

Efficacy of *Ocimum sanctum*, *Aloe vera* and chlorhexidine mouthwash on gingivitis: A randomized controlled comparative clinical study

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Abstract

Background: The medicinal plants are widely used for curing various diseases in day-to-day practice. *Ocimum sanctum* (*Tulsi*) is one such popular herb in Ayurvedic medicine, which is widely used in the treatment of several systemic diseases because of its antimicrobial property. *Aloe vera* is also widely known for its medicinal uses in wound healing and its anti-inflammatory properties. However, studies documenting the effect of *O. sanctum* and *A. vera* in treating gingivitis are rare. **Aim:** The aim of this study was to assess the effectiveness of two herbal mouthwashes in comparison with chlorhexidine mouthwash on gingivitis. **Materials and Methods:** A double-blind randomized placebo-controlled clinical trial, wherein sixty patients were randomly allocated into three study groups. (1) *O. sanctum* mouthwash ($n = 20$) (2) *A. vera* mouthwash ($n = 20$) and (3) Chlorhexidine mouthwash ($n = 20$). All groups were treated with scaling and asked to rinse with respective mouthwashes twice daily for 1 month. Clinical parameters such as plaque index (PI), gingival index (GI), and sulcus bleeding index (BI) were recorded at baseline, after 15 days and after 30 days, respectively. **Results:** Results of the study showed that *O. sanctum*, *A. vera* and chlorhexidine are equally effective in reducing plaque, gingival, and bleeding indices at 30-day interval. However, no significant reductions in PI, GI and BI in 15-day interval in group 1 and group 2 when compared with chlorhexidine were evident. **Conclusion:** The results in the present study indicate that *O. sanctum* and *A. vera* may prove to be as effective as chlorhexidine mouthwash in its ability in reducing all the three indices by reducing plaque accumulation, gingival inflammation and bleeding when used in the long-term follow-up.

Keywords: *Aloe vera*, chlorhexidine, gingivitis, *Ocimum sanctum*, plaque control

Introduction

The oral cavity is regarded as a mirror and a gateway to oral health, which is an important aspect of the overall health status of an individual. Among various oral diseases affecting the oral cavity, periodontal diseases and dental caries are the biggest threats to oral health.^[1]

Gingivitis, which is an early form of inflammatory manifestations affects the periodontal health, which is associated with dental plaque formation and is one of the most common gingival diseases.^[1] It is characterized by the presence of clinical signs of infection confining to the gingiva with no signs of attachment loss. In an attempt to attain periodontal health, plaque control is one of the key elements in the practice of dentistry, thereby facilitating a healthy periodontium by preventing the decay and preserving oral health for a lifetime.

The 1999 European workshop on mechanical plaque control even emphasizes that an effective oral and periodontal health throughout life is attained by an effective removal of plaque.^[2] Although an effective plaque control comprising both mechanical and chemical means does exist an improved understanding of the infectious nature of the dental disease and has dramatically raised interest in chemical method of plaque control, thereby holding a great promise in preventing the advancing of disease progression and prevention. Among various chemical plaque control agents used to maintain gingival health, chemical preparations like chlorhexidine

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have proven to be successful. On the other hand, alternative therapies in attaining plaque control as opposed to synthetic agents are being researched in the field of dentistry.

Ocimum sanctum and *Aloe vera* are such natural substances which have shown positive effects in combating the plaque biofilm.^[3,4] Although comparisons to evaluate the efficacy of various chemotherapeutic agents versus natural preparations exist in the literature, unfortunately very little literature is available to evaluate the efficacy of herbal mouthwashes such as *O. sanctum* and *A. vera* mouthwash in the treatment of gingivitis. Hence, the aim of the present study was to evaluate and assess antiplaque and anti-gingivitis effects of *O. sanctum* and *A. vera* in the treatment of gingival diseases.

Materials and Methods

This study was a double-blind, randomized, placebo-controlled clinical study for 1 month wherein a total of 60 healthy patients were selected. The study was approved by the Institutional Research Committee, and ethical clearance was obtained from the Institutional Ethical Committee (VDC/IEC/2016/77).

Inclusion criteria

1. The age group of 18–45 years with mild-to-moderate gingivitis
2. Patients with a minimum of 20 teeth
3. Patients who have not undergone periodontal treatment in the past 6 months.

Exclusion criteria

1. Patients with a history of systemic diseases
2. Pregnancy and lactating women
3. Patients on antibiotic therapy from the past 3 months
4. Patients with adverse habits
5. Patients allergic to chlorhexidine, *A. vera* and *O. sanctum*.

The patients enrolled in the study were divided into three groups

- Group I ($n = 20$) was given *O. sanctum* mouth wash 10 ml twice daily.
- Group II ($n = 20$) was given *A. vera* mouth wash 10 ml twice daily.
- Group III ($n = 20$) was given chlorhexidine mouthwash 10 ml twice daily. All the patients were instructed to use the respective mouthwashes twice daily about 1 min for 30 days.

In all the participants, oral hygiene status assessment was carried out by plaque index (PI), gingival index (GI) and sulcus bleeding index (BI) and the scores were recorded at baseline. Thorough professional scaling and polishing were carried and participants were instructed to rinse with 10 ml of respective mouthwashes for 1 min, twice daily. All indices were repeated and recorded on the 15th day and 30th day, respectively.

Preparation of *Ocimum sanctum* extract

Dried leaves of *O. sanctum* were grounded into a fine powder. Three hundred gram of finely powdered *O. sanctum* was

macerated with 100% ethanol for a week in a round-bottom flask. The extract was filtered through a muslin cloth for coarse residue and finally through Whatman no. 1 filter paper. The filtrate so obtained was reduced at a low temperature $<50^{\circ}\text{C}$ to obtain a solid residue of *O. sanctum* extract. From 300 g of *O. sanctum* powder dissolved in 1 L of ethanol, 18 g of residue (extract) was obtained yield 6% w/w. The extract was suspended in polyethylene glycol 400 (20% v/v) and sterile distilled water to give a final concentration of 4% (w/v). The flavoring agent 0.005% spearmint oil was added.

Aloe vera mouthwash

A. vera mouthwash (Patanjali™) used in the study was commercially obtained from the market.

Statistical analysis

All the data were analyzed using the SPSS version 20 (Vishnu dental college, Bhimavaram, Andhra Pradesh, India). Repeated ANOVA with least significant difference Bonferroni test was used for intragroup comparison between baseline and follow-up. One-way ANOVA followed by Turkey's *post hoc* test for intergroup comparison and a value of $P < 0.05$ was considered as statistically significant.

Results

The protocol of the study was strictly followed by all the participants in the study, with no reported systemic side effects in all the three groups. Mean plaque scores, gingival scores, and bleeding scores at baseline, 15 days and at 30 days were tabulated.

Plaque index

At baseline, there was not any significant difference between all three groups ($P = 0.49$). At 15 days, all three groups were found to be statistically significant ($P = 0.012$). At 30 days, the values of all the three groups were found to be statistically significant ($P = 0.000$) [Table 1].

Gingival index

At baseline, GI values did not exhibit significant difference between all the groups ($P = 0.523$). At 15th day, the chlorhexidine group showed maximum decrease than the other two groups, but the difference was not statistically significant ($P = 0.089$). At 30th day, all the three groups were found to be statistically significant ($P = 0.000$) [Table 2].

Bleeding index

At baseline, there was no significant difference between both the groups ($P = 0.120$). At 15th day, in an intergroup comparison, though the chlorhexidine group showed slightly better results than the other groups, the difference was statistically significant ($P = 0.004$). At 30th day, in an intergroup comparison, all the three groups exhibited values that were statistically significant ($P = 0.000$) [Table 3].

Discussion

Dental plaque is a biofilm that forms naturally on the surfaces of exposed teeth and other areas of the oral cavity and is the

Table 1: Plaque index

Days	Group 1 n=20	Group 2 n=20	Group 3 n=20	ANOVA (F)	P significance level = 0.05
PI baseline	0.8790	0.7740	0.9055	0.72	0.49
PI 15 days	0.6780	0.6440	0.4225	4.74	0.12
PI 30 days	0.6310	0.6090	0.1970	16.6	0

PI: Plaque index

Table 2: Gingival index

Days	Group 1 n=20	Group 2 n=20	Group 3 n=20	ANOVA (F)	P significance level = 0.05
GI baseline	0.6380	0.5745	0.6505	0.65	0.523
GI 15 days	0.5345	0.4558	0.4105	2.53	0.089
GI 30 days	0.4945	0.4175	0.2110	12.57	0

GI: Gingival index

Table 3: Bleeding index

Days	Group 1 n=20	Group 2 n=20	Group 3 n=20	ANOVA (F)	P significance level = 0.05
BI baseline	0.7170	0.5045	0.6390	2.197	0.120
BI 15 days	0.6184	0.3965	0.3455	6.159	0.004
BI 30 days	0.6030	0.3650	0.1540	21.63	0

BI: Bleeding index

main etiological factor for most of the oral diseases. Plaque control, which is an effective method in the elimination of plaque biofilm, may be mechanical and chemical.^[5] While mechanical plaque control with the usage of brushes and interdental aids plays a vital role in maintaining the oral hygiene of an individual, it requires patient’s motivation. On the other hand, chemical plaque control also facilitates good oral hygiene with the usage of adjuvants. Among the various agents advocated for chemical plaque control, mouth rinse play an essential role. Among them chlorhexidine is one essential mouth rinse which is considered to be the gold standard. Apart from its various advantages, it also has drawbacks such as alteration in taste sensation and staining of teeth.^[6] To overcome such side effects, herbal medications have also been introduced for attaining total plaque-free mouth.

Among the wide array of herbal plants possessing medicinal values, *O. sanctum* or *Tulsi* stands out as a time tested premiere medicinal herb. *O. sanctum* has also been conventionally employed in hundreds of different formulations for the treatment of a wide range of disorders, including those of the mouth and throat, lungs, heart, blood, liver, kidney and the digestive, metabolic, reproductive and nervous systems.^[3] Scientific studies have established that composition of *Tulsi* has potent anti-inflammatory, antioxidant and antimicrobial properties.^[7] *Tulsi* (*O. sanctum*) mouthwash has shown strong antimicrobial activity against various bacterial strains, along with its bacteriostatic, anti-oxidant and immune-modulatory properties. It is used also, as a therapeutic agent for gingival and periodontal diseases.

On the other hand, *A. vera* is also a medicinal plant which possess anti-inflammatory effect,^[8-10] anti-ulcer activity,^[11,12] astringent effect and enhancing wound healing.^[13-16] *A. vera* mouthwash has a significant effect on periodontal bacteria. It has natural antifungal and antibacterial properties and it also boosts body ability to create collagen, thereby enhancing gingival health. It also has an ability of reducing gingival bleeding as a result of its soothing and healing properties. On the whole, it restores gingival health, thereby reducing plaque and calculus formation.^[17]

Hence, taking into consideration the various above-said benefits of *Tulsi* and *A. vera*, the present study was conducted to assess the efficacy of these herbal mouthwashes in reducing plaque accumulation and gingival inflammation.

In the present study, the clinical parameters, namely PI, GI and BI were evaluated at baseline, 15 days, and 30 days.

In the present study, the plaque and gingival indices showed a significant difference at the end of 30 days in the *Tulsi* group compared to that of chlorhexidine group which were consistent with the findings of Gupta *et al.*,^[3] wherein *O. sanctum* mouth rinse was compared with that of chlorhexidine mouth rinse. Another study conducted by Hosamane *et al.* in an *in vitro* model,^[18] a significant reduction with respect to PI in a 4 days plaque regrowth model in the *O. sanctum* group was reported.

On the other hand, a 2% *O. sanctum* gel was used in an experimental model study done by Hosadurga *et al.* and a reduction in gingival inflammation and probing pocket depths were evident.^[19]

In present study, the usage of *A. vera* mouthwash had shown a significant reduction in all the three indices over 30 days, and the results are consistent with the results of Karim *et al.*^[20] wherein the efficacy of *A. vera* was evaluated on only GI and gingival BI and a significant improvement in gingival and bleeding indices at 15 and 30 days was evident. However, the results of the present study have not evidenced a significant reduction in the GI and BI at 15 days.

In a study done by Vangipuram *et al.*^[21] when the efficacy of chlorhexidine and *A. vera* were compared at 15 and 30 days, both the groups were equally effective in reducing the clinical parameters.

In a study done by Chandrahas *et al.*^[4] a significant reduction in plaque, gingival and bleeding scores on using *A. vera* mouthwash for 7, 14 and 22 days interval was evident which is in contrary to the findings of present study, wherein a significant reduction in the indices were found in the *A. vera* group at 30 days. However, the results of the study have shown significant improvement in the indices for the chlorhexidine group at 15 days.

The results of the present study were also in accordance with the studies of Ajmera *et al.*^[22] wherein there was a significant improvement in the gingival and bleeding indices after 1 month usage of *A. vera* mouthwash. On the other hand, in a study done

by Gupta *et al.*, a significant improvement in the gingival and plaque scores after 4 days was evident with the usage of *A. vera* mouth rinse and was in par with that of the chlorhexidine mouthwash group. Studies done by Chhina *et al.*^[23] concluded that there was a significant reduction of plaque scores at the 4th day on the usage of *A. vera* mouthwash and was as equally effective as a 0.2% chlorhexidine mouthwash.

Furthermore, a significant decrease in gingival inflammation with the usage of *A. vera* for 7 days was evident in a study done by Andi Mardian *et al.*^[24]

However, the results of the present study showed that there is a significant reduction of all the three indices at 30-day interval with the usage of both *Tulsi* and *A. vera* mouthwashes which were similar to that of the chlorhexidine group. However, no significant improvement was noticed during the 15 day interval for the herbal mouthwashes. On the other hand, the reduction in the clinical parameters in the chlorhexidine group at 15 day interval was maintained and was consistent till the end of 30 day re-evaluation.

However, regarding the clinical usage of *O. sanctum* and *A. vera* mouthwashes long-term studies involving larger sample sizes are recommended in future as extensive literature is not available regarding their efficacy.

Conclusion

Within the limitations of this clinical study, it is concluded that the usage of *Tulsi* and *A. vera* herbal mouthwashes was effective in plaque and gingivitis. Plaque, gingival and bleeding scores were reduced in both the experimental mouth wash groups with the maximum beneficial effect within 30 days. These can be used effectively alternative to chlorhexidine mouthwash.

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Conflicts of interest

There are no conflicts of interest.

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