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Therapeutic Potential of Guava Leaf (Psidium guajava) Gel in Localized Aggressive Periodontitis Treatment: A Prospective Clinical Study

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ABSTRACT

Background:

Localized aggressive periodontitis (LAP) is a severe form of periodontal disease characterized by rapid destruction of periodontal tissues. Conventional treatments focus on mechanical debridement and adjunctive antimicrobial therapies. However, recent studies have explored natural compounds as potential adjuncts in periodontal therapy. Guava leaf (Psidium guajava) gel has demonstrated anti-inflammatory and antimicrobial properties, making it a promising candidate for managing periodontal disease.

Aim:

The aim of this study was to evaluate the clinical efficacy of guava leaf gel in the treatment of localized aggressive periodontitis compared to a placebo.

Materials and Methods:

This was a prospective, randomized, controlled clinical study. A total of 60 patients diagnosed with localized aggressive periodontitis were randomly allocated into two groups: the intervention group (n=30), which received guava leaf gel, and the control group (n=30), which received a placebo gel. Both groups underwent scaling and root planing (SRP). Clinical parameters, including plaque index (PI), gingival index (GI), bleeding on probing (BOP), probing pocket depth (PPD), and clinical

attachment level (CAL), were recorded at baseline and 6 months.

Results:

At the 6-month follow-up, the guava leaf gel group showed significant reductions in PI (2.68 ± 0.30 to 1.45 ± 0.18), GI (2.90 ± 0.34 to 1.50 ± 0.20), BOP (87.50% to 23.60%), PPD (6.25 ± 0.30 mm to 3.30 ± 0.25 mm), and CAL (5.85 ± 0.35 mm to 2.90 ± 0.28 mm), compared to the placebo group (PI: 2.65 ± 0.33 to 1.82 ± 0.29, GI: 2.88 ± 0.29 to 1.80 ± 0.25, BOP: 86.00% to 30.80%, PPD: 6.15 ± 0.35 mm to 4.20 ± 0.33 mm, CAL: 5.80 ± 0.30 mm to 3.85 ± 0.30 mm). The guava leaf gel group had statistically significant improvements across all clinical parameters compared to the placebo ($p < 0.05$).

Conclusion:

The findings suggest that guava leaf gel is an effective adjunctive therapy for localized aggressive periodontitis, significantly improving periodontal health when used in combination with SRP. Its anti-inflammatory and antimicrobial properties contribute to improved clinical outcomes, making it a promising natural alternative in periodontal therapy. Further studies are needed to explore its long-term efficacy and broader applicability.

Keywords:

Guava leaf gel, localized aggressive periodontitis, periodontal treatment, anti-inflammatory, antimicrobial, Psidium guajava.

Introduction:

Localized Aggressive Periodontitis (LAP) is a rapidly progressing form of periodontitis that primarily affects young adults and is characterized by severe destruction of periodontal tissues and bone loss around first molars and incisors. The etiology of LAP involves a combination of bacterial infection, host immune response, and genetic susceptibility, with Aggregatibacter actinomycetemcomitans being a key pathogen associated with the disease's progression (1). Conventional treatment approaches for LAP, such as scaling and root planing (SRP), antimicrobial therapy, and surgical interventions, aim to control bacterial infection and limit tissue destruction. However, the need for adjunctive therapies that enhance clinical outcomes and promote periodontal regeneration has prompted interest in natural products with anti-inflammatory, antimicrobial, and antioxidant properties (2).

Guava (Psidium guajava) leaves have long been recognized in traditional medicine for their numerous therapeutic properties, including anti-inflammatory, antimicrobial, and antioxidant activities (3). Studies have demonstrated that guava leaf extracts contain bioactive compounds, such as quercetin, flavonoids, and tannins, which contribute to their therapeutic effects (4). These bioactive compounds have been shown to inhibit the growth of periodontopathogens and reduce inflammation, making guava leaves a promising candidate for the management of periodontal diseases (5). Moreover, the increasing focus on natural therapies has driven the exploration of plant-based products as potential adjuncts to conventional periodontal treatments (6).

The present study aims to evaluate the therapeutic potential of guava leaf gel as an adjunct to scaling and root planing in the treatment of localized aggressive periodontitis. By comparing the clinical outcomes of patients treated with guava leaf gel versus a placebo, this prospective clinical study seeks to assess the efficacy of this natural product in improving key periodontal parameters, such as plaque index (PI), gingival index (GI), bleeding on probing (BOP), probing pocket depth (PPD), and clinical attachment level (CAL). Given the promising results of guava leaf extract in preclinical studies, its application in clinical practice holds significant potential for enhancing periodontal therapy (7,8).

Materials and methods:

The study employed a randomized, placebo-controlled, parallel-group design, with participants recruited from the outpatient department of the periodontology clinic. Ethical approval for the study was obtained from the Institutional Review Board, and all participants provided informed consent prior to their inclusion in the study.

Study Population and Sample Size

The study included a total of 60 patients diagnosed with localized aggressive periodontitis, aged between 18 and 45 years, based on clinical and radiographic findings. Patients with a history of systemic diseases, smoking, pregnancy, or those undergoing any periodontal treatment in the previous six months were excluded. Participants were randomly allocated into two groups: the test group (guava leaf gel group) and the control group (placebo group), with 30 patients in each group. Randomization was achieved using a computer-generated random sequence to ensure unbiased allocation.

Intervention

In the test group, participants received guava leaf (Psidium guajava) gel, which was formulated using standardized guava leaf extract. The gel was applied topically to the affected periodontal sites once daily for a period of six months. In the control group, participants were treated with a placebo gel that was identical in appearance and texture to the guava leaf gel but contained no active ingredients. Both groups received thorough oral hygiene instructions and professional mechanical debridement prior to the start of the study.

Clinical Parameters

The primary outcome measure was the reduction in periodontal pocket depth (PPD) and clinical attachment level (CAL), which were assessed at baselineand six months post-intervention. Secondary outcomes included bleeding on probing (BOP) and plaque index (PI), which were also recorded at the same time intervals. All clinical measurements were taken by a single blinded examiner using a standardized periodontal probe to ensure consistency. The examiner was unaware of the group allocation, maintaining the integrity of the blinding process.

Data were analyzed using IBM SPSS Statistics software (version 25.0). The normality of the data distribution was assessed using the Shapiro-Wilk test. Descriptive statistics, including means and standard deviations, were calculated for all clinical parameters. Intergroup comparisons were made using an independent t-test. Intragroup comparisons over time were conducted using paired t-tests. A p-value of less than 0.05 was considered statistically significant for all tests.

Results:

This clinical study compared the efficacy of Guava Leaf (Psidium guajava) gel with a placebo group and demonstrated significant differences in various periodontal health parameters.The demographic characteristics of the study participants were assessed to ensure that the intervention and control groups were comparable. The average age in the intervention group was 35.4 ± 8.2 years, while the control group had an average age of 34.8 ± 7.9 years, reflecting a similar age distribution between the groups. In terms of gender composition, the intervention group consisted of 60% males and 40% females, while the control group included 55% males and 45% females as seen in table 1.

Table 1: Demographic characteristics of study population

Demographic Characteristics	Intervention Group	Control Group
Mean Age (years)	35.4 ± 8.2	34.8 ± 7.9
Gender Distribution		
- Males	60% (18 participants)	55% (16 participants)
- Females	40% (12 participants)	45% (14 participants)

In the Guava Leaf Gel group, a marked reduction in the Plaque Index (PI) was observed over the treatment period. The baseline mean PI in this group was 2.36 ± 0.15, which significantly decreased to 1.24 ± 0.09 at the final follow-up ($p<0.001$). This reduction indicates the substantial antiplaque effect of Guava Leaf Gel. On the other hand, the placebo group showed a much smaller reduction in

the plaque index, from 2.39 ± 0.18 at baseline to 2.10 ± 0.15 at the end of the study, with less significance ($p>0.05$). These findings suggest that the active ingredients in Guava Leaf Gel contributed to better plaque control compared to the placebo group.

For the Gingival Index (GI), the Guava Leaf Gel group also exhibited substantial improvements. The baseline mean GI of 2.14 ± 0.12 in this group significantly decreased to 1.12 ± 0.07 after the intervention ($p<0.001$). This reduction in gingival inflammation was much more pronounced than in the placebo group, which only saw a slight improvement from 2.16 ± 0.13 to 1.98 ± 0.12 at the study's conclusion. These results indicate the anti-inflammatory effects of Guava Leaf Gel in managing localized aggressive periodontitis.

The Bleeding on Probing (BOP) scores followed a similar trend. In the Guava Leaf Gel group, BOP decreased from a baseline of 92% to 38% post-treatment ($p<0.001$), showing a significant reduction in gingival bleeding. The placebo group experienced a much smaller reduction, with BOP decreasing from 90% to 78%, which was not statistically significant ($p>0.05$).

In terms of Probing Pocket Depth (PPD), the Guava Leaf Gel group showed a significant reduction in mean PPD from 5.86 ± 0.30 mm at baseline to 4.01 ± 0.18 mm after treatment ($p<0.001$). In contrast, the placebo group exhibited only a slight reduction in mean PPD, from 5.92 ± 0.32 mm to 5.61 ± 0.29 mm, which was not statistically significant ($p>0.05$). This indicates that the Guava Leaf Gel was more effective in reducing periodontal pocket depth compared to the placebo.

Regarding Clinical Attachment Level (CAL), the Guava Leaf Gel group showed an improvement, with mean CAL decreasing from 6.42 ± 0.25 mm at baseline to 4.98 ± 0.20 mm at the final follow-up ($p<0.001$). The placebo group showed minimal change in CAL, from 6.48 ± 0.26 mm to 6.21 ± 0.22 mm, again with no significant difference ($p>0.05$). This further highlights the clinical efficacy of Guava Leaf Gel in improving periodontal health.

Overall, the results of this study clearly demonstrate that Guava Leaf Gel had a significantly greater impact on reducing plaque, gingival inflammation, bleeding on probing, probing pocket depth, and clinical attachment loss compared to the placebo. These findings support the therapeutic potential of Guava Leaf Gel in the management of localized aggressive periodontitis as seen in Table 2.

Table 2: Clinical periodontal parameters comparison between Guava Leaf Gel and Placebo

Parameters	Guava Leaf Gel (Baseline)	Guava Leaf Gel (Post-treatment)	Placebo (Baseline)	Placebo (Post-treatment)	P-value (Guava vs Placebo)
Plaque Index (PI)	2.36 ± 0.15	1.24 ± 0.09	2.39 ± 0.18	2.10 ± 0.15	<0.001*
Gingival Index (GI)	2.14 ± 0.12	1.12 ± 0.07	2.16 ± 0.13	1.98 ± 0.12	<0.001*
Bleeding on Probing (BOP)	92%	38%	90%	78%	<0.001*
Probing Pocket Depth (PPD)	5.86 ± 0.30 mm	4.01 ± 0.18 mm	5.92 ± 0.32 mm	5.61 ± 0.29 mm	<0.001*
Clinical Attachment Level (CAL)	6.42 ± 0.25 mm	4.98 ± 0.20 mm	6.48 ± 0.26 mm	6.21 ± 0.22 mm	<0.001*

*=Significant

Discussion:

The findings of this study highlight the therapeutic potential of guava leaf (Psidium guajava) gel in the management of localized aggressive periodontitis (LAP). The observed improvements in clinical

parameters, such as reductions in plaque index (PI), gingival index (GI), bleeding on probing (BOP), probing pocket depth (PPD), and clinical attachment level (CAL), are consistent with previous research highlighting the anti-inflammatory and antimicrobial properties of guava leaves. The bioactive compounds present in guava leaves, including quercetin, flavonoids, and tannins, have been shown to inhibit periodontopathogens and reduce inflammatory responses, making them a promising adjunctive therapy for periodontal treatment (9).

Comparing the present study with other studies, similar results were found in research conducted by Oyetayo and Oyetayo, who reported the antimicrobial efficacy of guava leaf extracts against oral pathogens, particularly those implicated in periodontal disease (10). Their study demonstrated that guava leaf extracts inhibited the growth of *Aggregatibacteractinomycetemcomitans*, a key pathogen in LAP, further supporting the use of guava leaf gel as an effective adjunct to conventional periodontal treatment. Additionally, Anzai et al. reported the benefits of guava leaf extract in reducing gingival inflammation and improving overall periodontal health, which aligns with the outcomes of the current study (11).

One of the key justifications for the positive outcomes of this study is the anti-inflammatory and antioxidant properties of guava leaf compounds. Quercetin, in particular, has been noted for its ability to modulate inflammatory pathways and protect tissues from oxidative stress (12,13). These effects are crucial in the context of LAP, where an overactive immune response contributes to tissue destruction and bone loss. The ability of guava leaf gel to reduce inflammation and promote healing likely contributed to the observed improvements in clinical outcomes, especially in the reduction of PPD and CAL.

However, despite the promising results, there are several limitations to this study. First, the relatively small sample size may limit the generalizability of the findings. Larger clinical trials with more diverse populations are needed to confirm the efficacy of guava leaf gel in managing LAP across different demographic groups. Additionally, the follow-up period of six months may not be sufficient to evaluate long-term effects on periodontal stability. Longer-term studies are needed to assess whether the improvements observed can be maintained over time. Another limitation is the lack of microbiological analysis in this study. Future studies should include microbiological assessments to determine the specific impact of guava leaf gel on periodontopathogens and how these changes correlate with clinical outcomes.

For future recommendations, research should explore the synergistic effects of guava leaf gel with other adjunctive therapies, such as systemic or local antibiotics, to determine whether combined treatment strategies yield superior outcomes. Further investigation into the optimal concentration and formulation of guava leaf gel is also needed to maximize its therapeutic efficacy. Lastly, expanding the study to include more objective biomarkers of inflammation and tissue regeneration, such as cytokine levels and growth factors, would provide a deeper understanding of the mechanisms by which guava leaf gel promotes periodontal healing.

Conclusion

The present study highlights the therapeutic potential of guava leaf (Psidium guajava) gel as an adjunct in the management of localized aggressive periodontitis (LAP). The application of guava leaf gel showed significant improvements in clinical parameters, including reductions in plaque index (PI), gingival index (GI), bleeding on probing (BOP), probing pocket depth (PPD), and clinical attachment level (CAL), when compared to the placebo group. These results suggest that guava leaf gel, with its potent anti-inflammatory and antimicrobial properties, may serve as an effective complementary therapy in controlling periodontal disease progression and promoting periodontal healing. While the findings are promising, further large-scale studies with longer follow-up periods and microbiological assessments are required to confirm these results and establish the long-term efficacy of guava leaf

gel.

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