www.ajohas.com

Asian Journal of Oral Health and Allied Sciences

Review Article

Application and availability of indigenous, commercially available medicines in periodontology

Stuti Rai[1], Utkarsh Singh[1], Vivek Kumar Bains[1], Ruchi Srivastava[1]

[1]Department of Periodontology, Saraswati Dental College and Hospital, Lucknow, Uttar Pradesh, India.

***Corresponding author:**
Dr. Ruchi Srivastava,
Department of Periodontology,
Saraswati Dental College and
Hospital, Lucknow,
Uttar Pradesh, India.

drruchi117@gmail.com

Received : 08 June 2023
Accepted : 24 July 2023
Published : 14 August 2023

DOI
10.25259/AJOHAS_4_2023

Quick Response Code:

ABSTRACT

Across the globe, there has been increasing interest in the study of medicinal plants and its use in ailing various oral diseases including periodontal disease. Various antibiotics such as tetracycline, amoxicillin, penicillin, and metronidazole and antiseptics such as chlorhexidine are commonly used in periodontal diseases, but they have many side effects. While indigenous medicine has not only less side effects but can also be effective in regulating the systemic conditions that have been associated with periodontal diseases such as diabetes and cardiovascular diseases. These natural extracts contain phytochemical compounds which have anti-inflammatory property, prevent bleeding, and antimicrobial properties. Several plant extracts such as curcumin, green tea, and neem have shown promising results in the field of periodontics. However, in the current scenario, the biggest challenge is the significant gap in research and lack of information regarding its interaction with the oral tissue, mechanism of action, and side effects. This study gives an insight into the current use of available herbal medicines that have been readily used in dental treatment particularly periodontal disease. It also gives information regarding the availability of these drugs through various platforms. It can be concluded that indigenous remedies have potential benefits in controlling plaque and inflammation as adjuncts to daily oral hygiene in patients with periodontitis gingivitis.

Keywords: Traditional medicine, Periodontal disease, Antimicrobial

INTRODUCTION

Since centuries, different medicinal system exists such as Unani, Siddha, and Ayurveda which offer a vast variety of medicinal plants. According to the recorded history of civilization, our ancestral healers used these traditional medicines for healing purpose and to combat various human diseases. India offers a vast variety of 2500 species and 100 of plants are used regularly as a source of medicine. Based on the collected knowledge and evolved understanding in the past few decades, it is imperative to avail these medicines as a substitute for synthetic chemicals.[1]

Across the globe, there has been increasing interest in the study of medicinal plants and its use in ailing various oral diseases including periodontal disease. Periodontal disease is the most common and highly prevalent disease that occupies almost 50% of the world's population. It affects the periodontal ligament and alveolar bone and leads to the eventual loss of teeth.[2] Even though conventional therapies such as scaling and root planing, antibiotic therapy, and surgical intervention are effective in treating periodontal disease, there is an emerging trend in using adjunctive herbal medicines to enhance their efficacy.[3]

Various antibiotics such as tetracycline, amoxicillin, penicillin, and metronidazole and antiseptics such as chlorhexidine are commonly used in periodontal diseases, but they have many side effects. While indigenous medicine has not only less side effects but can also be effective in regulating the systemic conditions that have been associated with periodontal diseases such as diabetes and cardiovascular diseases.[4] These natural extracts contain phytochemical compounds which have anti-inflammatory property, prevent bleeding, and antimicrobial properties making them a great alternative approach in the management of periodontal disease. Several plant extracts such as curcumin, green tea, and neem have shown promising results in the field of periodontics.[3]

Despite the potential benefits of herbal medicines in the treatment of periodontal disease, it is important to understand that they are not a substitute for conventional therapies but should be used as adjuncts to scaling and root planing, antibiotic therapy, or surgical intervention, and not as a replacement for these treatments.

However, in current scenario, the biggest challenge is the significant gap in research and lack of information regarding its interaction with the oral tissue, mechanism of action, and the side effects. More clinical trials and better understanding of these herbal products are required to establish their safety and efficacy in the treatment. Some of the herbs have shown marked results in the prophylactic and therapeutic management of oral health. This review is based on the availability and utilization of various indigenous medicines for periodontal diseases.

MATERIALS AND METHODS

This review was done using several platforms for search such as Google, PubMed, and ResearchGate. It was carried out using keywords such as herbal, traditional medicine, adjunct, and periodontal disease. The articles included were original research, full-text articles, *in vitro* studies, review and articles other than the English language, case studies, and case reports were excluded from the study.

This review was based on the utilization of indigenous medicines as an adjunct to conventional treatment in periodontal disease as well as their availability to the public through various sources.

Three modes were used for evaluating the availability of various indigenous combinations by their trade names. The first mode was by physically visiting pharmacies which have their presence pan-India (Apollo Pharmacy, Guardian Pharmacy, Aster Medical, Pharmeasy pharmacies). The second method was by surfing the online pharmacy platforms (Netmeds, Pharmeasy, Amazon Pharmacy, 1 mg) and the third mode was by consulting the oral health care providers having their own dispensaries.

Based on the above findings, the availability of these indigenous medicines was categorized as A1, A2, and A3. Where A1 denotes as medicines available over the counter at physical pharmacies, through online channels, and also through dispensaries, A2 denotes medicines available over the counter at physical pharmacies and through online channels and not through dispensing doctors whereas A3 denotes the medicines which were available only through dispensing doctor [Tables 1 and 2].

DISCUSSION

The present study gives an insight into the current use of available herbal medicines that have been readily used in dental treatment particularly periodontal disease [Figure 1]. The effect of herbal products as an adjunct to non-surgical periodontal therapies cannot be neglected. Some of the herbs have shown marked results in the prophylactic and therapeutic management of oral health.

Aloe vera

It has analgesic, antibacterial, antiviral, antifungal, antioxidant, immune-modulating, antiseptic, and anti-inflammatory properties.[5] Dental diseases associated with lichen planus, acute monocytic leukemia, xerostomia, benign pemphigus, leukemia, migratory geographic tongue, denture stomatitis, candidiasis, desquamative gingivitis, and vesiculobullous disease are an indication for the use *A. vera*.[6,7]

Black cohosh (Rhizoma *Cimicifugae racemosae*)

The roots and rhizomes of black cohosh are primarily used for medicinal purposes. There are some studies that use its

Figure 1: Few of the commercially available indigenous brands.

Table 1: Herbal medicines with composition and availability.

Trade Name	Form	Composition	Availability
Afromin	Capsule	Nanocurcumine, Piperine, Lycopene, Boswellic Acid	A3
Geofort-LC	Capsule	Grape seed extract, Green tea extract, Lycopene	A3
Nanozing-DT	Dispersible tablet	Nanocurcumine, Piperine, Lycopene, Boswellic Acid, Spirulina	A3
Hadjod	Tablet	Asthisamhara (*Cissus quadrangularis*)	A2
Oxitard	Tablet	Amra (*Magnifera indica*), Ashwagandha (*Withania somnifera*), Gajara (*Daucus carota*), Yashtimadhu (*Glycyrrhiza glabra*), Draksha (*Vitis vinifera*), Amalaki (*Emblica officinalis*), Lavanga, Yashada bhasma, Godhuma oil	A2
Turmix	Tablet	Turmeric extract (*C. longa*), Piper Nigum extract (Piperine)	A2
Turmnova	Lozenges	Turmeric extract (*C. longa*), Eucalyptus oil, Menthol	A3
Curenext	Gel	Turmeric extract (*C. longa*)	A1
HiOra-GA	Gum paint	Indian Kino Tree (Asana), Triphala	A2
CNBC	Dentifrice	Co-enzyme Q10, Neem, betacarotene	A3
HiOra K	Dentifrice	Palakya, Triphala, Trikatu, Suryakshara, Yashadbhasma, Tvak oil, Lavanga oil	A2
Meswak	Dentifrice	Miswak extract	A2
Turmwash	Mouthwash	Curcumin, Thymol, Eucalyptol, Clove oil, Mentha oil, Tea tree oil	A3
Turmix	Mouthwash	Curcumin, Thymol, Eucalyptol, Clove oil, Mentha oil, Tea tree oil	A2
HiOra	Mouthwash	Bibhitaki (beleric myrobalan), Nagavalli (Betel leaf), Miswak	A2
Oralife	Mouthwash	Pomegranate dadima, Grapefruit seed extract, Thymol	A3
Q-puff	Mouthwash	Pomegranate peel extract, Green tea extract, Coenzyme Q10, Vitamin C, Sorbitol, Sodium carboxymethyl cellulose, Menthol, Xylitol, Erythritol	A1
OralVit	Probiotic mouthwash	Thyme, Cellulase, Amylase, Lipase	A2
Vedshakti	Oil pulling	Sesame oil, *Eucalyptus* oil, Clove oil, Basil oil, Lemon oil	A2
Vedic rinse	Oil pulling/Probiotic rinse	*Bacillus Coagulans*, Hyaluronic acid, Coconut oil, Spearmint oil, Peppermint oil, Sunflower oil, Vitamin E	A2
Jiva oil pulling	Oil pulling	Laung, Elaichi, Mulethi, Jasmine, Dalchini, Tea tree oil, Sesame oil, Khadira	A2
Dabur red oil pulling	Oil pulling	Coconut oil, sesame oil, Tulsi, Clove, Cinnamon oil, Thyme mint	A2

C. longa: Curcuma longa

anti-inflammatory properties in the treatment of periodontal diseases, but the evidence is lacking. It also has analgesic (pain-relieving) and sedative properties. It is contraindicated during pregnancy or lactation or in children under the age of 12 years. Minor gastrointestinal upset and headache are some of its side effects.[8]

Bloodroot (*Sanguinaria canadensis*)

It has antibacterial, anti-inflammatory, and antifungal properties. It is mainly used for toothache, periodontal diseases, remineralization of enamel lesions, and even for acute pain in the throat.[9]

It is contraindicated in children and pregnant or lactating women. Long-term use can cause nausea and vomiting, glaucoma, edema, heart disease, miscarriage, diarrhea, abdominal pain, vision changes, and dizziness.[10]

Ginger (*Zingiber officinalis*)

Ginger contains 1–4% essential oil and oleoresin, zingiberene, curcumin, sesquiphellandrene, and bisabolene. It also contains monoterpene aldehydes and alcohols. It has antibacterial, anti-inflammatory, and analgesic properties.[11] It is used as a treatment to relieve toothache and for the treatment of oral candidiasis. Ginger can reduce the toxic effects of cyclophosphamide in chemotherapy regimens. The ginger could be a promising mouthwash with anticariogenic and antimicrobial active ingredients and could offer a caries inhibitor that is cheaper but safer than conventional mouthwashes.[12,13]

It is contraindicated during pregnancy and gallstones. Because ginger can interfere with blood clotting, it should be used with caution during anticoagulant therapy such as heparin.

Table 2: Herbal medicines with trade name, dosage and indications.

Trade Name	DOSAGE	INDICATION
Afromin	1–2 tablets per day after meal or as directed by the physician	PC, C, PS, In
Geofort-LC	OD (Or as directed by the physician)	PC, C, PS, In
Nanozing-DT	1–2 tablets per day after meal or as directed by the physician	PC, C, PS, In
Hadjod	In children: 1 tablet after meal along with warm milk or ghee In adults: 2 tablets after meal along with warm milk, water or ghee (Or as directed by the physician)	Br
Oxitard	Adolescent: 1 tablet TID Adults: 1 tablet QID	PS, C, PC
Turmix	1 tablet 3 times a day or as directed by the physician	PC, C, PS
Turmnova	1–2 lozenges per day or as directed by the physician	PC, C, PS
Curenext	For topical application 3 times a day	G, Im, If, S
HiOra-GA	For topical application 3 times a day	G, Im, If, S
CNBC	Tooth brushing 2 times a day	G, P,
HiOra K	Tooth brushing 2 times a day	G, P, DH
Meswak	Tooth brushing 2 times a day	G, P, DH
Turmwash	10 mL undiluted for mouth rinse 2 times a day	PC, C, PS, Im
Turmix mouthwash	10 mL undiluted for mouth rinse 2 times a day	PC, C, PS, Im
HiOra	10 mL undiluted for mouth rinse 2 times a day	G, P, If, Im, S
Oralife	10 mL undiluted for mouth rinse 2–3 times a day	If, PS
Q-puff	10 mL undiluted for mouth rinse 2–3 times a day	PC, G, P, H
OralVit	10 mL undiluted for mouth rinse 2 times a day	G, P, H, Im, If, S
Vedshakti	Swish with 10 mL of oil for 5–10 min. Spit out and rinse. To be used once daily before brushing	G, P, PC, S
Vedic rinse	Swish with 10 mL of oil for 5–10 min. Spit out and rinse. To be used once daily before brushing	G, P, PC, S
Jiva oil pulling	Swish with 10 mL of oil for 5–10 min. Spit out and rinse. To be used once daily before brushing	G, P, PC, S
Dabur red oil pulling	Swish with 10 mL of oil for 5–10 min. Spit out and rinse. To be used once daily before brushing.	G, P, PC, S

PC: Pre-cancerous, G: Gingivitis, P: Periodontitis, H: Halitosis, C: Cancer, Pn: Pain, Br: Bone Remodeling, Im: Inflammation, If: Infection, S: Stomatitis, PS: Post Surgery, DH: Dentinal hypersensitivity

Clove oil (*Syzygium aromaticum*)

It has analgesic, antibacterial, antiviral, anti-inflammatory, and antioxidant properties. It is used to relieve toothache, in periodontal diseases, and as an anesthetic.[14] Clove gel can replace benzocaine as the most important agent before injection.[15] It should be used with caution in children, pregnant, or lactating women. Allergic contact dermatitis is seen but rarely with topical use. It is available as drops (1:5, ethanol 25%), as lozenges, and mouthwash.

Cranberry (*Vaccinium macrocarpon*)

Cranberry consists of polyphenols and flavonoids that have anticarcinogenic, antibacterial, antiviral, antifungal, and antioxidant properties.[16,17]

Green tea (*Camellia sinensis*)

Green tea is a polyphenol compound consisting of epicatechin, gallocatechin, epigallocatechin, epicatechin gallate, and epigallocatechin gallate. It is used as an anti-inflammatory, antibacterial, and antiviral. Due to its antioxidant and anti-inflammatory properties, it is used in the treatment of periodontal disease. It is an important part of the composition in newer mouthwashes.[18]

Neem (*Azadirachta indica*)

It consists of genie, sodium nimbinate, salannin, nimbin, azadirachtin, nimbidiol, quercetin, and nimbidin. Neem leaves contain fiber, carbohydrates, and protein with at least 10 amino acids, calcium, carotenoids, and fluoride.[19] Researches show that neem is useful in the treatment of dental caries and periodontal diseases.[20,21] Neem has antifungal, anthelmintic, anti-cariogenic, antioxidant, antibacterial, antipyretic, antimicrobial, anti-inflammatory, antitumor, and analgesic action.

Peppermint (*Mentha piperita*)

Peppermint consists of menthol (29–48%) and menthone (20–31%). It is analgesic and also has a muscle relaxant

action. Peppermint oil is applied by soaking a cotton ball in the oil and placing it in the cavity or rubbing it on the teeth for the management of toothache.[22]

Turmeric (*Curcuma longa*)

The chemical composition of turmeric consists of volatile oil (6%), consisting of monoterpenes and sesquiterpenes, including zingiberene, curcumin, and α- and β-turmerone, among others. The coloring principle (5%) is curcuminoid, of which 50–60% is curcumin, a mixture of mono-desmethoxycurcumin and bisdemesthoxycurcumin.[23] It is antimutagenic, anticarcinogenic, antioxidant, and antibacterial, and used in dental caries, oral lichen planus, gingivitis, halitosis, pit and fissure sealant, used in dental plaque detection system. Massaging the aching teeth with roasted, ground turmeric eliminates pain and swelling.[24]

Tulsi (*Ocimum sanctum*)

It contains tannin (4.6%) and essential oil (up to 2%), eugenol (up to 62%), methyl eugenol (up to 86%), and α- and β-caryophyllene (up to 42%) of methyl chavicol, linalool, and 1,8-cineole. It has anthelmintic, analgesic, antipyretic, immune stimulant, antiulcer, antimicrobial, and anti-inflammatory properties. It is used in inflammatory periodontitis.[25] Tulsi herbal extract (4%) and black myrobalans (2.5%) plant ethanol extract are prepared as herbal mouthwashes. This plant extract can be tested as an anticarious compound against cavity-causing microorganisms.[26] Tulsi against oral herbs has the utmost amount of secondary metabolites and has been proven to develop antimicrobial agents against oral microorganisms and has potential in toothpaste, mouthwashes, and mouthwashes to prevent and treat oral infections.[27]

Triphala

It is a combination of amalaki, haritaki, and bibhitaki. Amalaki contains ascorbic acid, thiamin, riboflavin, and niacin. Triphala is a potent antioxidant and anti-microbial. It is used in dental caries, bleeding, and injured teeth and gums and for the treatment of ulcers.[28,29]

Garlic (*Allium sativum*)

It has antibacterial, antiviral and antifungal, antiseptic, bacteriostatic, and anti-helminthic effects and also helps in the treatment of dental caries and periodontitis. There was no statistically significant difference in the 12-month follow-up period between garlic extract as irrigation and sodium hypochlorite. Garlic extract provides an honest and powerful natural antibacterial agent that can be used safely to irrigate the root canal of primary molars.[30]

Cissus quadrangularis

A plant has been revered for its medicinal properties for thousands of years. Historically, it has been used to treat many conditions, including hemorrhoids, gout, asthma, and allergies. However, recent research has found that this powerful herb can improve bone health, relieve joint pain, and protect against chronic conditions such as heart disease, diabetes, and stroke. *C. quadrangularis* is a plant rich in vitamin C and antioxidants. It has been used for centuries to treat many health conditions, and today, its extract is widely available as an herbal supplement.[31] Animal and human studies have found that *C. quadrangularis* can reduce bone loss, accelerate fracture healing, aid implant osseointegration, and help prevent conditions such as osteoporosis.[32,33]

Amla (*Emblica officinalis*)

It is considered the first medicinal plant that grew on earth. Due to the presence of vitamin C and bioactive phytoconstituents, Amla has antibiotic, antioxidant, hepatoprotective, aphrodisiac, cardioprotective, immunomodulatory, and tonic properties. It is used in various herbal preparations such as chyawanprash, murabba, and digestive tablets.[34] Periodontal disease is caused by microbes that destroy the periodontal structure. Amla is used in dentistry to treat periodontal disease due to its anti-microbial and anti-ulcer properties.[35]

Coenzyme Q_{10} (CoQ_{10})

Arrays of molecules are considered to mediate the inflammatory response at one time or another, among these are free radicals and reactive oxygen species (ROS). Periodontal pathogens can induce ROS overproduction and, thus, may cause collagen and periodontal cell breakdown. When ROS are scavenged by antioxidants, there can be a reduction in collagen degradation.[36] Ubiquinol (reduced form CoQ_{10}) serves as an endogenous antioxidant which increases the concentration of CoQ_{10} in the diseased gingiva and effectively suppresses advanced periodontal inflammation.[37]

Eucalyptus

Eucalyptus exerts a significant restriction zone against *Aggregatibacter actinomycetemcomitans* and *Porphyromonas gingivalis*. *Eucalyptus globulus* plays a promising alternative to antibiotics in preventing oral infections due to the natural phytochemicals that it contains.[38] According to Yap PS *et al*., *Eucalyptus* essential oil has been shown to enhance innate cell-mediated immunity, suggesting its use in immunosuppression, infectious diseases, as well as tumor chemotherapy.[39] Xylene was most effective in dissolving root canal sealers than *Eucalyptus* oil. *Eucalyptus* oil has been

found to have the same ability to dissolve Apexit Plus and Endomethasone.

Miswak

It reduces tartar and plaque, fights germs and bacteria for healthy gums, prevents cavities, eliminates bad breath, and provides strong teeth.[40] Commercial miswak chewing sticks contain high amounts of calcium and chloride, which can release phosphate and thiocyanate into all saliva, which can affect oral health conditions.[41] Herbal dentifrices containing mistake as the chief ingredient showed significant reductions in plaque index scores compared to conventional dentifrices.[42]

Sesame oil

Oil pulling with sesame oil can reduce *Streptococcus mutans*, a major contributor to poor oral health. Research shows that rinsing with sesame oil is just as effective as chlorhexidine (the gold standard for mouthwash).[43] In fact, sesame oil has many advantages compared to conventional and commercially used mouthwashes. Swishing with chlorhexidine causes stains and leaves an unpleasant taste, sesame oil does not offer this, it is a cheaper and easier-to-use alternative.[44]

Punica granatum

Pomegranate's main fatty acid ingredient, punicic acid, is an excellent anti-inflammatory compound that inhibits the production of prostaglandins. Cold-pressed pomegranate seeds inhibit cyclooxygenase and lipoxygenase enzymes in the oil. Both are key enzymes in the production of various inflammatory mediators. Pomegranate extract has a broad inhibitory effect on matrix metalloproteinase expression and tissue damage caused by interleukin-1 beta. In addition to the above mechanisms, the anti-inflammatory effect of pomegranate may also have an immunosuppressive effect on macrophages and T and B lymphocytes.[45]

Thyme

It is very useful in periodontal diseases due to its high anti-inflammatory property. Its an antiseptic widely used to relieve the discomfort caused by canker sores and eliminates the bacteria that cause halitosis.

A strong association in plaque control, halitosis, stains, and healing with the use of herbal products has been previously reported. Herbal medicines contain natural bioactive compounds with potential benefits in reducing the risk of periodontal disease. They act as substitute for the antibiotics and aid in the prophylactic and therapeutic management of periodontal disease.[46]

Furthermore, scarce evidence of research has not discouraged its use. It is widely used as it has low toxicity and less side effects as compared to mainstream antibiotics. A variety of herbal abundance exist in our environment, but the medicinal value of these plants is still lacking and can only be enhanced when brought into use in the form of products.[47] In addition, information must be infused about the use, safety, and efficacy of various traditional medicines and over-the-counter preparations among dentists. The findings of this suggest a gap between the demand and supply of the mentioned formulations and compositions. The brands which are being prescribed by the doctors are not available easily in online pharmacies or at physical pharmacies, whereas the brands which are available at online and physical pharmacies are not being prescribed by doctors probably due to lack of visits by these company representatives, this is leading to lack of general awareness among the patients regarding these indigenous medicines. By including this knowledge in the curriculum of dental education, it would allow dentists to dispense better treatment outcomes with traditional medicine for the patients. Moreover, a core understanding of the interlinkage of plant extracts with the body and other drugs would lead to suitable treatment plans, as most of these extracts have properties, which is important and required in dental treatment.[48]

CONCLUSION

It can be concluded that indigenous remedies have potential benefits in controlling plaque and inflammation as adjuncts to daily oral hygiene in patients with periodontitis gingivitis. The main advantages of using herbal medicine are easy availability, economy, extended duration, and low toxicity. The drawback of using herbal medicine such as clove oil is said to cause serious problems such as pharyngitis, vomiting, cytotoxicity, kidney failure, liver damage, seizures, breathing difficulties, and more when used in higher doses. Therefore, preclinical and clinical studies are required to meet the scientific criteria of biocompatibility and safety before using and prescribing these drugs for oral care.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

Financial support and sponsorship

Nil.

Conflicts of interest

Author Dr. Vivek Kumar Bains is also the Chief editor of this Journal.

REFERENCES

1. Yesh S, Devendra C, Ravi N, Atul B, Tangutoori T, Eliezer R. Herbal medicines-a natural cure in dentistry. Int J Res Rev 2018;5:114-7.
2. Sharif BA. Trends in utilization of herbal medicine: Implications for health education. Int Electron J Health Educ 2002;5:27-34.
3. Ahmed SI, Reddy VC, Sudhir KM, Kumar RK, Srinivasulu G. Effect of Tulsi extract and honey mouthrinses on salivary *Streptococcus mutans* count in comparison with 0.2% of chlorhexidine: A randomized controlled trial. J Indian Assoc Public Health Dent 2017;15:306-11.
4. Mamajiwala AS, Sethi KS, Raut CP, Karde PA, Khedkar SU. Comparative evaluation of chlorhexidine and cinnamon extract used in dental unit waterlines to reduce bacterial load in aerosols during ultrasonic scaling. Indian J Dent Res 2018;29:749-54.
5. Sudarshan R, Vijayabala GS. Role of ginger in medicine and dentistry-an interesting review article. Southeast Asian J Case Rep Rev 2012;1:66-72.
6. Fulzele P, Baliga S, Thosar N, Pradhan D. Evaluation of Aloevera gel as a storage medium in maintaining the viability of periodontal ligament cells-an *in vitro* study. J Clin Pediatr Dent 2016;40:49-52.
7. Jose J, Krishnamma S, Peedikayil F, Aman S, Tomy N, Mariodan JP. Comparative evaluation of antimicrobial activity of QMiX, 2.5% sodium hypochlorite, 2% chlorhexidine, guava leaf extract and aloevera extract against *Enterococcus faecalis* and *Candida albicans*-an *in-vitro* study. J Clin Diagn Res 2016;10:ZC20-3.
8. Yesh S, Devendra C, Ravi N, Atul B, Tangutoori T, Eliezer R. Herbal medicines-a natural cure in dentistry. Int J Res Rev 2018;5:114-7.
9. Kumar P, Ansari SH, Ali J. Herbal remedies for the treatment of periodontal disease--a patent review. Recent Pat Drug Deliv Formul 2009;3:221-8.
10. World Health Organization. WHO Monographs on Medicinal Plants Commonly used in the Newly Independent States (NIS). World Health Organization; 2010. Available from: https://apps.who.int/iris/handle/10665/44059
11. Yesh S, Devendra C, Ravi N, Atul B, Tangutoori T, Eliezer R. Herbal medicines - a natural cure in dentistry. Int J Res Rev 2018;5:114-7.
12. Javid AZ, Bazyar H, Gholinezhad H, Rahimlou M, Rashidi H, Salehi P, *et al*. The effects of ginger supplementation on inflammatory, antioxidant, and periodontal parameters in Type 2 diabetes mellitus patients with chronic periodontitis under non-surgical periodontal therapy. A double-blind, placebo-controlled trial. Diabetes Metab Syndr Obes 2019;12:1751-61.
13. Shrimathi S, Kemparaj U, Umesh S, Karruoaiah M, Pandian P, Krishnaveni A. Comparative evaluation of cocoa bean husk, ginger and chlorhexidine mouth washes in the reduction of *Steptococcus mutans* and *Lactobacillus* count in saliva: A randomized controlled trial. Cureus 2019;11:e4968.
14. Marya CM, Satija G, Avinash J, Nagpal R, Kapoor R, Ahmad A. *In vitro* inhibitory effect of clove essential oil and its two active principles on tooth decalcification by apple juice. Int J Dent 2012;2012:759618.
15. Alqareer A, Alyahya A, Andersson L. The effect of clove and benzocaine versus placebo as topical anesthetics. J Dent 2006;34:747-50.
16. Rathod S, Brahmankar R, Kolte A. Propolis-a natural remedy. Indian J Dent Res Rev 2012;50:99-103.
17. Sharif BA. Trends in utilization of herbal medicine: Implications for health education. Int Electron J Health Educ 2002;5:27-34.
18. Kudva P, Tabasum ST, Shekhawat NK. Effect of green tea catechin, a local drug delivery system as an adjunct to scaling and root planing in chronic periodontitis patients: A clinicomicrobiological study. J Indian Soc Periodontol 2011;15:39-45.
19. Arévalo-Híjar L, Aguilar-Luis M, Cabalero-Garcia S, Gonzáles-Soto N, Del Valle-Mendoza J. Antibacterial and cytotoxic effects of *Moringa oleifera* (moringa) and *Azadirachta indica* (neem) methanolic extracts against strains of *Enterococcus faecalis*. Int J Dent 2018;2018:1071676.
20. Niazi FH, Kamran MA, Naseem M, AlShahrani I, Fraz TR, Hosein M. Anti-plaque efficacy of herbal mouthwashes compared to synthetic mouthwashes in patients undergoing orthodontic treatment: A randomised controlled trial. Oral Health Prev Dent 2018;16:409-16.
21. Kelmanson JE, Jäger AK, van Staden J. Zulu medicinal plants with antibacterial activity. J Ethnopharmacol 2000;69:241-6.
22. Shekar BR, Nagarajappa R, Suma S, Thakur R. Herbal extracts in oral health care-a review of the current scenario and its future needs. Pharmacogn Rev 2005;9:87-92.
23. Rai A, Kaur M, Gombra V, Hasan S, Kumar N. Comparative evaluation of curcumin and antioxidants in the management of oral submucous fibrosis. J Investig Clin Dent 2019;10:e12464.
24. Nurdiana N, Krishnasamy S. Effect of two percent turmeric extract gel on minor recurrent aphthous stomatitis. Padjadjaran J Dent 2016;28:1. Doi: https://doi.org/10.24198/pjd.vol28no1.13503
25. Lev E. Ethno-diversity within current ethno-pharmacology as part of Israeli traditional medicine-a review. J Ethnobiol Ethnomed 2006;2:4.
26. Megalaa N, Thirumurugan K, Kayalvizhi G, Sajeev R, Kayalvizhi EB, Ramesh V, *et al*. A comparative evaluation of the anticaries efficacy of herbal extracts (Tulsi and Black myrobalans) and sodium fluoride as mouthrinses in children: A randomized controlled trial. Indian J Dent Res 2018;29:760-7.
27. Lolayekar NV, Kadkhodayan SS. Estimation of salivary pH and viability of *Streptococcus mutans* on chewing of Tulsi leaves in children. J Indian Soc Pedod Prev Dent 2018;37:87-91.
28. Penmetsa GS, Vivek B, Bhupathi AP, Rani PS, Subbareddy BV, Ramesh MV. 'Comparative evaluation of triphala, *Aloe vera*, and chlorhexidine mouthwash on gingivitis: A randomized controlled clinical trial. Contemp Clin Dent 2019;10:333-7.
29. Thomas B, Shetty YS, Vasudeva A, Shetty V. Comparative evaluation of antimicrobial activity of triphala and commercially available toothpastes: An *in vitro* study. Int J Public Health Dent 2011;2:8-12.
30. Elheeny AA. *Allium sativum* extract as an irrigant in pulpectomy of primary molars: A 12-month short-term evaluation. Clin Exp Dent Res 2019;5:420-6.
31. Justin SR, Baby J. Pharmacognostic and traditional properties of Cissus quadrangularis linn-an overview. Int J Pharm Bio Sci 2011;2:131-9.
32. Bhat S, Chowdhary R. Effect of *Cissus quadrangularis* hydrogel on enhancing osseointegration of titanium implant to bone: An *in vivo* study. J Contemp Dent Pract 2022;23:582-8.
33. Altaweel AA, Baiomy AA, Shoshan HS, Abbas H, Abdel-Hafiz AA, Gaber AE, *et al*. Evaluation of osteogenic potential of *Cissus quadrangularis* on mandibular alveolar ridge distraction. BMC Oral Health 2021;21:491.
34. Grover S, Tewari S, Sharma RK, Singh G, Yadav A, Naula SC. Effect of subgingivally delivered 10% *Emblica officinalis* gel as an adjunct to scaling and root planing in the treatment of chronic periodontitis-a randomized placebo-controlled clinical trial. Phytother Res 2016;30:956-62.
35. Thaweboon B, Thaweboon S. Effect of *Phyllanthus emblica* linn. on *Candida* adhesion to oral epithelium and denture acrylic. Asian Pac J Trop Med 2011;4:41-5.
36. Prakash S, Sunitha J, Hans M. Role of coenzyme Q(10) as an antioxidant and bioenergizer in periodontal diseases. Indian J Pharmacol 2010;42:334-7.
37. Manthena S, Rao MV, Penubolu LP, Putcha M, Harsha AV. Effectiveness of CoQ10 oral supplements as an adjunct to scaling and root planing in improving periodontal health. J Clin Diagn Res 2015;9:ZC26-8.
38. Jayanti I, Bankur PK, Mathew M, Almalki SA, Jalaluddin M, Durgaraju M. An *in vitro* evaluation of antibacterial efficacy of various concentration of *Eucalyptus globulus* leaf extract on periodontal pathogens. J Contemp Dent Pract 2019;20:1041-4.
39. Yap PS, Lim SH, Hu CP, Yiap BC. Combination of essential oils and antibiotics reduce antibiotic resistance in plasmid-conferred multidrug

resistant bacteria. Phytomedicine 2013;20:710-3.
40. Ahmad H, Rajgopal K. 'Biological activities of *Salvadora persica* L. (meswak). Med Aromat Plants 2013;2:129.
41. Kaur S, Jalil RA, Akmar SL. The immediate term effect of chewing commercially available meswak (*Salvadora Persica*) on levels of calcium, chloride, phosphate and thiocyanate in whole saliva. Ann Dent Univ Malaya 2004;11:51-9.
42. Gupta P, Agarwal N, Anup N, Manujunath BC, Bhalla A. Evaluating the anti-plaque efficacy of meswak (*Salvadora persica*) containing dentifrice: A triple blind controlled trial. J Pharm Bioallied Sci 2012;4:282-5.
43. Naseem M, Khiyani MF, Nauman H, Zafar MS, Shah AH, Khalil HS. Oil pulling and importance of traditional medicine in oral health maintenance. Int J Health Sci (Qassim) 2017;11:65-70.
44. Shanbhag VK. Oil pulling for maintaining oral hygiene-a review. J Tradit Complement Med 2016;7:106-9.
45. Prasad D, Kunnaiah R. *Punica granatum*: A review on its potential role in treating periodontal disease. J Indian Soc Periodontol 2014;18:428-32.
46. Kumar G, Jalaluddin M, Rout P, Mohanty R, Dileep CL. Emerging trends of herbal care in dentistry. J Clin Diagn Res 2013;7:1827-9.
47. Andrade-Cetto A. Ethnobotanical study of the medicinal plants from Tlanchinol, Hidalgo, Mexico. J Ethnopharmacol 2009;122:163-71.
48. Sinha DJ, Sinha AA. Natural medicaments in dentistry. Ayu 2014;35:113-8.

How to cite this article: Rai S, Singh U, Bains VK, Srivastava R. Application and availability of indigenous, commercially available medicines in periodontology. Asian J Oral Health Allied Sci 2023;13:3.