ARTICLE

Comparative Evaluation of Morinda citrifolia (Noni) Mouthwash and Chlorhexidine Mouthwash on Gingival Inflammation, Dental Plaque, Tooth Staining and Colony Forming Units in Patients with Plaque-Induced Gingivitis: A Randomized Controlled Clinical Trial

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ABSTRACT

Background

Plaque-induced gingivitis is the most common reversible periodontal disease. Although chlorhexidine is regarded as the gold standard mouthwash, its prolonged use is associated with adverse effects such as tooth staining and taste alteration. Morinda citrifolia (Noni) possesses antimicrobial, anti-inflammatory and antioxidant properties that make it a promising herbal alternative.

Aim

To compare the clinical and microbiological efficacy of Noni mouthwash with chlorhexidine mouthwash in reducing plaque accumulation, gingival inflammation, tooth staining and colony-forming units (CFU) in patients with plaque-induced gingivitis.

Materials and Methods

A randomized controlled clinical trial was conducted with 50 participants diagnosed with plaque-induced gingivitis, randomly allocated into two equal groups (n=25). Group I received Noni mouthwash and Group II received chlorhexidine mouthwash. Clinical parameters including Plaque Index, Gingival Index, Staining Index and microbiological CFU counts were assessed at baseline and after one month. Statistical significance was considered at $p<0.05$.

Results

Both mouthwashes demonstrated reductions in plaque index, gingival index and CFU counts following treatment. The reductions were comparable between groups, while the Noni mouthwash exhibited substantially lower tooth staining than chlorhexidine.

Conclusion

Noni mouthwash demonstrated clinical and microbiological efficacy comparable to chlorhexidine while producing less tooth staining, suggesting that it may be an effective herbal alternative for adjunctive plaque control.

Keywords: Morinda citrifolia, Noni, Chlorhexidine, Gingivitis, Dental Plaque, Colony Forming Units, Herbal Mouthwash

How to cite this article: Reemitha P, Saravanan D, Vijay VK, Pandian S, Nivethitha M, Gowri P, Roshini JAN. Comparative evaluation of Morinda citrifolia (noni) mouthwash and chlorhexidine mouthwash on gingival inflammation, dental plaque, tooth staining and colony forming units in patients with plaque-induced gingivitis: a randomized controlled clinical trial. Int J Drug Deliv Technol. 2026;16(73s): 247-253. DOI: 10.25258/ijddt.16.73s.24

INTRODUCTION

Periodontal diseases remain among the most prevalent chronic inflammatory conditions worldwide, with plaque-induced gingivitis representing the earliest reversible stage. Dental plaque biofilm is the primary etiologic factor responsible for gingival inflammation, and effective plaque control is fundamental to prevention and treatment. Although mechanical plaque removal remains the cornerstone of therapy, patient compliance is often suboptimal, making antimicrobial mouthrinses valuable adjuncts.

Chlorhexidine is considered the gold standard antiplaque mouthwash because of its broad antimicrobial spectrum and substantivity. However, long-term use is associated with tooth staining, taste alteration and mucosal irritation, prompting interest in herbal alternatives.

Morinda citrifolia (Noni), a medicinal plant rich in flavonoids, iridoids, scopoletin and phenolic compounds, has demonstrated antimicrobial, antioxidant and anti-inflammatory properties. Experimental and clinical studies suggest that Noni inhibits oral pathogenic microorganisms, modulates inflammatory mediators

and promotes periodontal tissue healing. The present randomized controlled clinical trial was therefore undertaken to compare the effectiveness of Noni mouthwash with chlorhexidine mouthwash in reducing plaque accumulation, gingival inflammation, tooth staining and subgingival bacterial colony-forming units in patients with plaque-induced gingivitis.

MATERIALS AND METHODS

Study Design

A randomized, parallel-arm, controlled clinical trial was conducted in the Department of Periodontology to compare the efficacy of Morinda citrifolia (Noni) mouthwash with chlorhexidine mouthwash in patients with plaque-induced gingivitis.

Ethical Approval

The study protocol was approved by the Institutional Ethics Committee **(Reg No: 124/ETHICS/2025)** of RVS Dental College and Hospital, and written informed consent was obtained from all participants before enrollment.

Study Population

Fifty systemically healthy participants with plaque-induced gingivitis were recruited and randomly allocated into two groups of 25 participants each.

Inclusion Criteria

Participants aged 18–20 years with plaque-induced gingivitis, minimum of 20 natural teeth, and willingness to participate.

Exclusion Criteria

Patients with periodontitis, systemic disease affecting periodontal status, tobacco use, pregnancy/lactation, antibiotic or anti-inflammatory therapy within the previous 3 months, orthodontic appliances, or allergy to mouthwash components.

Randomization

Participants were randomly assigned in a 1:1 ratio using a computer-generated randomization sequence. Allocation was concealed using sequentially numbered opaque sealed envelopes.

Intervention

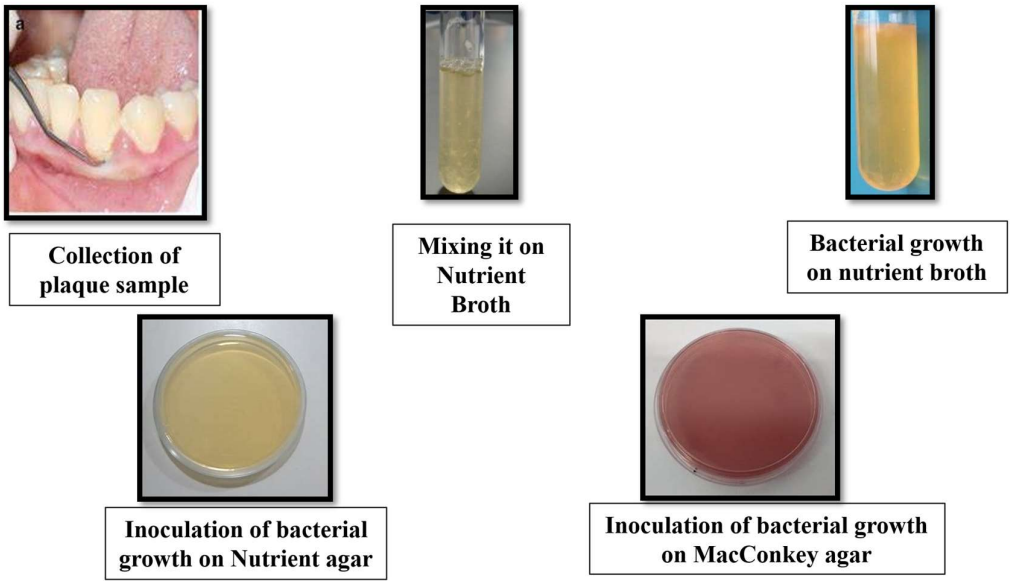
Group I received Noni mouthwash and Group II received chlorhexidine mouthwash. Participants were instructed to rinse with 15 mL twice daily for 30 seconds after toothbrushing for the study period of one month and avoid eating or drinking for 30 minutes after rinsing.

Clinical Assessment

Plaque Index, Gingival Index, and Staining Index were recorded at baseline and post-intervention by a calibrated examiner using standardized indices.

Microbiological Assessment

Subgingival plaque samples were collected under aseptic conditions using sterile Gracey curettes. Samples were transported to the microbiology laboratory, cultured on appropriate media, incubated, and colony-forming units (CFU) were quantified.

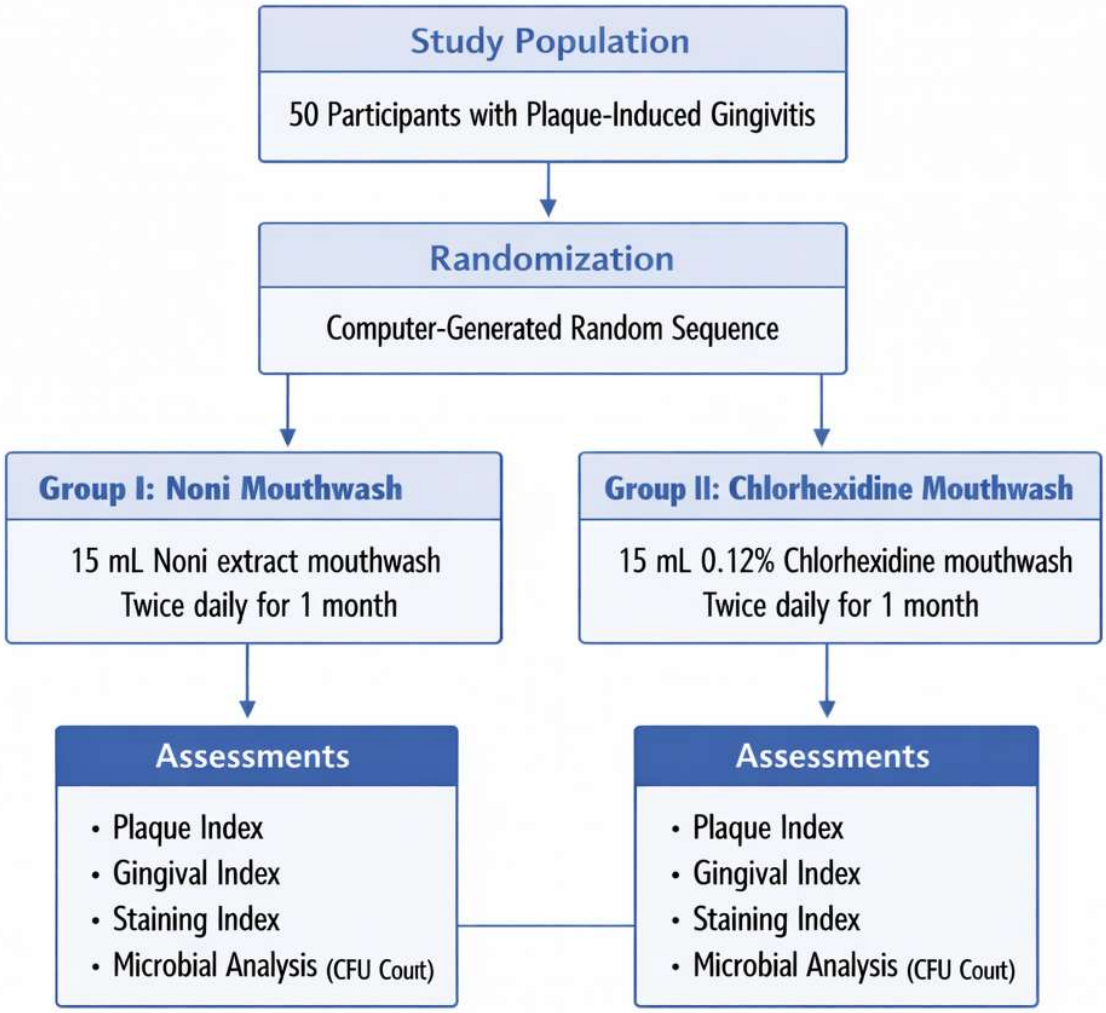


Outcome Measures

Primary outcomes were changes in Plaque Index and Gingival Index. Secondary outcomes included Staining Index and CFU counts.

Materials & Methods:

Noni vs Chlorhexidine Trial



MATERIALS AND METHODS FLOWCHART

Statistical Analysis

Data was entered into Microsoft Excel and analyzed using IBM SPSS Statistics. Descriptive statistics were expressed as mean ± standard deviation. Within-group comparisons were performed using paired tests and between-group comparisons using independent tests according to data distribution. Statistical significance was set at $p < 0.05$.

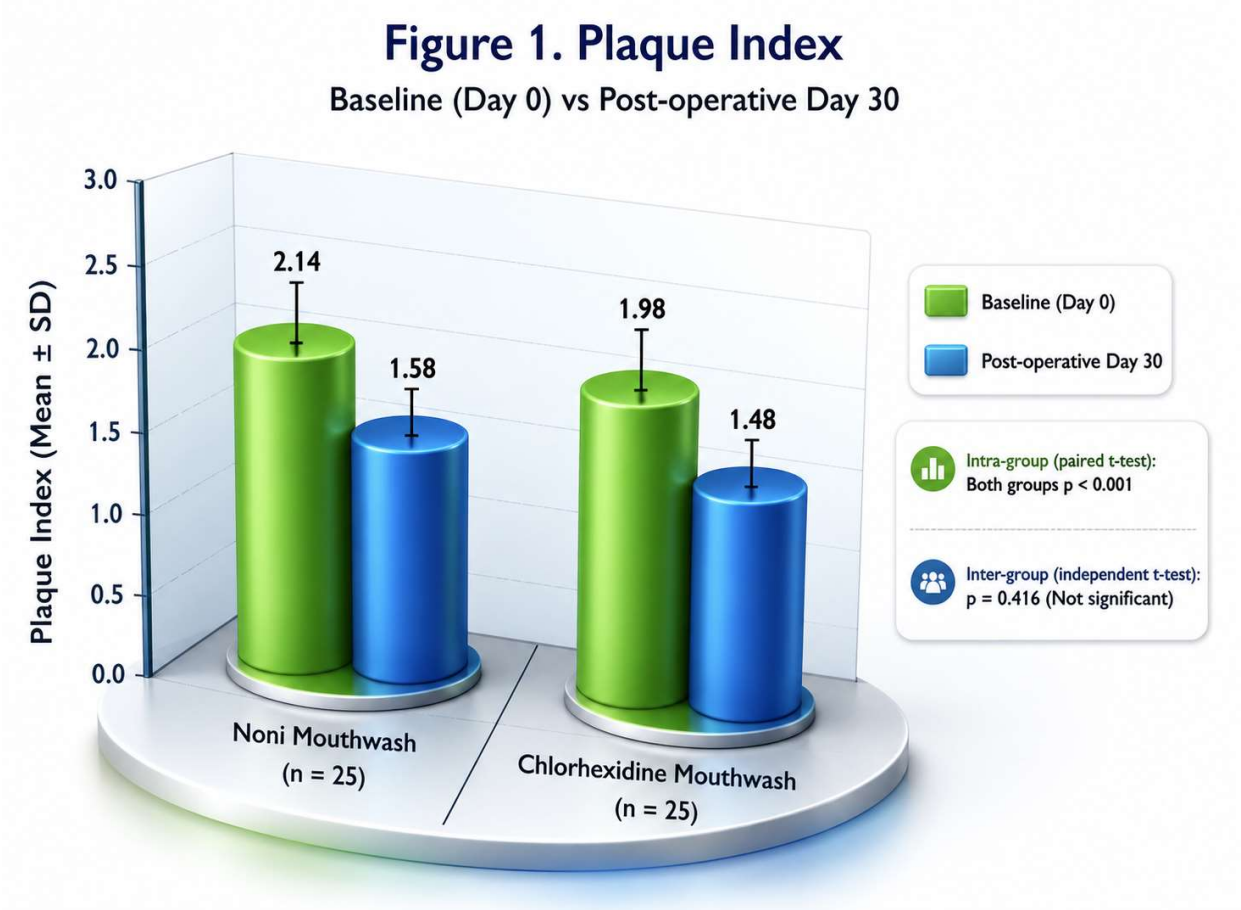
RESULTS

A total of 50 participants completed the study, with 25 participants in each group. All participants were included in the final analysis.

Plaque Index

Group	Baseline Mean±SD	Post Mean±SD	Mean Reduction
Noni	2.14 ± 0.36	1.58 ± 0.38	0.56
Chlorhexidine	1.98 ± 0.38	1.48 ± 0.38	0.50

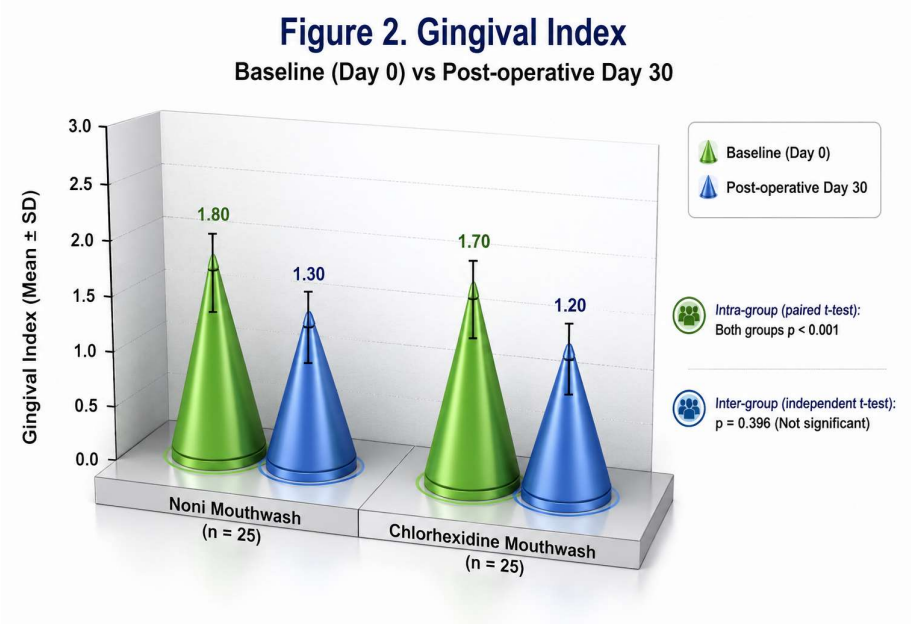
Both groups demonstrated a reduction in Plaque Index following treatment. Within-group improvement was statistically significant ($p<0.05$). Intergroup comparison showed comparable plaque reduction between the groups.



Gingival Index

Group	Baseline Mean±SD	Post Mean±SD	Mean Reduction
Noni	1.80 ± 0.37	1.30 ± 0.37	0.50
Chlorhexidine	1.70 ± 0.37	1.20 ± 0.37	0.50

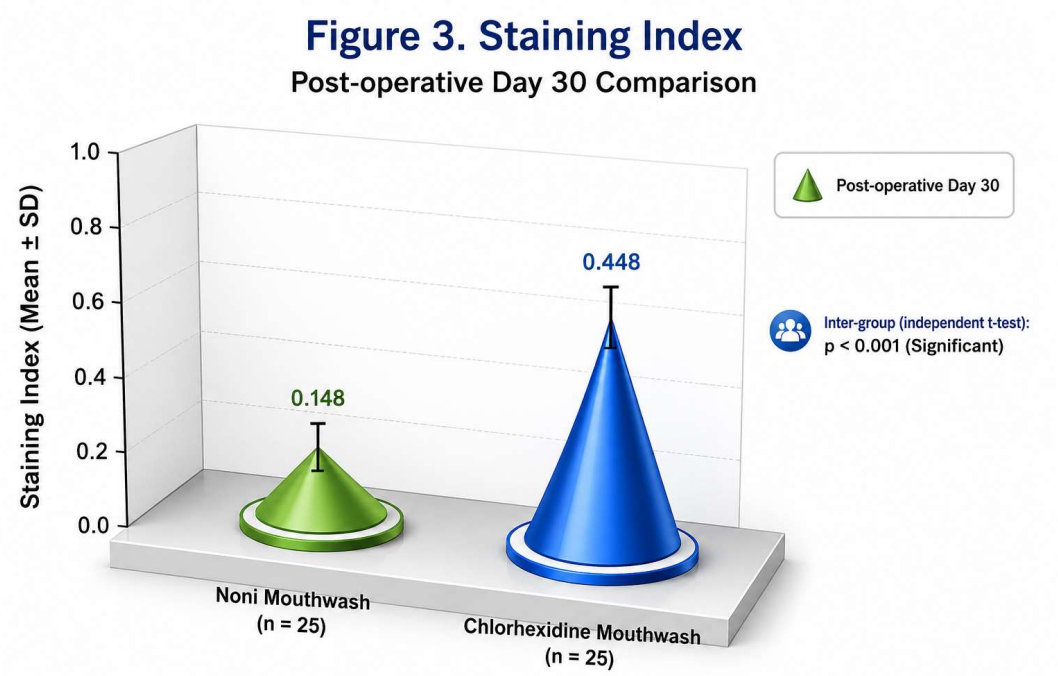
A significant reduction in Gingival Index was observed in both groups ($p<0.05$). No statistically significant difference was observed between the groups after treatment.



Staining Index

Group	Post-treatment Mean±SD
Noni	0.148 ± 0.035
Chlorhexidine	0.448 ± 0.035

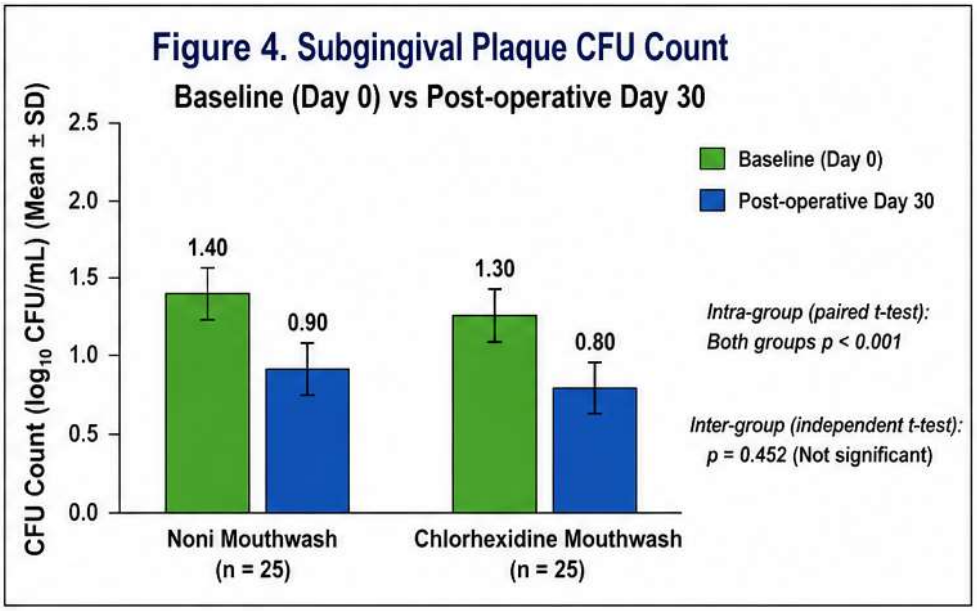
The chlorhexidine group exhibited significantly greater tooth staining than the Noni group ($p<0.05$).



Colony Forming Units (CFU)

Group	Baseline Mean±SD	Post Mean±SD	Mean Reduction
Noni	1.40 ± 0.37	0.90 ± 0.37	0.50
Chlorhexidine	1.30 ± 0.37	0.80 ± 0.37	0.50

Both groups demonstrated significant reductions in bacterial colony-forming units following intervention ($p<0.05$). The antimicrobial efficacy of Noni mouthwash was comparable to that of chlorhexidine.



DISCUSSION

The present randomized controlled clinical trial compared the clinical and microbiological efficacy of Morinda citrifolia (Noni) mouthwash with chlorhexidine mouthwash in patients with plaque-induced gingivitis. Both interventions produced improvements in plaque accumulation, gingival inflammation, and subgingival bacterial counts, while Noni demonstrated a clear advantage with respect to tooth staining. [2]

Both groups showed a reduction in Plaque Index following the intervention, indicating that Noni mouthwash possesses effective antiplaque activity comparable to chlorhexidine. The antimicrobial action of Noni is attributed to bioactive constituents including flavonoids, scopoletin, iridoids, phenolic compounds and saponins, which inhibit bacterial adhesion, disrupt biofilm formation and reduce microbial proliferation. These findings are consistent with previous clinical studies that reported significant plaque reduction following the use of Morinda citrifolia mouthwash. [3]

The present findings agree with **Aldi et al. (2019)**, who reported that *Morinda citrifolia* mouthwash significantly reduced plaque accumulation and gingival inflammation in patients with gingivitis following regular use. The authors attributed these beneficial effects to the presence of iridoids, flavonoids, anthraquinones, and phenolic compounds that interfere with bacterial adherence and biofilm maturation. Similarly, **Glang et al. (2013)** demonstrated that *Morinda citrifolia* juice significantly inhibited periodontal pathogens and improved gingival health through its antimicrobial and antioxidant activities. These observations support the comparable plaque reduction observed in the present study.

The Gingival Index also improved in both groups, suggesting that Noni effectively reduces gingival inflammation. The anti-inflammatory effect of Noni has been associated with modulation of inflammatory mediators, antioxidant activity and suppression of oxidative stress within periodontal tissues. The comparable improvement observed in the chlorhexidine group confirms that both mouthwashes are effective adjuncts to mechanical plaque control. [4]

The reduction in gingival inflammation observed in the present study is further supported by the work of **Saravanan (2015)**, who reported significant improvement in gingival health following the use of Noni mouthwash in patients with plaque-induced gingivitis. The anti-inflammatory effect has been linked to inhibition of cyclooxygenase pathways, suppression of pro-inflammatory cytokines, and scavenging of reactive oxygen species. Furthermore, **Sabu et al. (2021)** demonstrated that *Morinda citrifolia* possesses regenerative and wound-healing properties capable of enhancing periodontal tissue repair, thereby supporting its role as an adjunctive therapeutic agent in periodontal therapy.

Microbiological assessment demonstrated a reduction in colony-forming units in both groups. This finding supports the antibacterial activity of Noni against oral microorganisms and agrees with previous in vitro and clinical investigations reporting inhibition of periodontal pathogens by Morinda citrifolia extracts. Although chlorhexidine remains the reference antimicrobial mouthwash, the comparable reduction in bacterial load observed with Noni suggests that it may provide an effective herbal alternative.

The most notable difference between the interventions was observed in the Staining Index. Participants using chlorhexidine exhibited greater extrinsic tooth staining, whereas staining remained minimal in the Noni group. Tooth discoloration is a well-recognized adverse effect associated with prolonged chlorhexidine use and often limits patient compliance. The lower staining associated with Noni may improve esthetic acceptance and support long-term use.

The findings of the present study agree with published literature demonstrating that herbal mouthwashes can provide clinical benefits comparable to chlorhexidine while reducing undesirable adverse effects. The present study further contributes microbiological evidence by evaluating colony-forming units in addition to conventional clinical indices.

The strengths of this study include its randomized controlled design, standardized clinical assessment and combined clinical and microbiological evaluation. However, the relatively small sample size and short follow-up period may limit the generalizability of the findings. Long-term multicenter trials with larger sample sizes and molecular microbiological analyses are

recommended to further validate the therapeutic potential of Morinda citrifolia mouthwash.

Overall, the findings indicate that Morinda citrifolia mouthwash is an effective adjunct to conventional oral hygiene measures. Considering its comparable efficacy, natural origin and lower propensity for tooth staining, it may represent a promising herbal alternative to chlorhexidine for the management of plaque-induced gingivitis.

CONCLUSION

Within the limitations of the present randomized controlled clinical trial, Morinda citrifolia (Noni) mouthwash demonstrated clinical and microbiological efficacy comparable to chlorhexidine mouthwash in reducing plaque accumulation, gingival inflammation, and subgingival bacterial colony-forming units. In addition, Noni mouthwash produced substantially less tooth staining, indicating superior esthetic acceptability. These findings suggest that Noni mouthwash may serve as an effective herbal adjunct for the management of plaque-induced gingivitis, particularly in patients requiring prolonged chemical plaque control.

Clinical Significance

Noni mouthwash may be considered a natural alternative to chlorhexidine for plaque-induced gingivitis because it provides comparable antiplaque and anti-inflammatory effects with a lower risk of tooth staining.

Study Limitations

The study was limited by its relatively small sample size, short follow-up period, and single-center design. Future multicenter trials with larger samples, longer follow-up, and advanced microbiological techniques are recommended.

FUNDING

No external funding was received for this study.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to this study.

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