# The Effect of Commercial Toothpaste Containing Aloe Vera on Dental Plaque and Gingivitis: A Double-Blind Randomized Clinical Trial

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**Abstract**

**Objectives**: Aloe vera is a medical plant which has the greater medicinal value and enormous properties for curing and preventing gingivitis and oral diseases. This study aims to evaluate the effect of a commercial toothpaste containing Aloe vera on the reduction of plaque and gingivitis.

**Material and methods:** 24 patients diagnosed with generalized gingivitis, randomly divided into 2 groups, patients in the test group (n=12) used toothpaste containing Aloe vera, and patients in the control group (n=12) used toothpaste containing fluoride. Plaque Index (PI), Gingival Index (GI), and Bleeding on Probing (BOP) were assessed at days 0 and 30. Subjects were asked to brush their teeth with the stated toothpaste, twice a day, for 30 days. the data on toothpaste tubes were masked for both patients and examiner.

**Results: A**ll clinical parameters showed a significant reduction on 30$^{th}$ day in both test and control groups, but no significant differences between groups.

**Conclusion:** The results of the present study indicate that commercial toothpaste containing Aloe vera did not show an additional effect on plaque and gingivitis compared to the control fluoridated toothpaste.

***Key Words:*** *Aloe vera, Toothpaste, Dental Plaque, Gingivitis.*

## Introduction

Plaque-induced gingivitis is one of the most frequent periodontal diseases, affecting the majority of the population. The results of a study among the adult Saudi population showed a 100% prevalence of gingivitis [(1)]. A study on oral health status among fifteen-years-old students in Maysan governorate\Iraq showed a high prevalence of dental caries and gingivitis [(2)]. Gingivitis may turn into periodontitis characterized by pocket formation, alveolar bone destruction, and loss of clinical attachment level [(3)].

For effective plaque control, several mechanical oral hygiene aids as well as several anti-plaque agents are available. The mechanical plaque control is mainly achieved through tooth brushing, flossing, and supragingival irrigation. The chemical control of plaque inhibits the accumulation, growth, and survival of microbiota [(4)], however, the inability of the normal adult population to perform adequate toothbrushing has led to the search for chemotherapeutic agents to improve plaque control, these chemicals, mainly triclosan, amine fluoride and a chlorhexidine [(5, 6)].

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Nowadays many patients prefer using herbal preparations which are efficient without causing side effects such as tooth staining and taste alteration. herbs like Terminalia chebula, Punica granatum Linn, Centella Asiatica, Punica granatum, carvacrol, thymol, Aloe vera, Azadirachta indica, piper betel, Ocimum sanctum possess different biological properties [7, 8, 9, 10, 11].

Aloe vera is a succulent, cactus-like plant, the Aloe leaf consisting of two major parts, the outer green rind, and the inner colourless parenchyma containing the aloe pulp (gel), the chemical composition of Aloe vera leaf pulp is very complex, consisting of over 75 active ingredients including minerals, enzymes, carbohydrates, athraquinones, lipids, vitamins, steroids, amino acids, and salicylic acid. Aloe vera is the most commercialized aloe species, it has been used in the food industry, cosmetic industry, and pharmaceutical industry, it has been reported in new pharmacological data research that Aloe vera leaf gel has many biological activities such as immunostimulation, anti-inflammatory effects, wound healing, promotion of radiation damage repair, anti-bacterial, anti-viral, anti-fungal, skin and digestive protective activity, and anti-cancer action [12, 13, 14].

Some published studies reported the use of Aloe vera in dentistry for various purposes such as disinfecting dental unit water network [15], gutta-percha disinfection [16], the antiseptic effect on candida Albicans [17], aphthous stomatitis treatment [18], as an ingredient in toothpaste [19] and mouthwash [20 ] for gingivitis treatment, adjunctive treatment with scaling and root planning for chronic periodontitis [21], cavity disinfectant to minimizing secondary caries [22], preprocedural rinse in reducing aerosol contamination during ultrasonic scaling [23] and a local drug delivery system in periodontal pockets [24].

The results of studies about the effects of a dentifrice containing Aloe vera on gingivitis and plaque accumulation are controversial and inconclusive. A clinical and microbiologic study using toothpaste containing aloe vera showed improvement in plaque and gingival status comparable to those achieved with toothpaste containing triclosan [25], A systematic review and meta-analysis about herbal oral care found that herbal toothpaste was superior over non-herbal toothpaste in plaque reduction [26], In other studies using toothpaste containing Aloe vera showed no additional effect on plaque and gingivitis compared to a control toothpaste [19, 27].

To the present date, there is a few reported controlled trial evaluating the efficacy of a commercial toothpaste containing Aloe vera in the control of plaque and gingivitis. Hence this study intended to clinically evaluate the effect of commercial toothpaste containing Aloe vera on dental plaque and gingivitis as compared to control fluoridated toothpaste.

## Material and Methods

### Study population

Twenty four adult patients from Maysan governorate (Iraq) (12 male and 12 female, aged 18 to 40 ) diagnosed with generalized chronic gingivitis were enrolled in this controlled randomized, double-blind, clinical study. Patients were randomly divided into 2 groups: test group using Aleo vera containing toothpaste, and control group using over the counter fluoridated toothpaste with no anti-inflammatory properties.

Inclusion criteria**:** Bleeding on Probing index $\geq$ 30%, presence of at least 20 natural teeth, no signs of periodontitis.

Exclusion criteria: a history of allergy to Aloe vera or its products, tobacco use, participants undergoing orthodontic treatment, pregnant women excluded from the trial, systemic diseases, any periodontal treatment during six months before the study, and using antibiotic or antimicrobial mouthwash since 6 months.

**Clinical parameters**:

All the patients were examined from one examiner for the Plaque index of Silness and Loe (PI), Gingival index (GI), and presence of Bleeding on Probing (BOP) at baseline and after 30 days.

PI and GI were recorded on the buccal, mesial, distal and lingual surfaces of all teeth except for third molars, the values of 4 sites of each tooth were averaged to determine the score for each subject, a score of 0 to 3 was assigned to measure PI and GI.

Bleeding on Probing (BOP) was done through the gentle probing of the orifice of the gingival crevice if bleeding occurs within 20 seconds a positive finding

is recorded, and the number of positive sites is then expressed as a percentage of the number of sites examined [28].

**Toothbrushing**

Participants were instructed to brush with control or test toothpaste for 2 min. twice daily, during 30 days, using familiar technology, and to refrain from any other oral hygiene procedures throughout the clinical trial.

After an initial examination, a personal kit containing a new toothbrush, and the test or control toothpaste was given to all patients. Verbal instruction about the correct use of toothpaste was given to all patients.

The tubes containing the toothpaste were previously masked and color-coded to warrant that neither the examiner nor the patient knew their content, which was revealed only after completion of the study,

The Participants were asked to return their toothpaste tubes, that were weighted by a digital balance previously and after the trial, a telephone call was done every week to each participant, T-test was used to evaluate the statistical differences between weights of toothpaste tubes on day 0 and 30 so that compliance could be indirectly evaluated, statistical analysis was done by Student T-test.

**Ethical approval and informed consent:**

All participants were informed about the nature of the study and signed informed consent. The research protocol was approved by the ethics committee of Al-Manara College of Medical Sciences.

## Results

The test toothpaste had a good acceptance and did not show adverse effects, such as the formation of abscess and ulcerations or allergic reactions. There was a significant reduction of toothpaste tube weights between days 0 and 30 in both groups which indicates that the patients have used it.

On day 0, there was no statistically significant difference between the control and test groups concerning GI and PI, and BOP means These results indicated that both groups were well balanced at baseline.

Comparing the means between the baseline and day 30 for the test group (Aloe vera), there were statistically significant differences in reducing the plaque index, gingival index, and bleeding on probing (Table 1).

**Table 1: Gingival Index(GI), Plaque index (PI) and Bleeding on probing (BOP) means and standard deviation on day 0 and day 30 for the test group (Aloe vera).**

| Aloe vera group | | MEAN | Number | Standard deviation | P-Value | Statistical significance |
|---|---|---|---|---|---|---|
| Pair 1 | PI (BASELINE) | 1.06 | 12 | 0.349 | 0.0001 | S P<0.05 |
| | PI (Day 30) | 0.32 | 12 | 0.114 | | |
| Pair 2 | GI (BASELINE) | 0.69 | 12 | 0.431 | 0.0001 | S P<0.05 |
| | GI (Day 30) | 0.09 | 12 | 0.078 | | |
| Pair 3 | BOP (BASELINE) | 45.45 | 12 | 37.977 | 0.003 | S P<0.05 |
| | BOP (Day 30) | 8.80 | 12 | 10.353 | | |

Comparing the means between the baseline and day 30 for the control group, there were statistically significant differences in reducing the plaque index, gingival index, and bleeding on probing (Table 2).

**Table 2: Gingival Index(GI), Plaque index (PI) and Bleeding on probing (BOP) means and standard deviation on day 0 and day 30 for the control group**

| Control group | | Mean | Number | Standard deviation | P-Value | Statistical significance |
|---|---|---|---|---|---|---|
| Pair 1 | PI (BASELINE) | 0.91 | 12 | 0.757 | 0.011 | S P<0.05 |
| | PI (Day 30) | 0.40 | 12 | 0.505 | | |
| Pair 2 | GI (BASELINE) | 0.60 | 12 | 0.492 | 0.006 | S P<0.05 |
| | GI (Day 30) | 0.27 | 12 | 0.380 | | |
| Pair 3 | BOP (BASELINE) | 51.00 | 12 | 44.908 | 0.003 | S P<0.05 |
| | BOP (Day 30) | 18.22 | 12 | 23.323 | | |

Comparing the means between the test and control group after 30 days, although the mean numbers always better for the Aloe vera group, there were no statistically significant differences in reducing the plaque index, gingival index, and bleeding on probing (Table 3).

**Table 3: The differences between the test and control groups after one month.**

| | Group | Number | Mean | Standard deviation | P-Value | Statistical difference |
|---|---|---|---|---|---|---|
| PI (Day 30) | Control | 12 | 0.40 | 0.505 | .5930 | NS P>0.05 |
| | Test | 12 | 0.32 | 0.114 | | |
| GI (Day 30) | Control | 12 | 0.27 | 0.380 | .1420 | NS P>0.05 |
| | Test | 12 | 0.09 | 0.078 | | |
| BOP (Day 30) | Control | 12 | 18.22 | 23.323 | .2240 | NS P>0.05 |
| | Test | 12 | 8.80 | 10.353 | | |

## Discussion

The purpose of this clinical trial to assess the efficacy of Aloe vera commercial toothpaste in preventing plaque accumulation and gingival inflammation. According to this study, clinical improvement of plaque and gingival indices was observed in both test and control groups, although the Aloe vera group showed a considerably better improvement ( mean bleeding points after 30 days: test: 8,80%, control 18,22% . mean plaque index after 30 days: test 0.11, control 0.50 ) so the differences between both groups statically was not significant.

Home-use dentifrice studies are often influenced by several factors which can mask the differences between test agents and controls, to reduce these factors the patients of the present study were not aware of which toothpaste they were using, the toothpaste tubes were weighted by a digital balance previously and after the trial, and a telephone call was done every week to each patient.

The literature review didn`t give the dentists conclusive evidence about the effectiveness of toothpaste containing Aloe vera to control plaque and gingivitis. Some studies like this study concluded that toothpaste containing Aloe vera showed no additional effect on plaque accumulation and gingivitis compared to a control toothpaste [19, 29]. A systematic review suggested that even though there are some promising results, the clinical effectiveness of Aloe vera herbal dentifrices is not sufficiently defined at present [30].

Other studies concluded that toothpaste containing Aloe vera may be useful for improvement in plaque control and gingival status [25,31].

There is more interest using Aloe vera as mouthwash with more clear evidence about its effectivity on plaque control and gingivitis [32, 33], a recently published systematic review suggests that Aloe vera mouthwash is effective in reducing plaque and gingival inflammation, but less than chlorhexidine in reducing dental plaque, moreover, the results showed that Aloe vera was safe and well-tolerated by the patients, with no/ or minimal adverse effects as compared to chlorhexidine [34 ].

Despite some studies followed participants for more than one month, further long-term studies must be performed to evaluate the antigingivitis effect of this herbal toothpaste, if its real benefit is confirmed, the use of Aloe vera should be advantageous in cases where patients have little motor skills and toothbrushing is compromised. a comprehensive study with different density of Aloe vera could be done in the future.

## Conclusion

Within the limits of this clinical study, it may be concluded that both commercial toothpaste containing Aloe vera and fluoridated toothpaste show a significant reduction on plaque and gingivitis after 30 days of use, but toothpaste containing Aloe vera did not show an additional effect on plaque and gingivitis compared to the control fluoridated toothpaste.

**Conflict of Interest:** The authors declare there is no conflict of interest, and during this research, there is not any financial support or private connections to pharmaceutical companies.

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