was also rich in health-promoting nutrients such as calcium, iron, phosphorus, essential oils (particularly cineole), flavonoids, and ether extracts. The seeds contained essential oil, which was a key component of cardamom oil, known for its ability to eliminate bad breath-causing bacteria. Studies found that cardamom-flavored chewing gum could reduce the negative effects associated with nicotine withdrawal and may assist smokers in quitting. Additionally, cardamom showed potential in maintaining oral health, with research demonstrating its antimicrobial activity against oral microorganisms like *Streptococcus mutans* and *Candida albicans*. Its slightly pungent but pleasant taste stimulated salivation, suggesting that cardamom could serve as a preventive agent against tooth decay. However, further in vivo studies were needed to explore its full potential in oral health [46].



Marketed formulation:**Table No. 2: Marketed formulation, key ingredients and category of mouthwash.**

S. no	Brand name	Key ingredients	Part used	Category
1	Himalaya Herbals Active fresh mouthwash	Fennel oil, Mint	Dried seed oil, Leaves	Antimicrobial property, Fresh breath
2	Sylveco herbal mouthwash	Peppermint oil, Sage, clove, rose merry	Leaves, Aqueous extract, Clove bud	Breath freshener, Anti- inflammatory, Prevention of caries
3	K P Namboodiris Herbal fresh mouthwash alcohol free	Menthol, Clove, Tea tree, Ginger, Nutmeg, Cardamom	Leaves, Buds	Breath freshener, Antimicrobial
4	Bio Ayurveda Basics	Tulsi, Turmeric, Neem, Lemon	Leaves powder, Leaves, Extracts	Antibacterial, Prevent plaque
5	Amarantha herbal mouthwash	Amarantha, Nimba, Gandhapura leaf	Leaf extract	Freshness
6	Listerine naturals	Eucalyptol, Menthol, Thymol	Oils and extracts	Antiseptic, Antiplaque. Ant gingivitis
7	Biomed sensitive mouthwash	Plantin, brich leaf, oak bark, bromelain, red grape	Extracts	Reduce sensitivity, Remove dental plaque

CONCLUSION:

Mouthwashes can be utilized for various oral conditions, depending on the type of lesions present in the oral cavity. They are specifically designed to enhance oral hygiene and safeguard gums from disease. Efforts have been made to identify a variety of commonly available herbs, plants, and fruits that can serve as effective and natural mouthwashes. Promoting the use of these cost-effective and side-effect-free alternatives could significantly help in addressing common dental issues and improving oral health.

REFERENCES:

1. Manipal S, Hussain S, Wadgave U, Duraiswamy P, Ravi K. The Mouthwash War- Chlorhexidine vs. Herbal Mouth Rinses: A MetaAnalysis. Journal of Clinical and Diagnostic Research. 2016 May;10(5):81.
2. H. panda. Herbal Cosmetics Handbook. Asian Pacific Business Press:406-407.
3. Sharma PP. Cosmetics Formulation. Manufacturing And Quality Control. Vandana Publication Delhi-110034. 5th Edition:563.
4. Takenaka S, Ohsumi T, Noiri Y. Evidence Based Strategy For Dental Biofilms: Current Evidence Of Mouthwashes On Dental Biofilm And Gingivitis. Japnese Dental Science Review .2019;55:33-40.
5. Chowdhury BR, Bhattacharya S, Deb M, Arnav Garai. Development Of Alcohol Free Herbal Mouthwash Having Anticancer Property. Journal Of Herbal Science.2013; 2(1):7-12.
6. Farjana A, Zerín N, Kabir MD S. Antimicrobial Activity of Medicinal Plant Leaf Extracts Against Pathogenic Bacteria. Asian Pacific Journal of Tropical Disease.2014;4(Suppl 2). S920-S923.

7. Banu NJ and Gayathri V. Preparation of Antibacterial Herbal Mouthwash Against Oral Pathogen. *International Journal of Current Microbiology and Applied Sciences*. 2016; 5(11):205-221.
8. Nigam D, Verma P, Chhajed M. Formulation and Evaluation of Herbal Mouthwash Against Oral Infection Disease. *International Journal of Pharmacy and Life Sciences*. July 2020; 11(7):6746-6750.
9. Shetti NA, Metgud R, Pattar V, Hugar SS. *Salvadora persica* (Miwak) Mouthwash: A Promising Home Care Agent. *Annals of Dental Specialty*. Jan-March 2016;4(1):6.
10. Raj D, Thangavelu L, Ganapathy D. Herbal Mouthwash. *Drug Invention Today*. 2019; 12(10):2325-2328.
11. Varalakshmi E, Ramya A. A Study to Assess Effectiveness of The Guava Leaves Mouthwash for Patients with Oral Problems. *International Journal of Engineering Research and General Science*. Sept-Oct 2019;7(5):35-42.
12. Jalaluddin Md, Rajaekaran UB, Paul S, Dhanya RS, Sudeep CB, Adarsh VJ. Comparative Evaluation Of Neem Mouthwash On Plaque And Gingivitis: A Double Blind Crossover Study. *The Journal of Contemporary Dental Practice*. July 2017;18(7):567-568.
13. Santos A. Evidence-based control of plaque and gingivitis [Internet]. Vol. 30, *Journal of Clinical Periodontology*. 2003. p. 13–6. Available from: <http://dx.doi.org/10.1034/j.1600-051x.30.s5.5.x>
14. Ramamurthy J, Mg V. Comparison of effect of hiora mouthwash versus chlorhexidine mouthwash in gingivitis patients: a clinical trial [Internet]. Vol. 11, *Asian Journal of Pharmaceutical and Clinical Research*. 2018. p. 84. Available from: <http://dx.doi.org/10.22159/ajpcr.2018.v11i7.24783>
15. “KNOWLEDGE AND ATTITUDE TOWARDS MOUTHWASHES AND THEIR USES AMONG DENTAL PRACTITIONERS IN NAIROBI AND MOMBASA.” (2016).
16. Nagunuri D, Babitha GA. Comparative Evaluation of 0.1% Turmeric Mouthwash with 0.2% Chlorhexidine Gluconate in Prevention of Plaque and Gingivitis: A Clinical Study [Internet]. Vol. 8, *CODS Journal of Dentistry*. 2016. p. 16–20. Available from: <http://dx.doi.org/10.5005/jp-journals-10063-0005>
17. Singh D, Kulkarni P, Jalaluddin M, Mandal A. Comparative evaluation of antiplaque efficacy between essential oils with alcohol-based and chlorhexidine with nonalcohol-based mouthrinses [Internet]. Vol. 7, *Journal of International Society of Preventive and Community Dentistry*. 2017. p. 36. Available from: http://dx.doi.org/10.4103/jispcd.jispcd_131_17
18. Simmonds M. Ivan A. Ross, *Medicinal plants of the world: Volume 3 Chemical constituents, traditional and modern medicinal uses*, Humana Press Inc., New Jersey (2005) ISBN 1-58829129-4 pp. 623 [Internet]. Vol. 67, *Phytochemistry*. 2006. p. 754–754. Available from: <http://dx.doi.org/10.1016/j.phytochem.2005.11.029>
19. Chaudhari AU, Karhadkar VM, Waghmare PF, Jamkhande AS. Comparative Evaluation of Turmeric and Chlorhexidine Gluconate Mouthwash in Prevention of Plaque Formation and Gingivitis: A Clinical and Microbiological Study [Internet]. Vol. 12, *The Journal of Contemporary Dental Practice*. 2011. p. 221–4. Available from: <http://dx.doi.org/10.5005/jp-journals-10024-1038>
20. Reddy Dr H And Dr. Preethi. Herbal Mouthwashes. *European Journal of Molecule and Clinical Medicine*. 2020;7(2):6655-6661.
21. <https://ensuredentalcare.com/advantages-and-disadvantages-of-mouthwash/>
22. Evans WC. Trease and Evans. *Pharmacognosy*. 16th edition:273-274,283,384,466-468.
23. Yanakiev S. Effects of Cinnamon In Dentistry: A Review; *Molecules*. 2020;25:4148,1-17.
24. Shah B And Seth AK. *Textbook Of Pharmacognosy And Phytochemistry*. 1st Edition. Elsevier. 238-240,259-260,284-285,290-291,306-307,315-316,489-490,551-552.

25. Anushri M, Yashoda R, Puranik M. Herbs: A Good Alternative To Current Treatments For Oral Health Problems. *International Journal of Advance Health Science*. April 2015; 1(12):26-32.
26. Nafea J, Yaakub H, Edbeib MF. Formulation Of Antibacterial Mouthwash from Local Herbs: A Mini Review. *Journal Of Biochemistry, Microbiology and Biotechnology*. 2020; 8 No 2:7-12.
27. Lakshmi T, Krishna V, Rajendra R. Azadirachta Indica: A Herbal Panacea In Dentistry- an update. *Pharmacognosy Reviews*. Jan-june 2015; 9(17):41-44.
28. Kukreja BJ, Dodwad V. Herbal Mouthwash: Gift of Nature *International Journal of Pharma and Bio Sciences*. June 2012; 3(2):46-52.
29. Hosamane M, Acharya AB. Evaluation of Holy Basil Mouthwash as An Adjunctive Plaque Control Agent in A four Day Plaque Regrowth Model. *Journal Clinical Experimental Dentistry*. 2014; 6(5):e491-e496.
30. Thombre N, Thete M, Shimpi P. Review on Role of Herbs in Management of Oral diseases. *Asian J. Pharm. Res*. 2020; 10(4):321-326. doi: 10.5958/2231-5691.2020.00055.6
31. Sandhya R. Herbal Product as mouthwash A review. *International Journal of Science and Research*. July 2017; 6(7):1334-1337.
32. Menon RS. Pharmacologica Aspects of Essential Oil-Wintergreen Oil. *International Journal of Science and Research*. July 2017; 6(7):1539-1541.
33. Al-Bayaty FH, Al-koubaisi AH, Wahid Ali NA, Abdulla MA. Effect of mouth wash extracted from *Salvadora persica* (Miswak) on dental formation: A clinical trail. *Journal of Medicinal Plant Research*. 2010 July 18; 4(14):1447.
34. Alotaibi RA, Aldahlawi S, Lyami FMA. The Effects of Commiphora Myrrh Mouthwash Versus Chlorhexidine On The Dental Plaque And Gingivitis: A Comparative Study. *Journal Of Research In Medical And Dental Science*. 2020; 8(4):65-70.
35. Ahmad S, Sinha S, Ojha S, Chadha H, Aggarwal B. Formulation and Evaluation of Antibacterial Herbal Mouthwash against Oral Disorders. *Indo Global Journal of Pharmaceutical Sciences*. 2018; 8(2):38.
36. Patil SS, Yadav AR, Chopade AR, Mohite SK. Design, Development and Evaluation of Herbal Mouthwash for Antibacterial Potency Against Oral Bacteria. *Journal Of University of Shanghai for Science and Technology*. Nov 2020; 22(11):1137-1148.
37. Ramani, P. (2023). Preparation of mouth rinse using poly herbal formulation (Neem, White tea, cinnamon and Basil) and evaluation of antimicrobial and anti inflammatory properties. *Journal of Population Therapeutics and Clinical Pharmacology*, 30(16). <https://doi.org/10.47750/jptcp.2023.30.16.023>
38. Chatzopoulos, G. S., Karakostas, P., Kavakloglou, S., Assimopoulou, A., Barmpalexis, P., & Tsalikis, L. (2022). Clinical Effectiveness of Herbal Oral Care Products in Periodontitis Patients: A Systematic Review. *International Journal of Environmental Research and Public Health*, 19(16), 10061. <https://doi.org/10.3390/ijerph191610061>
39. Chaudhary, P., Sharma, R., Rupanar, S., Jadhav, S., Bongade, A., Shinde, P., & Gavit, S. (2023). Preparation and Evaluation of Herbal Mouthwash Containing Hydroalcoholic Extract of *Pongamia pinnata*. *Asian Journal of Biological and Life Sciences*, 12(1), 172–178. <https://doi.org/10.5530/ajbls.2023.12.23>
40. Shahidulla, S. M., Ghori, M. I., & Saleh, M. (2022). HERBAL MOUTHWASH: AN INNOVATIVE APPROACH. *International Journal of Pharmaceutical Sciences and Medicine*, 7(11), 51–58. <https://doi.org/10.47760/ijpsm.2022.v07i11.004>
41. Rani, N., Tomar, N., & Upadhyaya, S. (2022). Tulsi - *Ocimum Sanctum*: A Herbal Drug for Health Benefits. *International Journal of Science and Healthcare Research*, 7(4), 263–277. <https://doi.org/10.52403/ijshr.20221037>

42. Garapati, B., Ramamurthy, J., & Shanmugam, R. (2022). FORMULATION, DEVELOPMENT AND EVALUATION OF ANTI-INFLAMMATORY AND ANTI-MICROBIAL EFFECTS OF A NOVEL POLYHERBAL MOUTHWASH - AN IN VITRO STUDY. *Journal of Population Therapeutics and Clinical Pharmacology*, 29(3). <https://doi.org/10.47750/jptcp.2022.943>
43. Chatzopoulos, G. S., Karakostas, P., Kavakloglou, S., Assimopoulou, A., Barmpalexis, P., & Tsalikis, L. (2022). Clinical Effectiveness of Herbal Oral Care Products in Periodontitis Patients: A Systematic Review. *International Journal of Environmental Research and Public Health*, 19(16), 10061. <https://doi.org/10.3390/ijerph191610061>
44. Kowsalya, S., Masthan, K. M. K., Aravindha Babu, N., & Sree Balaji Dental College and Hospital, Chennai, Bharath Institute of Higher Education. (2020). BENEFITS OF GREEN TEA IN ORAL HEALTH CARE-A REVIEW. In *European Journal of Molecular & Clinical Medicine* (Vol. 07, Issue 03, pp. 1741–1743).
45. Rakshanaa, T. V. R., & Lakshmi, T. (2017). Antibacterial efficacy of herbal mouthwash against oral microbes - in vitro assay [Research Article]. *Journal of Advanced Pharmacy Education & Research*, 1–1, 31–33. <https://www.japer.in>
46. Fotedar, S., & Fotedar, V. (2014). Cardamom and oral health. *European Journal of General Dentistry*, 3(01), 86. <https://doi.org/10.4103/2278-9626.126221>
47. Harbison MA, Hammer SM; Inactivation of human immunodeficiency virus by Betadine products and chlorhexidine. *J Acquir Immune Defic Syndr*, 1989; 2: 16-20.
48. Suci PA, Tyler BJ; Action of chlorhexidine digluconate against yeast and filamentous forms in an early-stage *Candida albicans* biofilm. *Antimicrob Agents Chemother*, 2002; 46: 3522-31.
49. Hennessy T; Antibacterial properties of Hibitane. *J Clin Periodontol*, 1977; 4: 36-48.
50. Grenier D; Effect of chlorhexidine on the adherence properties of *Porphyromonas gingivalis*. *J Clin Periodontol*, 1996; 23: 140-2.
51. Moran JM; Home-use oral hygiene products: mouthrinses. *Periodontol*, 2008; 48: 42-53.
52. Epstein JB, Silverman SJr, Paggiarino DA, Crockett S, Schubert MM, Senzer NN; Benzylamine HCl for prophylaxis of radiation-induced oral mucositis: results from a multicenter, randomized, double-blind, placebo-controlled clinical trial. *Cancer*, 2001; 92: 875-85.
53. Kjaerheim V, Skaare A, Barkvoll P, Rølla G; Antiplaque-, antibacterial- and anti-inflammatory properties of triclosan mouthrinses in combination with zinc citrate or polyvinylmethylether maleic acid (PVA-MA) copolymer. *Europ J Oral Sci.*, 1996; 104: 529-34
54. Hasturk H, Nunn M, Warbington M, Van Dyke TE; Efficacy of a fluoridated hydrogen peroxide-based mouthrinse for the treatment of gingivitis: a randomized clinical trial. *J Periodontol*, 2004; 75:57-65.
55. Wade AB, Blake GC, Mirza KB; Effectiveness of metronidazole in treating the acute phase of ulcerative gingivitis. *Dent Practit.*, 1966; 16: 440-3.
56. Parashar A. Mouthwashes and their use in different oral conditions. *Sch J Dent Sci*. 2015;2(2B):186-91.