

Comparison Of Effectiveness Between Herbal And Non Herbal Mouthwashes In Reducing Gingivitis And Plaque Among Patients Undergoing Orthodontic Treatment – A Prospective Clinical Study

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Abstract:

Objective: This study aims to assess and compare the effectiveness of herbal and non-herbal mouthwashes in patients with gingivitis undergoing orthodontic treatment.

Materials and Methods: This experimental study included 40 patients aged 17-25 years undergoing fixed orthodontic treatment and diagnosed with gingivitis. Participants were divided into two groups: non-herbal mouthwash (chlorhexidine) (Group A), herbal mouthwash (Group B). Baseline gingival status was assessed using standard clinical indices such as the Gingival Index (GI) and Plaque Index (PI). All participants were instructed to maintain their routine oral hygiene practices along with the use of the assigned mouthwash twice daily for a period of 21 days. Follow-up assessments of gingival and plaque status were recorded after 21 days. Statistical analysis was performed to compare the reduction in gingival inflammation and plaque accumulation among the two groups.

Results: Both the group showed a reduction in plaque accumulation and gingival inflammation following the use of mouthwashes. The chlorhexidine group demonstrated the most significant improvement ($p < 0.05$) with greater reduction in both plaque and gingival index scores. The herbal mouthwashes group exhibited a moderate reduction, however the effect remained comparatively lower than observed with chlorhexidine.

Conclusion: Chlorhexidine mouthwash was more effective than herbal mouthwash in reducing plaque and gingival inflammation in orthodontic patients. Herbal mouthwash showed moderate benefits but lower efficacy. Further studies are needed to evaluate its long term potential as an alternative.

Keywords: Gingivitis, Chlorhexidine, non herbal mouthwash, fixed orthodontic treatment, plaque.

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I. Introduction:

Dental plaque is the underlying cause of most common oral diseases, including dental caries, gingivitis, periodontitis, and halitosis. It is also referred to as tooth plaque, microbial plaque, or dental biofilm, and appears as a soft, adhesive layer that accumulates on tooth surfaces¹. Gingivitis is marked by inflammation and bleeding of the gingival tissues. Its primary cause is dental plaque that accumulates on the surfaces of the teeth and gums². The efficient removal of dental plaque is essential for preserving periodontal and overall oral health³.

There are various plaque controlling measures such as mechanical and chemical plaque control⁴. Mechanical plaque control methods are the cornerstone of maintaining oral hygiene. Mechanical methods such as toothbrushing and dentifrices, are widely used to remove and control dental plaque¹. However, these techniques can be time-consuming and require adequate skill and motivation for effective performance².

Chemical plaque control through the use of mouthwashes serves as an adjunctive therapy that aids in plaque removal and helps prevent the accumulation of microbial plaque, potentially decreasing reliance on mechanical oral hygiene methods⁴. Among them, chlorhexidine (CHX) digluconate is considered the most effective antiplaque agent and is widely regarded as the gold standard. However, its usage may be limited due to its side effects, particularly when recommended for long-term use, which can affect patient compliance⁵.

Recent developments in alternative medicine have resulted in the introduction of various new herbal products for the treatment of gingivitis⁶.

The growing interest in new medicine has led to the development of complementary and alternative approaches for health promotion in many parts of the world, driven by increased awareness of traditional healing

systems. Herbal ingredients have long been incorporated into oral care products, particularly in South Asian countries, to support individuals with gingivitis in maintaining oral hygiene. Studies have associated oral microorganisms—especially those capable of forming adherent biofilms with specific clinical conditions such as periodontal diseases⁷.

However, despite numerous studies^{2,3,4} evaluating different herbal mouthwashes for reducing dental plaque and gingivitis, the results remain inconclusive⁸.

Hence, this study was planned with the aim of comparing the effectiveness between herbal and non-herbal mouthwashes in reducing gingivitis and plaque among patients undergoing orthodontic treatment.

II. Methodology

Study Design and setting: The present study was a 2-arm, parallel group, non randomized clinical study conducted in Department of Public Health Dentistry & Department Of Orthodontics Of M.A. Rangoonwala College Of Dental Sciences and Research Centre, Pune.

Study Population: Participants included healthy individuals aged 17–25 years who had been undergoing fixed orthodontic treatment for at least three months and presented with mild to moderate gingivitis. Only those who provided informed consent were enrolled in the study.

Exclusion criteria comprised a history of allergy or hypersensitivity to any mouthwash components, presence of systemic conditions affecting periodontal health, pregnancy or lactation, and use of antibiotics or immunosuppressive medications within the preceding two weeks.

This clinical trial was conducted on 40 individuals which were divided into 2 groups. Participants were selected and randomly divided into two groups:

- Group A (Non-herbal group): Patients using chlorhexidine wemouthwash - 2%
- Group B (Herbal group): Patients using herbal mouthwash active agent 'Miswak' - 2%

Study Procedure: Appointments for clinical examination were scheduled in the morning between 8:30 and 10:00 am to minimize the influence of diurnal variations in oral conditions and gingival status. Upon arrival, participants were instructed to remain seated and relaxed before the procedure.

Baseline Clinical Examination: A baseline clinical examination was carried out for all participants. Gingival health was assessed using the Gingival Index (Löe and Silness)⁹, and Plaque Index (Silness and Löe)¹⁰ scores were recorded for each subject to determine the initial prevalence and severity of gingivitis. All examinations were performed under standardized conditions using a mouth mirror and periodontal probe.

Intervention: Following the baseline assessment, participants were randomly assigned into two groups:

- Group A: Received Chlorhexidine (2%) mouthwash
- Group B: Received Himalaya Miswak Herbal Mouthwash

Participants were blinded to the type of mouthwash administered. All mouthwash bottles were uniformly packaged in opaque black coverings to conceal their identity, ensuring that participants were unaware of whether they received herbal or chlorhexidine formulations.

Participants were instructed to rinse with 5 mL of the assigned mouthwash twice daily for 30 seconds, after routine tooth brushing, for a period of 21 days. Standardized oral hygiene instructions were provided to all participants to ensure uniformity in brushing technique and plaque control measures. Participants were advised not to use any other mouthwash or adjunctive oral hygiene aids during the study period.

Follow-up: Follow-up clinical evaluations were conducted after 21 days to monitor changes in gingival health and plaque reduction. At the 21st day of follow-up, the Gingival Index and Plaque index was reassessed using the same methodology and examiner to maintain consistency.

Participants were instructed to avoid eating or drinking at least 1 hour prior to examination to prevent transient influences on gingival appearance. Compliance with mouthwash usage was monitored through verbal confirmation and follow-up questioning.

Statistical analysis: Statistical analysis was done with Statistical Package for Social Sciences (IBM SPSS Statistic for window, version 26.0. Armonk, NY: IBM Corp.) at 95% CI and 80% power to the study. Descriptive statistics was performed in terms of Mean, Std Deviation,

Frequency and Percentage. Comparison of Preop and Post op Gingival index and Plaque Index scores was done using Paired t test. Comparison of Gingival index and plaque index scores between Group A and Group B was done using Unpaired t test. Statistical significance was calculated at $p < 0.05$ was considered statistically highly significant.

III. Results:

Table 1: Demographic Characteristics of study population:

Sr. No	Gender	N	%	Mean Age 21.30 ± 2.16
1	Female	30	75%	
2	Male	10	25%	
Total		40	100%	

Table 2: Intragroup Comparison of Gingival Index (GI)

Group	Interval	Pre (Mean ± SD)	Post (Mean ± SD)	Mean Diff	p-value
Group A	Pre Vs Post	1.93 ± 0.60	1.21 ± 0.52	0.72	<0.001
Group B	Pre Vs post	1.14 ± 0.39	1.13 ± 0.34	0.01	0.453

Paired t-test applied. p < 0.05 considered significant.

Table 3: Intergroup Comparison of Gingival Index (GI)

Interval	Group A	Group B	Mean Diff	p-value
Preoperative	1.93 ± 0.60	1.14 ± 0.39	0.79	<0.001
Postoperative	1.21 ± 0.52	1.13 ± 0.34	0.08	0.518

Independent (Unpaired) t-test applied. p < 0.05 considered significant.

Table 4: Intragroup Comparison of Plaque Index (PI)

Group	Interval	Pre (Mean ± SD)	Post (Mean ± SD)	Mean Diff	p-value
Group A	Pre vs Post	1.59 ± 0.41	0.92 ± 0.28	0.67	<0.001
Group B	Pre vs Post	0.88 ± 0.28	0.88 ± 0.31	0.00	0.853

Paired t-test applied. p < 0.05 considered significant.

Table 5: Intergroup Comparison of Plaque Index (PI)

Interval	Group A	Group B	Mean Diff	p-value
Preoperative	1.59 ± 0.41	0.88 ± 0.28	0.71	<0.001
Postoperative	0.92 ± 0.28	0.88 ± 0.31	0.04	0.672

Independent (Unpaired) t-test applied. p < 0.05 considered significant.

Figure 1: Comparison of Gingival score between Group A (Chlorhexidine) and Group B (Herbal):

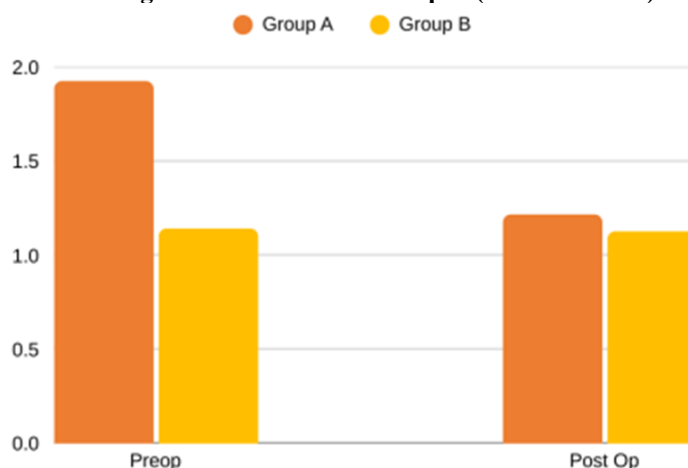
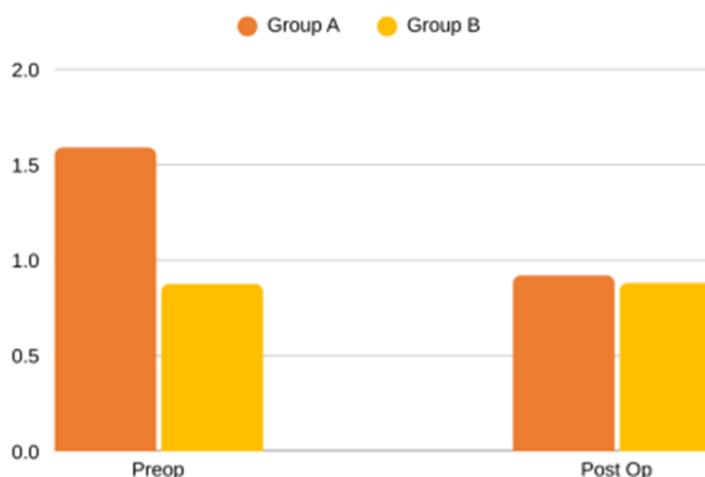


Figure 2: Comparison of plaque score between Group A (Chlorhexidine) and Group B (Herbal):



The study consisted of 40 participants with a mean age of 21.30 ± 2.16 years. The gender distribution showed a higher proportion of females (75%) compared to males (25%). (Table 1)

Group A demonstrated a statistically significant reduction in GI scores following the intervention ($p < 0.001$), indicating improved gingival health. In contrast, Group B showed no statistically significant change ($p = 0.453$). (Table 2)

At baseline, Group A had significantly higher GI scores compared to Group B ($p < 0.001$). Postoperatively, the difference was not statistically significant ($p = 0.518$), indicating comparable gingival status after intervention. (Table 3)

A statistically significant reduction in PI scores was observed in Group A ($p < 0.001$), reflecting improved plaque control. Group B did not show any significant change ($p = 0.853$). (Table 4)

Baseline PI scores were significantly higher in group A ($p < 0.001$). Post treatment differences were not significant ($p = 0.672$), indicating both groups achieved similar plaque control levels. (Table 5)

Figure 1 shows the comparison of gingival scores between Group A (Chlorhexidine) and Group B (Herbal) during the preoperative and postoperative periods. Both groups demonstrated a reduction in gingival scores postoperatively, indicating improvement in gingival health following the intervention. Group A showed a comparatively greater reduction in gingival score than Group B.

Figure 2 shows the comparison of plaque scores between Group A and Group B in the preoperative and postoperative phases. A decrease in plaque scores was observed in both groups after treatment, suggesting effective plaque control. However, Group A exhibited a slightly greater reduction in plaque score compared to Group B.

IV. Discussion:

Effective chemical plaque control plays a crucial role in preventing and managing gingivitis in such patients. This study compared the effectiveness of herbal and non herbal (chlorhexidine) mouthwashes in reducing gingival inflammation and plaque accumulation, aiming to identify an adjunctive rinse that provides optimal clinical benefits with minimal side effects.

According to a study conducted by Tidke et al. (2022)³, a comparison was made between chlorhexidine and herbal mouthrinses in reducing gingival inflammation. Their findings suggested that herbal mouthrinses showed comparable, and in some cases superior, anti-inflammatory effects compared to chlorhexidine. However, in the present study, the chlorhexidine group demonstrated greater reduction in gingival and plaque scores than the herbal group. It is important to note that the herbal formulations used in the referenced study were based on ingredients such as tea tree oil and lemongrass oil, which may not be widely available or commonly used in commercial products. In contrast, the herbal mouthrinse used in the present study contained readily available components such as neem, pomegranate, menthol and most importantly miswak making the findings more clinically applicable.

According to a study conducted by Dehghan M et al. (2015)¹¹, the effectiveness of different mouthrinses, including commercial formulations and water, was evaluated in maintaining oral health parameters. The results indicated no significant difference among the groups over time. However, their study included a relatively small sample size and involved repeated interventions, which may have influenced the outcomes. These limitations reduce the generalizability of their findings compared to our study.

In contrast to the findings of Polyakova M et al. (2021)¹², who reported no significant differences among

various mouthrinse formulations in improving gingival health, the present study demonstrated a statistically ($p < 0.05$) significant improvement in gingival and plaque indices following the use of chlorhexidine. Additionally, greater consistency in reduction of inflammation was observed over time, with clearer differences between groups, supporting stronger clinical relevance in orthodontic patients.

This study has several notable strengths that enhance its internal validity and clinical relevance. First, the use of an experimental design with two well-defined intervention groups (chlorhexidine and herbal mouthrinse) allows for direct comparison under standardized conditions. Second, the inclusion of repeated clinical assessments using established indices such as the Gingival Index and Plaque Index provides a comprehensive evaluation of treatment outcomes over time. Third, confounding factors were minimized by standardizing oral hygiene instructions, duration of mouthrinse use, and participant selection criteria, including the exclusion of individuals with systemic conditions or recent periodontal therapy.

Despite these strengths, certain limitations should be acknowledged. First, the study population was limited to young adults aged 17-25 years undergoing orthodontic treatment, which may restrict the applicability of results to other age groups or individuals without orthodontic appliances. Second, the herbal mouthrinse formulation used in this study does not encompass the wide variety of herbal products available in the market, limiting broader extrapolation. Additionally, the study duration was relatively short, and long-term effects of both herbal and non-herbal mouthwashes on gingival health were not assessed. Future studies with long term follow up and different herbal formulations can be plane

V. Conclusion:

Within the limitations of the present study, it can be concluded that both the rinsing agents—non-herbal mouthwash (chlorhexidine), herbal mouthwash—demonstrated effectiveness in reducing gingival inflammation and plaque accumulation in patients undergoing orthodontic treatment. However, the degree and consistency of improvement varied significantly among the groups.

Chlorhexidine mouthwash remains the gold standard for managing gingivitis in patients undergoing orthodontic treatment. However, herbal mouthwashes may serve as a suitable alternative for individuals seeking products with fewer side effects or for long-term use. Therefore, both can be considered as adjuncts to routine oral hygiene, with chlorhexidine being more effective in achieving optimal gingival health outcomes.

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