



Original Research Article

Comparative evaluation of oil pulling agents for reduction of plaque induced gingivitis: A clinico-microbiological study

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ABSTRACT

Introduction: Oil pulling is an ancient natural healing practice originated in India mentioned in Charak Samhita and Sushruta Samhita in ayurveda texts. The act of swishing oil draws out microbes from various parts of the mouth and detoxifies toxins. Thus oil pulling helps to reduce the severity of plaque induced gingivitis. Coconut oil and sesame oil, are naturally occurring product have been credited with antibacterial, and anti-inflammatory biologic activity. These are cost effective, with no side effects. Hence, we aimed Comparative evaluation of different oil pulling agents as an adjunct to full mouth scaling and root planing in plaque induced gingivitis

Aim and Objectives: To evaluate efficacy of oil pulling with coconut oil compared to sesame oil as an adjunct to SRP in subjects with plaque induced gingivitis.

Materials and Methods: A total of forty patients with plaque induced gingivitis was randomly divided into two groups, Group A: oil pulling with coconut oil as an adjunct to SRP, Group B: oil pulling with sesame oil as an adjunct to SRP. Following initial SRP, oil pulling was performed for 15 days. Clinical measurements included plaque index, gingival index, and simplified oral hygiene index at baseline, 7th day, 15th day, 1 month and 3 month. Microbial analysis was done with MIC using agar well diffusion method.

Results: There was significant reduction in plaque and gingival scores from baseline to 3 month in both the groups.

Conclusion: Oil pulling with coconut and sesame oil serves as promising antimicrobial agent to treat plaque induced gingivitis. Hence this holds chance to be added to other oral hygiene measures.

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1. Introduction

Gingivitis is an inflammation of the gingiva that may or may not progress to clinical attachment loss. Their primary etiological factor is bacterial plaque, which can initiate destruction of the gingival tissues.¹ In mechanical therapy of plaque control Scaling and root planing is the mainstay of periodontal therapy. Chemical plaque control agents such as chlorhexidine is one of the routinely prescribed antiseptic agents in dentistry. Chlorhexidine gluconate mouthwash

significantly reduce plaque bacteria and helps in prevention of development of gingivitis.² These procedures are used to remove all bacterial plaque and calculus from the surfaces of teeth.³ But mouthwash such as chlorhexidine have some drawbacks, like alteration in taste sensation, staining of teeth and increase calculus formation.⁴

Oil pulling or oil swishing is an ancient natural healing practice originated in India and has been described as Kavalagraha or Gandhoosha in the ayurvedic texts of Charaka Samhita and Sushruta Samhita.⁵ Oil pulling or oil swishing, in alternative medicine, is a procedure that involves swishing oil in the mouth for oral and systemic

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health benefits. It can be done using edible oils like coconut oil, sesame oil.⁶ There are no disadvantages for oil pulling therapy except that the procedure is required to be conducted for extended duration to be effective and to show positive results.⁷

Sesame oil is readily available in every household. It contains medium chain fatty acid. This influences the physical and chemical properties of the oil. It generates antioxidants which kill microbes and cause their cell wall damage. It has not only anti-inflammatory effect but also substantial antimicrobial activity against a range of microorganisms. Its palatability is better compared to other refined edible oils.^{8,9}

Coconut oil contains 92% saturated acids, approximately 50% of which is lauric acid and is believed to have anti-inflammatory and antimicrobial properties.¹⁰ It is also proposed that the alkalis in saliva react with oil resulting in saponification and formation of soap like substance which reduces adhesion of plaque.¹¹ Hence, the lauric acid in the coconut oil may react with salivary sodium hydroxide forming sodium laureate, the main constituent of soap which might be responsible for the cleansing action and decreased plaque accumulation.¹²

2. Material and Methods

The study was designed as single blind randomized controlled clinical trial. This clinical study was carried out in MGV's KBH Dental College And Hospital Nashik, Maharashtra, in department of Periodontology and Implantology. Ethical clearance was obtained from the Institutional Ethics Committee. Informed written consent was obtained from the patients before the study. A total of forty patients with mild to moderate plaque induced gingivitis of age group 15 – 25 years attending the dental hospital were selected for the study.

2.1. Selection criteria

Patients with gingival index score of more than 2, bleeding on probing with a minimum of 20 teeth, systemically healthy patients diagnosed with generalised chronic gingivitis.

2.2. Exclusion criteria

Patients having chronic localized or generalized periodontitis, with smoking and other tobacco related habits, patients undergoing orthodontic treatment, Pregnancy and lactating mother and participants who were not willing to participate in the study were excluded from the study.

Patients were divided into two groups-Group A - oil pulling with coconut oil as an adjunct to scaling and root planing. Group B- oil pulling with sesame oil as an adjunct to scaling and root planing.

Measurements of the clinical parameter performed by a single blind trained operator. Study parameters were checked were Gingival index (GI) according to Loe and Silness (1963),¹³ Plaque index (PI) assessed according to Silness and Loe (1964)¹⁴ and Simplified oral hygiene index (OHI-S) according to JC Greene 1963.¹⁵ OHI-S is a sufficiently sensitive method for assessing the oral hygiene of individuals in group and it offers a more rapid method for evaluating oral cleanliness.¹⁵

Minimum inhibitory concentration of oil pulling agents was determined by agar well diffusion methods.

All the participants were given 225 ml (15 ml for 15 days) of intervention agent in labeled bottles along with empty bottle to collect used oil. Participants in both groups were informed about intervention they were given in the study. Participants in the Group A were advised to take a 15 ml of coconut oil and participants in the Group B were advised to take a 15 ml of sesame oil and swish it in the mouth around gums, teeth, and tongue after brushing and before consuming any fluids in the morning for 15 days along with the routine oral hygiene practice. Once the oil became viscous and milky, it should spit into the empty bottle given and then rinse the mouth with warm water.

Postintervention gingival status for the Group A and Group B participants assessed using gingival index, plaque index and simplified oral hygiene index at the baseline, 7th day, 15th day, 1st month and at 3rd month.

2.3. Microbial analysis

Antibacterial activity of coconut oil and sesame oil were tested by minimum inhibitory concentration (MIC) assay by agar well diffusion method on Mueller Hinton agar with 5% sheep blood (MHBA). Plaque sample were collected using curette at the baseline. Using a sterile spreader Plaque samples were spread on MHBA Using 6-mm well cutter, two wells were made in each plate. Fifty microliters of both oils were added into their respectively marked wells and incubated for 24 hours at 37°C. After incubation the plates were observed for the zone of inhibition around the wells. None of the oil showed any inhibitory activity for plaque sample.

3. Results

The present study was undertaken to compare the effect of oil pulling practice using coconut oil with sesame oil in reducing the severity of plaque induced gingivitis.

Oral hygiene practices across the both groups were similar. Tooth brush and tooth paste were the only oral hygiene aids used. None of the participants had visited dentist in the previous three months.

To check normality of data Shapiro-Wilk test and Kolmogorov - Smirnov test were used Power of test is 95% and level of significance is 5%

Table 1: Intragroup Comparison at each follow up Group A Plaque Index

Group A	Mean	N	SD	SE	t-Value	P-Value	% Change	Result	
Plaque Index	Baseline	1.83	10	0.63	0.20	3.455	0.0072	19.08	Sig
	Day 7	1.48	10	0.59	0.19				
	Baseline	1.83	10	0.63	0.20	4.623	0.0012	28.54	Sig
	Day 15	1.31	10	0.44	0.14				
	Baseline	1.83	10	0.63	0.20	5.158	0.0006	53.09	Sig
	1 Month	0.86	10	0.34	0.11				
	Baseline	1.83	10	0.63	0.20	5.640	0.0003	55.82	Sig
	3 Months	0.81	10	0.27	0.09				

Paired t test was carried out to compare the values in group A at 7th day, 15th day, 1 month and 3 months as compared to baseline. Significant change was observed in the Mean plaque index value in Group A (Table 1)

Paired t test was carried out to compare the values in group B at 7th day, 15th day, 1 month and 3 months as compared to baseline. Significant change was observed in the Mean plaque index value in Group B (Table 2)

Paired t test was carried out to compare the values in group A at 7th day, 15th day, 1 month and 3 months as compared to baseline. Significant change was observed in the Mean gingival index value in Group A (Table 3)

Paired t test was carried out to compare the values in group B at 7th day, 15th day, 1 month and 3 months as compared to baseline. Significant change was observed in the Mean gingival index value in Group B (Table 4)

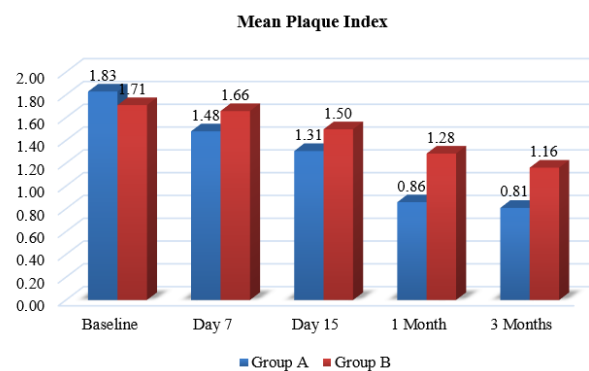
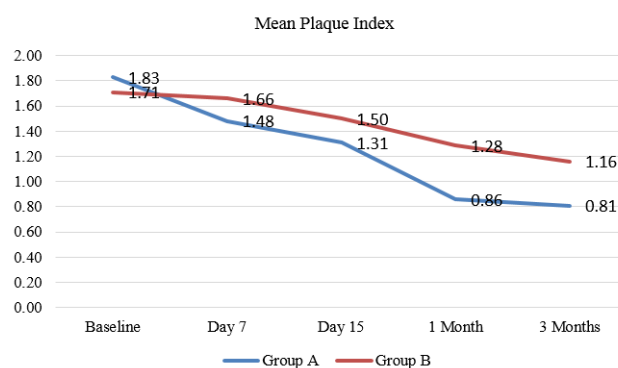
Paired t test was carried out to compare the values in group A at 7th day, 15th day, 1 month and 3 months as compared to baseline. Significant change was observed in the Mean OHIS index value in Group A (Table 5)

Paired t test was carried out to compare the values in group B at 7th day, 15th day, 1 month and 3 months as compared to baseline. Significant change was observed in the Mean OHIS index value in Group B. (Table 6)

For comparison between Group A and Group B, we have used unpaired t-test. From above table we can observe that, there is no significant difference observed in Group A and Group B for Baseline, Day 7 and Day 15. While P-Value for 1 month and 3 month is less than 0.05. Hence at 1 month and 3 months there is significant difference between Group A and Group B. (Table 7 and Figures 1 and 2).

However significant differences were obtained at 1 month and 3 month intervals between both the groups P less than 0.01 with group A showing decreased reduction of PI as compared to Group B

For comparison between Group A and Group B, we have used unpaired t-test. From above table we can observe that, there is no significant difference observed in Group A and Group B for Baseline. While P-Value for Day 7, Day 15, 1 month and 3 month is less than 0.05. Hence at Day 7, Day 15, 1 month and 3 months there is significant difference between Group A and Group B. (Table 8 and Figures 3

**Fig. 1:** Comparison of mean plaque Index of group A and group B**Fig. 2:** Comparison of mean plaque Index of group A and group B

and 4)

However significant differences were obtained at 1 month and 3 month intervals between both the groups P less than 0.01 with group A showing decreased reduction of GI as compared to Group B

For comparison between Group A and Group B, we have used unpaired t-test. From above table we can observe that, P-Value for each follow up is less than 0.05. Hence we conclude that, there is significant difference observed between Group A and Group B. (Table 9 and Figures 5 and 6)

Table 2: Intragroup Comparison at each follow up Group B Plaque Index

Group B		Mean	N	SD	SE	t-Value	P-Value	% Change	Result
Plaque Index	Baseline	1.71	10	0.60	0.19	1.096	0.3017	3.04	NS
	Day 7	1.66	10	0.55	0.17				
	Baseline	1.71	10	0.60	0.19	3.114	0.0124	12.40	Sig
	Day 15	1.50	10	0.57	0.18				
	Baseline	1.71	10	0.60	0.19	3.909	0.0036	24.85	Sig
	1 Month	1.29	10	0.34	0.11				
	Baseline	1.71	10	0.60	0.19	4.203	0.0023	32.11	Sig
	3 Months	1.16	10	0.32	0.10				

Table 3: Intragroup Comparison at each follow up Group A Gingival Index Index

Group A		Mean	N	SD	SE	t-Value	P-Value	% Change	Result
Gingival Index	Baseline	2.29	10	0.53	0.17	5.035	0.0007	33.65	Sig
	Day 7	1.52	10	0.50	0.16				
	Baseline	2.29	10	0.53	0.17	6.788	0.0001	52.93	Sig
	Day 15	1.08	10	0.35	0.11				
	Baseline	2.29	10	0.53	0.17	7.334	0.0000	64.03	Sig
	1 Month	0.82	10	0.20	0.06				
	Baseline	2.29	10	0.53	0.17	7.572	0.0000	66.35	Sig
	3 Months	0.77	10	0.23	0.07				

Table 4: Intragroup Comparison at each follow up Group B Gingival Index

Group B		Mean	N	SD	SE	t-Value	P-Value	% Change	Result
Gingival Index	Baseline	2.59	10	0.93	0.29	3.989	0.0032	14.91	Sig
	Day 7	2.20	10	0.72	0.23				
	Baseline	2.59	10	0.93	0.29	3.976	0.0032	27.42	Sig
	Day 15	1.88	10	0.64	0.20				
	Baseline	2.59	10	0.93	0.29	4.497	0.0015	35.69	Sig
	1 Month	1.67	10	0.46	0.15				
	Baseline	2.59	10	0.93	0.29	5.093	0.0007	47.08	Sig
	3 Months	1.37	10	0.47	0.15				

Table 5: Intragroup Comparison at each follow up Group A OHIS

Group A		Mean	N	SD	SE	t-Value	P-Value	% Change	Result
OHIS	Baseline	0.50	10	0.29	0.09	2.570	0.0302	9.22	Sig
	Day 7	0.45	10	0.27	0.09				
	Baseline	0.50	10	0.29	0.09	3.243	0.0101	19.04	Sig
	Day 15	0.40	10	0.23	0.07				
	Baseline	0.50	10	0.29	0.09	6.551	0.0001	28.26	Sig
	1 Month	0.36	10	0.24	0.08				
	Baseline	0.50	10	0.29	0.09	7.102	0.0001	32.67	Sig
	3 Months	0.34	10	0.24	0.08				

Table 6: Intragroup Comparison at each follow up Group B OHIS

Group B	Mean	N	SD	SE	t-Value	P-Value	% Change	Result	
OHIS	Baseline	0.91	10	0.34	0.11	0.557	0.5913	6.37	NS
	Day 7	0.85	10	0.47	0.15				
	Baseline	0.91	10	0.34	0.11	1.904	0.0894	18.44	NS
	Day 15	0.74	10	0.37	0.12				
	Baseline	0.91	10	0.34	0.11	3.870	0.0038	27.11	Sig
	1 Month	0.66	10	0.31	0.10				
Baseline	0.91	10	0.34	0.11	4.384	0.0018	33.04	Sig	
3 Months	0.61	10	0.31	0.10					

Table 7: Intergroup Comparison Between Group A and Group B at each follow up Plaque Index

Plaque Index	Group	N	Mean	SD	SE	t-Value	P-Value	Result
Baseline	Group A	10	1.83	0.63	0.20	0.432	0.671	NS
	Group B	10	1.71	0.60	0.19			
Day 7	Group A	10	1.48	0.59	0.19	-0.697	0.495	NS
	Group B	10	1.66	0.55	0.17			
Day 15	Group A	10	1.31	0.44	0.14	-0.839	0.412	NS
	Group B	10	1.50	0.57	0.18			
1 Month	Group A	10	0.86	0.34	0.11	-2.814	0.011	Sig
	Group B	10	1.29	0.34	0.11			
3 Month	Group A	10	0.81	0.27	0.09	-2.643	0.017	Sig
	Group B	10	1.16	0.32	0.10			

Table 8: Intergroup comparison between group A and group B at each follow up gingival Index

Gingival Index	Group	N	Mean	SD	SE	t-Value	P-Value	Result
Baseline	Group A	10	2.29	0.53	0.17	-0.887	0.387	NS
	Group B	10	2.59	0.93	0.29			
Day 7	Group A	10	1.52	0.50	0.16	-2.474	0.024	Sig
	Group B	10	2.20	0.72	0.23			
Day 15	Group A	10	1.08	0.35	0.11	-3.478	0.003	Sig
	Group B	10	1.88	0.64	0.20			
1 Month	Group A	10	0.82	0.20	0.06	-5.327	0.000	Sig
	Group B	10	1.67	0.46	0.15			
3 Month	Group A	10	0.77	0.23	0.07	-3.643	0.002	Sig
	Group B	10	1.37	0.47	0.15			

Table 9: Intergroup Comparison Between Group A and Group B at each follow up OHIS

OHIS	Group	N	Mean	SD	SE	t-Value	P-Value	Result
Baseline	Group A	10	0.50	0.29	0.09	-2.946	0.009	NS
	Group B	10	0.91	0.34	0.11			
Day 7	Group A	10	0.45	0.27	0.09	-2.341	0.031	NS
	Group B	10	0.85	0.47	0.15			
Day 15	Group A	10	0.40	0.23	0.07	-2.468	0.024	NS
	Group B	10	0.74	0.37	0.12			
1 Month	Group A	10	0.36	0.24	0.08	-2.468	0.024	Sig
	Group B	10	0.66	0.31	0.10			
3 Month	Group A	10	0.34	0.24	0.08	-2.218	0.040	Sig
	Group B	10	0.61	0.31	0.10			

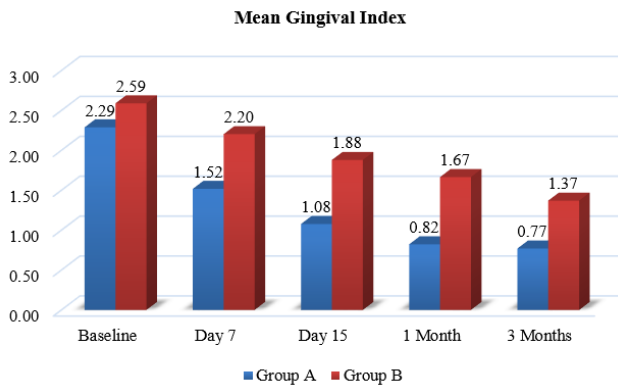


Fig. 3: Comparison of Mean gingival Index of group A and group B

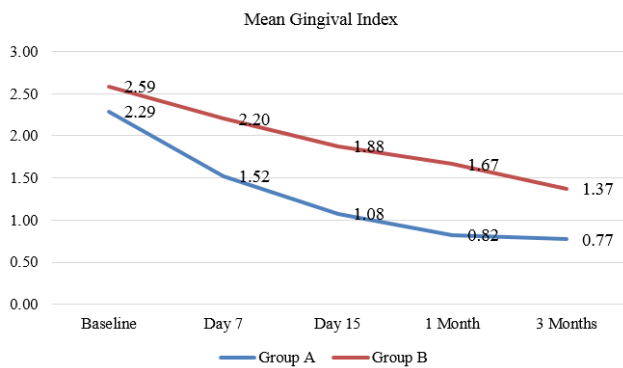


Fig. 4: Comparison of Mean gingival Index of group A and group B

However significant differences were obtained at 1 month and 3 month intervals between both the groups P less than 0.01 with group A showing decreased reduction of OHIS as compared to Group B

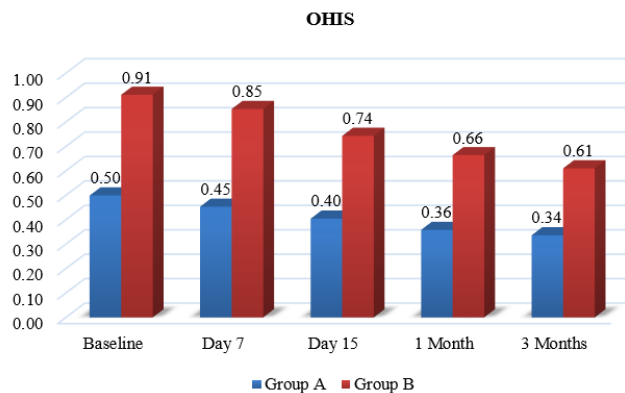


Fig. 5: Comparison of mean OHIS of group A and group B

To check Antibacterial activity of the coconut oil and sesame oil minimum inhibitory concentration (MIC) assay

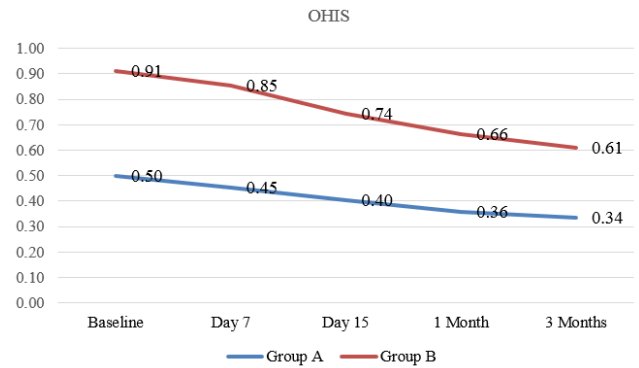


Fig. 6: Comparison of Mean OHIS of group A and group B

by agar well diffusion method on Mueller Hinton agar with 5% sheep blood (MHBA) was used. Results of the assay shows no inhibitory activity for plaque samples. There were no zone of inhibition found around wells for both the oil groups (Figure 7)

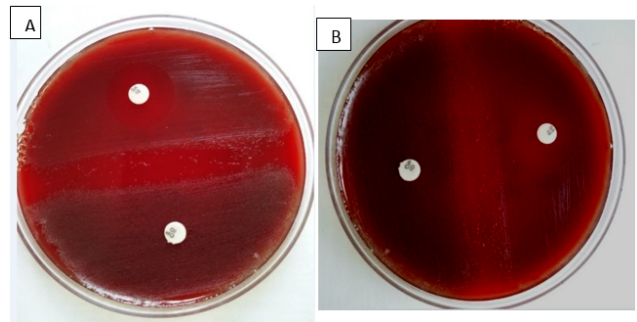


Fig. 7: No zone of inhibition around wells for both the groups

4. Discussion

Gingival diseases are family of complex pathological entities found in gingiva that are the result of a variety of etiologies. There are several clinical characteristics common to all gingival diseases and these include clinical signs of inflammation, signs and symptoms that are confined to the gingiva, reversibility of the disease by removing the etiology, the presence of bacterial laden plaque to initiate severity of disease and a possible role as a precursor for attachment loss around teeth.¹⁶

Adjunctive oral hygiene procedures such as chemical mouth wash have been advised to improve the oral health of individuals with gingivitis. The most common side-effect of the mouthwash like chlorhexidine is a yellow brown staining of teeth. Another disconcerting effect of chlorhexidine is alterations in taste sensation.

Oil pulling is an age-old process found in Charaka Samhita and Sushruta's Arthashastra.¹⁷ The process is called Kavala Gandoosha or kavala Graha in Ayurveda.¹⁸

Coconut oil has high very saponification index. Lauric acid in oil react with alkalies in saliva such as sodium hydroxide and bicarbonates it form sodium laureate. It is a soap like substance, which reduces the plaque adhesion and accumulation, and possesses cleansing action. Also it has antimicrobial and anti-inflammatory properties.¹⁹

In our study the mean PI in group A and B reduced significantly from baseline to 15 days, 1 month and 3 months. Similar results were obtained by Peedikayil et al 2015.¹²

In their preliminary study they concluded that the coconut oil pulling practice is effective in reducing plaque formation and plaque-induced gingivitis. A statistically significant decrease in gingival and plaque indices was noticed from day 7 and the scores showed continued decrease in their study.

Asokan et al. 2009²⁰ compared oil pulling with sesame oil and chlorhexidine mouth wash. It was found that oil pulling using sesame oil is equally effective as chlorhexidine in decreasing

4.1. plaque induced gingivitis

Saravanan et al. 2013²¹ conducted study in that the effect of oil pulling using sesame oil on plaque-induced gingivitis. They found statistically significant decrease in scores of plaque and gingival indices and number of bacteria in the mouth.

With background, present study compared the efficacy of coconut oil and sesame oil pulling practice in reducing the severity of plaque induced gingivitis.

Present study results shows reduction in the mean GI, PI, OHIS score for coconut oil and sesame oil comparing to the preintervention stage. Coconut oil and sesame oil group shows statistically significant difference in the reduction of PI, GI, OHIS score between preintervention and the 7th, 15th, 1 month and 3 month of post intervention stage.

Present study findings are in accordance with the previous studies i.e. both the coconut oil and sesame oil were effective in reducing the severity of gingivitis.

Coconut oil compared to sesame oil group shows that a more significant reduction in the severity of gingivitis was seen in coconut oil group than the sesame oil group at all postintervention stages. So the result in present study reveals that oil pulling using coconut oil is more effective than the sesame oil and possibly supported by the evidence of antimicrobial activity of coconut oil

5. Conclusion

Oil pulling with coconut and sesame oil serves as a promising antimicrobial agent to treat plaque-induced gingivitis. Hence this holds chance to be added to other oral hygiene measures. However coconut oil is better than sesame oil.

6. Source of Funding

No financial support was received for the work within this manuscript.

7. Conflicts of Interest

There are no conflicts of interest.

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