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Oil Pulling and Plaque Induced Gingivitis: A Pilot Study

Rupal Mehta[1] Gaurav Girdhar[2*] Tanvi Hirani[3] Vidhi Patel[4] Rinal Patel[5]

[1]Professor and Head, Department of Periodontology and Oral Implantology, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
[2]Post Graduate Student, Department of Periodontology and Oral Implantology, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
[3]Assistant Professor, Department of Periodontology and Oral Implantology, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
[4]BDS, Department of Periodontology and Oral Implantology, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
[5]BDS, Department of Periodontology and Oral Implantology, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.

ABSTRACT

Aims: The aim of this study was to evaluate the effect of oil pulling with sesame oil on plaque induced gingivitis and to compare its efficacy with chlorhexidine mouthwash.

Materials and Methods: A total of 20 age-matched male and females with plaque-induced gingivitis were selected for this study. They were divided randomly into the 1) Study or oil pulling group (Group A) and 2) Control or chlorhexidine group (Group B). The plaque index and modified gingival index scores were recorded in individual case records by a periodontist. A total of 20 subjects with almost equal baseline mean scores were chosen for the study. Each subject was assigned a specific number and simple random sampling was done using a table of random numbers. Group A (study group-oil pulling) included 10 subjects and Group B (control group-chlorhexidine) included 10 subjects. These samples were immediately transferred to the laboratory in saline. The plaque samples were used to identify the microorganisms and to measure the total colony count of the aerobic microorganism's present. The study group was subjected to oil pulling with sesame oil and the control group was given 0.12% chlorhexidine mouthwash for 1 minute every day in the morning before brushing for 10 days. The participants of both the groups were allowed to brush their teeth once daily as per their daily home oral hygiene schedule. Reassessment of the index scores and collection of plaque for measuring the colony count of the aerobic microorganisms was done after 15 days.

Result: There was a statistically significant reduction of the pre- and post-values of the plaque and modified gingival index scores in both the study and control groups ($P < 0.001$ in both). There was a considerable reduction in the total colony count of aerobic microorganisms present in both the groups.

Conclusion: The oil pulling therapy showed a reduction in the plaque index, modified gingival scores, and total colony count of aerobic microorganisms in the plaque of people with plaque-induced gingivitis.

Keywords: Oil Pulling, gingivitis, Periodontal disease.

INTRODUCTION

Dental caries are an infection associated with microorganisms embedded in a matrix of polymers of bacterial and salivary origin. The occurrence of dental caries is directly linked to the ability of microorganisms to colonize on to the tooth surface and form biofilm or dental plaque. Biofilm formation begins with the attachment of free-floating microorganisms to a surface. These first colonists facilitate the arrival of others by providing adhesion sites and the matrix that holds the biofilm together. *Streptococcus mutans*, *Lactobacilli* spp. and *Candida albicans* are the predominant microorganisms found in dental plaque associated with a caries lesion [1]. *Streptococcus mutans,*

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***Correspondence Dr. Gaurav Girdhar.**
Department of Periodontology and Oral Implantology, Karnavati School of Dentistry, Gandhinagar, Gujarat, India.
Email: drgauravgirdhar@gmail.com

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Fig 1: Plaque induced gingivitis.

Fig 2: Plaque sample collection.

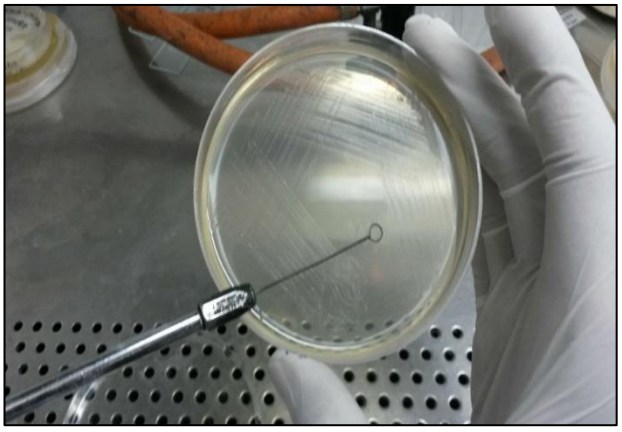


Fig 3: Special plate technique.

Lactobacilli spp. are considered crucial for the initiation and progression of dental caries as they have shown by their more acidogenic and acidophilic properties than those of other oral bacteria [2]. Their activity is to convert dietary carbohydrates mainly into acid which is able to lower the pH of the environment, solubilize the calcium phosphate of the enamel to produce a caries lesion. Conditions of low pH created by these bacteria shift the balance of plaque microflora and favor the proliferation of *Candida* species.

Fig 4: Colonies being formed

Fig 5: Colony counter

Fig 6: Colonies being counted.

Table 1: Shows comparison between pre and post values of Group A (Plaque index, Modified Gingival index and total colony count).

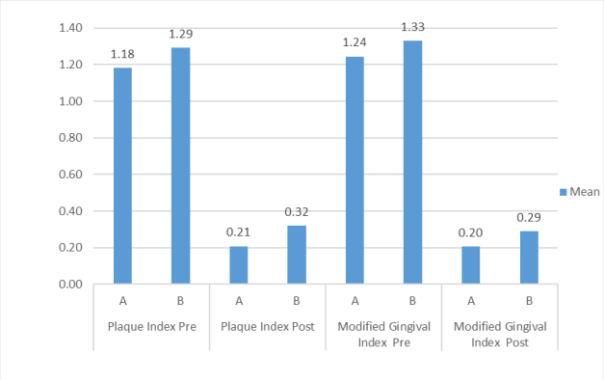
GROUP=A	(Study Group)						
		Mean	N	Std. Deviation	Std. Error Mean	Mean Difference	P Value
	Plaque Index Pre	1.18	10	0.02	0.008	-0.97	<0.001
	Plaque Index Post	0.21	10	0.01	0.004		
	Modified Gingival Index Pre	1.24	10	0.05	0.015	-1.04	<0.001
	Modified Gingival Index Post	0.20	10	0.02	0.007		
	Colony Count (per 1 ml) Pre	23,580.00	10	2,428.44	767.941	-4,300.00	<0.001
	Colony Count (per 1 ml) Post	19,280.00	10	2,350.79	743.386		

Table 2: Shows comparison between pre and post values of Group B (Plaque index, Modified Gingival index and total colony count).

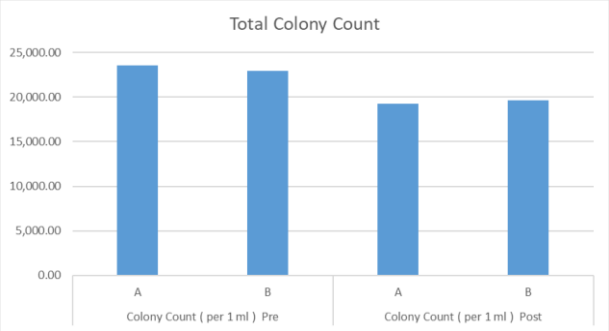
GROUP=B	(Control Group)						
		Mean	N	Std. Deviation	Std. Error Mean	Mean Difference	P Value
	Plaque Index Pre	1.29	10	0.11	0.033	-0.97	<0.001
	Plaque Index Post	0.32	10	0.05	0.014		
	Modified Gingival Index Pre	1.33	10	0.06	0.021	-1.04	<0.001
	Modified Gingival Index Post	0.29	10	0.03	0.009		
	Colony Count (per 1 ml) Pre	22,970.00	10	2,478.82	783.872	-3,320.00	<0.001
	Colony Count (per 1 ml) Post	19,650.00	10	2,289.71	724.070		

Table 3: Shows comparison between pre and post values of Group A and Group B (Plaque index, Modified Gingival index and total colony count).

	GROUP	N	Mean	Std. Deviation	Std. Error Mean	Mean Difference	P Value
Plaque Index Pre	A	10	1.18	0.02	0.008	-0.11	0.005
	B	10	1.29	0.11	0.033		
Plaque Index Post	A	10	0.21	0.01	0.004	-0.11	<0.001
	B	10	0.32	0.05	0.014		
Modified Gingival Index Pre	A	10	1.24	0.05	0.015	-0.09	0.003
	B	10	1.33	0.06	0.021		
Modified Gingival Index Post	A	10	0.20	0.02	0.007	-0.09	<0.001
	B	10	0.29	0.03	0.009		
Colony Count (per 1 ml) Pre	A	10	23,580.00	2,428.44	767.941	610.00	0.585
	B	10	22,970.00	2,478.82	783.872		
Colony Count (per 1 ml) Post	A	10	19,280.00	2,350.79	743.386	-370.00	0.726
	B	10	19,650.00	2,289.71	724.070		



Graph 1: Comparison of Plaque and Modified Gingival index of Group A and Group B.



Graph 2: Comparison of Total Colony microbiological colony count of Group A and Group B.

Gingivitis is one of the most commonly found diseases of the oral cavity. Also said as the initial stage of periodontal disease that occurs due to the colonization of plaque microorganisms on the tooth. Antibacterial mouthrinses like Chlorhexidine are used as an adjunct to mechanical plaque control. Chlorhexidine, also considered as a "gold standard" remedy, acts as an antiplaque, anticaries, and antigingivitis agent. [3, 4] It normally discourages the compliance because of its unpleasant taste and undesirable side effects such as tooth staining and alterations in taste sensations. There is a requirement for a long term, home based remedy which is also economical.

Oil pulling or oil swishing is a procedure which involves swishing oil in the mouth for oral and systemic benefits. [5] This concept of oil pulling is a very old concept and it has been discussed in the Ayurvedic text *Charaka Samhita* where it is also said to be as *Kavala graham* or *Kavala gandoosha*. [6] It has been used for many years for strengthening teeth, gums and jaws and to prevent tooth decay, oral malodour, bleeding gums, dryness of throat and cracked lips. [7]

The concept of oil pulling was familiarized by Dr. Karach in the 1990s in Russia. It is claimed to cure about 30 systemic diseases ranging from headache, migraine to diabetes and asthma. [8-10] The sesame plant (Sesamum indicum) of the Pedaliaceae family has been considered a gift of nature to mankind because of its nutritional qualities and its many desirable health effects. The seeds of the plant are commonly known as gingelly or til seeds. Sesame oil has a high concentration of polyunsaturated fatty acids, so is a good source of vitamin E.[11] The antioxidants present in it are mainly sesamol, sesamin, and sesamolin.[11] Sesamin has been found to inhibit the absorption of cholesterol as well as its production in the liver. It reduces lipogenesis and exhibits an antihypertensive action. [12] Oil pulling or oil swishing is a procedure that involves swishing oil in the mouth for oral and systemic health benefits. Oil pulling therapy with sesame oil has been extensively used as a traditional Indian folk remedy for many years for strengthening teeth, gums, and jaws and to prevent tooth decay, oral malodor, bleeding gums, dryness of throat, and cracked lips.[7] For oil pulling therapy, a tablespoon (teaspoon for children) of sesame or sunflower oil is taken in the mouth, sipped, sucked and pulled between the teeth for 10-15 minutes. The viscous oil turns thin and milky white. It is claimed that this swishing action activates enzymes and draws toxins out of the blood. [7] The oil should not be swallowed as it contains bacteria and toxins. It must be preferably disposed in a paper towel. Oil pulling must be followed by tooth brushing and rinsing of the mouth. It is better to perform oil pulling in the morning on an empty stomach.

There is no literature or scientific proof to accept oil pulling therapy as preventive adjunct. Online searches in pubmed and other databases do not provide any scientific articles on oil pulling therapy except for testimonies and literature on personal experiences. This study was planned with the following aims and objectives:

1) To evaluate the effect of oil pulling with sesame oil on plaque-induced gingivitis.

2) To compare the efficacy of oil pulling with the use of chlorhexidine mouthwash on plaque-induced gingivitis.

MATERIAL AND METHODS

A randomized, controlled study was planned to evaluate the efficacy of oil pulling therapy on plaque induced gingivitis. A total of 20 persons from the outpatient department of Karnavati school of Dentistry were included in this study. Personal details such as medical history including any recent antibiotic exposure, dental history including frequency of brushing, sweets/snacks intake, consumption of sugared/energy drinks, and the brand of toothpaste were obtained from patients to reduce bias. Twenty patients were included in the study based on the following inclusion and exclusion criteria.

Inclusion criteria

1. Subjects with plaque-induced gingivitis
2. All 20 subjects were age-matched (20 to 25 years old)

Exclusion criteria

1. Use of antibiotics in the past 3.4 weeks
2. History of dental treatment/use of mouthwash

The plaque index and modified gingival index scores were recorded in individual case records by a dentist. A total of 20 subjects with almost equal baseline mean scores were chosen for the study. Each subject was assigned a specific number and simple random sampling was done using a table of random numbers. Group I (study group-oil pulling) included 10 subjects and Group II (control group-chlorhexidine) included 10 subjects. The plaque samples were collected using sterile toothpicks 1 to 2 hours after eating/brushing, as it could affect the growth of the bacteria. A baseline plaque sample was collected by the dentist from the following four sites

a) The buccal surface of the maxillary right molar,
b) The labial surface of the maxillary incisor,
c) The labial surface of the mandibular incisor,
d) The lingual surface of the mandibular left molar for both the control and study groups.

These samples were immediately transferred to the laboratory in saline in a sterile test-tube. The samples were inoculated and were incubated at 37°C for 24 hours. Identification of the microorganisms was done using various biochemical tests and also sugar fermentation tests. The microbiologist assessed the total colony count of the aerobic microorganisms present in the plaque sample using the spread plate technique and the colony counter (Ahmedabad, India). The specimen was diluted serially and then spread on the culture media with sterile loops, which was incubated at 37°C for 24 hours. The colonies were counted using a colony counter.

The study group was subjected to oil pulling with Sesame oil (Uday Sesame Seed Oil, VVV Sons India) and the control group was given 0.12% chlorhexidine mouthwash (Rexidine, Warren India) for 1 minute every day in the morning before brushing for 10 days. The participants of both the groups were allowed to brush their teeth once daily as per their daily home oral hygiene schedule. Reassessment of the index scores and collection of plaque for measuring the colony count of the aerobic microorganisms was done after 15 days.

The pre- and post-values of the plaque and modified gingival index scores and the total colony count within the same group were compared using a paired t-test. The comparison of the pre- and post-values between the two groups was done using a student t-test. In the present study, $P<0.05$ was considered as the level of significance. The statistical analysis was done using SPSS software (Version 18, Inc Chicago).

RESULT

Table 1 and Table 2 both show the comparison of the baseline (pre) values and 15 days (post) values between the plaque index scores, modified index scores and total colony count of the study group (oil puling) and control group (chlorhexidine) respectively. There was a statistically significant difference between the pre and post values of the plaque index score, modified gingival index score and the total colony count in both the study group and control group ($p < 0.001$). Similarly in Table 3, shows a comparison of the baseline (pre) values of the plaque index scores, modified index scores, and total colony count between the study and the

control group. The comparisons of the pre- and post-therapy values of plaque index score and modified gingival index score showed a statistically significant difference. The total colony count scores had considerably reduced but there was no statistically significant difference between the pre- and post-mean values between both the groups as shown in Table 3.

DISCUSSION

Plaque-induced gingivitis is the most common form of gingival disease and may be the result of an interaction between which happens between the microorganisms found in the dental plaque biofilm and the tissues and inflammatory cells of the host. The effects of the local factors, systemic factors, or both; medications; and malnutrition can influence and alter the plaque-host interaction. [13]

The study included evaluation in both clinical and microbiological assessment. Clinical assessment was based on the modified gingival index given by Lobene and plaque index given by Silness and Loe .The modified gingival index is the most widely used index in clinical trials of therapeutic agents [13] and was used in this study. Microbiological assessment aimed at identification and the total colony count of aerobic microorganisms in the plaque sample. In this study, the microorganisms identified were the normal oral flora including Streptococcus, Staphylococcus.

Nagesh[14] showed that oil pulling therapy with sunflower oil significantly reduced plaque scores after 45 days. In this study, there was a significant reduction in the plaque index and modified gingival index scores after oil pulling therapy. There was a also found to be a considerable reduction in the colony count of microorganisms but it was not found to be statistically significant. This might be because of the fact that normal oral flora was also counted and mean values were assessed for the total colony count. Hence, in this study, oil pulling therapy was very effective against plaque-induced gingivitis both in the clinical and microbiological assessment.

A few studies have been carried out in the literature regarding oil pulling for oral health. Amith *et al*. have shown that oil pulling therapy with sunflower oil significantly reduced plaque scores after 45 days.[13] Sharath *et al*. showed that oil pulling therapy was very effective against plaque induced gingivitis both in clinical and microbial assessment.[10] Another study by Asokan *et al*. showed a definitive reduction in the *Streptococcus mutans* count in plaque and saliva after oil pulling therapy[15] thus reducing the incidence of dental caries. It is also known to deal with the problem of halitosis[14] which is proved in the study by Sharath *et al*.

The gold standard mouthwash was used as the control in this study to assess and compare the effect of oil pulling therapy on plaque-induced gingivitis. Axelsson and Lindhe have shown that chlorhexidine mouthwash is effective in the reduction of plaque and gingivitis.[16] Menendez and Santos have shown that chlorhexidine is very effective against the formation of dental plaque.[17,18] Salehi and Momeni Danaie have compared the antibacterial effects of persica mouthwash with the standard chlorhexidine on streptococcus mutans and showed that the chlorhexidine still remained the gold standard.[19] Arweiler, et al. and Lorenz compared the efficacy of two commercially available chlorhexidine mouthrinses on the development of dental plaque, plaque re-growth, and gingivitis and showed that there was no statistically significant difference between both commercially available mouthrinses with respect to plaque inhibition.[20,21]

The exact mechanism of the action of oil pulling therapy is not clear. It was claimed that the swishing activates the enzymes and draws the toxins out of the blood. The bottom line is that oil pulling actually cannot pull toxins out of the blood as claimed because the oral mucosa does not act as a semi-permeable membrane to allow toxins to pass through. Sesame oil has three lignans - sesamin, sesamolin, and sesaminol - that have antioxidant properties and potentiate Vitamin E action. Sesame oil has increased polyunsaturated fatty acids and the lipid peroxidation is reduced thereby reducing free radical injury to the tissues. [22.23] The mechanism by which oil pulling therapy causes plaque inhibition is not known. The viscosity of the oil maybe inhibits bacterial adhesion and plaque co-aggregation. The other possible mechanism might be the saponification or the .soap-making process

that occurs as a result of the alkali hydrolysis of fat. [24]

Sesame oil is a vegetable fat and when it is acted upon by the salivary alkali, like the bicarbonates, the soap making process is initiated. Soaps are good cleansing agents because they are effective emulsifying agents. Emulsification is the biochemical process by which insoluble fats like sesame oil can be broken down into minute droplets and dispersed in water. Emulsification increases the surface area of the oil thereby increasing its cleansing action. [24] Sesame oil is relatively high in unsaponifiable substances. The unsaponifiable fraction, a class of substances not found in other fats (sesamin or sesamolin) can probably protect the oral cavity from infection and inflammation by its antioxidant property. These mechanisms could have been the reason for the reduction of plaque scores and colony count of the microorganisms in this study. But more studies have to be done to check and prove the antibacterial effect of the components of the sesame oil.

In this study, oil pulling therapy has been as equally effective as chlorhexidine against plaque-induced gingivitis. Sesame oil has the following advantages over chlorhexidine: no staining, no lingering after-taste, and no allergy. Sesame oil is 5 to 6 times more cost effective than chlorhexidine and is readily available in most households. There are no disadvantages for oil pulling therapy except for the extended duration of the procedure compared with chlorhexidine. Though oil pulling therapy cannot be used as a treatment adjunct as of now, it can be used as a preventive home therapy to maintain oral hygiene. Extensive studies with larger samples, varying time periods, and long follow-up times should be carried out to establish the efficacy of oil pulling therapy in prevention of plaque-induced gingivitis. More studies with sesame oil can open new doors in the field of research in oral health care [5]

CONCLUSION

Hence, the following conclusion were obtained

1) A statistical significant reduction was seen in the plaque index and modified gingival index scores in both the oil pulling and the chlorhexidine groups ($p < 0.001$).
2) Also a considerable reduction in the total microbiological colony count was seen in the plaque sample taken from both the groups and thought it was much more in the oil pulling group but no significant difference was seen between both the groups.

Gingivitis when left untreated can progress to a more destructive form of periodontal disease. An effective modality of prevention which can arrest the disease progression and ensure healthy tissues is important. From the results obtained it can be concluded that Oil Pulling has a significant effect on plaque and gingivitis. Hence if practiced daily it can be developed into a healthy oral hygiene habit. Extensive studies with larger samples, varying time periods, and long time 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 hence further research studies with sesame oil will lead to wonderful approach in the field of dentistry for maintenance of oral health.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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