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ORIGINAL RESEARCH

The Effect of Coconut Oil pulling on *Streptococcus mutans* Count in Saliva in Comparison with Chlorhexidine Mouthwash

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ABSTRACT

Objectives: Oil pulling is an age-old practice that has gained modern popularity in promoting oral and systemic health. The scientific verification for this practice is insufficient. Thus, this study evaluated the effect of coconut oil pulling on the count of *Streptococcus mutans* in saliva and to compare its efficacy with that of Chlorhexidine mouthwash: *in vivo*. The null hypothesis was that coconut oil pulling has no effect on the bacterial count in saliva.

Materials and methods: A randomized controlled study was planned and 60 subjects were selected. The subjects were divided into three groups, Group A: Study Group: Oil pulling, Group B: Study Group: Chlorhexidine, and Group C: Control Group: Distilled water. Group A subjects rinsed mouth with 10 ml of coconut oil for 10 minutes. Group B subjects rinsed mouth with 5 ml Chlorhexidine mouthwash for 1 minute and Group C with 5 ml distilled water for 1 minute in the morning before brushing. Saliva samples were collected and cultured on 1st day and after 2 weeks from all subjects. Colonies were counted to compare the efficacy of coconut oil and Chlorhexidine with distilled water.

Results: Statistically significant reduction in *S. mutans* count was seen in both the coconut oil pulling and Chlorhexidine group.

Conclusion: Oil pulling can be explored as a safe and effective alternative to Chlorhexidine.

Clinical significance: Edible oil-pulling therapy is natural, safe and has no side effects. Hence, it can be considered as a preventive therapy at home to maintain oral hygiene.

Keywords: Chlorhexidine, Coconut oil, *Streptococcus mutans.*

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INTRODUCTION

Dental caries is the most common dental disease worldwide. It is caused by a complex interaction of oral microorganisms in dental plaque, diet and a broad array of host factors.[1]

Streptococcus mutans are generally regarded as the primary pathogenic bacteria in dental caries.[2] Hence, the control of microorganism should reduce the occurrence/susceptibility to dental caries.

Various antimicrobial agents have been used in the oral cavity with varying efficacy. These chemical antimicrobial substances are capable of inhibiting bacterial adhesion, colonization and metabolic activity ultimately affecting the bacterial growth. Among the various chemotherapeutic agents used in mouthwashes, Chlorhexidine is considered as the 'gold-standard' for comparison with other substances due to its proven efficacy.[3,4]

Alternately, traditional medicine recommends oil pulling therapy to prevent tooth decay, oral malodor, bleeding of gums, dryness of throat, mouth and cracked lips. The concept of oil pulling has been discussed in the Ayurvedic text *Charak Samhita* (*Sutrasthana* 5, 78–80) as 'kavalagraha' or 'kavala gandoosha'. It was Dr. Karach who popularized the concept of oil pulling in the 1990s in Russia. Oil pulling therapy can be done using edible oils such as sunflower oil, sesame oil or coconut oil.

In oil pulling therapy, a tablespoon (teaspoon for young children) of essential oil is taken in the mouth and sipped and pulled between the teeth for a period of 10 to 15 minutes. Due to the swishing action, the viscous oil

turns thin and milky white. It is claimed that the swishing activates enzymes and draws the toxins out of the blood. The oil should never be swallowed, as it contains bacteria and toxins. Oil pulling therapy should be followed by tooth brushing that should preferably be done early in the morning on an empty stomach.[5]

With alternate and evidence-based medicine gaining popularity in the recent times, the concept of oil pulling needs exploration.

The purpose of our study was to evaluate the effect of oil pulling with coconut oil on the count of *S. mutans* in saliva and to compare its efficacy with Chlorhexidine mouthwash.

MATERIALS AND METHODS

Sixty healthy volunteers with a mean age of 20 years (18–22 years) recruited at Army College of Dental Sciences, Secunderabad, India, participated in the study. Information on personal details such as past medical history (recent antibiotic exposure); past dental history, including recent fluoride treatment; frequency of brushing, sweets intake, and consumption of sugared/energy drinks; and the brand of toothpaste used (to assess its fluoride content) was obtained through a given questionnaire.

The DMF scores of all participants was 1 to 2. None of the subjects had a history of antibiotic therapy in the last 3 months and no fluoride treatment in the last 2 weeks.

The nature of the study was explained to the participants/volunteers and informed consent was obtained. The study was approved by the Institutional Ethical Committee, Army College of Dental Sciences, Secunderabad. The clinical trial registration number is CTRI/2014/12/005313.

Each subject was allotted a specific number and the subjects were randomly divided into three groups of 20 subjects each: Group A: Coconut oil pulling, Group B: Chlorhexidine mouthwash and Group C: Distilled water (Control group).

Group A subjects rinsed with 10 ml (one tablespoon) of virgin coconut oil for 10 minutes before brushing, on an empty stomach in the morning, Group B subjects with 5 ml chlorhexidine mouthwash for 1 minute (Rexidine; Warren India) and Group C subjects used 5 ml distilled water for 1 minute.

The rinsing was initiated after a baseline saliva sampling was done (day 1). First day unstimulated saliva samples were collected in sterile vials from all the subjects. The samples were immediately transferred to sterile Eppendorf tubes containing 1 ml phosphate buffered solution each, and were taken within 2 hours to the microbiological laboratory. Three-fold dilution was performed using phosphate buffered solution. The samples were then vortexed for 30 seconds and 50 µl of each sample was inoculated into mitis salivarius agar. Sixty such agar plates were incubated at 37°C for a period of 48 hours. Colony-forming units were counted using a digital colony counter (Fig. 1).

All the participants brushed and rinsed their teeth only once daily in the mornings throughout the duration of the study.

Mouth rinse was performed by the subjects for a period of 2 weeks. At the end of 2 weeks, saliva samples were again collected. The samples were transferred, processed and taken to the microbiological laboratory for inoculation into the agar medium. Following inoculation, the colony-forming units were counted using a digital colony counter and were recorded.

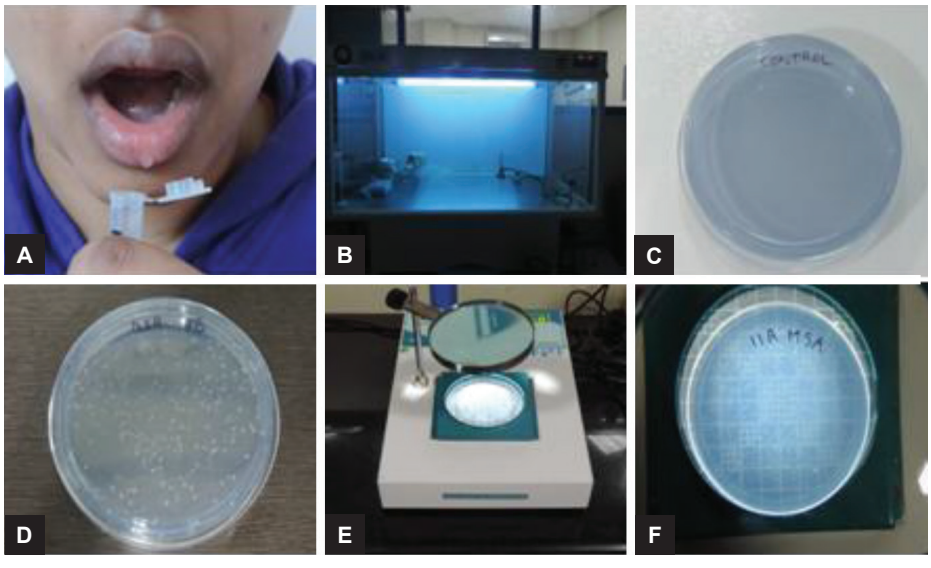


Fig. 1: Procedural images: (A) Sample collection, (B) Laminar flow for microbiological culturing, (C) Control group to show no growth of bacteria, (D) Colonies of bacteria on Mitis Salivarius agar, (E) Digital colony counter, (F) Colony counting performed

RESULTS

Data were statistically analyzed using Tukey's multiple *post hoc* (Table 1) Student *t* test (Table 2) as well as one-way analysis of variance test (Table 3) comparing day 1 with day 14 ($p \leq 0.05$). Statistically significant difference was found between control and experimental groups. The mean value of the change in the *S. mutans* counts during the study period of 15 days for all three groups is shown in Graph 1.

Table 1: Pairwise comparison of three groups (A, B, C) with respect to gain scores from day 1 to day 14 by Tukey's multiple *post hoc* procedures

Groups	*Group A*	*Group B*	*Group C*
Mean	29.7000	30.9000	0.9000
SD	54.8194	36.6806	1.1653
Group A	–		
Group B	p = 0.9946	–	
Group C	p = 0.0500*	p = 0.0410*	–

*p < 0.05

Table 2: Comparison of day 1 and day 14 in three groups (A, B, C) by paired *t* test

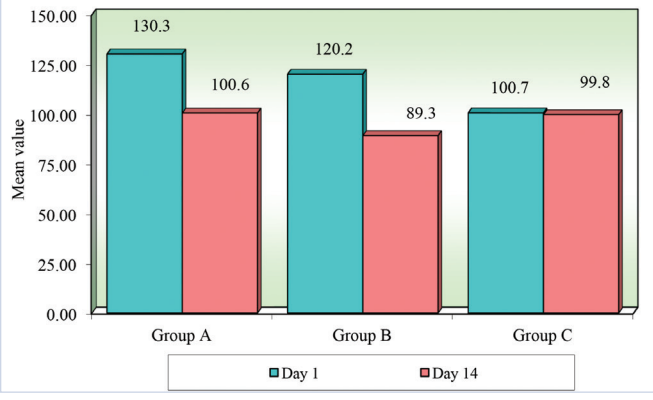
Groups	*Time*	*Mean*	*Std.Dv.*	*Mean diff.*	*SD diff.*	*% of change*	*Paired t test*	*p value*
Group A	Day 1	130.30	47.01	29.70	54.82	22.79	2.4229	0.0256*
	Day 14	100.60	46.29					
Group B	Day 1	120.15	48.64	30.90	36.68	25.72	3.7674	0.0013*
	Day 14	89.25	26.46					
Group C	Day 1	100.65	27.34	0.90	1.17	0.89	3.4540	0.0027*
	Day 14	99.75	27.44					

*p < 0.05

Table 3: Comparison of three groups (A, B, C) with respect to gain scores from day 1 to day 14 by one-way analysis of variance

Source of variation	*Degrees of freedom*	*Sum of squares*	*Mean sum of squares*	*F-value*	*p*
Between groups	2	11,539.2000	5769.6000	3.9772	0.0242*
Within groups	57	82,687.8000	1450.6632		
Total	59	94,227.0000			

*p < 0.05



Graph 1: Comparison of day 1 and day 14 scores in three groups (A, B, C)

DISCUSSION

Oral microorganisms present in dental plaque are considered crucial for the initiation and progression of dental caries.

The benefits of ayurvedic medicine in dental care and treatment are gaining popularity, as the products and practices used are natural and safe and help in balancing prevention and cure. Oil pulling is an important practice in ayurvedic medicine. Various oils such as sesame oil, sunflower oil, etc. have also been used for oil pulling therapy.

Amith et al[6] have shown that oil pulling therapy using sunflower oil significantly reduced plaque scores after 45 days. Another study carried out by Asokan et al[7] showed that oil pulling therapy with coconut oil was very effective against plaque-induced gingivitis both in the clinical and microbiological assessment.

Recognition of the antimicrobial activity of coconut oil has been reported by Hierholzer and Kabara[8] in the year 1982. In this study, coconut oil was chosen, as it contains 92% saturated acids, approximately 50% of which is lauric acid, which is rarely found in nature.[9] The benefits of coconut oil can be attributed to the presence of lauric acid. The body converts this lauric acid into monolaurin, a monoglyceride that claims to have the ability to destroy lipid-coated viruses such as human immunodeficiency virus (HIV) and herpes, influenza, measles, Gram-positive as well as Gram-negative bacteria.

Although the exact antibacterial mechanism of the action of coconut oil is still unclear, it was hypothesized that monolaurin and other medium-chain monoglycerides had the capacity to alter the bacterial cell walls, penetrate and disrupt cell membranes, inhibit enzymes involved in energy production and nutrient transfer, all of which leads to the death of the bacteria.[10]

This study also showed a definite reduction in the *S. mutans* count in saliva after oil pulling therapy (Table 1).

The viscosity of the oil could probably inhibit bacterial adhesion and plaque coaggregation. Other possible mechanism could be because of the saponification or the 'soap-making' process that occurs as a result of alkali hydrolysis of fat.[11] Soaps can be considered as good cleansing agents because they are effective emulsifiers. Emulsification is the process by which insoluble fats such as sesame oil etc. can be broken down into minute droplets and dispersed in water. Emulsification enhances the surface area of the oil, thereby increasing its cleansing action.[12]

In a study by Axelsson and Lindhe,[13] they have shown that chlorhexidine mouthwash is effective in reducing plaque and gingivitis Menendez,[14] Bae et al[15] and Santos[16] have shown that chlorhexidine is very effective against *S. mutans* in dental plaque. Salehi and Momeni[17] have compared the antibacterial effects of persica mouthwash with that of chlorhexidine mouthwash on *S. mutans* and found Chlorhexidine to be more effective. In the present study, Chlorhexidine showed the maximum reduction in bacterial count after 14 days as compared with coconut oil (Table 2).

Distilled water was used in control group. No reduction in bacterial count was seen after 14 days in this group (Table 3).

Figure 2 shows the mean values of bacterial score and also compares the reduction in bacterial counts in all the three groups after a period of 14 days.

Coconut oil has certain advantages over Chlorhexidine, that is, it does not stain, it has no lingering aftertaste and it does not cause allergy. It is easily available and is five to six times more cost-effective than Chlorhexidine. There are no disadvantages in oil pulling therapy except for the extended duration of the procedure compared with Chlorhexidine. Although oil pulling therapy cannot be recommended for use as a treatment adjunct as of now, it can be considered as a preventive home therapy to maintain oral hygiene.

Further studies are required to assess the antibacterial activity and spectrum of edible oils before a standard protocol of clinical usage can be established.

CONCLUSION

The following conclusions were derived from this study:

- Statistically significant reduction in *S. mutans* count was seen in both the oil pulling and Chlorhexidine groups.
- Reduction in the mean *S. mutans* counts was found to be more in the Chlorhexidine group than in the oil pulling group.

Hence, edible oil pulling therapy may be used as a preventive therapy at home to maintain oral hygiene, as it is natural, safe and has no side effects.

REFERENCES

1. Zero DT. Dental caries process. Dent Clin N Am 1999 Oct;43(4):635-664.
2. Loesche WJ. Role of Streptococcus mutans in human dental decay. Microbiol Rev 1986 Dec;50(4):353-380.
3. Jenkins S, Addy M, Newcombe RG. A comparison of cetylpiridinium chloride, triclosan and chlorhexidine mouthrinse formulations for effects on plaque regrowth. J Clin Peridontol 1994 Jul;21(6):441-444.
4. Pires JR, Rossa Junior C, Pizzolitto AC. *In vitro* antimicrobial efficiency of a mouthwash containing triclosan/gantrez and sodium bicarbonate. Braz Oral Res 2007 Oct-Dec;21(4): 342-347.
5. Sankar D, Sambandam G, Rao R, Pugalendi KV. Modulation of blood pressure, lipid profi les and redox status in hypertensive patients taking different edible oils. Clin Chim Acta 2005 May;355(1-2):97-104.
6. Amith HV, Ankola AV, Nagesh L. Effect of oil pulling on plaque and gingivitis. J Oral Health Comm Dent 2007;1:12-18.
7. Asokan S, Emmadi P, Chamundeswari R. Effect of oil pulling on plaque induced gingivitis: a randomized, controlled, triple-blind study. Indian J Dent Res 2009 Jan-Mar;20(1):47-51.
8. Hierholzer JC, Kabara JJ. *In vitro* effects of monolaurin compounds on enveloped RNA and DNA viruses. J Food Safety 1982;4:1-12.
9. Pehowick DJ, Gomes AV, Barnes JA. Fatty acid composition and possible health effects of coconut constituents. West Indian Med J 2000 Jun;49(2):128-193.
10. Verallo-Rowell VM, Dillague KM, Syah-Tjundawan BS. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis. Dermatitis 2008 Nov-Dec;19(6):308-315.
11. Lorenz K, Bruhn G, Heumann C, Netuschil L, Brecx M, Hoffmann T. Effect of two new Chlorhexidine mouthrinses on the development of dental plaque, gingivitis, and discoloration: randomized, investigator-blind, placebo-controlled, 3-week experimental gingivitis study. J Clin Periodontol 2006 Aug;33(8):561-567.
12. Shanmugam A. Lipids. In: Fundamentals of biochemistry for medical students. 7th ed. Kartik Offset Printers; 2001. p. 50-54.
13. Axelsson P, Lindhe J. Efficacy of mouthrinses in inhibiting dental plaque and gingivitis in man. J Clin Periodontol 1987 Apr;14(4):205-212.
14. Menendez A, Li F, Michalek SM, Kirk K, Makhija SK, Childers NK. Comparative analysis of the antibacterial effects of combined mouthrinses on Streptococcus mutans. Oral Microbiol Immunol 2005 Feb;20(1):31-34.
15. Bae K, Jun EJ, Lee SM, Paik DI, Kim JB. Effect of water soluble reduced chitosan on Streptococcus mutans, plaque regrowth and biofilm vitality. Clin Oral Investig 2006 Jun;10(2): 102-107.
16. Santos A. Evidence-based control of plaque and gingivitis. J Clin Periodontol 2003;30(Suppl 5):13-16.
17. Salehi P, Momeni DS. Comparison of antibacterial effects of persica mouthwash with chlorhexidine on Streptococcus mutans in orthodontic patients. DARU J Pharm Sci 2006;14: 169-174.