

The effect of oil pulling with rice bran oil, sesame oil, and chlorhexidine mouth rinsing on halitosis among pregnant women: A comparative interventional study

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ABSTRACT

Context: Rice bran oil, owing to its potential antioxidant benefits, could be an effective and novel alternative to sesame oil for oil pulling. As it is safe and a growingly popular edible oil, it may be acceptable during pregnancy, especially in the Indian context where women may be hesitant to use chemical plaque control methods for preventing halitosis.

Aims: The present study was conducted to compare the effects of oil pulling with rice bran oil, oil pulling with sesame oil, and oil pulling with chlorhexidine mouth rinsing on reducing halitosis among pregnant women.

Settings and Design: Thirty pregnant women who attended the Gynecology Outpatient Department (OPD) of Muslim Medical Hospital, Haran Khana Road, Pani Gate, Vadodara, Gujarat, India, were recruited in the present randomized double-blind interventional study.

Subjects and Methods: Eligible pregnant women individuals who gave consent for the study were randomly allocated to receive the interventions under investigation. Halitosis was measured at baseline and after 14 days of intervention using TANITA breath checker HC-212M-BL.

Statistical Analysis Used: Data entry was done in Microsoft Excel 2007, and statistical analysis was performed using SPSS version 17. Wilcoxon signed rank tests were used to interpret the differences in baseline and postintervention halitosis levels. One-way ANOVA was done to compare the mean reduction in halitosis scores of the three intervention groups.

Results: There was a statistically significant reduction in the grades of halitosis at baseline and 14 days after intervention for all the three groups. There was no statistically significant difference between chlorhexidine mouth rinsing, oil pulling with sesame oil, and oil pulling with rice bran oil in halitosis reduction.

Conclusions: Rice bran oil when used in oil pulling was effective in reducing halitosis. It performed comparably and marginally superior to other agents tested in the study when change in halitosis postintervention was considered.

Key words: Breath checker, oil pulling, oral malodor, pregnant women

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Halitosis originates from volatile sulfide compounds.^[1] It is one of the embarrassing problems that a patient never wants to experience. It affects a person's social image. Halitosis

may result due to poor periodontal health, petrifying oral infections, tongue coatings, or poor systemic health. Various measures have been found in literature with varying degrees of evidence regarding the role of mechanical plaque control and use of chemical plaque control methods. Although chlorhexidine mouthwash is a gold-standard agent against

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oral pathogens and infections,^[2] in some cases, namely, pregnant women, it is often used with caution. Pregnancy has been associated with poor gingival and periodontal health, halitosis, and lack of care to oral problems.^[3] A novel, revisited traditional Indian method of plaque control called “oil pulling” is regaining popularity in scientific literature. Oil pulling is a procedure that involves swishing oil in the mouth for oral and systemic health benefits. It has been used extensively as an Indian folk remedy since long to prevent decay, oral malodor, bleeding gums, etc.^[4-7]

Many studies have been conducted on the effect of oil pulling on *Streptococcus mutans* and plaque and gingival status, which are surrogate outcomes. These outcomes are not appreciated from patient’s perspectives. On thorough review of literature, it was observed that limited number of studies have reported on tangible outcomes, namely, halitosis. Hence, the present study was done to assess the effect of oil pulling on halitosis.

Oil pulling therapy has been done using edible oils such as sunflower oil, sesame oil.^[8] In this study, rice bran oil was used because it is cheaper and economical compared to all other oils, making it affordable to a larger strata of society. It has been reported to provide health benefits and meet the WHO standards.^[8-10] Oryzanol and Vitamin E found in this oil are found to be potent antioxidants which have beneficial role in immunity, tissue response, and anti-carcinogenicity.^[11] However, no study has reported use of rice bran oil in oil pulling in literature till date. Hence, the present study aims to study and compare its effect on halitosis compared to oil pulling with sesame oil and chlorhexidine mouth rinsing among pregnant women.

Therefore, this study was conducted with the aim to study the effect of oil pulling with rice bran oil, sesame oil, and chlorhexidine mouth rinsing on halitosis among pregnant women through a comparative interventional study. The objective of this study was to measure and compare pre- and post-intervention halitosis among pregnant women randomly allocated to receive one of the three interventions, namely, oil pulling with rice bran oil, sesame oil, and chlorhexidine mouth rinsing.

SUBJECTS AND METHODS

The present study was carried out after the approval of the Ethics Committee, Sumandeep Vidyapeeth (Reference no: SVIEC/ON/D-CMT/SRP/13274).

A comparative interventional study was conducted in which the effects of oil pulling with rice bran oil, sesame oil, and chlorhexidine mouth rinsing were compared in terms of halitosis reduction among pregnant women. The agents used in the study were commercially available edible rice

bran oil, sesame oil, and commercially available 0.02% of chlorhexidine gluconate mouth rinse.

The Study population (pregnant women) was drawn from the Gynecology Outpatient Department (OPD) of Muslim Medical Hospital, Haran Khana Road, Pani Gate, Vadodara, Gujarat, India. Based on the previous studies and in consultation with statistician, the sample size was estimated to be 30, considering power of the study at 80% and 95% confidence interval.

The sample was randomly allocated in such a manner that 10 received rice bran oil, 10 received sesame oil, and 10 received chlorhexidine.

Methodology

All pregnant women willing to take part in the study were included in the study. The exclusion criteria were:

- Pregnant women who were advised bed rest
- Those who were not willing to participate
- Those suffering from other systemic problems
- Those who had a history of any antibiotic intake for at least 3 weeks before the time of study.

From the OPD, the eligible individuals were informed about the study and once their informed consent was received, they were instructed about the following protocol for the study and were called on the next day:

- The night before the appointed day, not to ingest pungent, spicy food such as garlic and onion
- Not to consume alcoholic beverages the previous night
- The last oral hygiene procedure should be performed not earlier than 12 h before the reporting time for the patient on the next day
- On the appointed day’s morning, patient should refrain from food until assessment.^[12]

An early morning appointment at 8 am was given for the eligible participants. On each day, three eligible participants from the Gynecology OPD of Muslim Medical Hospital were randomly selected by a simple random sampling method. The participants were informed about the nature of the study and informed consent was obtained. The selected three participants were randomly allocated to receive any of the three interventions by a lottery method in which the participants had to select one out of the three coded chits. The individuals were blinded to the intervention they received. The random allocation of the participants by this method was facilitated by a helper at the hospital. The detail was entered in the relevant data collection sheet by the helper. Before the intervention and after the intervention, the participants were directed to the investigator only with their serial numbers for the recording of halitosis. This ensured the blinding of the investigator to the interventions.

Halitosis was measured by TANITA breath checker HC-212M-BL (TANITA breath checker HC212M-BL; Tanita Company, Japan). TANITA breath checker HC-212M-BL is a sulfide monitor, used for detection of volatile sulfides. It is a portable instrument, making it suitable for assessment at chairside and field settings. It gives the following display readings: 0 - no odor; 1 - slight odor; 2 - moderate odor; 3 - heavy odor; 4 - strong odor; 5 - intense odor; e: error, please try again. It also been used in a previous similar study to assess and confirm halitosis. Unlike a halimeter, the breath checker does not give values in ppb; however, it is a pocket device for chairside use and useful at a community setting. The display readings from 0 to 5 are in an ordinal scale, with the reading proportional to the intensity of volatile sulfur compounds when one breathes into the sensor in the device at a distance of 1 cm from the sensor. The time of breathing is regulated by a beep sound.

The measurements of respective participants were taken 3 times so as to improve the reliability of the instrument. In case of any discrepancy in the readings, the most frequently observed reading was recorded for the participant. Baseline level of halitosis was measured using the breath checker according to the manufacturer's instructions. After the baseline halitosis assessment, participants in each of the intervention groups were asked to use the respective agents every morning followed by routine brushing. For oil pulling with sesame oil and rice bran oil (Group 1 and Group 2, respectively), a tablespoon (15 ml) of oil was instructed to be swished for 10 min and expectorated.^[7] For Group 3, 0.02% chlorhexidine was rinsed for 1 min and expectorated. Fifteen milliliter 0.2% chlorhexidine was diluted in a glass of water (150 ml capacity), to attain the concentration of 0.02%. Although many studies use 0.2% or 0.12%, considering the population - pregnant women, a safe and effective dosage was chosen as the Food and Drug Administration recommends chlorhexidine mouthwash only when absolutely indicated, to be used with caution.^[13]

Again, halitosis was measured after 14 days. The change in halitosis if any was assessed at the end of 14 days.

Analysis

Data collected were entered in Microsoft Excel spreadsheet. Descriptive statistics and inferential statistics were applied to the compiled data. SPSS version 17 (SPSS Inc., Chicago, IL) was used for statistical analysis. *P* value and confidence interval were set at 0.05 and 95%, respectively. Nonparametric counterpart of paired *t*-test, the Wilcoxon signed ranks test was used to make before and after comparisons of halitosis for all the three intervention groups as the outcome halitosis was assessed on an ordinal scale. Means were computed for the reduction in halitosis score after the intervention in all the three groups and were compared using one-way ANOVA test.

RESULTS

Thirty pregnant women were recruited in the present study with a mean age of 27.63 ± 2.77 years. None of the participants had a baseline TANITA breath checker display value of "0" indicating that all the participants had halitosis at baseline. Pre- and post-intervention data were collected for all the participants and there was no loss to follow-up/drop-out in the study.

There was a statistically significant reduction in the grades of halitosis at baseline and 14 days after intervention for all the three groups, namely, chlorhexidine mouth rinsing ($p = 0.004$), oil pulling with sesame oil ($p = 0.004$), and oil pulling with rice bran oil [$p = 0.002$]; [Tables 1-3]]. The difference in reduction in the grades of halitosis at baseline and after 14 days for oil pulling with rice bran oil can be inferred as a highly significant difference owing to the smaller *p* value observed relative to the other comparison groups [Table 3].

One-way ANOVA test to compare the mean reduction in halitosis scores for the three types of intervention revealed no statistically significant difference between chlorhexidine

Table 1: Wilcoxon signed ranks test for comparing difference in halitosis scores before and after chlorhexidine mouth rinsing

	<i>n</i>	Mean rank	Sum of ranks	Significance
After-before				
Negative ranks	10 ^a	5.50	55.00	Wilcoxon signed ranks test statistic=-2.850 <i>P</i> =0.004 (S)
Positive ranks	0 ^b	0	0	
Ties	0 ^c			
Total	10			

^aAfter < before, ^bAfter > before, ^cAfter=before. S=Significant

Table 2: Wilcoxon signed ranks test for comparing difference in halitosis scores before and after oil pulling with sesame oil

	<i>n</i>	Mean rank	Sum of ranks	Significance
After-before				
Negative ranks	10 ^a	5.50	55.00	Wilcoxon signed ranks test statistic=-2.850 <i>P</i> =0.004 (S)
Positive ranks	0 ^b	0	0	
Ties	0 ^c			
Total	10			

^aAfter < before, ^bAfter > before, ^cAfter=before. S=Significant

Table 3: Wilcoxon signed ranks test for comparing difference in halitosis scores before and after oil pulling with rice-bran oil

	<i>n</i>	Mean rank	Sum of ranks	Significance
After-before				
Negative ranks	10 ^a	5.50	55.00	Wilcoxon signed ranks test statistic=-3.051 <i>P</i> =0.002 (S)
Positive ranks	0 ^b	0	0	
Ties	0 ^c			
Total	10			

^aAfter < before, ^bAfter > before, ^cAfter=before. S=Significant

mouth rinsing, oil pulling with sesame oil, and oil pulling with rice bran oil in halitosis reduction [Table 4].

DISCUSSION

The present study attempted to answer the research question: "Is oil pulling with rice bran oil an effective alternative to chlorhexidine mouth rinsing and oil pulling with sesame oil for reduction of halitosis among a group of pregnant women?" The results of the study clearly answered this research question and in favor of the choice of rice bran oil.

An extensive search of MEDLINE and EMBASE did not list a single article evaluating the use of rice bran oil in oil pulling therapy. Hence, the present study results related to rice bran oil could not be subject to comparative analysis in the existing literature.

In the present study, oil pulling with rice bran oil, oil pulling with sesame oil, and chlorhexidine mouth rinsing were found to similarly and significantly reduce halitosis. The results are in agreement with that reported by Asokan *et al.*^[7] in which it was reported that oil pulling with sesame oil was equally effective as chlorhexidine in reducing halitosis.

Furthermore, in the present study, grades of halitosis were found to significantly drop from baseline to postintervention for all the three groups. Similar findings were reported in the study conducted by Asokan *et al.*^[7]

Plausible mechanisms of action oil pulling - saponification, emulsification, antibacterial action, etc., have been discussed by Asokan *et al.*; however, still research is on to ascertain the exact mechanism of action.^[8] The same explanation could be applicable in the context of effectiveness of rice bran's oil as well. Furthermore, the plausible role of antioxidant property of γ -oryzanol in rice bran oil is worthy of discussion. The antioxidant potential of γ -oryzanol has been reported to be four times greater than that of Vitamin E28. Although many edible oils, namely, sesame oil are rich in antioxidants, rice bran oil has been claimed to retain its antioxidant and nutritional value even at high temperatures of 475°F or higher.^[14]

Besides all these, owing to the health benefits of rice bran oil in cholesterol control, in a world with increasing lifestyle-related problems, rice bran oil is marketed

extensively. Hence, the use of this oil may be expected to increase, widening the consumption circle in the population. This oil is also fairly priced and is one of the least expensive commercially available edible oils. This also holds a promise of greater than before use by people.

The present study revealed yet another application of the benefits of the oil, namely - in the oil pulling therapy, as a remedy for halitosis and is the first of its kind in literature. Furthermore, as discussed previously, the study is of value from applicability perspective - in terms of cost and acceptance. Furthermore, as a quality control measure and to minimize bias, the participants and the examiner were blinded as to which agent was being administered to which participant.

The present study had a limitation with respect to method of halitosis assessment. Due to feasibility constraints, sophisticated methods, namely, halimeter and gas chromatography instruments could not be used to assess halitosis; nevertheless, three repeated readings were recorded using TANITA breath checker HC-212M-BL for improving reliability of outcome measurement and as a quality control measure.

Also, this study used a diluted concentration of chlorhexidine; the concentration used delivering chlorhexidine by irrigating devices.^[15] Confirmatory studies are needed to ascertain the clinical efficacy. Furthermore, this study could not correlate clinical condition with halitosis as periodontal status, caries, and oral hygiene was not assessed.

In spite of these limitations, the study could however, prove with adequate validity that oil pulling with rice bran oil was effective in reducing halitosis in a group of pregnant women. The pregnant women's group was chosen to be studied in this study as so many culture-related oral health care beliefs are prevalent in the community and acceptance of oral self-care methods during pregnancy are looked upon with caution. Oil pulling, being a traditional remedy may be more acceptable to pregnant women. However, future studies on other population groups, namely, general population, young adults, aged population, and postmenopausal women may be done to reflect the effect of oil pulling with rice bran oil on halitosis with ample generalizability. There is also a need for conducting more studies on efficacy of oil pulling and adverse event reporting if we have to promote this oral hygiene practice in a scientific and evidence-based manner.

Table 4: One-way ANOVA for comparison of mean reduction of halitosis scores in the three interventional groups

	Sum of squares	df	Mean square	F	P
Between groups	0.867	2	0.433	0.900	0.418 (NS)
Within groups	13.000	27	0.481		
Total	13.867	29			

NS=Not significant

CONCLUSIONS

From the present study, it was concluded that:

- Oil pulling with rice bran oil was effective in reducing halitosis
- All the three interventions used in the study - chlorhexidine mouth rinsing, oil pulling with sesame

oil, oil pulling with rice bran oil produced statistically significant reduction on halitosis grades as compared with the baseline values recorded, with rice-bran oil giving highly significant results

- Mean reduction in halitosis by oil pulling with rice-bran oil was comparable to that recorded for sesame oil and chlorhexidine mouth rinsing.

With reference to the conclusions made above and considering the cost-effectiveness and health benefits of rice-bran oil, oil pulling with rice-bran oil can be recommended as a remedy for halitosis. Furthermore, considering the cultural dominance of health practices in India, oil pulling with rice-bran oil is expected to be a more acceptable alternative to chlorhexidine, especially for a group such as pregnant women.

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Conflicts of interest

There are no conflicts of interest.

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