

## Comparative Evaluation of 0.2% Chlorhexidine and Aloe Vera Mouthwashes as Antiplaque Agents in the Treatment of Chronic Gingivitis: A Randomized Control Trial

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### ABSTRACT

**Background:** Recently, there has been growing interest in the use of herbal products, as an adjunct to scaling and root planing, for the management of periodontal conditions. One such product with immense potential is Aloe vera. It's pharmacological attributes have been revalidated in modern sciences through various in vivo & in vitro studies.

**Material and Methods:** 30 subjects, aged between 18-40 years with generalised chronic gingivitis were randomly assigned to two groups: Group A (0.2% chlorhexidine gluconate mouthwash; n=15) and Group B (Aloe vera mouthwash; n=15). Baseline assessments of plaque index and gingival index were conducted. Scaling & polishing was done, and both types of mouthwash were distributed to patients for use twice daily. Follow-up evaluations will be performed on the 14th & 21st day.

**Results:** Both mouthwashes were effective in reducing the PI and GI over time. However, there was no significant difference between the two groups at any time point, indicating that Aloe Vera mouthwash is as effective as 0.2% Chlorhexidine gluconate in the management of chronic gingivitis.

**Conclusion:** Aloe Vera can be recommended as a natural and safe alternative to Chlorhexidine, particularly for patients who experience side effects from chemical mouthwashes or prefer herbal treatment options.

**Keywords:** Aloe vera mouthwash, Chlorhexidine mouthwash, Dental Plaque, Gingivitis, Oral hygiene.

### INTRODUCTION

Periodontal diseases are among the most common chronic diseases affecting a significant proportion of the global population. Gingivitis, the mildest form of periodontal disease, is characterized by inflammation of the gums without the loss of connective tissue attachment. If left untreated, gingivitis can progress to periodontitis, leading to

irreversible damage to the supporting structures of the teeth and ultimately resulting in tooth loss.<sup>1</sup>

The etiology of gingivitis is strongly associated with dental plaque, a biofilm that forms on the surface of the teeth. Plaque is composed of bacteria, their metabolic byproducts, and salivary components, and it plays a crucial role in the initiation and

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progression of gingival inflammation.<sup>2</sup> Effective plaque control is therefore essential for the prevention and management of gingivitis and other periodontal diseases.<sup>2</sup>

Mechanical plaque control methods, such as tooth brushing and flossing, are the cornerstone of periodontal therapy. However, these methods are often insufficient to completely remove plaque.<sup>4</sup> Consequently, chemical plaque control agents, such as mouthwashes, have been developed to enhance the efficacy of mechanical plaque removal.<sup>5</sup> Chlorhexidine, a bisbiguanide antiseptic, is widely regarded as the gold standard for chemical plaque control due to its broad-spectrum antimicrobial activity and substantivity.<sup>6</sup> Chlorhexidine is effective against a wide range of oral microorganisms, including Gram-positive and Gram-negative bacteria, yeasts, and some viruses.<sup>7</sup> However, the long-term use of chlorhexidine is associated with several side effects, including tooth staining, taste alteration, increased calculus formation, and mucosal irritation.<sup>8</sup> These adverse effects have prompted the search for alternative antiplaque agents that are effective yet have fewer side effects.

Aloe Vera, a succulent plant belonging to the genus *Aloe*, has been used for centuries in traditional medicine for its various therapeutic properties, including wound healing, anti-inflammatory, and antimicrobial effects.<sup>9</sup> In recent years, Aloe Vera has gained popularity in dentistry as a natural alternative to conventional chemical agents for the prevention and treatment of periodontal diseases.<sup>10</sup> Aloe Vera contains a variety of bioactive compounds, including polysaccharides, glycoproteins, vitamins, and minerals, which contribute to its therapeutic effects.<sup>11</sup> Studies have shown that Aloe Vera exhibits antimicrobial activity against a range of oral pathogens, including *Streptococcus mutans*, the primary causative agent of dental caries, and *Porphyromonas gingivalis*, a key pathogen in periodontitis.<sup>12</sup>

Additionally, Aloe Vera has been reported to reduce plaque formation and gingival inflammation in clinical studies.<sup>13</sup> This study aims to compare the antiplaque efficacy of 0.2% chlorhexidine gluconate and Aloe Vera mouthwashes in the treatment of chronic gingivitis, with a focus on clinical parameters such as plaque index and gingival index over a 21-day period. The findings of this study

could provide valuable insights into the potential role of Aloe Vera in modern dentistry as a safe and effective alternative to chlorhexidine for the management of gingivitis.<sup>14</sup>

## MATERIALS AND METHODS

This study was conducted at the Department of Periodontology, involving 30 patients aged between 18 and 40 years diagnosed with generalized chronic gingivitis. The study design was randomized, double-blind, and controlled, ensuring that both the participants and the examiners were blinded to the treatment allocation. Ethical approval was obtained from the Institutional Review Board, and all participants provided written informed consent before the commencement of the study. Inclusion criteria: Adults aged 18-40 years, diagnosed with generalized chronic gingivitis, with plaque and gingival index score greater than 1.

Exclusion criteria included the presence of any systemic conditions that could influence periodontal health, such as diabetes or immunosuppressive conditions, pregnancy or lactation, history of periodontal treatment within the last six months, the use of antibiotics or anti-inflammatory drugs within the last six months.

**Study Groups:** The 30 participants were randomly assigned to two equal groups using a computer-generated randomization table. Group A (n=15) received 0.2% chlorhexidine gluconate mouthwash, while Group B (n=15) received Aloe Vera mouthwash. Both mouthwashes were dispensed in identical bottles to prevent any bias related to the appearance or smell of the products. The Aloe Vera mouthwash was prepared specifically for this study, containing 100% aqueous Aloe Vera extract.

**Preparation of Aloe Vera Mouthwash.** Mature, healthy and fresh leaves of AV were washed using running tap water and rinsed with sterile distilled water, and then dissected longitudinally, the colorless parenchymatous tissue (aloe gel) without the fibers was scraped out using a sterile knife. AV gel was transformed to a liquid form using a blender, aloe juice (80% Aloe Vera 20% normal saline) was prepared. AV mouthwash prepared by adding 98% aloe juice, 0.2% sodium benzoate crystal as a preservative and 0.001% lemon-lime flavor, these measurements were done using a

sensitive scale. The pH of the prepared mouthwash was measured to be equal to 7.3 using a pH meter.

**Baseline Examination** At the baseline visit, a comprehensive oral examination was conducted for all participants. The clinical parameters recorded included the Plaque Index (PI), Gingival Index (GI), and Modified Sulcus Bleeding Index (MSBI). All clinical measurements were performed by a single calibrated examiner using standardized periodontal probes to ensure consistency and accuracy in the measurement. **Phase I therapy** Following the baseline examination, all participants underwent professional ultrasonic scaling and polishing to remove supragingival plaque and calculus. Detailed oral hygiene instructions were provided, emphasizing the importance of regular brushing and interdental cleaning. Participants were instructed to use the allocated mouthwash twice daily, in the morning and before bedtime, for one minute each time. They were advised to avoid eating, drinking, or rinsing their mouth for at least 30 minutes after the placement of gel.

Participants were recalled for follow-up evaluations at 14 days and 21 days after the baseline examination. During these visits, the same clinical parameters (PI, GI, and MSBI) were recorded. Additionally, participants were interviewed regarding any side effects or adverse reactions they experienced during the study period. Compliance with the mouthwash regimen was assessed by asking participants to return the used bottles and by inquiring about their adherence to the prescribed protocol.

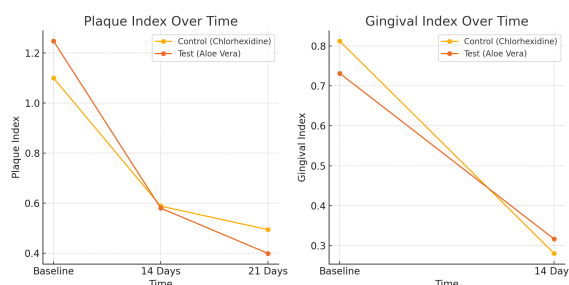
### Statistical Analysis

The collected data were analyzed using SPSS software version 17.0 (IBM Corporation, Chicago, IL, USA). Descriptive statistics, including means and standard deviations, were calculated for all clinical parameters. The paired t-test was used to compare the baseline and follow-up measurements within each group, while the unpaired t-test was used to compare the differences between the two groups at each time point. To further explore the differences across multiple time points, a repeated measures ANOVA was conducted. A p-value of less than 0.05 was considered statistically significant. In addition to p-values, effect sizes were calculated for each of the comparisons.

## RESULTS

To evaluate the effectiveness of the mouthwashes on plaque and gingival indices, a comprehensive statistical analysis was conducted. The data collected at baseline, 14 days, and 21 days were subjected to various statistical tests to determine the significance of the observed changes over time within and between the groups.

The statistical analysis revealed that both mouthwashes were effective in reducing the PI and GI over time. However, there was no significant difference between the two groups at any time point, indicating that Aloe Vera mouthwash is as effective as 0.2% Chlorhexidine gluconate in the management of chronic gingivitis. The effect sizes calculated also supported the clinical relevance of the findings, particularly in the context of the significant reductions observed in PI and GI within both groups.



## DISCUSSION

The findings of this study contribute to the growing body of evidence supporting the efficacy of natural products like Aloe Vera in the management of periodontal diseases. While Chlorhexidine remains the gold standard for chemical plaque control, the results of this study indicate that Aloe Vera mouthwash offers a comparable antiplaque and antigingivitis effect, with the added benefit of fewer side effects, which has significant implications for patient compliance and long-term use<sup>14</sup>. **Comparison with Previous Studies** Several previous studies have highlighted the benefits of Aloe Vera in reducing plaque and gingival inflammation. For instance, Bhat et al<sup>16</sup>. (2011) demonstrated the significant reduction in gingival index with the use of Aloe Vera gel as an adjunct to scaling and root planing. Similarly, Vangipuram et al. (2016) found that Aloe Vera mouthwash was as effective as Chlorhexidine in

controlling plaque and gingivitis, corroborating the findings of this study.

The efficacy of Aloe Vera in managing gingivitis can be attributed to its multiple pharmacological properties. Aloe Vera contains several bioactive compounds such as anthraquinones, saponins, and salicylic acid, which contribute to its anti-inflammatory, antimicrobial, and antioxidant effects. The anti-inflammatory action of Aloe Vera is particularly relevant in the context of gingivitis, where inflammation plays a central role in disease progression. By inhibiting the cyclooxygenase pathway and reducing inflammation<sup>17</sup>. The results of this study have important clinical implications. Given the comparable efficacy of Aloe Vera to Chlorhexidine, Aloe Vera mouthwash can be recommended as a safe and effective alternative<sup>10,11</sup>, particularly for patients who are sensitive to the side effects associated with Chlorhexidine, such as tooth staining, altered taste sensation, and mucosal irritation. Additionally, the natural origin of Aloe Vera may be more appealing to patients seeking herbal or organic treatment option.

One of the key advantages of Aloe Vera over Chlorhexidine is its suitability for long-term use. While Chlorhexidine is highly effective in the short term, its prolonged use is often limited by adverse effects, including the development of resistant microbial strains. In contrast, Aloe Vera, with its wide range of bioactive compounds, provides a multifaceted approach to oral health that is less likely to contribute to resistance. This makes Aloe Vera an attractive option for long-term maintenance of periodontal patients<sup>9,13</sup>.

Despite the rigorous design of this study, certain limitations must be acknowledged. The relatively short duration of the study (21 days) may not fully capture the long-term effects of the mouthwashes on gingival health. Additionally, the study was conducted in a single center with a relatively small sample size, which may limit the generalizability of the findings to broader populations. Future studies with larger sample sizes and longer follow-up periods are warranted to confirm the results of this study<sup>12</sup>.

The findings of this study suggest that Aloe Vera mouthwash is a viable alternative to 0.2% Chlorhexidine gluconate for the management of

chronic gingivitis. Its comparable efficacy, coupled with a favorable side effect profile, supports its use as part of a comprehensive oral hygiene regimen<sup>18,19</sup>. However, further research is warranted to explore its long-term benefits and to identify the specific components of Aloe Vera that contribute most significantly to its therapeutic effects<sup>20</sup>.

## CONCLUSION

This study has demonstrated that Aloe Vera mouthwash is as effective as 0.2% Chlorhexidine gluconate in reducing plaque and gingival inflammation in patients with chronic gingivitis. The findings suggest that Aloe Vera can be recommended as a natural and safe alternative to Chlorhexidine, particularly for patients who experience side effects from chemical mouthwashes or prefer herbal treatment options. Aloe Vera's anti-inflammatory, antimicrobial, and antioxidant properties make it a more valuable.

Given the rising interest in natural products for oral health, Aloe Vera offers a promising approach to periodontal care. However, further research is needed to confirm the long-term benefits of Aloe Vera mouthwash and to explore the specific mechanisms underlying its therapeutic effects. This study adds to the growing body of evidence supporting the use of Aloe Vera in clinical practice and highlights the potential of herbal medicines in the management of periodontal diseases.

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