Azadirachta indica: A herbal panacea in dentistry – An update

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ABSTRACT

Azadirachta indica commonly known as Neem, is an evergreen tree. Since time immemorial it has been used by Indian people for treatment of various diseases due to its medicinal properties. It possesses anti-bacterial, anti-cariogenic, anti-helminthic, anti-diabetic, anti-oxidant, astringent, anti-viral, cytotoxic, and anti-inflammatory activity. Nimbidin, Azadirachtin and nimbinin are active compounds present in Neem which are responsible for antibacterial activity. Neem bark is used as an active ingredient in a number of toothpastes and toothpowders. Neem bark has anti-bacterial properties, it is quite useful in dentistry for curing gingival problems and maintaining oral health in a natural way. Neem twigs are used as oral deodorant, toothache reliever and for cleaning of teeth. The objective of this article is to focus on the various aspects of Azadirachta indica in dentistry in order to provide a tool for future research.

Key words: Azadirachta indica, anti-bacterial, anti-cariogenic, oral health

INTRODUCTION

Neem has been extensively used in Ayurveda, Unani and Homoeopathic medicine and has become a wonder tree of modern medicine.[1] It has been used traditionally for the treatment of inflammation, infections, fever, skin diseases and dental problems.


Neem twigs are used as oral deodorant, toothache reliever and for cleaning of teeth. Neem bark possesses antibacterial and deodorant activity. The phytochemical constituents present in neem are nimbidin, nimbin, nimbolide, Azadirachtin, gallic acid, epicatechin, catechin, and margolone. All these exhibit potent antibacterial activity. The chief active constituent of neem is azadirachtin, which is an effective antimicrobial agent.[15,16] Neem has also been traditionally used as a skin moisturizer.[17]

Objective of the literature review

Azadirachta indica is an evergreen tree having potential medicinal values. It has been found to be active against many dreadful disorders like hepatitis, viral infections, malaria and cancer. It is also effective against periodontal pathogens, and oral acidogenic bacteria responsible for dental caries and dental plaque. The aim of the present review is to focus on the dental aspects of various parts of Neem extract with their chemical constituents and biological activities. Several traditional uses of the miraculous tree have also been briefly discussed. This information may give a bird’s eye view for the dentist, and consequently this database might play a major role in future research in the field of dentistry [Figure 1].

Therapeutic role of Azadirachta indica in dentistry

Nimbidin, a major active principle isolated from seed kernels of A. indica exhibits several biological actions. From nimbidin other active constituents like nimbin, nimbinin, nimbidinin, nimbulide and nimbidic acid have been isolated which are responsible for its biological activities.[16]
Neem dental care products contain Neem leaf or bark extract. Neem leaf is rich in antioxidants and helps to boost the immune response in gum and tissues of the mouth. Neem offers a good remedy for curing mouth ulcers, tooth decay and acts as a pain reliever in toothache problems.

Dental applications of Neem

Antibacterial activity

Neem is a natural antibacterial agent. Various scientific studies have revealed its antibacterial activity. The antimicrobial effects of Neem have been reported against S. mutans and S. faecalis. Ethanol extract of Neem leaves and sticks and bark exhibited significant antibacterial activity. Dried chewing sticks of Neem showed maximum antibacterial activity against S. mutans compared to other dental caries-causing organisms, S. salivarius, S. mitis, and S. sanguis.

Anti-candidial activity

Ethanolic and aqueous extract of Neem leaf showed significant anti-candidial effect against C. albicans. A clinical study demonstrated the effects of the leaf aqueous extract from Azadirachta indica (Neem) on adhesion, cell surface hydrophobicity and biofilm formation, which may affect the colonization by Candida albicans. The results suggest that Neem leaves have a potential anti-adhesive effect on the sample studied in vitro.

Anti-cariogenic activity

Mango and Neem extract showed antimicrobial activity against S. mutans, S. salivarius, S. sanguis and S. mitis. A combination of chewing sticks is found to be beneficial in eradicating the dental caries-causing organism. Chloroform extract of Neem leaf inhibited Streptococcus mutans and Streptococcus salivarius and provides an aid for treating dental caries. Antimicrobial activity of commercially available Himalaya herbal dental cream containing neem and fluoride-containing cheerio gel toothpaste has been assessed in school children. The study reported both the toothpastes showed a good antimicrobial effect on caries producing salivary Streptococcus mutans. The toothpaste containing Neem as well as fluoridated toothpaste were equally efficacious against caries-producing bacteria. Acetone extract from the bark of Neem is bactericidal against S. sobrinus hence indicates its anti-cariogenic activity.

Anti-plaque activity

Aqueous extract of Neem stick and the gallotannin-enriched extract from Melophis chinensis inhibited insoluble glucan synthesis and results in bacterial aggregation. It reduces the ability of Streptococcus to colonize tooth surfaces. Neem oil shows significant antibacterial activity and has been suggested for use in treating dental plaque. Mucoadhesive dental gel containing Azadirachta indica is found to be beneficial in reducing the plaque index and salivary bacterial count comparatively better than chlorhexidine gluconate mouthwash.

Efficacy of Neem extract against acidogenic oral bacteria in fixed orthodontic appliance patients

The primary acid-tolerant bacteria associated with dental plaque including Streptococcus mutans, Streptococcus oralis, Streptococcus sobrinus, Lactobacillus acidophilus, Streptococcus salivarius, Streptococcus mitis, Streptococcus sanguis, Streptococcus intermedius, and Streptococcus anginosus that surround orthodontic appliances are a common problem in many patients undergoing orthodontic treatment. It has also been reported that presence of fixed orthodontic appliance greatly inhibits oral hygiene and creates new retentive areas for plaque and debris.

Ethanolic leaf extract of Azadirachta indica shows significant antibacterial activity against selected acidogenic oral bacteria causing dental plaque in fixed orthodontic appliance patients. The study conducted by us evaluated the anti-plaque activity of the extract against S. mutans, S. sanguis, and S. mitis. The extract did not inhibit L. acidophilus when tested.

Efficacy against periodontal pathogens

Brushing with Neem toothpaste after every meal and using a mouthwash with Neem extract is recommended treatment for preventing gingivitis. In a study, Neem-based mouth rinse was given to patients for assessing anti-plaque and anti-gingivitis activity. The findings conclude that Neem mouth rinse is as effective as chlorhexidine in reducing periodontal indices. Neem stick is found to be effective as a toothbrush in reducing dental plaque and gingival inflammation.

Studies indicate that leaf extract of A. indica-based mouth rinse is highly efficacious and that it may be used as an alternative therapy in the treatment of periodontal disease. Gingivitis has been prevented or even reversed with regular use of Neem toothpaste and mouthwash. Shefali Sharma conducted a study on Soluneem (a water-soluble formulation from the Neem seed kernel from Shefali Sharma conducted a study on Soluneem (a water-soluble formulation from the Neem seed kernel from Azadirachta indica containing Azadirachtin) as an antimicrobial agent and the effective concentration of Soluneem required to inhibit periodontopathic bacteria and to compare it with a known antiplaque agent chlorhexidine (0.2%) in vitro. Study

Figure 1: Azadirachta indica
revealed that soluneem extract did not show activity against the organisms (Bacteroides fragilis, B. distatonics, Prevotella corporis, Prevotella melagynogoga, Pepto streptococcus species) tested.[37]

Also Botelho et al., and Behl et al., in their experiments and trials concluded that Azadirachta indica is highly efficacious in the treatment of periodontal disease thus exhibiting its biocompatibility with human periodontal fibroblast.[38]

Neem as root canal irrigant
Sodium hypochlorite has been used as root canal irrigant for decades; it causes potential weakening of the tooth structure by decreasing the hardness and structural integrity of the dentin within the root canal. To overcome this disadvantage herbal drugs are used effectively to inhibit E. faecalis that causes root canal failure in patients undergoing endodontic treatment.

Aqueous and ethanolic extract of Neem leaf inhibits S. mutans and E. faecalis which cause root canal failure in endodontic procedure. Its antioxidant and antimicrobial properties makes it a potential agent for root canal irrigation as an alternative to sodium hypochlorite.[39] Literature suggested that the Neem (Azadirachta indica) leaf extract has significant antimicrobial effect against E. faecalis derived from infected root canal samples. The extract was found to be efficacious compared with 2% sodium hypochlorite.

Neem in dental care industry
Various parts of the Neem tree possess astringent and antiseptic activity. Leaf extracts have been widely used in both traditional and conventional times to manufacture toothpaste and mouthwash in the oral care dentistry. Its antibacterial properties due to the presence of nimbidin, Azadirachtin, and nimbinin help to remove many oral aerobic and anaerobic pathogens existing in the oral cavity.

Neem bark and leaf extract is most effectively used in preventing cavities and gum disease. Mouthwash containing Neem is a remedy for tooth decay, oral infections, prevents bleeding and sore gums. Twigs of Neem tree are used as chewing sticks by people all over India.

CONCLUSION
Regular brushing with Neem-containing toothpaste will reduce the deposition of plaque, prevents caries, and enhances the immune response for overall oral health. Frequent usage of mouthwash containing Neem extract will lessen gingival problems, and also treats halitosis.

In this modern, trendy world, we have done enough damage to nature. It is high time we start changing ways, to synchronize ourselves with nature, providing ample space for each other. Here we are trying to retrieve and learn the ancient Indian ways, which can still be infused into our fast-paced lives for a good effect, benefitting our future generations to come. This article hopes to lay a good solid base for further uses of one of nature’s best gift—Neem in many more day-to-day functions. If education can be provided in dental and dentistry schools about the use of Neem-based and also herbal oral care products, it would help our dentists treat patients more holistically.

REFERENCES


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