

COMPARATIVE EVALUATION OF THE EFFECTIVENESS OF COCONUT OIL PULLING AND CHLORHEXIDINE MOUTH RINSE IN PATIENTS UNDERGOING ORTHODONTIC TREATMENT – RANDOMIZED CONTROL TRIAL

Orthodontics

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ABSTRACT

Background: Fixed orthodontic appliances create plaque-retentive areas that increase the risk of plaque accumulation and gingival inflammation. Coconut oil pulling has emerged as a natural oral hygiene practice with antimicrobial and anti-inflammatory properties. **Objective:** To compare the effectiveness of coconut oil pulling and 0.2% chlorhexidine mouth rinse in reducing plaque accumulation and gingival inflammation in orthodontic patients. **Methods:** A randomized controlled trial was conducted among 100 systemically healthy patients aged 20–30 years undergoing fixed orthodontic treatment. Participants were randomly assigned to either a chlorhexidine mouth rinse group or a coconut oil pulling group. Plaque Index (PI) and Modified Gingival Index (MGI) were assessed at baseline and at regular intervals over a 16-week period. Statistical analysis was performed using SPSS version 26.0. **Results:** Both groups showed significant reductions in PI and MGI scores during the study period. However, the coconut oil pulling group demonstrated significantly greater improvement than the chlorhexidine group. Progressive reductions in plaque accumulation and gingival inflammation were observed throughout the follow-up period. **Conclusion:** Coconut oil pulling was more effective than 0.2% chlorhexidine mouth rinse in improving plaque control and gingival health among orthodontic patients. It may be considered a safe, economical, and natural adjunct to routine oral hygiene practices during orthodontic treatment.

KEYWORDS

Coconut Oil Pulling, Chlorhexidine, Orthodontic Treatment, Plaque Index, Gingival Index.

INTRODUCTION

Fixed orthodontic appliances create plaque-retentive areas that increase plaque accumulation and gingival inflammation, making oral hygiene maintenance challenging. The Plaque Index (PI) and Modified Gingival Index (MGI) are commonly used to assess oral hygiene status and gingival health. Although mechanical plaque control remains essential, adjunctive measures are often required during orthodontic treatment.

Chlorhexidine is considered the gold standard antiplaque mouth rinse due to its broad-spectrum antimicrobial activity. However, its long-term use is associated with adverse effects such as tooth staining, taste alteration, and mucosal irritation. Coconut oil pulling, an Ayurvedic oral hygiene practice, has gained attention as a natural alternative because of its antimicrobial and anti-inflammatory properties, primarily attributed to lauric acid.

Limited evidence is available comparing coconut oil pulling with chlorhexidine in orthodontic patients. Therefore, this randomized controlled trial was conducted to compare the effectiveness of coconut oil pulling and 0.2% chlorhexidine mouth rinse in reducing plaque accumulation and gingival inflammation among patients undergoing fixed orthodontic treatment.

Materials and Methods

This randomized controlled trial was conducted in the Department of Orthodontics and Dentofacial Orthopaedics, Kannur Dental College, after obtaining Institutional Ethics Committee approval and registration with the Clinical Trial Registry of India (CTRI/2025/03/082614). A total of 100 systemically healthy patients aged 20–30 years undergoing fixed orthodontic treatment were included after obtaining written informed consent. Participants were randomly allocated into two groups (n = 50 each). Group I used 0.2% chlorhexidine mouth rinse once daily, while Group II performed coconut oil pulling once daily immediately after waking. Baseline recordings were obtained one month after the initiation of orthodontic treatment.

Plaque Index (PI) and Modified Gingival Index (MGI) were assessed at baseline, 30 days, 7 weeks, 10 weeks, 13 weeks, and 16 weeks. Clinical examination was performed using a mouth mirror and probe on the maxillary and mandibular first molars and central incisors. The primary outcome measures were plaque accumulation and gingival inflammation, assessed using PI and MGI scores, respectively.



Figure 1: Armamentarium 1



Figure 2: Armamentarium 2

RESULTS

Both groups showed a significant reduction in Plaque Index (PI) and Modified Gingival Index (MGI) scores over the 16-week study period. In the coconut oil pulling group, mean PI decreased from 1.5586 ± 0.4827 at baseline to 0.4102 ± 0.3402 at 16 weeks, while mean MGI decreased from 1.3956 ± 0.5118 to 0.3650 ± 0.3453 . Repeated measures ANOVA demonstrated highly significant improvements in both PI ($F = 92.4, p < 0.001$) and MGI ($F = 88.7, p < 0.001$).

Table 1-Plaque Index (PI)-Group A within group comparison

Time Point	Mean $\pm$ SD	F value	p value
30 Days	1.5586 $\pm$ 0.4827	92.4	< 0.001*
7th Week	1.1838 $\pm$ 0.5457		
10th Week	0.8927 $\pm$ 0.5114		
13th Week	0.6077 $\pm$ 0.4088		
16th Week	0.4102 $\pm$ 0.3402		

Table 2-Post-Hoc Analysis – Plaque Index (PI) (Group A)

Comparison	Mean Difference	95% CI	t value	p value
30d vs 7w	0.3748	(0.28 – 0.47)	5.92	<0.001*
30d vs 10w	0.6659	(0.57 – 0.76)	10.84	<0.001*
30d vs 13w	0.9509	(0.86 – 1.04)	15.63	<0.001*
30d vs 16w	1.1484	(1.05 – 1.24)	19.42	<0.001*
7w vs 10w	0.2911	(0.19 – 0.39)	4.76	<0.001*
7w vs 13w	0.5761	(0.48 – 0.67)	9.52	<0.001*
7w vs 16w	0.7736	(0.67 – 0.87)	13.88	<0.001*
10w vs 13w	0.2850	(0.18 – 0.38)	4.41	<0.001*
10w vs 16w	0.4825	(0.38 – 0.58)	8.36	<0.001*
13w vs 16w	0.1975	(0.11 – 0.28)	3.5	0.001*

Table 3-Gingival Index (GI)-Group A within group comparison

Time Point	Mean $\pm$ SD	F value	p value
30 Days	1.3956 $\pm$ 0.5118	88.7	< 0.001*
7th Week	1.0842 $\pm$ 0.5025		
10th Week	0.7740 $\pm$ 0.4562		
13th Week	0.5762 $\pm$ 0.4084		
16th Week	0.3650 $\pm$ 0.3453		

Table 4-Post-Hoc Analysis – Gingival Index (GI) Group A

Comparison	Mean Difference	95% CI	t value	p value
30d vs 7w	0.3114	(0.22 – 0.40)	5.11	<0.001*
30d vs 10w	0.6216	(0.53 – 0.71)	10.12	<0.001*
30d vs 13w	0.8194	(0.73 – 0.90)	13.64	<0.001*
30d vs 16w	1.0305	(0.94 – 1.12)	17.81	<0.001*
7w vs 10w	0.3102	(0.21 – 0.40)	4.98	<0.001*
7w vs 13w	0.5080	(0.41 – 0.60)	8.41	<0.001*
7w vs 16w	0.7192	(0.62 – 0.81)	12.93	<0.001*
10w vs 13w	0.1978	(0.11 – 0.28)	3.66	0.001*
10w vs 16w	0.4090	(0.32 – 0.49)	7.42	<0.001*
13w vs 16w	0.2112	(0.13 – 0.29)	3.88	<0.001*

In the chlorhexidine group, PI decreased from 1.6384 $\pm$ 0.5306 to 1.3676 $\pm$ 0.7500 and MGI decreased from 1.5308 $\pm$ 0.5751 to 1.2029 $\pm$ 0.7002. Although these reductions were statistically significant ($p < 0.05$), the magnitude of improvement was smaller than that observed in the coconut oil pulling group.

Table 5- Plaque Index (PI) Within group comparison(Group B)

Time Point	Mean $\pm$ SD	F value	p value
30 Days	1.6384 $\pm$ 0.5306	6.42	0.001*
7th Week	1.4982 $\pm$ 0.6407		
10th Week	1.3982 $\pm$ 0.7263		
13th Week	1.3694 $\pm$ 0.7553		
16th Week	1.3676 $\pm$ 0.7500		

Intergroup comparison showed no significant difference at baseline. However, from the 7th week onward, the coconut oil pulling group demonstrated significantly lower PI and MGI scores than the chlorhexidine group ($p < 0.05$), with highly significant differences observed at the 10th, 13th, and 16th weeks ($p < 0.001$).

Table 6- Post-Hoc Analysis – Plaque Index (PI)(Group B)

Comparison	Mean Difference	95% CI	t value	p value
30d vs 7w	0.1402	0.02 – 0.26	2.31	0.023*
30d vs 10w	0.2402	0.10 – 0.38	3.78	<0.001*
30d vs 13w	0.2690	0.12 – 0.41	4.12	<0.001*
30d vs 16w	0.2708	0.13 – 0.42	4.18	<0.001*
7w vs 10w	0.1000	-0.05 – 0.25	1.34	0.18 (NS)
7w vs 13w	0.1288	-0.03 – 0.28	1.68	0.09 (NS)
7w vs 16w	0.1306	-0.03 – 0.29	1.71	0.08 (NS)
10w vs 13w	0.0288	-0.13 – 0.19	0.36	0.72 (NS)
10w vs 16w	0.0306	-0.13 – 0.19	0.39	0.69 (NS)
13w vs 16w	0.0018	-0.15 – 0.16	0.02	0.98 (NS)

Table 7- Gingival Index (GI)-Within group comparison (Group B)

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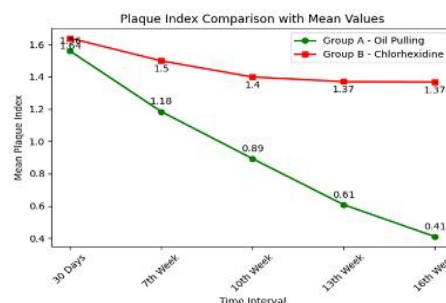
Time Point	Mean $\pm$ SD	F value	p value
30 Days	1.5308 $\pm$ 0.5751	5.88	0.002*
7th Week	1.3998 $\pm$ 0.6679		
10th Week	1.2731 $\pm$ 0.7347		
13th Week	1.2256 $\pm$ 0.7083		
16th Week	1.2029 $\pm$ 0.7002		

Table 8-Group B – Gingival Index (GI)-Posthoc Analysis

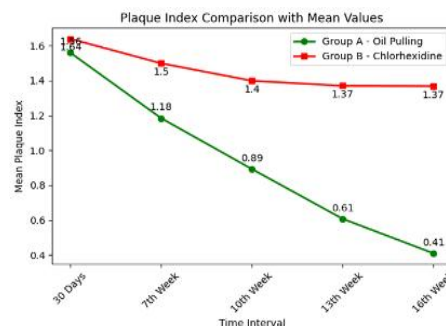
Comparison	Mean Difference	95% CI	t value	p value
30d vs 7w	0.1310	0.01 – 0.25	2.17	0.032*
30d vs 10w	0.2577	0.12 – 0.39	3.91	<0.001*
30d vs 13w	0.3052	0.16 – 0.45	4.54	<0.001*
30d vs 16w	0.3279	0.18 – 0.48	4.89	<0.001*
7w vs 10w	0.1267	-0.02 – 0.27	1.68	0.09 (NS)
7w vs 13w	0.1742	-0.01 – 0.35	1.92	0.06 (NS)
7w vs 16w	0.1969	-0.02 – 0.37	1.99	0.05 (Borderline)
10w vs 13w	0.0475	-0.11 – 0.20	0.58	0.56 (NS)
10w vs 16w	0.0702	-0.09 – 0.23	0.88	0.38 (NS)
13w vs 16w	0.0227	-0.12 – 0.16	0.31	0.75 (NS)

Table 9-Intergroup Comparison – Plaque Index (PI)

Time Point	Group A Mean $\pm$ SD	Group B Mean $\pm$ SD	t value	p value
30 Days	1.5586 $\pm$ 0.4827	1.6384 $\pm$ 0.5306	-0.88	0.38 (NS)
7th Week	1.1838 $\pm$ 0.5457	1.4982 $\pm$ 0.6407	-2.75	0.007*
10th Week	0.8927 $\pm$ 0.5114	1.3982 $\pm$ 0.7263	-4.27	<0.001*
13th Week	0.6077 $\pm$ 0.4088	1.3694 $\pm$ 0.7553	-6.35	<0.001*
16th Week	0.4102 $\pm$ 0.3402	1.3676 $\pm$ 0.7500	-8.92	<0.001*

**Graph 1: Graph showing mean comparison of mean Plaque Index of oil pulling & Chlorhexidine group****Table 10-Intergroup Comparison – Gingival Index (GI)**

Time Point	Group A Mean $\pm$ SD	Group B Mean $\pm$ SD	t value	p value
30 Days	1.3956 $\pm$ 0.5118	1.5308 $\pm$ 0.5751	-1.27	0.20 (NS)
7th Week	1.0842 $\pm$ 0.5025	1.3998 $\pm$ 0.6679	-2.85	0.005*
10th Week	0.7740 $\pm$ 0.4562	1.2731 $\pm$ 0.7347	-4.41	<0.001*
13th Week	0.5762 $\pm$ 0.4084	1.2256 $\pm$ 0.7083	-5.78	<0.001*
16th Week	0.3650 $\pm$ 0.3453	1.2029 $\pm$ 0.7002	-7.96	<0.001*

**Graph 2: Graph showing mean comparison of mean Gingival Index of oil pulling & Chlorhexidine group**

The overall percentage reduction in PI and MGI was 73.7% and 73.9%, respectively, in the coconut oil pulling group, compared with 16.5% and 21.4% in the chlorhexidine group, indicating superior effectiveness of coconut oil pulling in improving oral hygiene and gingival health among orthodontic patients.

Table 11: Percentage Reduction in Both Groups

Variable	Group A (Oil Pulling)	Group B (Chlorhexidine)
Plaque Index (PI)	73.7% reduction	16.5% reduction
Modified Gingival Index (GI)	73.9% reduction	21.4% reduction

DISCUSSION

The present study evaluated the effectiveness of coconut oil pulling and 0.2% chlorhexidine mouth rinse in reducing plaque accumulation and gingival inflammation among orthodontic patients. Both interventions resulted in significant reductions in Plaque Index (PI) and Modified Gingival Index (MGI) scores over the 16-week study period. However, the coconut oil pulling group demonstrated significantly greater improvements compared to the chlorhexidine group.

The superior performance of coconut oil pulling may be attributed to the antimicrobial and anti-inflammatory properties of lauric acid, the major fatty acid present in coconut oil. In addition, the emulsification process during oil pulling may facilitate the mechanical removal of plaque and oral microorganisms. These findings are consistent with previous studies that reported significant reductions in plaque levels, gingival inflammation, and oral microbial counts following coconut oil pulling therapy.

Although chlorhexidine is considered the gold standard antiplaque agent, its effectiveness in the present study was comparatively lower. This may be related to reduced compliance during prolonged use due to known adverse effects such as tooth staining, taste alteration, and mucosal irritation.

The findings suggest that coconut oil pulling can serve as a safe, economical, and effective adjunct to routine oral hygiene measures in orthodontic patients. However, the study was limited by its single-center design and relatively short follow-up period. Further multicenter studies with larger sample sizes and longer follow-up are recommended to validate these findings.

Overall, coconut oil pulling demonstrated superior plaque control and gingival health improvement compared with chlorhexidine mouth rinse in patients undergoing fixed orthodontic treatment.

CONCLUSION

The present randomized controlled trial was conducted to evaluate and compare the effectiveness of coconut oil pulling and 0.2% chlorhexidine mouth rinse in reducing plaque accumulation and gingival inflammation in patients undergoing fixed orthodontic treatment. A total of 100 systemically healthy orthodontic patients were randomly divided into two groups, with one group advised to perform coconut oil pulling once daily and the other instructed to use chlorhexidine mouth rinse once daily. Plaque Index and Modified Gingival Index were recorded at baseline and at regular intervals over a sixteen-week period to assess oral hygiene status and gingival health. The results of the study demonstrated a statistically significant reduction in plaque accumulation and gingival inflammation in both groups during the study period. However, the reduction was greater in the coconut oil pulling group compared to the chlorhexidine group. The antimicrobial and anti-inflammatory properties of coconut oil along with the mechanical cleansing effect of oil pulling, may have contributed to the improved clinical outcomes. Within the limitations of the present study, it can therefore be concluded that coconut oil pulling is an effective, safe, economical, and natural adjunctive oral hygiene practice that can help reduce plaque and improve gingival health in orthodontic patients and may serve as a useful alternative to chlorhexidine mouth rinse for long-term oral hygiene maintenance.

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