



## IS TOOTHPASTE NECESSARY? A STUDY ON THE ADDED BENEFIT OF DENTIFRICES ON PLAQUE REMOVAL AND GINGIVAL INDEX SCORE

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### ABSTRACT

#### Background

This study aimed to evaluate whether the addition of non-fluoridated toothpaste provides any added advantage in reducing plaque and improving gingival health compared to brushing with water alone.

#### Methods

A randomized controlled trial was conducted at the Department of Periodontology, Sardar Begum Dental College, from April 2024 to October 2024. A total of 71 participants were randomly allocated into two groups: Group A brushed with a soft-bristle toothbrush and water only (n=35), while Group B brushed with a soft-bristle toothbrush and non-fluoridated toothpaste (n=36). All participants were instructed in the modified Bass technique using a model. Plaque Index (PI) and Gingival Index (GI) were recorded at baseline and after two weeks. Data were analyzed using paired and independent t-tests, with  $p < 0.05$  considered statistically significant.

Results: Both groups showed significant reductions in plaque and gingival scores after two weeks of brushing ( $p < 0.05$  for intragroup comparisons). However, intergroup analysis revealed no significant difference between the brush-only group and the brush + non-fluoridated toothpaste group for either PI ( $p = 0.81$ ) or GI ( $p = 0.76$ ). Percentage reductions were comparable across groups, indicating similar efficacy.

#### Conclusion

The findings suggest that the mechanical action of toothbrushing, when performed using proper technique, is the key factor in plaque control and gingival health improvement. The use of non-fluoridated toothpaste did not provide any additional benefit beyond brushing with water.

#### Keywords

Non-fluoridated toothpaste, Plaque Index, Gingival Index, Oral hygiene, Toothbrushing, Modified Bass technique

## INTRODUCTION

Dental plaque is a structured biofilm that plays a central role in the development of gingivitis and periodontal disease. Effective removal of plaque is therefore a cornerstone of preventive dentistry. Mechanical toothbrushing, when carried out regularly and with proper technique, remains the most reliable method of plaque disruption (1-3).

Toothpaste has long been considered an integral part of oral hygiene routines, largely due to its cleaning, flavoring, and therapeutic components. Modern formulations often contain fluoride, abrasives, detergents, and antimicrobial agents. Fluoridated toothpastes, in particular, have well-established benefits for reducing caries and improving gingival health. However, the role of non-fluoridated toothpaste remains less clear. Without fluoride or other active therapeutic ingredients, its primary function may be limited to cosmetic cleaning, raising questions about whether it contributes meaningfully to plaque reduction or gingival health beyond brushing alone (4-7).

Several studies have demonstrated that toothbrushing itself, regardless of the use of toothpaste, is sufficient to remove substantial amounts of plaque when performed correctly. Evidence also suggests that the benefit of toothpaste depends largely on its active ingredients rather than the paste itself. In this context, the question arises: *does non-fluoridated toothpaste provide any added advantage compared to brushing with water?* (8-10).

The present study was designed to address this question in a controlled setting. By providing all participants with instruction in the modified Bass technique and comparing plaque and gingival index scores over a two-week period, we sought to evaluate the actual impact of non-fluoridated toothpaste on oral hygiene outcomes.

## METHODOLOGY

This study was conducted as a randomized controlled trial (RCT method) in the Department of Periodontology, Sardar Begum Dental College, from April 2024 to October 2024. The primary aim was to evaluate whether the use of non-fluoridated toothpaste provides any additional benefit in plaque removal and gingival health compared to brushing with a toothbrush and water alone.

A total of 71 participants were recruited through convenient sampling from dental outpatients and student volunteers.

### Inclusion Criteria

- Periodontally healthy subjects with less than 3mm pocket depth.
- Adults aged 18–40 years.
- Presence of at least 20 natural teeth.
- No periodontal therapy in the last 6 months.
- Willingness to comply with instructions and provide consent.

### Exclusion Criteria

- Systemic illnesses affecting periodontal status.
- Recent antibiotic/anti-inflammatory use (within 3 months).
- Current orthodontic appliances or prostheses.
- Pregnant and lactating women.

Participants were randomly allocated into two equal groups Group A (n = 35): Provided with a soft-bristle toothbrush only. Group B (n = 36): Provided with a soft-bristle toothbrush and non-fluoridated toothpaste.

All participants received standardized instructions and were demonstrated the modified Bass technique on a dental model by a trained examiner before starting the trial. They were instructed to brush twice daily for two minutes using the assigned intervention.

### Data Collection

Plaque Index (PI) and Gingival Index (GI) were measured at baseline and after two weeks of regular brushing. A calibrated examiner performed all measurements to reduce bias. Primary outcome:

Change in Plaque Index after two weeks. Secondary outcome: Change in Gingival Index after two weeks.

Data were analyzed using SPSS version 26. Continuous variables were presented as mean  $\pm$  SD, while categorical data were expressed as frequencies and percentages. Intragroup comparisons were performed with paired t-tests, and intergroup comparisons with independent t-tests. A p-value of  $<0.05$  was considered statistically significant.

## RESULTS

A total of 71 participants completed the study, with 35 in Group A and 36 in Group B. The mean age of participants was comparable between groups ( $24.8 \pm 4.7$  years vs.  $25.1 \pm 4.9$  years,  $p = 0.74$ ). Gender distribution and baseline oral hygiene practices were similar, with no significant differences ( $p > 0.05$ ).

**Table 1. Demographic Characteristics of Participants (n = 71)**

Variable	Group A: Brush only (n=35)	Group B: Brush + Non-fluoridated toothpaste (n=36)	p-value
Age (years, Mean $\pm$ SD)	$24.8 \pm 4.7$	$25.1 \pm 4.9$	0.74
Gender (Male/Female)	17 / 18	18 / 18	0.91
Brushing $\geq 2$ /day (%)	11 (31.4%)	12 (33.3%)	0.85

At baseline, both groups exhibited comparable PI and GI scores, with no significant difference.

**Table 2. Baseline Plaque Index (PI) and Gingival Index (GI)**

Index	Group A: Brush only (Mean $\pm$ SD)	Group B: Brush + Non-fluoridated toothpaste (Mean $\pm$ SD)	p-value
Plaque Index	$2.12 \pm 0.41$	$2.15 \pm 0.43$	0.68
Gingival Index	$1.94 \pm 0.38$	$1.96 \pm 0.37$	0.72

After two weeks of brushing, both groups showed significant improvement compared to their baseline scores. However, no statistically significant difference was observed between the two groups, indicating that the addition of non-fluoridated toothpaste did not provide any extra benefit.

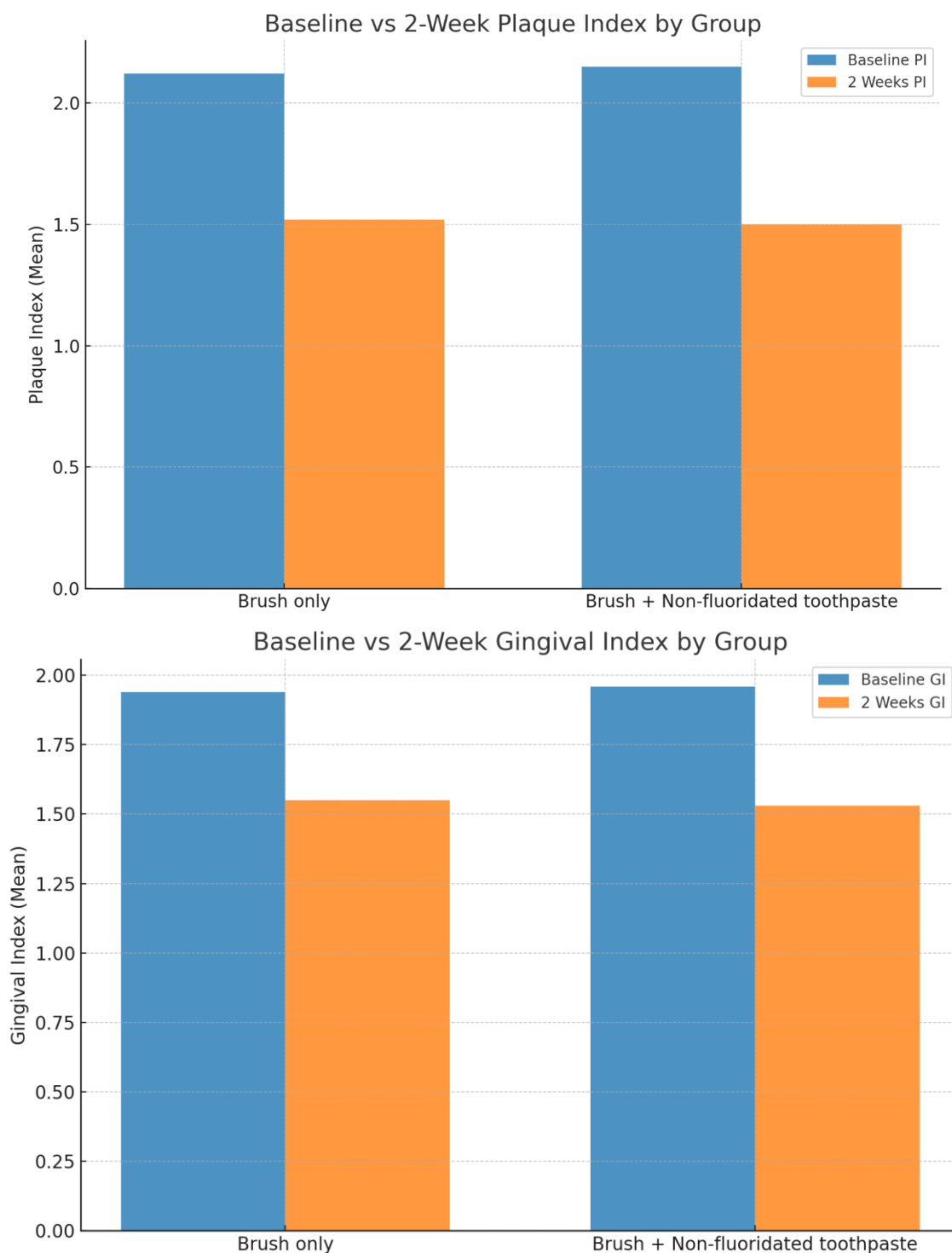
**Table 3. Plaque and Gingival Index Scores After Two Weeks**

Index	Group A: Brush only (Mean $\pm$ SD)	Group B: Brush + Non-fluoridated toothpaste (Mean $\pm$ SD)	p-value
Plaque Index	$1.52 \pm 0.36$	$1.50 \pm 0.34$	0.81
Gingival Index	$1.55 \pm 0.33$	$1.53 \pm 0.31$	0.76

Percentage reduction in PI and GI was observed in both groups, but the differences were not statistically significant.

**Table 4. Percentage Reduction in Plaque and Gingival Scores**

Outcome	Group A: Brush only (%)	Group B: Brush + Non-fluoridated toothpaste (%)	p-value
Plaque reduction	28.3%	30.2%	0.67
Gingival index improvement	20.1%	21.9%	0.72

**Figure 1 and 2**

(a) **Plaque Index (PI):** Both groups showed a reduction from baseline to 2 weeks, but the changes were nearly identical. (b) **Gingival Index (GI):** Both groups also improved, yet with no meaningful difference between brushing alone and brushing with non-fluoridated toothpaste.

## DISCUSSION

The present study evaluated whether non-fluoridated toothpaste provides any additional benefit in plaque removal and gingival health compared to brushing with water alone using a standardized soft-bristle toothbrush. Over the two-week follow-up period, both groups demonstrated significant improvements in plaque index and gingival index scores. However, the magnitude of change was nearly identical, and no statistically significant difference was observed between the groups.

These findings suggest that the reduction in plaque and gingival inflammation was primarily due to the mechanical effect of brushing, rather than the addition of non-fluoridated toothpaste. This is consistent with earlier clinical evidence which has shown that toothbrushing itself, when performed correctly using a validated technique such as the modified Bass method, is effective in disrupting dental plaque biofilm and improving gingival health(11-13).

The lack of additional benefit from non-fluoridated toothpaste observed in this study can be explained by its formulation. Unlike fluoridated dentifrices, which have documented anti-caries and mild antibacterial properties, non-fluoridated pastes largely rely on abrasives and detergents. These components may enhance cosmetic cleaning but do not appear to significantly influence gingival inflammation or plaque reduction when compared to thorough brushing with water alone. Previous investigations in different populations have reported similar results, where the absence of fluoride or antimicrobial agents limited the long-term benefits of dentifrices (14-16).

An important strength of this study was that all participants were instructed and demonstrated the modified Bass technique on a model, ensuring that plaque removal was performed using a standardized and scientifically recommended method. This minimized variability due to brushing technique and reinforced that the observed improvements were due to effective brushing rather than the paste formulation (17-20).

Nonetheless, the study has some limitations. The follow-up period was limited to two weeks, which allowed for evaluation of short-term effects but not for longer-term outcomes such as caries prevention or progression of gingival disease. The trial was also conducted in a single institution with a modest sample size, which may limit the generalizability of results. Despite these limitations, the consistency of improvement across both groups provides strong evidence that non-fluoridated toothpaste offers no measurable advantage over water brushing alone.

## CONCLUSION

This study demonstrates that while regular brushing with a soft-bristle toothbrush significantly reduces plaque and gingival inflammation, the addition of non-fluoridated toothpaste does not provide any extra benefit. Both groups achieved comparable improvements in oral hygiene measures, indicating that the primary determinant of plaque control and gingival health is the mechanical action of toothbrushing performed with proper technique.

In clinical practice, this highlights the importance of educating patients about effective brushing methods rather than relying solely on dentifrice formulations without fluoride or therapeutic agents. For long-term prevention of caries and periodontal disease, fluoridated toothpastes remain the gold standard, while non-fluoridated options may be limited to cosmetic use. Future studies with longer follow-up periods and broader populations are recommended to further confirm these findings.

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