Herbal care for dental plaque-induced gingivitis: A review

T. Lakshmi¹, Ruckmani Rajesvari², Arokiyaraj Selvaraj³, R. Parameswari⁴

¹Department of Pharmacology, Saveetha Dental College & Hospitals, Saveetha University, Chennai, Tamil Nadu, India. ²Department of Cancer Epidemiology, Saveetha Dental College & Hospitals, Saveetha University, Chennai, Tamil Nadu, India, ³Senior Research Fellow, National Cancer Center Korea, Division of Cancer Epidemiology and Prevention, Goyang-si, South Korea, ⁴Senior Research Fellow, SRU Center for Indian Systems of Medicine, Sri Ramachandra University, Chennai, India

Correspondence: T. Lakshmi, Department of Pharmacology, Saveetha Dental College & Hospitals, Saveetha University, Chennai, Tamil Nadu, India.
E-mail: Lakshmi085@gmail.com

ABSTRACT
The use of botanicals to treat health ailments is in practice from the beginning of recorded human history. The Egyptian Ebers Papyrus dated around 1550 BC contains herbal remedies for over 876 illnesses. It is reported that Hippocrates, the “Father of Medicine,” whose writings contain references about 250 medicinal plants and herbs. Many other ancient Indian, Chinese, medicines also have references proving the use of medicinal herbs to treat various diseases. Hence, the use of various herbal extracts for the treatment of plaque-induced gingivitis is discussed in this review.

Keywords: Dental plaque, gingivitis, botanicals, practice

Introduction
Mouth rinses are widely used to provide oral hygiene by degrading the plaque which is responsible for gingivitis.¹ Several substances are used for their effectiveness on removing plaque which includes bisbiguanides, essential oils, enzymes, and herbal extracts. Certain substances produce side effects which limits their regular use. Hence, herbs can be used which does not have any side effects.

Gingivitis
Gingivitis is inflammation of the gums and is a non-destructive periodontal disease. The most common form of gingivitis is due to bacterial biofilms (plaque) which are adherent to tooth surfaces and hence known as plaque-induced gingivitis. In the absence of treatment, gingivitis may progress to periodontitis, which is a destructive form of periodontal disease.

Causes of gingivitis
Bacterial plaque initiates the body’s immune response which causes destruction of the gingival tissues, which leads to the destruction of the periodontal tissue. Plaque gets trapped in small gaps between the teeth and accumulates the bacteria in them, which produce proteolytic enzymes and toxins which causes an inflammatory reaction in the gingiva.

Pathophysiology of gingivitis
Bacterial toxins cause an inflammatory response in the gingiva within 4–8 days of dental plaque accumulation. It is composed of T-lymphocytes and macrophages and the immune response produced is like delayed hypersensitivity reaction [Figure 1].

Herbs Which Can be Used to Treat Plaque-induced Gingivitis
• Neem (Azadirachta indica)
• Essential oils (clove oil: Syzygium aromaticum)
• Pomegranate (Punica granatum)
• Guava (Psidium guajava)
• Tulsi (Ocimum sanctum)
• Cranberry (Vaccinium macrocarpon)
• Boswellia serrata
Neem

*A. indica*

*A. indica* has a wide array of biologically active compounds that are chemically different and structurally complex. The leaves, flowers, seeds, fruits, roots, and bark of neem are traditionally used for the treatment of inflammation, infections, fever, skin diseases, and dental disorders. A study recorded the properties of 150 triterpenoids from *A. indica* leaves.

The extract from the leaves of *A. indica* at 25% was tested, reaching significant reductions in the amount of biofilms and gingivitis.

Neem has astringent, antiseptic, insecticidal, antiulcer, and many other medicinal properties. It is used for periodontitis and other dental diseases. The antibacterial activity of neem appreciated its use as a medicament from ancient times.[2,3] The leaf extract of neem proved to have superior antiviral and antihyperglycemic activity *in vitro* and *in vivo* on animals.[4] Neem leaves are used in the treatment of gingivitis and periodontitis.

**Mechanism of action**

The anti-inflammatory action of neem is by inhibiting prostaglandin E and 5 HT, thereby it reduces the inflammation. The antibacterial action is due to azadirachtin, a chemical constituent of neem, which will destroy bacterial cell wall and acts as a bactericidal agent,[5] it also acts by destructing the cell wall of bacteria and disturbing its osmotic pressure which in turn leading to destruction of the bacteria.[6]

**Antigingivitis and Antiplaque Properties of Neem**

The use of *A. indica* for the treatment of dental diseases such as gingivitis, plaque, and periodontitis has been reported in India, since several decades ago, due to its antiseptic properties[7] along with bactericidal properties. In a study, 45 subjects with plaque-induced gingivitis divided into three groups are asked to rinse with 15 ml of neem mouthwash twice a day.

The results of the study showed that *A. indica* was effective in reducing periodontitis like chlorhexidine, by reducing gingival bleeding and plaque indices significantly [Figure 2].[7]

**B. serrata**

Extract of *B. serrata* species was used in the Indian traditional medicine in the treatment of several inflammatory diseases. A study was designed to evaluate anti-inflammatory effects of Frankincense in the treatment of gingivitis. A double-blind randomized placebo-controlled trial was carried out among high school female students with moderate plaque-induced gingivitis, which proved that anti-inflammatory effects of the extract and powder of Frankincense in the treatment of plaque-induced gingivitis were investigated. Improvement in the healing of inflammation of periodontium by the use of extract or powder of Frankincense was effective. Frankincense, a safe herbal medicine, may be applied to improve inflammatory diseases of oral cavity as an adjunct to the conventional treatment [Figure 3].[8,9]
Extracts of Guava

*P. guajava*

In southern Nigeria, the twigs are used as chew sticks. The presence of bioactive compounds comprised saponins, tannins, flavonoids, and alkaloids is responsible for their effectiveness. Chewing sticks when used without toothpaste are very efficient and reliable for cleansing teeth. The teeth of chewing sticks users are usually strong, clean, fresh, and devoid of dental plaques and caries and guava is considered an astringent also. Extract is also recommended as a gargle for sore throats also for inflammations of the mouth. A concentrated extract of the root bark is recommended as a mouthwash for swollen gums and decoction of the leaves makes an effective and excellent gargle for ulceration of the mouth.

Hence, the extracts of guava can be used to remove plaque thereby to treat gingivitis induced by plaque [Figure 4].

Extract of Cranberry

*V. macrocarpon*

Native Americans were the first who used cranberries knowing its advantages. They used mashed cranberries to make pemmican which is one of their foods. A study published in the Journal of the American Dental Association reported that a high-molecular-weight non-dialyzable material (NDM) a unique constituent of cranberry extract has the ability to reverse and inhibit the coaggregation of certain oral bacteria responsible for dental plaque and periodontal disease in vitro. Critical Reviews in Food Science and Nutrition reported on a preliminary clinical trial using a mouthwash containing cranberry NDM which proved the efficacy of cranberry to fight plaque and gingivitis [Figure 5].

Extract of Tulsi

*O. sanctum*

Ayurveda mentions the importance of medicinal uses of tulsi. The leaves are effective for the infections in the mouth and also in mouth ulcers. Its leaves can be used for brushing teeth in the form of powder or toothpaste. It can be used to treat halitosis. It is also useful in gum inflammations. The anti-inflammatory and anti-infectious properties of tulsi can be used in the treatment for gingivitis due to plaque [Figure 6].

Oil Pulling

*Sesame indicum* oil is relatively high in unsaponifiable substances. It has sesamin which will protect the oral cavity from infection and inflammation by its antioxidant property.

Ayurveda, oil pulling called as KAVALA GRAHAM, is said to be effective in protecting the teeth from caries and periodontitis. Oil pulling is in practice for about thousands of years as an Indian traditional therapy. Taking about a tablespoon of oil such as sesame oil or coconut oil, in the mouth, then, swishing it around teeth for 10–20 min is called oil pulling. *Streptococcus mutans* produces certain chemicals to form a biofilm on the teeth, known as plaque. This plaque will be dissolved by the unsaponifiable substance present in the oil [Figure 7].
Clove Oil

*S. aromaticum*

Efficiently relieves toothache as it has an astringent property. It also inhibits the growth of biofilms of *Candida albicans* and other bacterial pathogens that causes dental plaque [Figure 8].

Extract of Pomegranate

*P. granatum*

Pomegranate has important applications in the field of dentistry. It is proved that the antioxidant component present in pomegranate fights microorganisms fiercely through clinical studies. Pomegranate containing mouthwash may fight dental plaque and tartar formation by its bactericidal property. It has anti-inflammatory properties that may help to heal the irritated tissues. A research shows that pomegranate extract suppresses the ability of the bacteria to adhere to the surface of the tooth.

The mechanism is by inhibiting a common species of *Streptococcus*, preventing it from producing substances which enhances the survival and growth of other organisms. Plaque may favor different microorganisms to colonize the surface of the teeth. Pomegranate inhibits the production of such adhering substances. Pomegranate rinsing significantly decrease the salivary activity of the enzyme aspartate. Lowered saliva activities of alpha-glucosidase, an enzyme that breaks down sucrose, it increased the activities of ceruloplasmin, an antioxidant [Figure 9].

Conclusion

Herbal extracts are more efficient and effective than chemical compounds in treating plaque-induced gingivitis. Moreover, the natural components are much biocompatible and harmless to the body. Organic compounds found in the extracts have several other properties which are good to human body. They are safer and economical. Their mechanisms of action are unique, and hence, development of resistance to herbal extracts by the microorganisms is rare. Hence, herbal extracts can be used to treat plaque-induced gingivitis in the form of mouthwash and toothpaste.

References


