

Utility of Neem as a Herbal Drug in Oral Diseases: A Review

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ABSTRACT

This review titled 'utility of neem as an herbal drug in oral diseases: A review', seeks to explore, evaluate and assess the role of neem in purview of herbal drugs in dentistry. As such the herbal drug which is the topic of this research article is a wonder tree, neem, with the botanical name *Azadirachta indica*. Neem is accorded the status of a miracle tree not only in India but also in the entire world. Neem has numerous amazing benefits. It is anti-bacterial as well as antimicrobial and it is also said to prevent viral, helminthic and inflammatory diseases. It is also anti-cariogenic and anti-carcinogenic. The ancient Indian wisdom and treatises of Ayurveda have held medicinal plants like neem in highest esteem. Not only ancient Ayurveda but modern medicine also places utmost faith in this green treasure. Each and every segment of this valuable evergreen tree has some or the other potential that can be made use of to benefit medicine. It can therefore be exploited commercially. Now it has the potential to be considered as a profitable source of special organic goods for the advantage and advancement of medicines that possess potential strength against various disorders and ailments. The present review describes medicinal uses of neem, with more emphasis on oral diseases.

Key words: Antibacterial, Antimicrobial, Anti cariogenic, Neem

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INTRODUCTION

Azadirachta indica is the scientific name of neem. Nimtree or Indian lilac is other names commonly used and in Nigeria it is called dogoyaro or dogonyaro. It is an evergreen tree belonging to the Mahogany family Meliaceae [1]. It possesses curing, healing and preventive wonders. It has been used as a cure for dental infections, skin problems, inflammatory diseases and pyrexia. Every part of it has a different medicinal property. Leaves of neem have been observed to lower blood sugar, alters/modulates immunity, fights inflammation, helps in malarial fever, antimutagenic and anticariogenic, anti-oxidant, and anti-viral properties. The twigs of neem are used to get rid of foul smell in mouth, get a feeling of freshness and to get relief from pain in teeth. They are also used for maintaining oral cleanliness. Effective action against bacteria as well as in imparting a fresh breath is exhibited by neem bark.

LITERATURE REVIEW

Therapeutic role of neem

Malaria, TB, rheumatism, arthritis, jaundice, parasite infections, and skin ailments have all been proven to be of benefit in treatment with neem. It has also been discovered that certain plant sections are used in the prevention and cure of heart diseases, hepatic disease, and fungal infections. Psoriasis, eczema, lice, and ulcers, are all examples of infections that have been found to make use of neem in their treatment modalities. Neem is also used in cosmetics for its antibacterial properties. Acne and pimples are treated, and the elasticity of the skin is known to be improved significantly [1]. Nimbodin, a primary functioning convention derived from kernels of the grains or seeds of neem, really does have a wide variety of biological functions. Other active compounds of nimbodin have been found, including nimbin, nimbinin, nimbodinin, nimbolide, and nimbidic acid, which are responsible for its biological activity [2]. The leaf or bark extract of neem is used in dental care products. The antioxidants in neem leaf aid to improve the immune response in the mouth, gums and tissues [3]. Neem is an approved treatment modality for, carious teeth, toothaches and ulceration of the oral mucosa [4].

Implementations of neem in dentistry

Anticariogenic action: The use of a combination of chewing twigs has been demonstrated to be effective in

removing the bacteria that causes dental caries [5]. *Streptococcus mutans* and *Streptococcus salivarius* were suppressed by chloroform extract of neem leaf, suggesting that it could be used to treat dental caries [6]. In school children, the microbe fighting capabilities of Himalaya herbal, which is a dental cream available in stores, comprising of neem as well as a cheerio gel toothpaste which contains fluoride was evaluated. Both toothpastes had a good antibacterial impact on caries causing salivary *Streptococcus mutans*, according to the study [7]. Both neem based toothpaste and toothpaste comprising of fluoride were found to be of equitable efficacy hostile to tooth decay causing microbes. Propanone extirpate, drawn out from the woody bark of tree, exhibits microbe killing abilities hostile to *S. sobrinus*, indicating that it has anti-cariogenic properties [8].

Chewing mango or neem tree twigs is a common practice for rural and semi urban people to clean their teeth. These twigs are also said to have therapeutic qualities. In a study performed by Elavarasu S, et al. [10], the purpose of a study was to see how the chewable neem twigs affected the microbes which play a significant role in the formation of tooth-decay or dental cavitation. The results exhibited that at a concentration of 50%, mango extract inhibited *Streptococcus mitis* to the greatest extent. At a concentration of 50%, neem extract inhibited *Streptococcus mutans* and has been recommended for use in the treatment of tooth plaque [11]. Mucoadhesive dental gel containing neem established to be of greater efficacy when compared to a chlorhexidine gluconate oral rinse, for lowering the plaque index and salivary bacterial count [12].

Antibacterial activity: Neem is a plant that has antimicrobial properties. Its antimicrobial action has been demonstrated in a number of scientific researches [13]. Neem has proven to display bacteria fighting capabilities, hostile to *S. mutans* and *S. faecalis* [14]. The antibacterial activity of an ethanolic extract of neem leaves, sticks, and bark was shown to be substantial [15,16]. When contrasted with to other tooth decay resulting microorganisms such as *S. salivarius*, *S. mitis*, and *S. sanguis* dried chewing woody pieces of neem bark demonstrated the highest microbe fighting capabilities hostile to *S. mutans* [17]. In a study by Shravan KD, et al. [18], methanol, petroleum ether, and aqueous extracts of neem leaves Meliaceae, *Allium cepa* bulbs (Liliaceae), and methanol *Aloe vera* (Liliaceae) gel extracts were evaluated for their antimicrobial properties. The cup plate agar diffusion method was used to test antimicrobial activity. They were put to the test opposed to six microbes, two of which were gram positive (*Bacillus subtilis* and *Staphylococcus aureus*) and four gram-negative bacteria (*Escherichia coli*, *Proteus*, and *Bacillus subtilis*), *Salmonella typhi*, *Pseudomonas aeruginosa*, and *Pseudomonas vulgaris*. The microbes' susceptibility to these plant extracts was compared to that of other microorganisms as well as antibiotics. Neem methanol extract showed significant efficacy against *Bacillus subtilis* (28 mm) [18].

Anticandidal activity: Against *Candida albicans*, ethanolic and aqueous extracts of neem leaf had a substantial anti-candidal action [19]. The efficacy of neem leaves aqueous extirpate on adherence, hydrophobicity of surface of cell, as well as development of biofilm, were observed in clinical research, which could affect *Candida albicans* colonization. The findings implied that the leaves of neem may showcase an anti-adherent impact on the *in vitro* sample [20].

The extracts from aqueous as well as ethanolic solutions of leaves of neem have been reported to be of significant efficacy, hostile to *Candida albicans* with sensitivity at concentrations of 15% and 7.5% for the aqueous extract and a minimum inhibitory concentration of 7.5% for the ethanolic extract [21].

Analgesic effects: Kumar, et al. observed that the oil of seeds of neem in a dose of 2 ml/kg body weight was appropriate in comparison with morphine with a dose of 1 mg/kg body weight. Neem Seed oil gives rise to a stronger analgesic pain relieving outcome as compared to morphine within 45 minutes time period. Srinivasa et al. found that neem resembles indomethacine in a study done using albino rats [21].

Neem as a root canal irrigant

Since decades, sodium hypochlorite is being utilized as a root canal irrigant as it reduces the denseness and constructional wholeness of the dentin enclosed, in the canal of root potentially compromising tooth structure. Herbal medications are utilized efficiently to prevent *E. faecalis*, which causes root canal failure in patients having endodontic therapy. *S. mutans* and *E. faecalis*, which cause root canal failure in endodontic procedures, are inhibited by aqueous and ethanolic extracts of neem leaf. Its antioxidant and antibacterial characteristics make it a viable option to sodium hypochlorite for root canal irrigation [16]. The Neem leaf extract has been shown to have a substantial antibacterial action against *E. faecalis* generated from infected root canal samples in the literature. On comparison with 2% sodium hypochlorite, the extract was determined to be effective [4].

In a randomized control trial done on mandibular molars with necrotic pulps, on comparing the efficacy of neem with 2.5% sodium hypochlorite to irrigate the root canals, the results found neem to be of great benefit. This was studied on the level of post-operative discomfort and the amount of endotoxins. The mean pain scores in both groups steadily decreased over time. At 6, 12, 24, and 48 hours after instrumentation and canal filling, the mean pain scores in the group of neem were found to be lesser when compared to the one that were in the 2.5% NaOCl group, in the same study. But, there was no remarkable differentiation in between both excluding the significant observation at 24 hours after instrumentation (P=0.012). The additional benefit of neem that the authors have mentioned here is about the reduction of endotoxin levels by 18% for the category of neem, whereas it was just by 8% for the category of Sodium Hypochlorite. This

was observed when compared to pre instrumentation samples [22].

Efficacy of neem against periodontal pathogens

Gingivitis can be prevented by brushing with dentifrice containing neem, following eating anything, and making use of an oral rinse comprising of extirpate of neem. Patients were given a neem based mouth rinse to test its anti-plaque and anti-gingivitis activity in a study. According to the data, Mouth wash that contains neem is just equitably efficacious when compared to chlorhexidine, at lowering prevalence and severity of index of diseases of the periodontium. The use of a neem stick as a toothbrush has been demonstrated to be beneficial in reducing dental plaque and gingival irritation [23]. According to studies, neem leaf extract-based oral rinse is extremely effective, as well as it could be utilized to be a substitute method of healing to treat ailments of the periodontium [24]. Regular use of neem toothpaste and mouth rinse has been shown to prevent or even reverse gingivitis [25].

The potential of neem extract against acidogenic oral bacteria in subjects with fixed orthodontic appliances

It has been claimed that wearing a fixed orthodontic appliance makes dental hygiene much more difficult and produces new retentive sites for plaque and debris [4]. In fixed orthodontic appliance patients, an ethanolic leaf extract of neem exhibits strong bacterial fighting action as opposed to a few selective acidogenic dental microbes that cause tooth plaque. The extract's anti-plaque ability against *S. mutans*, *S. sanguis*, and *S. mitis* was tested in a research; results revealed extract had no effect on *L. acidophilus* [26].

Neem as a preventive major in dental care

Astringent and antiseptic properties can be found in several parts of the neem tree. Leaf extracts have long been utilized in the oral care, dentistry industry to make toothpaste and mouthwash in both traditional and modern eras. Its antibacterial characteristics, which are attributed to the presence of nimbidin, Azadirachtin, and nimbinin, aid in the removal of numerous oral aerobic and anaerobic infections. The most effective usage of neem bark and leaf extract is to prevent cavities and gum disease. Tooth decay, oral infections, bleeding, and painful gums can all be treated with neem mouthwash. People utilize twigs from the neem tree as chewing sticks all over India [4]. Similarly a number of herbal products have been studied and found to be effective in various oral disorders [27-30].

DISCUSSION

It is well known that for management of almost all the diseases might be general or oral, allopathic drugs are available. Nevertheless, the global scenario is now changed. Everybody is intending to explore the remedies which are least toxic or with no side effects on the body.

For the said purpose, lot of work is going on in the medical field. The use of plant products has been given importance in this reference. Neem is one of the plants of such kind.

Overall information mentioned earlier reveals that neem, an herbal with multiple actions can be used in a number of oral diseases. It can be used for prevention purpose as well as for treating the disease. Thus it is named as 'arista'. Arista is a Sanskrit word the meaning of which is "perfect, complete, and imperishable."

For the last few years, there has been an increasing trend and awareness in neem research. Quite a significant amount of research has already been carried out during the past few decades in exploring the chemistry of different parts of neem. An extensive research and development work should be undertaken on neem and its products for their better economic and therapeutic utilization. Neem's medicinal applications are discussed in this paper, with a focus on oral illnesses.

The exemplary role of neem in oral disorders has been examined, evaluated, and assessed in the aforementioned research work. It could be used as a supplement to traditional allopathic therapy. Additionally, it lessens the likelihood of adverse effects including serious allergic responses. Thus, the use and implementation of natural medicines like neem will be extremely beneficial to the field of dentistry.

CONCLUSION

The above research paper has attempted to analyse, assess and evaluate the remarkable role of neem in oral diseases. It serves as a potential adjunct to conventional allopathic treatments. It also reduces the side effects and chances of significant allergic reactions. It has antimicrobial, antibacterial, anti-carcinogenic, anti-cariogenic properties, in addition to being of good use in periodontal treatment. It is well tolerated and widely accepted, and interestingly also has cultural and psychological acceptance especially among the Indian population. Thus, the field of dentistry stands to gain immense benefit from the implementation and use of herbal drugs like neem.

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