



## Effect of Two Herbal Mouthwashes on Gingival Health of School Children

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### ABSTRACT

This study aimed at determining the effect of indigenously prepared neem and mango chewing stick mouthwashes on plaque and gingival indices. A sample of 105 children aged 12-15 years was randomized into three groups, namely neem, mango, and chlorhexidine mouthwash groups. All the children were examined at baseline and gingival and plaque indices were recorded. Baseline scores for plaque and gingivitis were fair and moderate, respectively, in all the three groups and there existed no statistically significant difference among them. Ten millilitres each of herbal and chlorhexidine mouthwashes (0.2%) were administered according to the group allocation twice daily for 21 days. Indices were reassessed at 21 days (immediately after intervention) and at 1 month, 2 months, and 3 months after discontinuing the mouthwashes. Statistically significant reduction ( $P < 0.001$ ) in plaque index was found in all the three mouthwash groups at 21 days and at 1 month from discontinuing the mouthwash. Chlorhexidine additionally showed statistically significant reduction in plaque index at 2 months from discontinuing the mouthwash. Statistically significant reduction ( $P < 0.001$ ) in gingival index was found in all the three mouthwash groups at 21 days (immediately after discontinuing the mouthwash) and at 1 and 2 months from discontinuing the mouthwash. To conclude, all the three mouthwashes were effective antiplaque and antigingivitis agents. Chlorhexidine and neem possess equivalent efficacy in reducing plaque, while chlorhexidine has superior antigingivitis properties.

**Key words:** *Azadirachta indica*, Gingival index, *Mangifera indica*, Mouthwash, Plaque index

### INTRODUCTION

Research has linked oral microorganisms, particularly those with adherent biofilm properties, to clinically specific oral conditions such as dental caries, periodontal disease, and oral malodor.<sup>[1,2]</sup> Plaque reduction has been the hallmark of preventive dentistry since the advent

of antibiotics and the realization that bacteria are possible causative agents of the major dental diseases, caries, and periodontal disease.<sup>[3]</sup>

Mechanical hygiene procedures such as tooth brushing, interdental brushing, and dental floss are the key methods of plaque control. However, despite the potential for adequate mechanical plaque control, clinical experience and population-based studies

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demonstrate that such methods are not being employed sufficiently by large numbers of the population.<sup>[2,4]</sup>

Chemical methods of reducing plaque, such as mouthwashes, are less technically demanding alternatives to mechanical plaque control.<sup>[5]</sup> Chlorhexidine is the most popular mouthwash which has been recognized by the pharmaceutical industry as the positive control against which the efficacy of alternative antiplaque agents should be measured, and has earned its eponym of gold standard.<sup>[6]</sup> But its long-term usage may result in various side effects.<sup>[3]</sup> An effective substitute to chlorhexidine with all the good qualities and sans its unpleasant effects is highly desirable and has been long awaited.

Plants have been exploited by man for many centuries as sources of chemotherapeutic and other medicinal drugs due to the presence of various bioactive compounds. These herbal products are not only economical, but also have minimal side effects.

Brushing with neem and mango twigs and chewing neem leaves and seeds after a meal have been the traditional dental care practices in India. Stems of *Azadirachta indica* (neem) contain substances like nimbin and nimbidin which have anti-inflammatory and broad-spectrum antimicrobial activities.<sup>[7]</sup> The natural C-glucoside xanthone mangiferin, a phenolic compound, has been reported in various parts of *Mangifera indica* leaves, fruits, stem, bark, heartwood, and roots.<sup>[8-12]</sup> It is known to possess antioxidant, radioprotective, immunomodulatory, antitumor, anti-allergic, anti-inflammatory, antidiabetic, and antimicrobial properties.<sup>[13]</sup> Mangiferin has also demonstrated promising therapeutic potential both in the prevention and treatment of periodontitis.<sup>[14]</sup> *In vitro* studies indicate that neem and mango stick extracts are inhibitory to oral streptococci which are responsible for various oral diseases.<sup>[15-18]</sup> Literature review revealed very few *in vivo* studies worldwide assessing the effects of neem and mango stick extracts on plaque and gingiva. Hence, the present study was planned to evaluate the effect of neem and mango on plaque and gingival scores in high school children of Belgaum city.

## MATERIALS AND METHODS

The present study was a triple-blind randomized controlled field trial conducted to evaluate the effectiveness of two herbal mouthrinses (neem and mango) on plaque and gingival scores of 12-15-year-old school children in Belgaum city. Permission to conduct the study was obtained from the institutional review board of KLE VK Institute of Dental Sciences, Belgaum, Karnataka, India, Deputy Director of Public Instruction (DDPI), Belgaum, and the principal of the selected high school.

A pilot study was conducted on 10 people to determine the acceptability, palatability, and safety of the mouthwashes. The required sample size was estimated based on the difference in the plaque and gingival scores between the study and control groups. Sample size was calculated based on the minimum difference expected between the two groups, which was 0.7.

Two examiners were selected to ensure blind evaluation of the study participants. Examiner 1 (principal investigator) selected the schools, obtained permission from them, did primary screening (examination for inclusion and exclusion criteria, which included baseline clinical examination) and selection, collected baseline

data, and administered the mouthwashes for 21 days. Examiner 2 recorded the plaque and gingival scores after 21 days (immediately after the intervention) and 1 month, 2 months, and 3 months after discontinuing the mouthwash. Examiner 2 was blinded to the type of mouthwashes administered. The statistician remained blinded regarding the subject allocation to the three groups. Both the examiners were trained and calibrated before the start of study in the Department of Public Health Dentistry, KLE VK Institute of Dental Sciences, Belgaum under the guidance of a professor in order to limit the intra-examiner and inter-examiner variability. They were reassessed for satisfactory agreement at various time intervals during the clinical examinations. Recording assistants were trained in documenting the readings accurately. The intra-examiner and inter-examiner variabilities were calculated using Kappa statistics. Inter-examiner and intra-examiner variability (Kappa) for plaque index and gingival index ranged from 0.8 to 0.9 and from 0.7 to 0.8, respectively, during all the assessments.

For obtaining the study sample, two-stage random sampling was done. In the first stage, a list of all the schools was obtained from DDPI, Belgaum. From these schools, one school was selected by lottery method. Written informed consent was obtained from the parents of all the children examined. Children were free to withdraw from the study at any point during the study period.

During the initial phase of study (before selecting the sample), a 29-item self-designed combination of closed and open-ended questionnaire and assessment form was prepared to collect information regarding socio-demographics, oral hygiene practices, and food habits from all the children aged 12-15 years. All the children were also clinically examined for the inclusion and exclusion criteria, as mentioned later. This form was divided into five parts:

- First part (13 questions) pertained to socio-demographic data
- Second part (9 questions) dealt with self-reported oral hygiene practices of children
- Third part (4 questions) was concerned with food habits
- Fourth part (3 questions) was concerned with their use of mouthwashes, medication, and presence of any systemic, chronic diseases
- Fifth and last part of this form was designed to record DMFT, plaque and gingival indices.

Inclusion and exclusion criteria used were as follows.

### Inclusion criteria

- Free from systemic diseases
- Gingival scores were moderate and plaque scores were fair according to the plaque and gingival indices proposed by Silness and Loe<sup>[19]</sup> and Loe and Silness,<sup>[20]</sup> respectively
- DMFT scores between 3 and 6
- Should not have used mouthwashes for the last 1 month
- All the index teeth should be completely erupted
- Parents should give informed consent.

### Exclusion criteria

- Suffering from diseases which might affect the salivary flow
- History of antibiotic therapy in the previous 1 month till the start of the study

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