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Effects of Herbal and Non-Herbal Toothpaste on Plaque and Gingivitis among Undergraduate Students in A Dental College in Rajahmundry City – A Randomized Controlled Trial

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Abstract

Introduction: The presence of excessive plaque may be the culprit for dental caries, gingivitis, periodontal problems, and halitosis. Many mechanical aids are practiced worldwide to remove or control plaque, including toothbrushes, dental floss, and dentifrices.

Aim and objective: To conduct a Randomized Controlled Trial for the effectiveness of herbal and non-herbal toothpaste in controlling plaque and gingivitis among undergraduate students in a dental college.

Methodology: All the undergraduate students with at least 20 natural teeth were examined for plaque and gingivitis and divided randomly into two equal groups A and B. Before the intervention baseline plaque Index (PI) and gingival index (GI) scores were recorded. One group was given herbal toothpaste and the other, conventional dentifrice. Subjects were told to use them

twice a day for 15 days. Again, on the 15th day of usage respective dentifrices, plaque, and gingival scores were recorded. Differences between groups were compared with the Mann–Whitney U test and the mean scores of PI and GI by the Wilcoxon test.

Results: At the end of 15 days into the study, there was a statistically significant difference between both groups for gingival scores. And for plaque score herbal paste was significant in reducing plaque.

Conclusion: No adverse reactions to dentifrices products were observed during the trial. It was concluded that herbal dentifrice was as effective as non-herbal dentifrices in the control of plaque and gingivitis

Keywords: Dental Plaque, Herbal, Toothpaste, Gingivitis

Introduction

Chronic gingivitis, one of the most prevalent oral diseases, is caused by a systematically formed biofilm known as dental plaque.[1,2] Dental plaque is an organised group of complex microorganisms that adheres tenaciously to both hard and soft tissues of the oral cavity. The second most frequent oral disease is plaque-induced gingivitis. Preventing and eliminating gingival inflammation is essential for maintaining good oral hygiene.[2,3,4,5]

Plaque control is the removal of microbial plaque and the prevention of its accumulation on the teeth and associated gingival tissues, as well as the prevention of calculus formation and the resolution of gingival irritation.[5]

Toothbrushing is the most common practice to maintain good personal oral hygiene. It is well known that using dentifrice as an additional application has proven to be extremely beneficial.[5,6]

Antimicrobials are being added to dentifrices to increase their effectiveness in controlling bacteria.[6,7] Dentifrices serve as a daily, convenient, and preventive aid for appropriate oral hygiene care, limiting plaque formation and growth and reducing oral diseases.[1,6]

Several formulations containing specific chemical agents or medicinal herbs are manufactured and commercialised, however, people choose herbal toothpaste because they believe that herbal toothpastes are significantly less hazardous than non-herbal toothpastes containing synthetic and chemical ingredients. According to a few studies, sodium lauryl sulphate in non-herbal toothpaste can result in perioral dermatitis, ulceration, and lesions on the oral mucosa.[7,8]

The people's interest in herbal toothpaste has grown recently. Herbal ingredients such as Triphala, fake black pepper, neem, Miswak, and chaste trees have several advantages.

- Triphala's astringent properties minimise gum bleeding and antibacterial properties may help prevent cavities, plaque, and halitosis.[8]
- Embelia ribesis, or False Black Pepper, has anti-inflammatory qualities that can alleviate gum inflammation.[10]
- Neem (Azadirachta indica) has been used for millennia to improve oral hygiene and contains antioxidant qualities.[11]
- Miswak (Salvadora persica) fresh twigs might protect gums and teeth. The bark extract contains tannins, which are recognised for their antioxidant effects.[12]
- Chaste Tree is known for its anti-inflammatory and analgesic benefits.[13]

The current study was carried out to investigate and contrast the efficacy of herbal and non-herbal toothpaste for preventing gingivitis and dental plaque because only a few studies are accessible in our context.

Aims and Objectives

To evaluate the effectiveness of herbal and non-herbal toothpaste in controlling plaque and gingivitis among undergraduate students in a dental college.

Material and Methods

This randomised controlled study involved 100 undergraduate (1st year BDS) students at the Lenora Institute of Dental Sciences in Rajahmundry City. The ethical approval was obtained from the institutional review board (File No.05/IEC/LIDS/2024), and study participants (both in the study and control groups) provided written agreement.

This experimental investigation comprised subjects who met the inclusion criteria listed below: Having at least 20 teeth, good overall health, the presence of established gingivitis, being willing to provide written informed consent, a willing to follow the schedule, and having not participated in a comparable investigation in the previous four weeks.

Participants with severe tooth misalignment, those undergoing orthodontic treatment, those who had undergone oral prophylaxis, patients unwilling to provide informed permission, and those with a medical or pharmacological history, were excluded from the study.

Subjects were examined for plaque and gingivitis and divided randomly into two equal groups i.e., Group A and Group B. Baseline plaque Index (PI) and gingival index (GI) scores were recorded before the intervention. Group A was given herbal toothpaste (Hiora) and Group B, a non-herbal toothpaste (conventional dentifrice). The subjects were instructed to use the products twice daily for 15 days. Again, on the 15th day of using respective dentifrices, plaque, and gingival scores were recorded. Triple blinding was followed. Differences between groups were compared with the Mann–Whitney U test and the mean scores of plaque index (PI) and gingival index (GI) by the Wilcoxon test.

Results

Among the 100 participants, those who failed to fulfil the inclusion criteria were excluded from the study. In total, 84 study participants (42 in the A group and 42 in the B group) completed the 15-day trial period. Plaque and gingivitis levels were not significantly different between the two groups at baseline. At baseline, the PI median scores for the herbal and non-herbal groups were 0.834 and 0.987, respectively. The baseline values for gingivitis in the herbal and non-herbal groups were 1.0695 and 0.5914, respectively.

On the 15th day, both herbal and non-herbal groups demonstrated a reduction in plaque and gingivitis; the PI median score for herbal and non-herbal groups was 0.5662 and 0.29906, and the GI index scores for herbal and non-herbal groups were 0.3569 and 0.42497, respectively. The reduction in plaque and gingivitis from 0 to 15 days was statistically significant in both groups [Tables 1 and 2]. There were no statistically significant differences between the groups. During this experimental study, no toothpaste caused any adverse responses.

Discussion

Good oral hygiene helps to prevent dental caries, gingivitis, periodontitis, and other oral infections. Dental plaque is the primary cause of chronic gingival inflammation, which can result in tissue loss and, if left untreated, advance to the more destructive stages of periodontitis. As a result, managing plaque and gingivitis contributes in the maintenance of a healthy oral cavity. Mechanical plaque control with toothbrushes and medicated toothpastes can effectively achieve this goal.

This study aimed to assess the effectiveness of herbal toothpaste in reducing plaque and gingivitis. As a result, we focused on the preventive effect of toothpastes rather than the composition of the items themselves. All 84 study participants completed the 15-day study period. At baseline, there was no significant difference between the groups for plaque and gingivitis. At baseline, the PI median score for Group A (herbal and Group B (non-herbal) groups was 0.834 and 0.987, respectively

At 15 days, both group A (herbal) and group B (non-herbal) had lower plaque scores, respectively. Plaque scores were significantly reduced in group A (Herbal) at both baseline and 15 days. (For group A, p = 0.000*). These findings were comparable to those reported by Tatikonda et al.[14] Group B (non-herbal) likewise noticed a reduction in plaque, but the difference between baseline and 15th-day scores was not statistically significant (p=0.678). Tatikonda et al., Ozaki et al., and Sushma et al. reported similar results.[14,15,16] Several more studies have demonstrated the efficiency of herbal dentifrices in plaque management compared to conventional toothpaste.

At 15 days, inter-group and intra-comparison of GI between group A and group B showed a reduction of gingivitis, respectively.

Statistically, there was a significant difference between the groups from baseline to 15 days. (group A (Herbal), p=0.000*; group B (Non-Herbal), p=0.000). Hence, herbal toothpastes are as effective as non-herbal toothpastes in reducing gingivitis.

These findings are similar to the studies done by Tatikonda et.al, Ozaki et.al, George et.al, and Matue et.al.[14,15,17,18]. Contrary results were observed in the studies done by Sushma et al., Oliveira et.al, and Pannuti et al.[16,19,20]

No adverse reactions to dentifrices products were observed during the trial in the present study. Herbal products have been shown in multiple studies to have medicinal benefits. Medicated herbal toothpastes are safe for controlling plaque and gingivitis.[1,2,5.7,14,15,16,17,21] Long-term studies are necessary to prove their effectiveness.

Conclusion

Although both herbal and non-herbal toothpaste have distinct benefits and considerations for maintaining oral hygiene, herbal toothpaste, which is frequently made with natural ingredients such as false black pepper, neem, miswak, chaste tree, and so on, appeals to those seeking a more organic approach to dental care.

After 15 days of trial, both herbal and non-herbal groups showed effective reduction of plaque and gingivitis, which was statistically significant and hence scientifically successful in controlling plaque and gingivitis, comparable to non-herbal toothpaste.

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Legend Tables

Table 1: Inter-group and Intra-group comparison of PI by Wilcoxon and Mann–Whitney u test:

Groups	Plaque scores			
	Statistics	Baseline	Day 15	P(W)
Herbal	Mean + SD	0.6555±0.51428	0.4748±0.48195	0.000*
	Median	0.834		
Non-herbal	Mean + SD	1.0667±0.42061	1.0207±0.42061	0.678
	Median	0.987		
	P(MW)	0.000*	0.988	
*= statistically significant, PI= Plaque index, MW=Mann-Whitney, W= Wilcoxon				

Table: 2: Inter-group and Intra-group comparison of GI by Wilcoxon and Mann–Whitney u test:

Groups	Gingival scores			
	Statistics	Baseline	Day 15	P(W)
Herbal	Mean + SD	1.0695±0.49497	0.5662±0.29906	0.000*
Non-herbal	Mean + SD	0.5914±0.5581	0.3569±0.42497	0.000*
	P(MW)	0.000*	0.763	
*= statistically significant, GI= Gingival index, MW=Mann-Whitney, W= Wilcoxon				