

# Comparison of Anti-Bacterial Activity between Commercial and Herbal Mouthwash

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Running Title: Anti-Bacterial Activity between Commercial and Herbal Mouthwash

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## Abstract

### Aim

Mouthwash, mouth rinse, or mouth bath is a liquid which is held in mouth and swilled around the oral cavity by contraction of the peri-oral muscles with movement of head, and the liquid is bubbled at the back of the mouth. The aim of the study is to compare the antibacterial activity of commercially available and Herbal mouthwash.

### Materials and Methods

This study is to compare the antibacterial activity of commercially available and herbal mouthwash in a sample of 20 individuals.

### Results

Oral cavity consists of oral flora and other microbes. Commercially available and herbal mouthwashes exhibit different antimicrobial properties. Overall percentage reduction of bacteria after usage of chlorhexidine was found to be 85.5% of bacteria in oral cavity, whereas herbal mouthwash had the percentage reduction of 74.1% of bacteria.

### Conclusion

To Recommend the mouthwash to patients based on anti-bacterial activity.

**Keywords:** Antibacterial, Chlorhexidine, Herbal, Microbes, Mouthwash.

## Introduction

Duthwash mixture of decoct extracted from the olive tree leaves, milk, wine and oil, pomegranate peelings, nutgalls and vinegar. This was how ancient mouth washes were prepared using traditional methods and herbs [1]. It was observed that in the 18<sup>th</sup> century urine served as a key active ingredient due to the presence of ammonia that rendered the oral cavity free from oral pathogens especially Sulphur producing organisms [2].

Ideally, it is required that any antimicrobial/antiseptic agent used should be able to modify the oral environment by being specifically effective against pathogens without altering the normal flora. There are several types of mouthwash available in the market today worldwide. Many of these mouthwashes have not been tested adequately, and the information is lacking as to when and how to use these agents for maximum benefit. Chlorhexidine (CHX) digluconate has been the agent of choice as an antiplaque agent when compared to others and is considered as the gold standard. However, due to its side effects, its acceptance by patients can be limited, especially when a longer period of use is recommended.

Mouthwashes are often prescribed in dentistry for prevention and treatment of several oral conditions. In the recent times the use of naturally occurring products what is otherwise known as grandmothers remedy are used on a large scale. This has now called for a newer age of mouth washes but is the new age mouth washes at par with the gold standard or even better than them this study investigates.

Commercial interest in mouthwashes has been intense and several newer products claim effectiveness in reducing the build-up of dental plaque, gingivitis and halitosis. As the number increases the questions that frequently arise is which one is better. Hence this study aimed to investigate the effects of chlorhexidine and herbal mouth rinses on controlling plaque and gingivitis effectively.

## Materials and Methods

0.12% chlorhexidine (Hexidine's) and Hiora herbal (Himalaya's) mouthwash are two mouthwashes used in our study. 20 Participants of age group between 18-25 were selected. Amount of 15 ml of each sample of mouth wash were given to 20 individuals in two categories consisting 10 each. They are instructed to swish and gargle the mouthwash inside mouth for 2 mins and then spat out. Saliva samples were collected from all 20 individuals prior to usage of mouthwashes as pre-testing sample. While, another set of salivary samples were collected after usage of mouthwashes as post testing sample. Both were collected in a 10ml sterile sputum container to avoid contamination. Both the samples are diluted in ratio of 1:80. Nutrient agar plates were used, and the salivary sample was inoculated for streak culture. After 24 hours microbiological analysis of total bacterial count was examined in both the samples before and after usage, and results were compiled by using SPSS software.

## Results

The results of present study show that the Chlorhexidine mouthwash had bacterial reduction as on [Table 1], with significant value of 0.000\*, and Herbal mouthwash had a bacterial reduction as on [Table 2], with significant value of 0.000\*. Overall percentage reduction of bacteria after usage of chlorhexidine was found to be 85.5% of bacteria in oral cavity, whereas herbal mouthwash had the percentage reduction of 74.1% of bacteria as mentioned in [Table 3].

CHLORHEXIDINE	MEAN VALUE + STANDARD DEVIATION (Bacterial count)	P- value
BEFORE	118720.0 ± 43782.5	0.000*
AFTER	17184.0 ± 15280.6	

Table 1 : Bacterial reduction in Group A before and after usage of Chlorhexidine

\*paired t-test, \*p-value ≤0.05 highly significant

HERBAL	MEAN VALUE + STANDARD DEVIATION (Bacterial count)	p- value
BEFORE	132920.0 ± 36695.6	0.000*
AFTER	34492.0 ± 20519.2	

Table 2 : Bacterial reduction in Group B before and after usage of Herbal mouth wash

\*paired t-test, \*p-value ≤0.05 highly significant

MOUTHWASH	REDUCTION (%)	p-value
CHLORHEXIDINE	85.52	0.000*
HERBAL	74.09	

Table 3 : The percentage reduction of bacteria in both mouth washes

\*paired t-test, \*p-value ≤0.05 highly significant

## Discussion

The results of the present study show that both the 0.12% chlorhexidine and Hiora herbal mouthwashes can cause inhibition of bacterial growth but there was a significant difference between both. Though present study showed that chlorhexidine mouthwash is slightly more effective in reducing the total bacterial count than herbal, long term usage might have greater impact on herbal products as it carries least side effect. According to studies that have been conducted on the effects of mouthwashes on oral microorganisms[3,4], the chlorhexidine mouthwash is the most superior amongst all mouthwashes. Most studies comparing chlorhexidine and other mouthwashes have shown the superiority of chlorhexidine, and only a few studied products have been able to compete with chlorhexidine in terms of antibacterial properties[5]. Streptococci are the main etiological agents of dental caries. Streptococci bind to the acquired pellicle leading to plaque formation. The removal of streptococci prevents disease extension[6]. Jarvinen et al. in their study on the susceptibility of *S. mutans* to chlorhexidine showed that *S. mutans* is resistant to antimicrobial agents[7]. Emilson explained that *S. mutans* had the greatest resistance to chlorhexidine mouthwash[8]. Even though chlorhexidine mouth wash is more significant than herbal, it still cannot completely destroy microorganisms, as it has few limitations on resistance of streptococcus mutants.

Recently, numerous studies have been conducted to verify the enormous wealth of medicinal plants. These herbal mouthwashes are gaining popularity as they contain naturally occurring ingredients called as Phytochemicals that achieve the desired antimicrobial and anti-inflammatory effects. Herbal formulations may be more appealing because they work without alcohol, artificial preservatives, flavours or colours.

Some salivary micro floras like *S. mutans* play an important role in initiation and progression of dental caries[9,10]. Although chlorhexidine has anti-microbial 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 paediatric patients[11]. A review demonstrated that, compared to herbal mouth rinse, chlorhexidine mouth rinse provided better results in its antimicrobial efficacy against *Streptococcus mutans*[12]. It also causes extrinsic staining while using beverages like tea and coffee. In a study, result shows that herbal mouthwash has got antimicrobial activity equal to the activity of conventional chlorhexidine mouth wash[13]. Many herbal mouthwashes contain anti-inflammatory, anti-microbial, and anti-oxidant properties.

Mixture of herbal extract from myrrh, Echinacea and chamomile inhibit the growth of *S. mutans* and *Actinomyces viscosus*. A. Vera mouthwash contains vitamin C, hyaluronic acid, and dermatan sulphate which are involved in collagen synthesis and hence relief swelling and bleeding gums. It has a similar anti-plaque action to chlorhexidine[14,15].

Chlorhexidine was also more efficient in improving gingival inflammation. Both chlorhexidine and herbal mouthwash were found to be helpful in reducing bleeding score, but results were not significant statistically.

Acacia catechu and *Mentha spicata* which reduce bleeding because of their astringent action. These results are consistent with other findings by Scherer et al 1998 who demonstrated that herbal mouthwash reduces gingival bleeding over a period of time[16].

It is suggested that the significant antibacterial efficacy of herbal mouthwash was found in this study and could be attributed due to the presence of polyphenols[17].

Maintaining good oral hygiene prevents most of the oral diseases. Oral hygiene habits among majority of the population include regular tooth brushing; but when mouthwash is used as an adjunct, it has positive synergistic effect in the oral cavity. *S. mutans* is a gram-positive facultative anaerobe which initiates dental caries by metabolizing sucrose to lactic acid using the enzyme glucanucrase, creating an acidic environment in the oral cavity and thus facilitating demineralization of the enamel. It utilizes sucrose to form a dextran-based polysaccharide that helps in adhering to tooth surface, thereby forming dental plaque. Over 50 strains of *S. mutans* have been isolated, out of which 12 different strains are known to cause dental caries.

The results of the present study indicate that both mouthwashes were effective, though Chlorhexidine showed better clinical improvement. Herbal mouthwash was found to be comparable to Chlorhexidine in reducing bleeding on probing. Thus, herbal mouthwash can be effectively used as an alternative to Chlorhexidine and can be prescribed for longer duration without any side effects in children. Till present, chlorhexidine mouthwash is considered as gold standard for the best plaque control agent[18].

Herbs, which are powerful healing agents, must be used appropriately. Herbs contain active ingredients that may interact negatively with prescribed medications or other remedies. It is wise, therefore, to consult a health-care professional in situations in which you question the appropriateness of the herb or its interaction with other remedies. The use of herbs in dentistry should be based on evidence of effectiveness and safety. The anti-bacterial activities could be enhanced if active components are purified and adequate dosage determined for proper administration. The present results therefore offer a scientific basis for traditional use of herbal mouth wash[19].

Chlorhexidine gluconate is a cationic bisbiguanide having low toxicity and broad-spectrum antibacterial activity. When used as a mouthwash, it has a flushing action; its effects in the oral cavity are attributed to its lethal effects on the bacteria. It results in membrane disruption of the bacteria, causing a concentration-dependent growth inhibition and cell death. Secondary interactions leading to inhibition of proteolytic and glycosidic enzymes are also significant. The cationic nature of chlorhexidine helps it to bind to the tooth structure and oral mucosa, reducing pellicle formation and increasing substantivity through controlled release of the agent. It strongly inhibits plaque regrowth and prevents gingivitis[20].

The use of a particular genre of mouthwash continues to be a debatable argument. In the recent times the use of herbal mouth washes is on the rise due to the spread in the awareness of the effect of complementary and alternative medicine. It is also due to the much stronger belief that the alternative therapy is with less side effects. The marked products lacked labels furnishing detailed history of the composition of the ingredients and it was also shown that they were contaminated with other natural contaminants and heavy metals making it suspicious for future use.

Chlorhexidine as with other drugs is not devoid of side effects, it includes increased staining of the natural teeth and altered taste sensation associated with prolonged use. Though this meta-analysis supports the use of herbal mouth rinses it should be taken into account that the side effects of chlorhexidine are well documented but the same is not so in the case of herbal mouth rinses. Hence it is warranted that further studies need to be undertaken with a more emphasis on a gold standard comparison against the preferred herbal products in order to show the effectiveness and hence prove its merit. More clinical trials are to be carried out to show the toxic effect of the tested product.

## Conclusion

The present study shows that chlorhexidine has more anti-bacterial activity than the herbal mouthwash, though the fact that many documented evidence is not available for herbal mouthwash on its efficacy. The present situation supports the use of chlorhexidine which still complies with its standards and hence more studies on herbal products need to be done with more number of clinical and randomized control trials on a larger scale for usage and efficacy.

## Conflict of Interest

Nil

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