

Efficacy of eucalyptus oil over chlorhexidine mouthwash in dental practice

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ABSTRACT

Background: Mouthwashes are often prescribed in dentistry for prevention and treatment of several oral conditions. Eucalyptus oil has many therapeutic properties such as antimicrobial effect and anti-inflammatory effect. It possesses strong cytotoxic effect and also have antibacterial effect against several pathogens. However, its efficacy as a mouthwash in oral hygiene maintenance needs to be investigated further. **Aim:** The aim of the present study was to compare the therapeutic effect of chlorhexidine and eucalyptus oil mouthwashes in oral hygiene maintenance. **Materials and Methods:** A total of 74 human subjects selected were randomly allocated into two groups, Group I and Group II. The subjects in Group I were instructed to use 10 ml of chlorhexidine mouthwash for 14 days and Group II were instructed to use eucalyptus oil mouthwash for 14 days twice daily. Oral hygiene status was assessed by measuring the plaque and gingival scores. The plaque formation was assessed using erythroline disclosing agent, and their scores were recorded using the Loe and Silness index and gingival index was calculated using Silness and Loe index at the baseline and 14 days. The results were then statistically analyzed. **Results:** A decrease of plaque level was seen in both mouthwashes without any adverse effects. The plaque index and gingival index scores for Group I and Group II after 14 days were 1.012 ± 0.25 , 1.008 ± 0.27 and 1.254 ± 0.58 , 1.233 ± 0.72 respectively. There was no statistical significant difference between chlorhexidine and eucalyptus mouthwashes ($P > 0.05$). **Conclusion:** An effective alternative to chlorhexidine, eucalyptus oil, can be used as mouthwash for effective oral hygiene maintenance. The present results, therefore, offer a scientific basis for traditional use and awareness about eucalyptus oil mouthwash.

KEY WORDS: Chlorhexidine, Efficacy, Eucalyptus oil, Mouthwash

INTRODUCTION

Many herbal remedies have been used for oral health for hundreds of years in the form of powders, lambatives, decoctions, medicated oils, medicated ghees, confections, and wines.^[1,2] Increased recent use of herbal remedies seems to come from the public view that natural products are harmless or at least have fewer side effects than regular drugs. Eucalyptus oil is one such herbal drug which is widely used for a number of ailments. A mouthwash is a medicated liquid which is held in the mouth and swished by the action of perioral musculature to eliminate the oral pathogens.^[3] The earliest reports of usage formulated a mouthwash mixture extracted from the olive tree

leaves, milk, wine and oil, pomegranate peelings, nutgalls, and vinegar.^[4]

Since then, a variety of herbal remedies are available as eucalyptus oil, neem, clove oil, mint, ajwain, white oak bark, horsetail herb, plantain leaf, aloe vera, organic *Echinacea angustifolia* root, myrrh gum, organic lobelia herb and seed, organic peppermint leaf, wildcrafted goldenseal root, clove essential oil, peppermint essential oil, and tea tree essential oil.^[5] The breakthrough was obtained in the 1960s when Harald Loe demonstrated that a chlorhexidine compound could prevent dental plaque buildup.^[6] Since then, commercial interest in mouthwashes has been intense and several newer products claim effectiveness in reducing the buildup of dental plaque, gingivitis, and halitosis. The number of mouthwash variants in the world has grown from 15 in 1970 to nearly about 113 in 2012.^[7] As the number of mouth

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rinses have increased rapidly over a period of time the questions that arises frequently is which one is better mouth rinse among them. It has also 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 the gold standard. However, it cannot be used on a long-term basis because of various side effects such as brown discoloration, taste perturbation, oral mucosal lesions, parotid swelling, enhanced supragingival plaque formation, and sometimes unacceptable taste.^[8]

The herbal oils can be effective substitutes for chlorhexidine by virtue of their less reported side effects, no known allergy, biological safety, and easy availability. Eucalyptus oil is one such herbal remedy documented with antimicrobial and anti-inflammatory effects. Nevertheless, their clinical effectiveness as mouthwash is scarcely reported in the literature and needs to be explored further.

Aim

The aim of the present study was to compare the therapeutic effect of chlorhexidine and eucalyptus oil mouthwashes in plaque control and oral hygiene maintenance.

MATERIALS AND METHODS

This *in vivo*, experimental randomized control trial was approved by the Institutional Ethical Committee, and informed consent was obtained from all the study participants. 74 human subjects with no evidence of dental caries and periodontal disease were selected and randomly allocated into two groups, Group I where eucalyptus oil mouthwash was prescribed and Group II where chlorhexidine gluconate mouthwash was prescribed to be used twice daily for a period of 5 min. The outcome measures of oral hygiene were the plaque and gingival index scores, respectively. The data were collected at the baseline and 14 days. The plaque was disclosed using erythrosine disclosing agent, and their scores were recorded using the Loe and Silness index and Silness and Loe index was used to calculate the gingival index. The dental undergraduate students with no dental caries, periodontal disease, history of any dental treatment, antibiotic, or anti-inflammatory drug therapy for the past 3 months were included in the study. Those students who had used antibiotics or mouthwash for 5 consecutive days or corticosteroids in the past 30 days were excluded from the study. Furthermore, those who had undergone professional measures to remove plaque and calculus in the past 15 days and did not give consent for the clinical trial were excluded. A sampling frame was thus prepared. Random allocation of mouth rinses using the lottery method was done.

Group I ($n = 37$) was given chlorhexidine (0.12%) and instructed to use 10 ml twice a day for 5 min for 14 days.

Group II ($n = 37$) was given eucalyptus mouthwash and instructed to use 10 ml twice a day for 5 min for 14 days.

A single examiner, who was trained and calibrated to record the plaque and gingival scores, recorded the findings at all two intervals and for both the groups. There were no dropouts from the study, and the participants reported no adverse effects with the mouthwashes.

Statistical Analysis

The data were analyzed using SPSS version 17. Descriptive statistics followed by independent sample *t*-test were used for analysis. $P < 0.05$ was considered to be statistically significant.

RESULTS

A significant decrease was noted in the plaque in both the herbal and chlorhexidine groups at 14 days ($P < 0.05$). There was a progressive decrease in the plaque in both the groups at 5% level of significance. Table 1 shows the total number of participants (n) in both Group I and Group II which include 19 males and 20 females in Group I and 18 males and 17 females in Group II. Age range of the participants was between 18 and 30 for both the groups. Table 2 shows the baseline plaque index score for Group I to be 1.125 ± 0.16 , and after 14 days, it was 1.125 ± 0.16 . Baseline plaque index score for Group II was 1.123 ± 0.24 , and after 14 days, it was 1.008 ± 0.27 . *t* and *P* values were 1.1767 and 0.1365, respectively. No statistically significant difference was observed between both the groups after 14 days with $t = 1.1767$ and $P = 0.1365$. Table 3 shows the baseline gingival index score for Group I to be 1.485 ± 0.34 , and after 14 days, it was 1.254 ± 0.58 . Baseline gingival index score for Group II was 1.483 ± 0.42 , and after 14 days, it was 1.233 ± 0.72 with *t* and *P* value 0.32 and 0.776, respectively. No statistically significant difference was observed between both the groups after 14 days ($t = 0.32$ and $P = 0.776$).

DISCUSSION

Herbal extracts have been of particular interest these days owing to various side effects associated with conventional modes of treatment.^[9] It is generally accepted that the formation of dental plaque at the tooth/gingiva interface is one of the major causes of gingival inflammation and caries. Plaque accumulation and oral microorganisms are the main predisposing factors to various orodental infections and targeting these, therefore, can prove to be an effective way of combating these diseases. The best methods to remove harmful plaque from teeth are to brush teeth regularly and appropriately and

Table 1: Demographic characters

Participants	Group I	Group II
Number (n)	37	37
Males	19	20
Females	18	17
Age	18-30	18-30

Table 2: Plaque index score

Groups	Baseline	After 14 days	t value	P value
Group I	1.485±0.34	1.254±0.58	0.32	0.776
Group II	1.483±0.42	1.233±0.72		

Table 3: Gingival index score

Groups	Baseline	After 14 days	t value	P value
Group I	1.125±0.16	1.012±0.25	1.1767	0.1365
Group II	1.123±0.24	1.008±0.27		

the use of antimicrobial mouthwashes.^[10] There is an increase in the use of mechanical and chemical plaque control agents to prevent dental caries and periodontal disease. Various chemical mouthwashes are available in the market but are associated with side effects such as immediate hypersensitivity reactions, toxicity, and tooth staining.^[11] Alternative medicines may be developed from medicinal plants as these plants contain natural phytochemicals and hence can replace synthetic drugs. In the recent times, the use of herbal mouthwashes 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.^[12]

The use of essential oils for the prevention and treatment of infection has been gaining popularity over the past decade.^[13] Eucalyptus oil has antibacterial properties and has a long history of use against the effects of colds, influenza, other respiratory infections, rhinitis, and sinusitis and suggests that 47 compounds were identified in the essential oils, and the main constituents of the essential oils were eucalyptol.^[14] A study done by Rahman *et al.* supports the use of tea tree oil which is an essential oil, as an anti-plaque agent in comparison with chlorhexidine.^[15] 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.^[16] According to recent study, the minimum inhibitory concentration of herbal and conventional chlorhexidine mouthwash for *Streptococcus mutans* was 7.81 and 3.9 ($\mu\text{g/mL}$), respectively. The minimum bactericidal concentration of herbal and conventional chlorhexidine mouthwash for *S. mutans* was 15.62 and 3.9 ($\mu\text{g/mL}$), respectively,

in which the result shows that eucalyptus oil mouthwash has got antimicrobial activity equal to the activity of conventional chlorhexidine mouthwash.^[17] A few other studies were conducted earlier which did not show similar results. A study by Nagappan *et al.* showed that compared to herbal mouth rinse, chlorhexidine mouth rinse provided better results in its antimicrobial efficacy against *S. mutans*.^[18] Weijdan *et al.* said that chlorhexidine mouthwash was the first choice and the most reliable alternative for plaque control can be essential oil. There was no significant difference observed between chlorhexidine and eucalyptus oil with respect to gingivitis.^[19]

Pourabbas *et al.*^[20] also found a significant reduction in plaque scores with the herbal mouthwash with chamomile extracts. Mullaly *et al.*,^[21] Pannuti *et al.*,^[22] and George *et al.*^[23] also found the antiplaque effect of herbal mouthwash compared to conventional mouthwash. The antimicrobial effect of *Ocimum* was also supported by the *in vitro* study done by Agarwal *et al.*^[24] who found significant inhibition zones associated with various concentration of *Ocimum*. Grossman *et al.*^[25] and Moran *et al.*^[26] on the contrary could not relate to this study as they found chlorhexidine to have better effect on plaque control than extracts of chamomile. Dalirsani *et al.*^[27] found chlorhexidine to have a better antimicrobial effect. Eucalyptus oil mouthwash may act as a good and cost-effective oral hygiene product. Hence, this study aimed to investigate the effects of chlorhexidine and herbal mouthwash (eucalyptus oil) on controlling plaque and gingivitis effectively.^[28]

The present study has showed that both eucalyptus and chlorhexidine mouthwashes have very potent antimicrobial effects in decreasing the plaque formation. However, when the efficacy between both these agents was compared, there was no statistically significant difference between them. No side effects were reported by the participants in the study. The participants in this study were of relatively good health with optimum oral hygiene, and the effectiveness of these mouthwashes in periodontally compromised conditions, severe dental caries, and oral lesions needs to be investigated further. Furthermore, further studies can be done with longer follow-up periods to understand the clinical performance of these mouthwashes better.

CONCLUSION

The present study concluded eucalyptus oil mouthwash was equally effective as 0.12% chlorhexidine mouthwash in controlling plaque formation and maintenance of oral hygiene. Since eucalyptus oil is more biocompatible and advantageous than chemical

antimicrobial agents, it can be routinely prescribed in clinical practice.

REFERENCES

- Little JW. Complementary and alternative medicine: Impact on dentistry. *Oral Surg Oral Pathol Oral Radiol Endod* 2004;98:137-45.
- Halkes SB. Safety issues in phytotherapy. In: Ernst E, editor. *Herbal Medicine: A Concise Overview for Professionals*. Oxford: Butterworth & Heinemann; 2000. p. 82-100.
- Marsh PD. Dental plaque as a biofilm: The significance of pH in health and caries. *Compend Contin Educ Dent* 2009;30:76-8, 80, 83.
- Ceylana A, Daniel Y. Antimicrobial activity of spices. *J Rapid Methods Autom Microbiol* 2004;12:1-55.
- Rashad JM. Effect of water cinnamon extract on *Mutans streptococci*, in comparison to chlorhexidine gluconate and zac. *Mustansiria Dent J* 2008;5:250-60.
- Rani P, Khullar N. Antimicrobial evaluation of some medicinal plants for their anti-enteric potential against multi-drug resistant *Salmonella typhi*. *Phytother Res* 2004;18:670-3.
- Ooi LS, Li Y, Kam SL, Wang H, Wong EY, Ooi VE. Antimicrobial activities of cinnamon oil and cinnamaldehyde from the Chinese medicinal herb *Cinnamomum cassia* Blume. *Am J Chin Med* 2006;34:511-22.
- Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by the chloromethyl analogue of vitamin C. *J Periodontol* 1970;41:41-3.
- Rasooli I, Shayegh S, Astaneh S. The effects of *Mentha spicata* and *Eucalyptus camaldulensis* essential oils on dental biofilm. *Int J Dent Hyg* 2009;7:196-203.
- Hardel DK, Laxmidhar S. Review on phytochemical and pharmacological of *Eucalyptus Globulus*-A multipurpose tree. *Int J Res Ayurveda Pharm* 2011;2:1527-30.
- Barnett ML. The rationale for the daily use of an antimicrobial mouth rinse. *J Am Dent Assoc* 2006;137:16S-21.
- Fischman SL. The history of oral hygiene products: How far have we come in 6000 years? *Periodontology* 2000 1997;15:7-14.
- Vijayaalakshmi LG, Geetha RV. Conventional mouth wash in use in reducing *Streptococcus mutans* - An *in vitro* study. *J Pharm Sci Res* 2015;7:485-6.
- Warnke PH, Sherry E, Russo PA. Antibacterial essential oils in malodorous cancer patients: Clinical observations in 30 patients. *Phytomedicine* 2006;13:463-7.
- Rahman B, Alkawas S, Al Zubaidi EA, Adel OI, Hawas N. Comparative antiplaque and antigingivitis effectiveness of tea tree oil mouthwash and a cetylpyridinium chloride mouthwash: A randomized controlled crossover study. *Contemp Clin Dent* 2014;5:466.
- Rath SK, Singh M. Comparative clinical and microbiological efficacy of mouthwashes containing 0.2% and 0.12% chlorhexidine. *Dent Res J* 2013;10:364-9.
- Sherry E, Boeck H, Warnke PH. Topical application of a new formulation of eucalyptus oil phytochemical clears methicillin-resistant *Staphylococcus aureus* infection. *Am J Infect Control* 2001;29:346.
- Nagappan N, John J. Antimicrobial efficacy of herbal and chlorhexidine mouth rinse-a systematic review. *IOSR J Dent Med Sci* 2012;2:5-10.
- Weijdan FA, Van der Weijden FA, Van der Sluijs E, Ciancio SG, Slot DE. Can chemical mouthwash agents achieve plaque/gingivitis control?. *Dent Clin North Am* 2015;59:799-829.
- Pourabbas R, Delazar A, Chitsaz MT. The effect of german chamomile mouthwash on dental plaque and gingival inflammation. *Int J Pharm Res* 2005;2:105-9.
- Mullaly BH, James JA, Coulter WA, Linden GJ. The efficacy of an herbal-based toothpaste on the control of plaque and gingivitis. *J Clin Periodontol* 1995;22:686-9.
- Pannuti CM, Mattos JP, Ranoya PN, Jesus AM, Lotufo RF, Romito GA. Clinical effect of a herbal dentifrice on the control of plaque and gingivitis: A double-blind study. *Pesqui Odontol Bras* 2003;17:314-8.
- George J, Hegde S, Rajesh KS, Kumar A. The efficacy of a herbal-based toothpaste in the control of plaque and gingivitis: A clinic-biochemical study. *Indian J Dent Res* 2009;20:480-2.
- Agarwal P, Nagesh L, Krishnan M. Evaluation of the antibacterial activity of various concentrations of tulsi (*Ocimum sanctum*) extract against *Streptococcus mutans*: An *in vitro* study. *Indian J Dent Res* 2010;21:357-9.
- Grossman E, Meckel AH, Isaacs RL, Ferretti GA, Sturzenberger OP, Bollmer BW, et al. A clinical comparison of antibacterial mouthrinses: Effects of chlorhexidine, phenolics, and sanguinarine on dental plaque and gingivitis. *J Periodontol* 1989;60:435-40.
- Moran J, Addy M, Roberts S. A comparison of natural product, triclosan and chlorhexidine mouthrinses on 4-day plaque regrowth. *J Clin Periodontol* 1992;19:578-82.
- Dalirsani Z, Aghazadeh M, Adibpour M, Amirchaghmaghi A, Pakfetrat A. *In vitro* comparison of the antibacterial activity of ten herbal extracts against *Streptococcus mutans* with chlorhexidine. *J Appl Sci* 2011;11:878-82.
- Parwani SR, Parwani RN, Chitnis PJ, Dadlani HP, Prasad SV. Comparative evaluation of anti-plaque efficacy of herbal and 0.2% chlorhexidine gluconate mouthwash in a 4-day plaque regrowth study. *J Indian Soc Periodontol* 2013;17:72.

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