Effect of oil pulling on halitosis and microorganisms causing halitosis: A randomized controlled pilot trial

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Abstract

Background: Oil pulling therapy has been used extensively as a traditional Indian folk remedy for many years for strengthening teeth, gums, and jaws and to prevent decay, oral malodor, bleeding gums and dryness of throat, and cracked lips. **Aims:** The aims of this study were to evaluate the effect of oil pulling with sesame oil on halitosis and the microorganisms that could be responsible for it and to compare its efficacy with

chlorhexidine mouthwash. **Materials and Methods:** Group I (oil pulling) and group II (chlorhexidine) included 10 adolescents each. The following parameters were assessed: marginal gingival index, plaque index, organoleptic breath assessment (ORG 1), self-assessment of breath (ORG 2), and BANA test from tongue coating samples on days 0 and 14 of the experimental period.

Results : The comparisons of the pre and post therapy values of plaque and modified gingival index score showed a statistically significant difference (P = 0.005 and 0.007, respectively) in group I and II. There was a definite reduction in the ORG 1, ORG 2, scores and BANA test score in both groups I and II. **Conclusions:** Oil pulling therapy has been equally effective like chlorhexidine on halitosis and organisms, associated with halitosis.

Keywords: Halitosis, oil pulling therapy, sesame oil

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Introduction

The terms halitosis, breath malodor, or bad breath are used to denote unpleasant breath odor. These terms are not synonymous with oral malodor, which has its origin only from the oral cavity. Halitosis should not be confused with odor associated with food intake, smoking, or morning breath on awakening. [1] Halitosis is a considerable social problem but most patients who complain about the problem seek proper advice and treatment after several months or years. Nearly 85% of the cases of halitosis have the cause originating from the oral cavity. Gingivitis, periodontitis, and tongue coating

are the predominant causative factors. [2],[3],[4],[5] Extra oral causes include ear-nose-throat pathology, systemic diseases like diabetes, metabolic, hormonal, renal, or hepatic disturbances, bronchial carcinoma, or gastroenterologic pathology. [6],[7]

Oil pulling or oil swishing, in alternative medicine, is a procedure that involves swishing oil in the mouth for oral and systemic health benefits. Oil pulling has been used extensively as a traditional Indian folk remedy for many years to prevent decay, oral malodor, bleeding gums, and dryness of throat, and cracked lips and for strengthening teeth, gums, and jaws. [8],[9],[10],[11] It is not a new concept and it has been mentioned in the Ayurvedic text Charaka Samhita where it is called Kavala Gandoosha/Kavala Graha. The concept of oil pulling was familiarized by Dr. F. Karach in the 1990s in Russia. It is claimed to cure about 30 systemic diseases ranging from headache, migraine to diabetes and asthma. [8],[9],[12]

Oil pulling therapy can be done using edible oils like sunflower or sesame oil. Sesame plant (Sesamum indicum) of the Pedaliaceae family has been considered a gift of nature to mankind for its nutritional qualities and desirable health effects. [13],[14]

For oil pulling therapy, a tablespoon (teaspoon for young children above 5 years of age) of sesame oil is taken in the mouth, sipped, sucked, and pulled between the teeth for 10 to 15 min. The viscous oil turns thin and milky white. The oil should not be swallowed as it contains bacteria and toxins. Oil pulling therapy should be followed by tooth brushing and is preferably done on empty stomach in the morning.

There is no scientific proof to accept oil pulling therapy as a treatment adjunct to cure halitosis. Online searches in pubmed and other databases show only testimonies and literature on personal experiences. Pilot studies conducted by Asokan *et al* have shown that the oil pulling therapy with sesame oil has been equally effective in reduction of *S. mutans* count, plaque index, and modified gingival index scores as compared to chlorhexidine mouthwash. [15],[16] So, this study was planned with the following aims and objectives.

- To evaluate the effect of oil pulling with sesame oil on halitosis and microorganisms which could be causing it in adolescents.
- To compare the efficacy of oil pulling and use of chlorhexidine mouthwash on halitosis.

Materials and Methods

A randomized controlled trial was planned in the Department of Periodontics, Meenakshi Ammal Dental College, Chennai. The trial protocol was analyzed and approved by the Institutional Review Board of Meenakshi University. Ethical committee clearance was obtained to carry out the research work. Written consent was obtained from all the participants and their parents. Among the 60 adolescents aged 17-19 years examined, screened, and assessed with the personal questionnaire, 20 adolescents were included for the study based on the following criteria. [17]

Inclusion criteria

1. 20 age-matched healthy adolescents
2. Should have at least 24 permanent teeth with gingival probing depth < 3 mm
3. Gingival and plaque index score = 1 in more than 10% of the sites

Exclusion criteria

1. History of antibiotics for past 3-4 weeks
2. Wear orthodontic appliances, prosthesis
3. Smokers and participants with deep-fissured tongue

Seven days prior to the experimental period the following clinical parameters were assessed: Modified gingival index (MGI), plaque index (PI), and probing depth (PD). These measurements were performed to ensure that the participants fit the selection criteria and did not have any periodontal disease. Professional scaling was done for all the participants. Each person was assigned to a group by simple random sampling using the table of random numbers by examiner (A). Group I (study group-oil pulling) and group II (positive control group-chlorhexidine) included 10 participants each. After the pre-experimental phase, the participants were scheduled an appointment for breath analysis, in compliance with the following criteria: the night before the assessment the participants were required not to ingest spicy foods, with garlic or onions, or alcoholic beverages and the last tooth brushing had to be done before 12 p.m. In the morning,

the participant should be in absolute fasting, without performing any type of oral hygiene measures, and should not use any cosmetics/perfumes that release odor. [17]

The following parameters were assessed: MGI, PI, organoleptic breath assessment (ORG1) by a blinded and calibrated examiner (examiner A), Self-assessment of breath (ORG2) by participant themselves, BANA test from tongue coating samples (Examiner B) on days 0 and 14 of the experimental period.

The study group was subjected to oil pulling with sesame oil (Idhayam Oil, VVV Sons India) for 10 to 15 min every day in the morning before brushing. The control group was given 0.2% chlorhexidine mouthwash (Hexidine, ICPA Health Products Ltd, India) for 1 min every day in the morning for 14 days. The participants of both the groups were allowed to brush their teeth once daily as per their daily home oral hygiene schedule.

Organoleptic assessment: The participants were asked to keep their mouths completely closed for 3 min, breathing only through the nose. After the time had elapsed they were instructed to release the air slowly through the mouth from a distance of 10 cm from the examiner's nose. Asking the participant to lick his wrist and smell it after it has dried constituted the self-assessment part. The intensity ratings of 0 to 5 score, as proposed by Rosenberg and McCulloh was used. [18]

Score 0 = No odor present

Score 1 = Barely noticeable odor

Score 2 = Slight but clearly noticeable odor

Score 3 = Moderate odor

Score 4 = Strong offensive odor

Score 5 = Extremely foul odor

BANA Test: Most cases of oral malodor are the result of proteolytic activity of bacteria and three species (*P. gingivalis*, *B. forsythus* or *T. denticola*) could be responsible for this activity. These microorganisms can be detected in the tongue coating samples using BANA test. The tongue is wiped with a cotton swab (tongue coating sample) and the samples are placed on the BANA test strip (BANAMet LLC, USA), which is then

placed in an incubator at 55° for 5 min. If the microorganisms are present, the test strip turns blue. Results were scored as either blue spots (positive) or no color change (negative). [17]

The pre and post values of the PI, GI, ORG1, ORG2, and BANA test within the same group were compared using Wilcoxon signed ranks test and chi-square test appropriately. The comparison of the pre values and the post values between the two groups was done using Mann-Whitney test and chi-square test appropriately. In the present study, $P<0.05$ was considered as the level of significance. The statistical analysis was done using the software SPSS version 15 (SPSS Inc., Chicago). The examiners who assessed the index scores, collected the tongue coating samples, and interpreted the results, the organoleptic rating judge, and the statistician were blinded about the division of groups.

Results

[Table 1] shows the comparison of the baseline (pre) values of the MGI scores, PI scores, ORG 1, ORG 2, and BANA between groups I and II. There was no statistically significant difference in any of the scores indicating that the baseline values of both the groups were almost the same. The comparison of the post therapy values of the all the 5 parameters between the two groups showed no significant difference [Table 2]. The comparisons of the pre and post therapy values of plaque index score and modified gingival index score showed statistically significant difference ($P = 0.005$ and 0.007, respectively) in groups I and II, as shown in [Table 3] and [Table 4]. There was a definite reduction in the ORG 1, ORG 2 scores, and BANA test score in both group I and II. But only the self-assessment breath score (ORG 2) showed statistically significant reduction in group I.

Table 1: Comparison of the baseline values of modified gingival index, plaque index, ORG scores (1 and 2), BANA result between groups I and II

Click here to view

Table 2: Comparison of the post therapy values of modified gingival index, plaque index, ORG scores (1 and 2), BANA result between groups I and II

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Table 3: Comparison of pre and post values of modified gingival index, plaque index, ORG scores (1 and 2), BANA result within group I

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Table 4: Comparison of pre and post values of modified gingival index, plaque index, ORG scores (1 and 2), BANA result within group II

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Discussion

Halitosis mainly originates from volatile sulfide compounds (VSCs), especially hydrogen sulfide, methylmercaptan, and dimethyl sulfide as first discovered by Tonzetich. [19] Diamines, indole, skatole, butyric of propionic acid in the mouth air can also cause the offensive odor. [20] Most of the malodor-causing compounds result from proteolytic degradation of peptides present in saliva, shed epithelium, food debris, and plaque by oral microorganisms. Gram-negative, anaerobic bacteria possess such proteolytic activity. Bacteria associated with gingivitis and periodontitis are almost all gram negative and are known to produce VSCs.

Self-examination, organoleptic rating, sulfide monitor, gas chromatography electronic nose, diamond probes, dark field microscopy, and saliva incubation tests are some of

the methods of identifying malodor. [1] Sulfide monitor (Halimeter) or gas chromatograph (Oral Chroma) is very expensive; inexpensive Tanita Breath Alert Monitors are not very reliable and so in this study the "gold standard" organoleptic assessment was done. Self-examination was included as a part of the study to actively involve the participants and also to get a subjective feel response from them at the end of the study.

The dorsal tongue mucosa shows a very irregular topography and the innumerable depressions are ideal niches for bacterial adhesion and growth, sheltered from cleaning actions. [21],[22] The accumulation of food remnants intermingled with exfoliated cells and bacteria causes a coating on the tongue dorsum. Samples from tongue dorsum, a source of oral malodor [22],[23],[24] were collected and placed on BANA test strip in this study.

The BANA test, a highly sensitive, inexpensive and easy-to-use chairside test to assess the microorganisms which could be responsible for malodor was used in this study. The BANA test is a modification of the BANA hydrolysis test developed by Dr. Walter Loesche and colleagues at the University of Michigan School of Dentistry. It exploits an unusual enzyme found in *Treponema denticola*, *Porphyromonas gingivalis*, and *Bacteroides forsythus*, three anaerobic bacteria highly associated with oral malodor. [25],[26] Of some 60 subgingival plaque species, only these 3 possess an enzyme capable of hydrolyzing the synthetic peptide benzoyl-dl-arginine-naphthylamide (BANA) present on BANA test strips. If any of the three species is present, they hydrolyze the BANA enzyme producing B-naphthylamide, which in turn reacts with an imbedded diazo dye to produce a permanent blue color indicative of a positive test. Negative reaction indicates that the BANA-positive organisms, even if present in the sample, are below the detection threshold (below the range of 1000 to 5000 CFU's) at the site of sampling. Studies with individuals with halitosis demonstrated that tongue coating samples were positive for BANA test and the tongue coating of individuals with high organoleptic scores were related to greater positive BANA result. [22],[23]

Chlorhexidine is considered the most effective antiplaque and antigingivitis agent. [27],[28],[29] Chlorhexidine rinsing provides a significant reduction in VSC levels and ORG scores because of its strong antibacterial effects and superior substantivity in the oral cavity. [18],[22],[30],[31] Rosenberg *et al*[31] showed that a 0.2% chlorhexidine regimen reduced the VSC values by 43% and ORG scores by more than 50%. De Boever and Loesche [22] reported that a 1-week rinsing with 0.12% chlorhexidine, in combination with tooth and tongue brushing, significantly reduced VSC levels, mouth odor, and tongue odor by 73%, 69%, and 78%, respectively. Morning halitosis was reduced up to 90%. Hence, the gold standard mouthwash was used as the positive control in the clinical trial.

In this study, oil pulling therapy has been equally effective like chlorhexidine against halitosis and organisms which are associated with halitosis. Sesame oil has the following advantages over chlorhexidine: no staining, no lingering after taste, and no allergy. Sesame oil is five to six times cost-effective than chlorhexidine and is readily available in the household. There are no disadvantages for oil pulling therapy except for the extended duration of the procedure compared with chlorhexidine.

Although oil pulling therapy cannot be used as a treatment adjunct as of now, it promises to be a better preventive home therapy in developing countries like India. Extensive studies with larger samples, varying time periods, and longtime follow-up should be carried out to establish the efficacy of oil pulling therapy in prevention of halitosis. The exact mechanism of action of oil pulling therapy is still not clear and we are currently carrying out research in this area. More studies with sesame oil can open new doors in the field of research in oral health care.

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