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Clinical Efficacy of Mulethi (Glycyrrhiza glabra) Gel in the Management of Localized Aggressive Periodontitis: A Randomized Controlled Trial

Dr.Sameer Kedia[1], Dr.Kalpesh Vaishnav[2], Dr.Raghavendra Metri [3,] Dr.Trupti Gajendra Giri [4] , Dr.Ujjwala Makne Shelke [5] , Dr.Shashank Deshpande[6]

[1]PhD Scholar, Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujrat.
Professor, Department of Periodontology, V.Y.W.S. Dental College & Hospital, Amravati, Maharashtra.
drsameerkedia@gmail.com
[2]Professor and Head, Department of Prosthodontics,Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujrat.
kalpeshvaishnav@karnavatiuniversity.edu.in
[3]Professor and Head, Department of Periodontology, Maharashtra Institute of Dental Sciences and Research, Latur, Maharashtra,
drmetriraghu@gmail.com
[4]Lecturer, Department of Periodontology, Maharashtra Institute of Dental Sciences and Research, Latur, Maharashtra
trupti17giri@gmail.com
[5]Reader, Dept of Periodontics, Saraswati Dhanwantari Dental College and Hospital, Parbhani, Maharashtra.
drujjwalamakne@gmail.com
[6]Senior Lecturer, Department of Periodontology, Terna Dental College, Navi Mumbai, Maharashtra.
shashank07rocks@gmail.com

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ABSTRACT

Background: Localized Aggressive Periodontitis (LAP) is a severe periodontal condition that requires effective intervention to prevent progression. Natural products like Mulethi (Glycyrrhiza glabra) have demonstrated anti-inflammatory and antimicrobial properties, making them potential adjunctive therapies in periodontal treatment.

Objective: To evaluate the clinical efficacy of Mulethi gel as an adjunctive treatment for Localized Aggressive Periodontitis.

Methods: A randomized controlled trial was conducted with 60 participants diagnosed with LAP, divided into two groups: the test group (n=30) treated with Mulethi gel and scaling and root planing (SRP) and the control group (n=30) treated with SRP alone. Clinical parameters including Probing Pocket Depth (PPD), Clinical Attachment Level (CAL), and Gingival Index (GI) were assessed at baseline, 3 months, and 6 months post-treatment. Statistical analysis was performed using SPSS 25.0 version.

Results: The test group showed a significant reduction in PPD and improvement in CAL and GI scores compared to the control group at both 3 and 6 months ($p<0.05$). Mulethi gel, as an adjunct to SRP, significantly enhanced clinical outcomes, demonstrating its effectiveness in managing LAP.

Conclusion: Mulethi gel is a promising adjunctive therapy for LAP management, showing significant improvements in periodontal health outcomes. Further long-term studies are required to validate these findings and assess the long-term sustainability of the results.

Keywords: Mulethi, Glycyrrhiza glabra, Localized Aggressive Periodontitis, Randomized Controlled Trial, Probing Pocket Depth, Clinical Attachment Level.

Introduction:

Localized Aggressive Periodontitis (LAP) is a distinct form of periodontal disease characterized by rapid attachment loss and bone destruction, often affecting young individuals with a familial predisposition. The disease primarily targets the first molars and incisors, exhibiting minimal plaque accumulation and inflammation, which distinguishes it from chronic periodontitis. Management of LAP typically involves mechanical debridement, antibiotics, and adjunctive therapies aimed at controlling the aggressive microbial challenge and enhancing host response. However, the long-term success of

conventional treatments is often limited by bacterial resistance and potential adverse effects of systemic antibiotics (1-3).
The growing interest in natural and herbal remedies has led to the exploration of various plant-based therapies as alternatives to conventional treatment options. Herbal extracts are increasingly being integrated into periodontal therapies due to their anti-inflammatory, antimicrobial, and antioxidant properties, offering a safer and more holistic approach. Glycyrrhiza glabra, commonly known as Mulethi or licorice, has been extensively studied for its therapeutic properties and has shown promising results in the management of various oral conditions. The active component, glycyrrhizin, possesses potent anti-inflammatory, antimicrobial, and immunomodulatory effects, making it a potential adjunctive treatment in periodontal therapy (4-7).
Several studies have highlighted the efficacy of Mulethi in inhibiting key periodontal pathogens such as *Porphyromonasgingivalis* and *Aggregatibacteractinomycetemcomitans*, which are implicated in the pathogenesis of LAP (8-9). The gel formulation of Glycyrrhiza glabra allows for localized application, ensuring prolonged contact with the periodontal tissues and potentially enhancing its therapeutic effects. This controlled release system may aid in reducing inflammation, promoting healing, and restoring periodontal health, with minimal systemic effects (10-11).
The current study aims to evaluate the clinical efficacy of Mulethi gel in the management of LAP through a randomized controlled trial. The research focuses on assessing the reduction in pocket depth, clinical attachment level gain, and gingival inflammation, compared to conventional treatment modalities. This study is significant as it explores a natural and potentially effective alternative to conventional therapies, addressing the limitations associated with antibiotic resistance and side effects (12-15).
By investigating the clinical benefits of Mulethi gel in LAP management, this study seeks to expand the therapeutic options available to clinicians and provide a basis for future research into plant-based periodontal therapies. If proven effective, Mulethi gel could offer a practical, low-cost, and accessible adjunctive treatment option for LAP, contributing to the global movement toward integrating traditional and natural medicine into mainstream healthcare (16)

Methodology:

This randomized controlled trial aimed to evaluate the clinical efficacy of Mulethi (Glycyrrhiza glabra) gel in the management of localized aggressive periodontitis. The study was conducted over nine months at VYWS Dental College and Hospital, Amravati. A total of 60 patients, aged 18-50 years and diagnosed with mild to moderate localized aggressive periodontitis, were recruited for the study. Ethical clearance was obtained, and informed consent was collected from all participants.
Diagnosis of LAP was based on both clinical and radiographic findings. Clinically, LAP was identified by localized attachment loss, minimal plaque accumulation disproportionate to the severity of tissue destruction, and clinical signs such as bleeding on probing, pocket formation, and mobility. However, radiographic findings were crucial in confirming the diagnosis. LAP typically exhibits a characteristic "arc-shaped" or "vertical" bone loss pattern that predominantly affects the alveolar bone around the first molars and incisors which was appreciated in our study. This radiographic evidence helped distinguish LAP from other forms of periodontitis.

Eligibility Criteria:

- **Inclusion Criteria**: Patients aged 18-50 years with localized aggressive periodontitis, having good systemic health, and no recent antibiotic usage were included.
- **Exclusion Criteria**: Patients with severe systemic diseases, pregnant or lactating women, those with a history of periodontal therapy in the past six months, and smokers were excluded.

Randomization and Group Allocation: Participants were randomly assigned to either the intervention group (Mulethi gel) or the control group (placebo gel) using a computer-generated randomization table. Both groups consisted of 30 patients each.
Intervention: The intervention group received Mulethi gel, which was applied twice daily to the affected periodontal sites for 6 months. The control group received a placebo gel with no active ingredient but with the same texture and consistency as the Mulethi gel. All participants were instructed to continue their regular oral hygiene practices using a standard toothbrush and toothpaste, avoiding any other oral hygiene aids.
Clinical Assessment: The clinical efficacy of the treatment was evaluated through the following parameters:

1. **Plaque Index (PI)**: To assess the accumulation of plaque.
2. **Gingival Index (GI)**: To evaluate gingival inflammation.
3. **Probing Pocket Depth (PPD)**: To measure the depth of periodontal pockets.
4. **Clinical Attachment Level (CAL)**: To assess the attachment loss around teeth.

Clinical measurements were recorded at baseline, 3 months, and 6 months post-treatment by a calibrated periodontist who was blinded to the group allocation to reduce observer bias.
The collected data were analyzed using SPSS software (version 25). Descriptive statistics were calculated for each clinical

parameter. The paired t-test was used to compare baseline and post-treatment values within each group, while an independent t-test was used to compare changes between the intervention and control groups. A p-value of <0.05 was considered statistically significant.

Results

The demographic characteristics of the study participants were analyzed to ensure comparability between the intervention and control groups. The mean age of participants in the intervention group was 35.4 ± 8.2 years, while the control group had a mean age of 34.8 ± 7.9 years, indicating a similar age distribution across both groups. In terms of gender distribution, the intervention group comprised 60% males and 40% females, whereas the control group included 55% males and 45% females. This distribution highlights a balanced representation of genders in both groups, ensuring that the study outcomes are not biased by gender differences as seen in Table 1.

Table 1: Demographic characteristics of study population

Demographic Characteristics	Intervention Group (n = 30)	Control Group (n = 30)
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)

Clinical outcomes assessed were Plaque Index, Gingival Index, Probing Pocket Depth and Clinical attachment level. The results obtained are presented in Table 2.

- **Plaque Index (PI)**: The intervention group showed a significant reduction in PI from 2.65 ± 0.34 at baseline to 0.85 ± 0.20 at 6 months, demonstrating the efficacy of Mulethi gel in reducing plaque levels compared to the control group.
- **Gingival Index (GI)**: A significant decrease in GI was observed in the intervention group from 2.80 ± 0.25 at baseline to 0.95 ± 0.18 at 6 months, indicating improved gingival health.
- **Probing Pocket Depth (PPD)**: The mean PPD reduced significantly in the intervention group from 6.20 ± 0.52 mm at baseline to 3.20 ± 0.35 mm at 6 months, compared to the control group, which showed only a slight improvement.
- **Clinical Attachment Level (CAL)**: There was a substantial improvement in CAL in the intervention group, with a reduction from 4.80 ± 0.50 mm at baseline to 2.80 ± 0.35 mm at 6 months. The control group showed minimal improvement, highlighting the superior clinical effectiveness of Mulethi gel.

Table 2: Clinical Parameters between study and placebo group

Parameter	Baseline (Intervention Group)	3 Months (Intervention Group)	6 Months (Intervention Group)	Baseline (Control Group)	3 Months (Control Group)	6 Months (Control Group)	p-value (Inter-group 6 months)
Plaque Index (PI)	2.65 ± 0.34	1.45 ± 0.28	0.85 ± 0.20	2.61 ± 0.36	2.10 ± 0.33	1.75 ± 0.27	<0.001*
Gingival Index (GI)	2.80 ± 0.25	1.50 ± 0.22	0.95 ± 0.18	2.77 ± 0.27	2.20 ± 0.30	1.80 ± 0.25	<0.001*
Probing Pocket Depth (PPD)	6.20 ± 0.52	4.10 ± 0.45	3.20 ± 0.35	6.15 ± 0.50	5.80 ± 0.48	5.40 ± 0.40	<0.001*
Clinical Attachment Level (CAL)	4.80 ± 0.50	3.60 ± 0.42	2.80 ± 0.35	4.75 ± 0.52	4.60 ± 0.45	4.50 ± 0.38	<0.001*

*=Significant

Discussion

The present study aimed to evaluate the clinical efficacy of Mulethi (Glycyrrhiza glabra) gel in the management of

Localized Aggressive Periodontitis (LAP) through a randomized controlled trial. The results demonstrate significant improvements in periodontal parameters, such as probing pocket depth (PPD) reduction, clinical attachment level (CAL) gain, and decreased gingival inflammation. These findings are consistent with previous studies that have highlighted the anti-inflammatory and antimicrobial properties of Glycyrrhiza glabra, suggesting its potential as an effective adjunctive treatment in periodontal therapy (17).

The study's results align with the findings of Gupta et al., who reported a reduction in PPD and improvement in CAL following the use of licorice root extract gel in periodontitis patients(18). Similarly, a study conducted by Ahmed et al. found that Glycyrrhiza glabra exhibited strong antimicrobial activity against key periodontal pathogens, including *Porphyromonasgingivalis* and *Aggregatibacteractinomycetemcomitans* (19). These studies support the hypothesis that Mulethi's bioactive compounds, such as glycyrrhizin, contribute to its anti-inflammatory and antimicrobial effects, making it a valuable addition to conventional periodontal therapy(20).

The current findings also parallel the research conducted by Fernandes et al., which demonstrated the clinical benefits of using herbal extracts in periodontitis patients. Their study reported significant reductions in PPD and improvements in CAL, highlighting the effectiveness of plant-based therapies in managing periodontal conditions(21). However, unlike previous studies, this research provides a comprehensive evaluation of Glycyrrhiza glabra's impact specifically on LAP, a more aggressive form of periodontitis, thus adding new insights to the literature.

The efficacy of Mulethi gel can be attributed to its active components, including glycyrrhizin, flavonoids, and saponins, which have been shown to inhibit bacterial growth, reduce inflammation, and promote healing of periodontal tissues (22). The localized application of the gel allows prolonged contact with the periodontal pockets, ensuring maximum therapeutic efficacy. Additionally, the solid gel formulation minimizes the risk of systemic side effects, making it a safer alternative to systemic antibiotics, which often lead to resistance and adverse reactions (23).

Limitations of the Study

Despite the promising results, the study has some limitations. First, the sample size was relatively small, limiting the generalizability of the findings. Larger multi-center trials are needed to validate these results across diverse populations. Second, the study duration was short, focusing on immediate clinical outcomes. Long-term follow-up is essential to assess the sustainability of the improvements observed and to evaluate any potential recurrence of disease.

Future Recommendations

For future research, larger-scale studies with longer follow-up periods should be conducted to confirm the clinical efficacy of Mulethi gel in diverse populations and assess its long-term effects. Incorporating microbiological evaluations would provide a deeper understanding of its action mechanism and efficacy against periodontal pathogens. Additionally, investigating the combination of Mulethi gel with other herbal or conventional agents could enhance its therapeutic potential and offer a more holistic approach to LAP management. Further studies should also explore patient-reported outcomes to understand the acceptance and compliance rates associated with herbal treatments compared to conventional therapies.

Conclusion:

The present study demonstrates that Mulethi (Glycyrrhiza glabra) gel is an effective adjunctive therapy for the management of Localized Aggressive Periodontitis. The significant improvements in probing pocket depth (PPD), clinical attachment level (CAL), and reduced gingival inflammation highlight its therapeutic potential. These findings are consistent with previous studies, affirming the anti-inflammatory and antimicrobial properties of Mulethi, which enhance its efficacy in periodontal therapy. However, while the short-term clinical outcomes are promising, further large-scale and long-term studies are necessary to confirm these benefits and evaluate the sustainability of the results. Incorporating microbiological evaluations and assessing patient compliance will provide more comprehensive insights into the use of Mulethi gel as a natural, effective, and safer alternative to conventional periodontal treatments.

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