Vol. 2 No. 3 (2025)
ONLINE ISSN :3007-309X
PRINT ISSN :3007-3081
Journal of Medical & Health Sciences Review

HERBAL REMEDIES FOR ORAL HYGIENE USED IN KARACHI, PAKISTAN

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ARTICLE INFO:

Keywords:
Herbal remedies, Oral hygiene, Periodontal problems, Dental caries, Oral disease, Antibiotic resistance, Karachi, Pakistan

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Article History:
Published on 09 September 2025

ABSTRACT

Objective: Studies showed that periodontal problems are increasing day by day worldwide among the elders, youngsters and especially the children due to more consumption of sugary food and improper oral hygienic habits. Dental caries, mucosal lesions and periodontal illnesses are the fast growing periodontal diseases. Various medications are available for treatment but now people are seeking herbal remedies due to easy availability, low cost and less side effects. Healthcare professionals also suggest herbal remedies for less severe disorders due to increasing antibiotic resistance. The intent of the study is to investigate the use of herbal remedies for oral hygiene used in Karachi, Pakistan.

Methodology: A comprehensive search of three electronic databases (Google Scholar, Pub Med, and Research Gate) was performed to gather existing research on oral diseases and herbal plants. A survey was conducted among 119 oral disorder patients in Karachi to gather information on the herbal plants they use for oral hygiene. The survey included 10 herbal plant options. Research followed a structured methodology for the systematic review including citation screening, data extraction and validation. However, we were not able to conduct a meta-analysis due to the descriptive statistics.

Results: A study of 119 participants found that 93.3% believe herbal remedies work for oral hygiene and 60.5% use them. Common oral diseases reported included herpangina, dental caries and gingivitis, with 63.6% experiencing bad breath, while many participants had habits that could harm oral health. 73.9% used mouthwash and the

top herbal remedies used were *Eucalyptus leaf, S.aromaticum, A.indica* and *Cinnamon* bark. However 6.7% reported allergic reactions to herbal remedies.
Conclusions: Herbal medicines such as *Eucalyptus, S.aromaticum* and *Cinnamon* are popular for oral hygiene among patients with oral disorders but further study is needed to validate their efficacy and safety.

INTRODUCTION

WHO confines different conditions as oral disease including dental caries, periodontal (gum) disease, tooth loss, oral cancer, oro-dental trauma and birth defects such as cleft lip and palate. Approximately almost 3.5 billion persons afflicted by oral illness. The most prevalent are oral mucosal lesions, periodontal disorders and dental caries. It is widely acknowledged that one of the main causes of gingival irritation and caries is the development of dental plaque at the tooth/gingiva interface.[1]

In dental caries bacteria adheres to the tooth chronically and de-mineralize the teeth with passage of time. With the passage of time as the living style of people changes, dietary habits also changes. People shifted toward the sugary food. Research work revealed that sucrose is major contributing factor than cereals in dental caries. Aristotle stated that "Figs and soft sweets produce damage to the teeth because small adhere between the teeth where the easily become the cause of putrefaction".[2] Based on the existing data about 60% people have dental caries in Pakistan and the estimation prevalence ratio from Sindh was 58.946%.[3]

Periodontal disease is a group of various inflammatory and degenerative conditions of gums and tissues that hold the teeth.[2] Bacterial growth in roots of teeth spreads to the nearby gingiva which cause bleeding and pus collection that leads to gradual bone loss.[4] It encompasses gingiva, alveolar bone, periodontal ligaments and chronic in nature and can continue in the absence of treatment.[5]

A reviewed study explains in developing countries periodontal disease effecting 20-50% people and at national level in Pakistan the total estimation of periodontitis was 56.62% (95%Cl). Balochistan had a 3% prevalence of periodontitis, Khyber Pakhtunkhwa had 20% prevalence, Punjab had 37% prevalence and Sindh had 40% prevalence. They collected data from different cities of each province out which 12 were from the Karachi. In this study total of 17,757 subjects was included.[4]

An ulcer or a change in the thickness, color or texture of the oral mucosa is two examples of oral mucosal lesions, which are breaks in the oral epithelium. They could show up as red and white/gray lesions. In white lesions, there is a decrease in vascularity in the lamina propira (fibrosis) and an increase in epithelial thickness (intracellular edema). Reduced epithelial thickness and increased vascularity in the lamina propria (inflammation) are examples of red lesions. Leukoplekia, lichen planus, candidiasis and frictional keratosis are all present in white. Erythroplakia, denture-induced stomatitis and geographical tongue are examples of red lesions. Study found out 58.7% prevalence of oral lesions. With 58% of all soft tissue lesions and 47% of soft tissue texture reported, the buccal mucosa was the most common area. White mouth lesions were the most prevalent.[6]

Halitosis is an unpleasant condition may or may not associate with oral disease. If the disease is not present appropriate therapy should be given.[7] Saliva provides protein as

substrate which is oxidized by bacteria in buccal cavity results in bad breath.[8]

Normal flora of buccal cavity includes bacteria like *Streptococcus, Actinomyces* and *Veillonella.* They play important role in oral cavity health and involve in plaque formation and preservation oral homeostasis. There are several factors that disturb the normal flora balance of oral cavity that includes host genetic, oral hygiene habits (alcoholism, smoking and consumption of carbonated drinks) and food (high consumption of sugary, spicy foods). There is connection between oral diseases and imbalance of normal flora of buccal cavity.[9] Studies shows that yeast in the periodontal pocket is related to some bacterial periodontal pathogens imply a possible role of *Candida* in the pathogenesis of the disease.[10] Yeast is the most common fungus found in buccal cavity.[10] General health problems also one of the reason of oral diseases like diabetes, cancer and respiratory problems etc.

Commonly used herbs/plants for oral hygiene in Karachi, Pakistan

Syzygium aromaticum (clove)

Clove is redolent and dried flower buds of unfading tree of *Myrtaceae* family. It is native to India, Indonesia, Ceylon, Maurutius and Zanzibar.[11] Eugenol covers 50% of its constituents, others are eugenyl acetate, β – caryophyllene and α -humulene in less concentration.[12] These constituents show antibacterial, antifungal, antioxidant and anti-inflammatory properties.[11] Clove essential oil also represents anti-nociceptor activity due to COX-2 inhibitation, cholinergic receptor system, activation of opioids and modulation of Gamma-amminobutyric acid (GABA) receptors. It also shows anticancer properties.[12] *Porphyromonas gingivalis, Prevetolla intermedia, Actinomycosis viscosus* and *Streptococcus mutans* are hampered in their growth by its alcoholic extract.[13] It is used as a spice, worldwide. Clove's in vitro antibacterial activity against gram-positive bacteria like *Bacillus sabucus* and *S.aureus*, as well as gram-negative bacteria like Salmonella enteritidis, *Escherichia coli*, Campylobacter jejuni, *Klebsiella pneumoniae*, *Proteus vulgaris* and *Pseudomonas aeruginosa*, is exponded in may studies.[11] With 3% aqueous extract of clove, the bactericidal activity against food-borne pathogens *E.coli, S.areus* and *Bacillus cereus* was assessed.[14]

Cinnamon bark (dalchini)

Cinnamomum zeylanicum is abundantly present in Southeast Asia. It belongs to *Lauraceae*. Cinnamon bark extract used to as spice in cooking all over the world. Due to the presence of cinnamaldehyde, it reduces bad breath. It also shows antifungal, antibacterial and antidiabetic effects. Highly effective in reducing infection of dental caries.[15]

Eucalyptus (sufaida/lachi)

Eucalyptus oil is obtained from the drying, crushing and distillation of Australian Eucalyptus tree leaves. This oil has antibacterial action and highly cytotoxic against *Haemophilus influenza* and *Staphylococcus pyogenes.*[16] *Eucalyptus globulus* is member of *Myrtaceae* family which is approachable in Pakistan. In the discussion only this specie is discussed.

Azadirachta indica (neem tree)

Neem tree is easily available in Pakistan which belongs to family *Meliaceae.* Many studies reported its antitumor, antipyretic, hypoglycemic, antimicrobial, antifungal, antibacterial, antigastric ulcer, antiarthritics and anti-inflammatory propertie, due to the presence of limonoid, querecitin, salanine, sodium nimbinate, gedunine, nimbidine, nimbin and nimbolides.[17]

METHODOLOGY

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) standards were followed in the direction of this systematic review.[18] Gathering the information on oral disorders and herbal plants, a thorough search of three electronic databases—Google Scholar, Pub Med and

Research Gate—is conducted. Each retrieved citation is examined by two independent reviewers in accordance with the guidelines in (Table 1).

Table 1: Study eligibility criteria

	Inclusion Criteria	Exclusion Criteria
Population	81.5% are Medical students and Health care professionals	18.5% are the non-medical persons
Intervention	A questionare based google form used in research as primary source	
Comparator	Not applicable	Not applicable
Key outlines	Oral hygiene habits Dietary Habits Additional oral care (Use of mouth wash) General Health problems Herbal remedies for oral problems Satisfaction level after the use of herbal remedies	Outcomes other than listed under inclusion criteria
Study design	Randomized Control Study Cluster Randomized Control Study Questionare Based Study Observational Study	Abstracts Editorials/commentaries/review articles/expert opinions
Language	English	Urdu
Search time frame	24 Oct. to 12 Nov. 2024	Not applicable
Any other criteria	No limits on sample size or countries	Not applicable

Citations with set eligibility requirements were removed, while those with incomplete or ambiguous information were added to the full-text screening (also known as secondary screening). Two separate reviewers got the full-text publications of the potentially eligible citations and performed secondary screening on them. There are no disagreements among the reviewers. Several papers from the study were linked together and removed as a single study. While the second reviewer confirmed the accuracy and completeness of the data, the first reviewer extracted the data from the eligible studies into a pre-made extraction grid. The descriptive format of the data from the included studies made meta-analysis impractical.

We run a questionnaire among the oral disorder patients of Karachi, belongs to different areas. A total 119 people participated in this survey. Different age patients participate ranges from 10-20 to 80 years old. We asked about the herb/plant that they used for oral hygiene. Questionnaire was consists of *Eucalyptus* leaf, *Trachyspermum ammi, Acacia catechu, Echnichea sp.* (Purple coneflower), *S.aromaticum, A.indica, Glycyrrhiza glabra, A.sativum* and *Cinnamon* bark.

RESULTS

In our questionnaire about 93.3% believes that herbal remedies work in oral hygiene. 60.5% people uses herbal remedies for oral hygiene and remaining do not use. 35.3% people were more conscious about their oral health, they brush their teeth in evening and morning, majority with 58% brush teeth before breakfast and only 6.7% people brush after dinner. 63.6% people experience bad breath. Herpangina, dental caries, gingivitis are common oral diseases among the participants as given in Figure (1). All of the participants were non-alcohol drinkers but about 51.3% and 7.6% were often and

frequent consumer of carbonated (acidic) drinks respectively. 5.9% were smokers. 40.3% people were fond of sugary food. Only 0.8% consumes mava, gutka, chalia, filter, naswar. 73.9% participants were more curious about oral hygiene as they also use mouth wash for oral health. Other general health problems among the participants are given in Figure (2). The four most commonly used are *Eucalyptus* leaf, *S.aromaticum, A.indica* and *Cinnamon* barks, others are also given in Figure (3). 6.7% face the allergic reaction after using the herbal remedies. Two also use Miswak *(Salvadora persica)* instead of toothpaste for teeth brushing. Daily water consumption ratio is given in Figure (4).

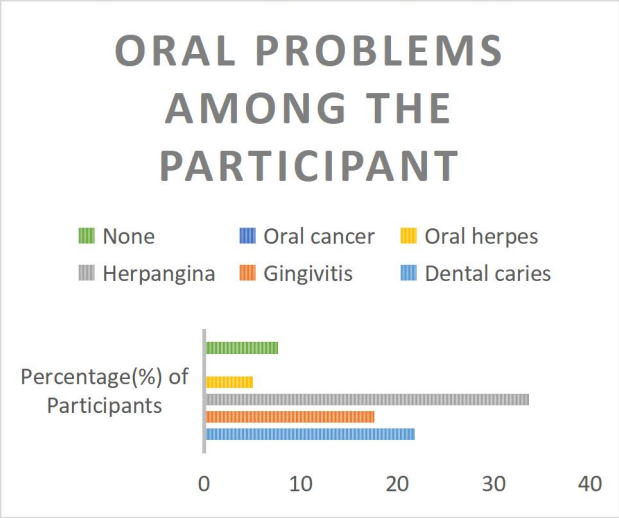

Figure (1). Oral problems among the participants

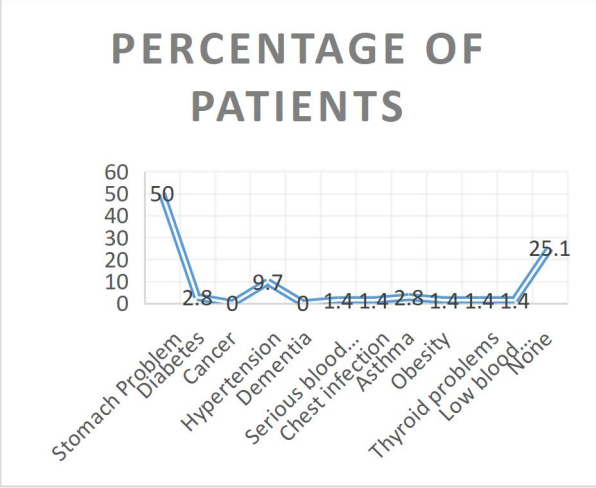

Figure (2). Other comorbidities prevalence among participants

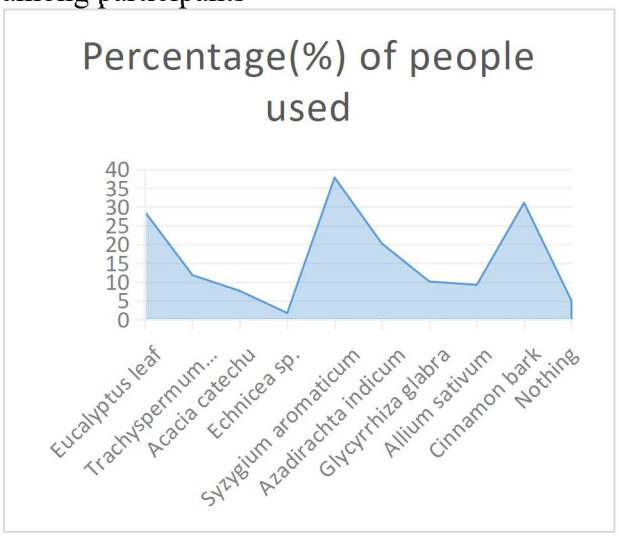

Figure (3). Distribution of herbal remedies usage among participants

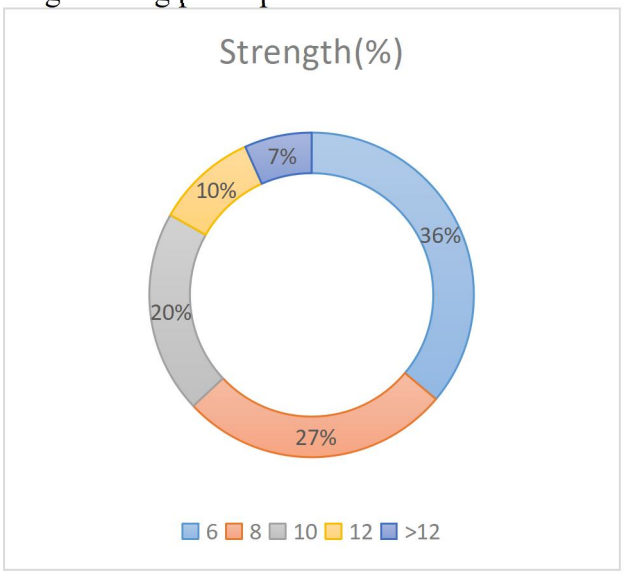

Figure (4). Water drinking habit among participants

DISCUSSION

Now a day, resistance to antibacterial drugs is a major issue in health care system. People use antibiotics due to lack of awareness. So, it will be beneficial to shift people toward herbal remedies to treat minor to moderate diseases. Oral diseases can be treated with the use of herbal medicines. Many plants have antibacterial activities that include *Syzygium aromaticum, Eucalyptus sp., Cinnamon bark,*

Azadiracta indicum, Acacia catechu, Piper betle, Rosmarinus officinalis, Juglans regia, Myristica fragrans, Mimusops elengi, Punica granatum, Terminalia bellirica, Terminalia chebula, Baccharis dracunculifolia, Salvadora persica, Sanguinaria Canadensis, Quercus infectoria, Nidus vespae, Cratoxylum formosum, Cichorium intybus, Prunella vulgaris, Macleya cordata, Trigonella foenum-graecum and Saussurea lappa etc.[19]

Methanol extract of clove buds showed significant antibacterial activity against periodontal pathogens include *Prevotella intermedia* and *Porphyromonas gingivalis* (both are gram negative bacterial). But, against cariogenic bacteria like *S.mutans* and *A viscosus* (both are gram positive bacteria), it showed no substantial avtivity. Two compounds include kaempferol (3,5,7,4′ tetrahydroxyflavone) and myricetin out of eight isolated compounds were highly active against the periodontal bacteria.[20] Hydro-ethanolic extract of clove also showed the antibacterial activity. Three different extracts of clove were tested against the *Aggregatibacter actinomycetemcomitans*, *Fusobacterium nucleatum* and *P.intermedia*. All three extracts contain Tri-terpenes, sterols, alkaloids, polyphenols, gallic tannins and coumarins in common, with exception of flavonoids that were not present in the fresh and the dry delipidated extracts, but detected in the dry non-delipidated extract. Phytochemical studies revealed that polyphenols and gallic tannins showed intensively positive reactions. Fresh extract showed inhibitory effects at highest concentrations, while dry dilapidated extract showed inhibitory at low concentrations but higher than dry non-dilapidated. Water content reduce the antibacterial potential in adjacent to flavonoids.[21] It has been demonstrated that clove essential oil can stop the growth of *Candida* species including *C.inaequalis, C.albicans, C.glabrata,* and *C.tropicalis.* The antifungal activity of the extracts was evaluated using four solvents such as methanol, ethyl acetate, n-hexane and diethyl ether. Of all of them, ethyl acetate had the strongest antifungal effect.[22]

The essential oil's main components are coumarin (13.39%), eugenol (17.62%) and cinamaldehyde (60.72%). They have anti-bacterial, anti-inflammatory and anti-cancer qualities.[23] At all doses, its ethanolic extract exhibits antimicrobial properties.[24] Despite being less effective than mouthwashes and antifungal medications, its essential oil is the most potent against 40 isolates of *C.albicans*.[25]

Studies have demonstrated that ethanol extracts from *E.globulus* are effective against a range of bacteria including oral bacteria.[26] Macrophages A or B that have been purified from a 60% ethanolic (Nagata et al.) of *E. globulus* at a concentration of 1 mg/L inhibit the growth of *P.gingivalis* ATCC 33277.[27] The current study found that eucalyptus oil mouthwash was just as effective as 0.12% chlorhexidine mouthwash in terms of maintaining dental hygiene and preventing plaque formation.[1] The main constituents of essential oil are 1,8-cineole, terpenes, oleanolic acid, tannins and macrocarpal C.[28] Extracts and oil from *E.globulus* leaves are antifungal; they gradually stop Malassezia furfur from growing on Sabouraud's destrose agar medium compared to *C.albicans*.[29]

Neem is a useful treatment for tooth decay and mouth ulcers. It also relieves toothaches. Significant antibacterial activity was demonstrated by an ethanolic extract of neem leaves, sticks and bark which inhibits *Streptococci's* capacity to colonize tooth surfaces. Comparing its leaf extract to 2% sodium hypochlorite, it was discovered to be effective.[30] In a study on neem bark and leaf extracts, it was discovered that ethanol extract had greater antibacterial activity than aqueous extract. Methanol extract is greater in antibacterial activity than petroleum ether and ethyl acetate extract.[31]

Wash your teeth once a day to maintain oral health and prevent cavities and periodontal issues. Most patients, however, are unable to adequately remove plaque with at-home dental hygiene procedures. To help control plaque, most dentists recommend cleaning your teeth twice a day.[32] Children with disabilities can maintain improved dental health by brushing their teeth at home, at institutions and in schools according to research.[33]

Halitosis has several causes but the oral cavity accounts for 90% of cases. These include poor dental hygiene, food impaction, periodontal disease, tongue coat, dirty dentures, improper restorations, oral cancers and throat infections. The majority of people who complain of halitosis seek treatment at a clinic because it negatively impacts their everyday lives, although other people who may have halitosis do not exhibit any detectable symptoms.[34]

According to study severity of tooth decay was high in those children who consume carbonated drinks than those who did not consume in the same school.[35] Nowadays, it is widely accepted that smoking cigarettes is one of the avoidable risk factors for the development and progression of periodontal diseases. Numerous studies have shown that smokers have higher PPD (probing pocket depth), attachment loss and more missing teeth than non-smokers.[36] An analysis of regular chewers of pan, areca nut and gutka revealed that 100% of them had oral sub mucous fibrosis.[37] The prevalence of smokeless tobacco use in the studied population is 93.7% in a cross-sectional survey, among Karachi's heavy load truckers and general public, gutka was the most commonly consumed preparation (60.2%), followed by naswar (35.8%), paan (32.4%) and mawa (16.7%).[38]

The reflux of food, bile and stomach acid from the digestive tract into the esophagus is the hallmark of gastroesophageal reflux disease (GERD), a disorder that causes discomfort and occasionally bad breath. Crohn's disease and ulcerative colitis are the two types of IBD (Irritable bowel disease) that cause intestinal inflammation and structural abnormalities. Some studies have connected bad breath to GI (Gastrointestinal) tract and digesting alterations associated with IBD. The *H. pylori* bacterium is naturally present in the stomach but an excess of it can create stomach ulcers which can result in digestion issues and bad breath.[39]

Gingival recession, tooth movement and recession in the aesthetic zone are more common in diabetics than in non-diabetics. They also had more decayed, missing and filled surfaces as well as more lost teeth from caries. Those without diabetes had more cavities and poorer periodontal health than those with diabetes who brush and floss more regularly.[40]

Changes in microcirculation (system of small blood vessels that deliver oxygen and nutrients to tissues) in hypertension can lead to periodontal ischemia which promotes periodontal disease. Atherosclerotic plaque and the development of lesions in target organs are encouraged by endothelial disorder.[41] Chronic periodontitis has been associated with diminished endothelial dysfunction, elevated blood pressure and a higher risk of death in hypertensive patients.[42]

Chronic conditions like obesity, diabetes and dental caries are on the rise in emerging economies which could lead to a decline in both general and oral health-related quality of life.[43] A study found that people who drank more water each day have better oral health.[44]

CONCLUSIONS

The study concludes that herbal remedies are widely used and believed to be effective for oral hygiene among oral disorder patients in Karachi, Pakistan. The most commonly used herbal remedies were *Eucalyptus* leaf, *S.aromaticum, A.indica* and *Cinnamon* bark. However, further research is needed to

address the potential allergic reactions and to establish the efficacy of these herbal remedies.

Limitations:

The study only polled 119 people, which may not be typical of the overall population. The study may not be applicable to other areas or nations because it only looked at Karachi, Pakistan. The lack of a meta-analysis in the study may have limited the breadth of the investigation and results reached. The study relied on participant-reported data which may be biased and inaccurate. Only roughly ten distinct herbal plant options were questioned about in the study which might not have fully captured the variety of herbal medicines that individuals employed. The study may not have included a varied range of demographics such as age, socioeconomic status and education level. Other cultural or regional situations might not be able to use the study's conclusions. The study did not include a control group to compare the efficacy of herbal medicines. A long-term follow-up to evaluate the long-term effects of herbal treatments was not carried out in this investigation.

Conflicts of interest

No conflicts of interest were disclosed by the writers.

Funding Disclosure:

None to declare.

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