Antimicrobial activity of Azadirachta Indica for prevention of Dental diseases

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Abstract

Background: If it would be possible to find out the appropriate medicinal plants which will be effective against for the prevention of dental diseases, thus one can use these medicinal plants for dental care in order to prevent the invasion of dental diseases forming bacteria. Obviously, plants materials are available in the rural area of Bangladesh, and use of these plants will be cost effective, user friendly and acceptable to all label of people. More importantly, it could be one of best preventive measure for dental plaque formation. **Objective:** To observe the anti-bacterial activity of Neem (Azadirachta Indica) against the isolated oral bacteria to prevent dental diseases specifically dental plaque. **Methods:** This study was carried out among the patients having dental plaque attending at the Dental Unit of Rajshahi Medical College and Hospital, and Udayan Dental College and Hospital, Rajshahi Bangladesh. A total of 30 specimens of dental plaques were collected by simple random sampling in this study. Data were collected by oral examination, investigation and interviewing the patients having dental plaque. Microorganisms of oral cavity were isolated by culture of the dental plaques and tested against medicinal plants methanolic extracts at a concentration of 1 mg/disc, 2mg/disc and 3mg/ disc by disc diffusion method. **Results:** The study result showed antibacterial activity by implementation of Disc diffusion method. The zone of inhibition was in between 8mm to 20mm in 1 mg/-disc. The plant extracts were again subjected to antimicrobial test with 2 mg/disc against the plaque sample of 5 patients. To rationalize the antibacterial activity 3 mg/disc of plant extracts were used against plaque of 5 patients and in this case neem extract was showed the Significant antibacterial activity. **Conclusion:** Neem (Azadirachta Indica) has potential antibacterial activity in general and in specific patients which is somehow dose dependent.

Key words: Dental diseases, Neem *(Azadirachta Indica),* Disc diffusion method, Antibacterial activity.

Introduction

About 80% of our rural population and even 50% of the urban population are suffering from dental problems and in most cases, it caused by dental plaque. Generally dental plaque is formed by lack of knowledge, ignorance and awareness of oral hygiene. Moreover, in the rural area of Bangladesh dental care facilities are almost absent. For the lack of

above causes and carelessness of dental cleanliness, dental plaque is formed by bacterial invasion and causes different dental diseases along with loss of tooth in very early stage. In reviewing the literature, the majority of recent studies have focused primarily on the composition of subgingival plaque suggesting a role for a number of subgingival microorganisms in the initiation of periodontal infections which causes dental diseases.[123] To overcome these problems some medicinal plants of Bangladesh are selected which are used traditionally use for the dental care.

Every part of the neem (Azadirachta Indica) plant is used medicinally. Various parts of the plant are used in inflammation of gums, gingivitis, sores, fevers (including malaria), spleen complaints, tumors, head scald, smallpox, diarrhea. and cholera. In addition, the leaves possess antiseptic properties and are used in boils, ulcers, eczema, ringworm and scabies. Aqueous and alcoholic extracts of the leaves and bark show good antibacterial activity. Extracts of leaves, bark, gum and seeds are used as remedies for scorpion-sting, snake-bite, as antiviral, antineoplastic and antifungal agents. The gum is a demulcent tonic and is useful in catarrhal affections. Flowers are used in atonic dyspepsia and general debility. Seed kernel produces anti-diabetic and anti- hyperlipidemic effects in alloxan diabetic rabbits. The oil is used in the treatment of ulcers, chronic skin diseases and rheumatism. Most of the constituents of the plant exhibit antibacterial and anti-i nflammatory effects.[4]

This study was carried out to observe/measure the anti-bacterial activity of Neem (Azadirachta Indica) against the isolated oral bacteria to prevent dental diseases specifically dental plaque.

Materials and methods

This descriptive type of study was carried out among the patients having dental plaque attending at the Dental Unit of Rajshahi Medical College and Hospital, and Udayan Dental College and Hospital, Rajshahi Bangladesh. A total of 30 specimens of dental plaques were collected by simple random sampling in this study. Specimens of Dental plaque was collected periodically from the selected outdoor patients with inform consent. Sufficient specimen material was collected from different tooth surfaces containing dental plaque by help of a sterile cotton bud with aseptic precaution and inoculated in a test tube containing commercially prepared Nutrient broth media (5 ml) and seal the opening of test tube with sterile cotton pellet and aluminum foil. For collection of the specimen all glass wear, media and instrument were sterilized at 121ºC temperature and 15 Pascal's pressure. For preparation of anaerobic environment, candle jar technique was used before seal the opening of the test tube. The collected specimen was transferred to the laboratory immediately to avoid contamination with bacteria or rapidly growing yeast. Growth of pathogens from collected dental Plaque was made by following direct method of isolation followed by incubated at 37ºC temperature for 48 hours. During these period bacteria was grown within the media and clear nutrient media become hazy for the growth of the bacteria. In the in-progress study, the in vitro antibacterial activity test was carried out taking methanol extracts of different parts of fifteen different plants using three different concentration (1 mg/disc, 2mg/disc,3mg/disc) and cefradine (30 mg/disc were used as standard). For anti-bacterial work disc diffusion method was applied. The methanol extracts of the plants extracted by using hot extraction method in Soxhlet

apparatus. The antibacterial activity of the test agents (methanol extracts of different parts of the plants) was determined after 12 hours of incubation by measuring the diameter of the zones of inhibition in millimeter (mm) with a temperate scale and compared with that of standard disc. (cephradine).

Data were collected by a data collection sheet through oral examination, investigation and interviewing the patients having dental plaque. The data collection sheet was designed to record the information regarding socio-demographic and oral hygiene status. The diagnosis was based on clinical history, physical examination and relevant oral examination associated with dental plaque. Informed consent was taken from the patients prior to handle them.

Results

Preliminary, plaque was collected from the 20 patients between 15 to 45 years age and the dental plaque samples were tested against the crude methanolic extracts of medicinal plant. Three experiments were performed at concentration of 1 mg/disc, 2 mg/disc and finally 3 mg/disc and the results are given below

Table I: Zone of inhibition of neem extracts against dental plaque bacteria in different concentration.

Patient sample	Zone of inhibition of neem extracts against dental plaque bacteria in different concentration		
	1 mg/disc	2 mg/disc	3 mg/disc
1	6	6.5	9
2	8	9	20
3	8	8	12
4	9	10	14
5	6	7	10

The results of the above experiments showed that where 1 mg/disc was used, showed remarkable zone of inhibition ranging from 8 mm to 9 mm in diameter on the disc. The plant extracts were again subjected to antimicrobial test with 2 mg/disc against the plaque sample of 5 patients and in this case neem *(Azadirachta Indica)* showed remarkable activity and highest activity was shown by specimen neem extract on patient sample no 4. To rationalize the bacterial activity, at concentration of 3mg/disc of selected plant were also used against 5 patient samples. Moreover, at a concentration of 3mg/disc, *(Azadirachta Indica)* neem extract showed overall highest activity against all the 5 patients and highest against the plaque of patient sample no 2 (Table-I).

Discussion

Recently many researchers have shown interest in Azadirachta Indica and proved that every part of the plant of neem is used medicinally. In a review5of International Journal of Herbal Medicine, investigated 120 species of plants from 46 families, which were being potentially exploited by the Indian population for oral health care, majority of these plant species were used as natural tooth brush. Certain trees were used for management of gum bleeding, tooth ache, sores in mouth and bad breath. Stem, Young Twigs, Leaves, Bark, Fruit, Spines, Seeds and latex were the parts of trees being exploited for oral health care. Plant-based traditional knowledge has become a recognized tool in search for new sources of drugs; it is clear that these herbal medicines can offer a platform for further research in dentistry.

Furthermore, It was also proved that the antimicrobial activity of Azadirachta indica, showed considerable antimicrobial activity against

selected endodontic pathogens.6 Neem bark is used as an active ingredient in a number of tooth paste and tooth powders. Neem bark has anti-bacterial properties. It is used to treat gingival problems and maintaining oral health in natural way. Neem bank are used as oral deodorant, tooth ache reliever and for cleaning of teeth. It also effective in viral infection of mouth, which is also a risk factor of core mouth ulcers and tooth decay. Neem oil shows significant anti-bacterial activity and has been suggested for use in treating dental plaque. It reduces plaque index and salivary bacterial count comparatively better than chlorhedine gluconate mouth wash.7 The present study also agree with these findings.

During the last few decades there has been an increasing interest in the study of medicinal plants and their traditional use in different parts of the world. Present literature documentation reveals that medicinal plants continue to play a major role in oral healthcare needs of Indian population. Hence there is an urgent need to conserve the biodiversity as well as the traditional knowledge by proper documentation and for further research in dentistry.

From the above experimental result, it can be concluded that of the selected plant specimens, the neem (Azadirachta Indica) extract showed the significant antimicrobial activity in general and in specific patients which is somehow dose dependent.

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