

Original Research Article

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## Anti-plaque and Anti-gingivitis Effect of Herbal Mouthwash

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### ABSTRACT

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Herbal mouthwashes are cost-effective and relatively safe. Chlorhexidine is regarded as the "gold standard" anti-plaque agent. The aim of this study was to evaluate efficacy of herbal mouthwashes in comparison with chlorhexidine mouthwashes. Total 60 participants were randomly divided into two groups: A (Chlorhexidine mouthwash), B (Herbal mouthwash). These groups were asked to use with their respective mouthwash twice daily for 25 days after brushing. Individuals were given the same type of soft bristle toothbrush and whitening toothpaste. Data is analyzed utilizing the Gingival Index (GI), Plaque Index (PI). There was statistically significant reduction in plaque and gingival scores and microbial load after 25 days in both the groups A and B. Though herbal mouthwashes can maintain good oral hygiene on daily basis, but still it is less effective than chlorhexidine mouthwash during treatments such as gingivitis, periodontitis, trauma. Both Chlorhexidine and herbal mouthwash reduce plaque and gingivitis. Although Chlorhexidine showed more efficacy than herbal, Herbal mouthwash can be an alternative for chlorhexidine if we considered its side effects.

### Introduction

Dental plaque is host associated matrix enclosed biofilm with different bacterial populations, which adhere to tooth surfaces or other surfaces. Their end products bring about initiation of tissue destruction and alveolar bone loss. Effective plaque control measures will bring about change in quantity and

composition of plaque biofilm (1). Bacteria in the subgingival area are organized in a complex microbial biofilm. These biofilms are extraordinarily persistent, difficult to maintain, and play a vital role in plaque and periodontal disease and its progression. Thus, elimination of these bacterial biofilms is the priority of the therapy (2).

The chemical control of plaque includes organic or inorganic chemicals, which inhibit the accumulation, growth and survival of microbiota and debris. The main advantage of chemicals and their action depends on increased concentration in gingival crevicular fluid and saliva, which improves gingival health (3). Chemical plaque control has been found to augment mechanical plaque control procedures. Mouthwashes provide a method of depositing an active material for slow release in the mouth. This helps in maintaining an effective concentration of the material in the mouth over a considerable period following its use.

There are many such active materials which are conventionally administered by mouthwashes, for example, anti-inflammatories, fluorides, desensitizers, deodorants, and antimicrobials. Commercial interest in mouth washes has been intense due to their effectiveness in reducing halitosis, build-up in dental plaque, and the associated severity of gingivitis, in addition to disinfecting the tongue. From this perspective, the utilization of antimicrobial mouthwashes, as antiplaque agents, has been considered a useful adjunct to oral hygiene.

There are two types of mouthwash - chemical and herbal. Chlorhexidine mouthwash comes under chemical mouthwash. Many of the plant extracts has an anti-microbial property which is effectively used in maintaining good oral hygiene.

Chlorhexidine digluconate has been the most effective plaque inhibitor or against which other antiplaque agents is measured. But there are side-effects associated with chlorhexidine, such as staining of teeth, altered taste sensation, and supragingival calculus formation in some patients when used over a long period. As a result, there is an increased interest in research for newer formulations.

The relative safe nature of herbal extracts has led to their use in several fields of medicine. Natural herbs such as triphala, tulsi patra, neem, clove oil, pudina, and many others are used as single or in combination have been scientifically proven to be safe and effective medicine against oral health problems such as effects (4, 5).

This study aimed to evaluate the antiplaque effect of the herbal mouthwash in comparison to Chlorhexidine mouthwash as gold standard.

## **Materials and Methods**

### **Study design and population**

The study protocol was approved by the Ethics Committee. The study was conducted in King Khalid hospital, Hafr Elbatin, Saudi Arabia trial. The study duration was 25 days. A written informed consent was obtained from all subjects before the initiation of the study.

A total of 60 participants were included in the study. Male or female non-smokers aged between 18 and 35 years with a Plaque Index (PI) (7) and Gingival Index (GI) (8) score of >1.5 were included in the study.

The participants were randomly classified to two groups: The test group A ( $n = 30$ ) in which participants were given the herbal mouthwash, the gold standard group B ( $n = 30$ ) in which the participants were given a commercially available chlorhexidine mouthwash.

The inclusion criteria were participants had a minimum of 20 teeth and did not have diabetes, hepatic or kidney disease, rheumatoid arthritis, or any other systemic condition contains dictating participation in the study. Exclusion criteria included

individuals who had received chronic treatment with any medication like steroids, nonsteroidal anti-inflammatory drugs (NSAIDs), antibiotics, or with a history of periodontal therapy in the last 6 months.

### **Clinical procedure**

All the participants underwent oral prophylaxis procedure at the first visit. Participants were also given proper oral hygiene instructions including standard brushing technique with a toothpaste and toothbrush (provided to the participants), twice daily, during the study period. Participants were instructed to use the respective mouth wash twice daily for 25 days (10 ml twice daily for 30 s). Participants were instructed not to drink, eat, or rinse for 30 min after the use of mouthwash. The following indices were measured at 25 days: PI, (7) GI, (7) and Papillary Marginal Attachment (PMA) Index (8). At each visit, each subject was also queried in a non specific manner to record any adverse events and the oral hygiene instruction was re-enforced.

### **Microbiological analysis**

Plaque samples were collected at the baseline and at 25 days for microbiological evaluation. Sterile curette or a scaler was used to collect the plaque samples which were transported to the laboratory in thioglycollate broth for microbiological analysis. A quantitative analysis was conducted for the total aerobic and anaerobic bacteria. One loopful of sample was then inoculated onto blood agar supplemented with Hemin (5 µg/ml) and Vitamin K (10 µg/ml). Blood agar plates used for anaerobic isolation were prepared with Brucella agar base. Plates were incubated in anaerobic conditions for 3-5 days at 37°C. The anaerobiosis was carried out in the jar with "Internal Gas Generating system." After 72 h of incubation at 37°C, the anaerobic jar

was opened. The plates were examined for the presence of colonies. When the colonies appeared on the plates; the microorganisms were then identified under the microscope.

### **Data analysis**

The mean and standard deviation were calculated for the clinical parameters (GI, PI, and PMA Index) and microbiological parameters [colony-forming units (CFU)/ml] of the test and control groups. Intra-group comparison was done using Student's paired t-test, while inter-group comparison was done using Student's and antiplaque effects of herbal mouthwash containing with commercially available Chlorohexidine mouth wash unpaired t-test. The level of significance was 0.05. The MedCalc software was used to perform the data analysis.

### **Results and Discussion**

Comparison of the two groups with respect to demographic conditions showed no significant difference between the two groups at the baseline. Demographic and baseline characteristics were similar across both the study groups. The results of the present study showed that the use of chlorhexidine rinse and herbal extract mouthwash along with mechanical methods both reduced the GI in patients, but this reduction in GI was more considerable in chlorhexidine than the herbal mouthwash group, and their differences were statistically significant.

In both groups A and B, there was highly significant reduction mean plaque and gingival scores ( $P < 0.001$ ). Regarding taste acceptability in all the thirty subjects in Group B reported the taste of herbal mouthwash as Good. Regarding reported burning sensation of the mouth, Group B subjects did not experience any such symptom (Table 1).

At baseline, there was no statistically significant difference in the total microbial load (CFU/ml) between the group A and the group B. In both the groups, there was a highly significant reduction in the total

microbial load (CFU/ml) on Day 25. However, on Day 25, the microbial load in the group A was slightly lesser than in the control group. This difference was statistically significant ( $P < 0.001$ ) (Table 2).

**Table.1** In the groups A and B, there was highly significant reduction in mean plaque and gingival scores

Variables		Group A	Group B
Gingival Index	Before intervention	1.62 ± 0.3	1.6 ± 0.41
	After intervention	0.56 ± 0.4	0.62 ± 0.36
Plaque Index	Before intervention	1.68 ± 0.33	1.7 ± 0.23
	After intervention	0.51 ± 0.24	0.54 ± 0.41
Taste		Acceptable	Acceptable
Burning sensation		1	--
Dryness of mouth		2	--

**Table.2** In the groups A and B, there was highly significant reduction in mean of bacterial load CFU/ml

Variables		Group A	Group B
CFU/ml	Before intervention	97.3 ± 0.42	97.26 ± 0.52
	After intervention	91.2 ± 0.51	9.2 ± 0.23

Bacterial plaques have been proven to have a role in the etiology of dental caries and periodontal diseases. The use of mouthwashes as disinfectants can help mechanical methods to reduce plaque (9).

Mouthwashes with antimicrobial effects perform this task using three methods, which include apoptosis, inhibition of bacterial growth and/or cell metabolic inhibition: and depending on their concentration their bactericidal and/or bacteriostatic properties vary (10). Although chlorhexidine has antimicrobial activity and good choice for effective plaque control by dentist in clinics, it cannot be used for long duration because it has various side effects such as taste alteration, supragingival calculus formation and desquamation of oral mucosa and also restricted usage in pediatric patients (11).

Herbal medications are being introduced for the prevention and treatment of oral conditions to enable their wide spread use among all communities and is beneficial especially to those of low socioeconomic status. The cost-effectiveness of these products, along with the non-significant side-effects, guarantees a safe option to the current load of medications available.

The study attempted to demonstrate the antiplaque and antigingivitis efficacy of a newly herbal mouthwash compared to the Chlorhexidine mouthwash over a 25-day period. Many studies have been conducted in comparison of chlorhexidine with herbal mouthwash. Although the herbal mouthwashes are less effective than chlorhexidine mouthwash, it can be used as a good oral prophylaxis as it does not have any adverse effects. Many herbal mouthwashes

contain anti-inflammatory, anti-microbial, and antioxidant properties which enhances oral hygiene comparatively with chlorhexidine mouth wash (12).

In the current study, both Chlorohexidine and herbal mouthwash significantly reduced the plaque and gingivitis ( $P < 0.001$ ). Chlorhexidine mouthwash is more effective in reducing *S. mutans* in plaques indicates the high antimicrobial activity of chlorhexidine mouthwashes (12). Chlorhexidine (0.2%) as the gold standard for oral health care has been accepted. There are some studies that confirmed the beneficial effects of Herbal extracts and *A. vera* gel on oral cariogenic bacteria in vitro and in vivo conditions, separately (13, 14, 15). The newly formulated mouthwash contained a new combination of phytochemicals, namely TTO, clove, and basil. TTO (*M. alternifolia*) shares a similar range of antimicrobial activity with chlorhexidine, having antibacterial, antifungal, and antiviral properties (16). Clove oil is known for its analgesic, local anesthetic, anti-inflammatory, and antibacterial effects (17).

The microbiological studies showed that herbal mouthwashes killed a wide range of microorganisms within 30s (18). It penetrates the plaque biofilm and exerts a bactericidal activity to the embedded bacteria (19, 20). It kills microorganisms by disrupting their cell walls and inhibiting their enzyme activity (21, 22). Bacteria are prevented from aggregating with Gram-positive bacteria, and bacterial multiplication is slowed (21). As a result, the bacterial load is reduced with slower plaque maturation and a decrease in plaque mass and pathogenicity. The above mechanism of action of herbal mouthwash is also suggested in the present study with the reduction of the scores.

Though this study supports the use of chlorhexidine mouthwashes it should be

considered that the side effects of chlorhexidine are well documented but the same is not so in the case of herbal mouthwashes. additional long-term longitudinal trials are required to further assess the efficacy and safety of the mouthwashes and it to be utilized as an adjuvant to periodontal therapy.

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