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Azadirachta indica – Therapeutic Potential in Oro Dental Conditions

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Abstract

Azadirachta indica is an evergreen tree and has been known as a traditional medicinal plant in India. It has several beneficial properties and therapeutic effects like antibacterial, antifungal, antiviral, anthelminticand anti-inflammatory properties. Neem is indeed a 'wonder tree' as various constituents of neem have been used in medicine, public health, agriculture and beauty products. Innumerable studies have been done in diabetes, cancer and malaria, to name a few. Neem has been used since ages to maintain the Oro dental health, especially in our country as a substitute for toothbrush.

Key words: Neem, bark, leak extract, neem chewing stick, dental gel, mouth rinse.

Introduction

Azadirachta indica, commonly known as Neem tree, Indian lilac or margosa tree belongs to meliaceae family. It is one of the most common tree found all over India. Neem has been used as a traditional plant medicine in various diseases, the records of which can be traced in 'Devnagri' script, also mentioned in Ayurveda and Unani. The beneficial effects of Neem are mentioned in the earliest Sanskrit medical writings by Susruta. Neem is a tall, fast growing evergreen tree with a straight trunk, spreading branches, moderately thick bark, round crown and delicate foliage. Mature trees attain a height of upto 7-20 metres and may live for more than 200 years. [1]

Products and preparations of almost every part of *Azadirachta indica* like leaves, flowers, bark and seeds are used. The leaves of *Azadirachta indica* are anthelmintic [2], insecticidal [3] and anti-inflammatory [4], and are used in innumerable clinical conditions. Bark exudes a clear amber coloured gum containing a bitter alkaloid "margosine" similar to the constituent present in leaves. [5] The purpose of this review is to provide the therapeutic potential of neem in Oro Dental health.

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Azadirachta indica in Oro Dental health

Various studies have shown that neem has antibacterial activity.[6] From centuries, the green twigs of Neem have been used as chewing stick because of its potent antibacterial properties. [7,8] Azadirachtin and nimbidin are responsible for the antibacterial action of neem.

S. mutans is one on the main microorganism involved in dental caries.Ethanolic extract of Neem leaves and stick was prepared and the zone of inhibition observed against S. mutans. It was observed that Neemstick had significantlyhigher antibacterial activity against S mutans.[9]Maximum antibacterial activity has been seen against S mutans with dried chewing sticks. Antimicrobial activity of aqueous extract of neem chewing stick was also compared with Salvadora persica, and it was observed that Neem chewing stick was effective against S mutans and S faecalis.[10]Bhambal et al showed that Neem chewing stick and toothbrush resulted in a significant reduction in plaque and gingival scores.[11]

Neem based mouth rinse was compared to chlorhexidine and it was found that neem mouth rinse was as effective as chlorhexidine in reducing plaque and gingivitis.[12]

Endodontic infections may be due to retention of microorganisms in dentinal tubules.Enterococci is frequently found in patients with apical periodontitis[13,14]In a recent study by Chandrashekar et al, chlorhexidine, neem leaf extract, aloevera and

calcium hydroxide were compared in infected root canal dentin. Neem showed similar activity compared to chlorhexidine in reducing E. faecalis colony count, when compared to calcium hydroxide and aloevera.[15]

Mucoadhesive dental gel containing neem leaf extract was compared with chlorhexidine for a period of 6 weeks. The results suggest that the dental gel containing neem extract significantly reduced the plaque index. Significant reduction of S. mutans and Lactobacilli was also observed.[16]

Neem leaf extract has shown the highest zone of inhibition against E faecalis and C albicans in a study conducted by Hegde et al.[17]Neem sticks were studied against caries inducing microorganisms (S. mutans, S. salivarius, S. mitis and S. sanguis). Neem extract has demonstrated significant antibacterial activity. [18] Neem bark (acetone extract) has bactericidal action against S. sobrinus, hence has anticariogenic action.[19]

S.mutans is one of the main causative micro-organism responsible for periodontal disease. In a randomized controlled trial by Botelho et al, ethanolic extract of leaves of *Azadirachta indica* demonstrated a significant decrease in the gingival index, plaque index and gingival bleeding index, with a significant reduction in S. mutans in the salivary samples collected.[20] Ethanolic neem leaf extract demonstrated a high antimicrobial efficacy and can be used in root canal as irrigant.[21]

The study by Botelho et al showed that *Azadirachta indica* is highly efficacious in the treatment of periodontal disease. Due to the bitter taste of Neem, the patient acceptability and compliance becomes an issue, which can be altered by different formulations due to addition of sweeteners and flavours.[20]Neem leaves are rich in antioxidants and boosts the immune response in gums and oral tissues. [22-24]

Endodontic infections are usually polymicrobial in nature.S. faecalis and C.albicans are particularly responsible for recalcitrant endodontic infections andpulp necrosis [25,26] In vitro study showed that neem leaf extract has antimicrobial action against C. albicans, E. faecalis and in mixed state when compared to sodium hypochlorite.[27]

Various micro-organisms like S. mutans, S. mitis, S. sanguis and S. salivarius that are present in patients with fixed orthodontic appliance, and makes it difficult for them to maintain the oral hygiene. Ethanolic leaf extract of *Azadirachta indica* has demonstrated significant antibacterial action against the oral acidogenic bacteria in patients causing dental plaque in fixed orthodontic appliance patients.[28]Antimicrobial effects of chewing sticks of neem and mango on *S mutans*, *S salivarius*, *S mitis*, and *S sanguis* which are commonly involved in causing dental caries was studied by Prashant et al in 2007. It was observed that Neem (dried chewing sticks powder) inhibited all the four microorganisms. Maximum zone of inhibition was seen on S mutans [29]

Neem leaf extract showed significant action against E. faecalis and C. albicans, which are common in secondary endodontic infections. Neem has anti-adherence activity by altering the bacterial adhesion and ability of organism to colonize. It also shows biocompatibility to human periodontal ligament fibroblasts which is an important factor for its clinical application.[17]

Azadirachta indica showed inhibitory zone against *E. faecalis*, hence can be used as root canal irrigant.[30] Antimicrobial efficacy of *Morinda citrifolia*, *Azadirachta indica*, and sodium hypochlorite was studied as root canal irrigants. There was a significant reduction in aerobic and anaerobic bacteria in all the groups.[31]

Dental pathogens isolated from the dental plaque samples were identified as *Streptococcus mutans*, *Streptococcus salivarius* and Fusobacterium nucleatum, and it was found that Neem leaf extract showed significant inhibition of all the strains. Chloroform extract of Neem demonstrated a strong activity against Streptococcus salivarius and Fusobacterium nucleatum was highly sensitive to both ethanol and water extract [32]

Mucoadhesive dental gel containing neem extract significantly reduced the plaque index and S mutans and lactobacilli (salivary bacterial count) during the 6week study.[33] *Azadirachta indica* mouth rinse demonstrated a statistically significant reduction of gingival, bleeding and plaque indices over a period of 21 days.[34] Neem leaf extract exhibited antifungal action against C albicans and antibacterial action against *S mutans* in patients of denture stomatitis.[35]

In India, where majority of the population is rural, Neem is used as a substitute for toothbrush for cleaning the teeth. Various studies have been done, and show the beneficial effects of Neem as chewing sticks and mouth rinse. Neem is effective in the treatment of infections of oral cavity, prevents dental caries and bleeding gums. Lack of oral hygiene results in deposition of plaque and calculus, gingivitis and periodontitis. *Azadirachta indica* can be used in the treatment of periodontal disease. Neem can also be used as root canal irrigating solution as it is cheap, easily available and less toxic than chemical irrigating solutions; with several beneficial effects, however further in-vivo studies in large patient size would be of

great help in the clinical applications of *Azadirachta indica* in various dental departments.

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