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COMPARATIVE EVALUATION OF POVIDONE IODINE AND ALOE VERA ON GINGIVAL HEALTH: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Mechanical therapy has been strengthened by adjunctive use of several anti-plaque agents in the effective treatment of plaque induced gingivitis. Aloe vera, an herbal product, known for its antibacterial and anti-inflammatory property, has been shown to significantly reduce gingival inflammation. Povidone-iodine has broad spectrum antimicrobial effect against harmful periodontal pathogens. This study aimed to compare and evaluate the efficacy of Aloe vera and Povidone iodine as an antimicrobial and anti-inflammatory mouthwash in plaque induced gingivitis. **Materials and methods:** The study was conducted for 30 days on 45 subjects. The patients were randomized into three groups namely Aloe vera (Group A), Povidone iodine (Group B) and Chlorhexidine group (Group C). Clinical parameters like Plaque index (PI), Gingival index (GI), Sulcus Bleeding Index (SBI) and microbiological parameter like Gram's staining for quantitative assessment of Gram positive and Gram negative organisms and immunological parameter IL-6 Level were assessed at baseline and at the end of 1 month. **Results:** The results of the current study showed that the mean scores of PI, GI, SBI and microbial count and the levels of IL-6 at one month had decreased to lower values in the three groups which were statistically significant. **Conclusion:** 99% Aloe vera mouthwash was as effective as 0.2% chlorhexidine and had better efficacy then 1% Povidone iodine mouthwash in treating chronic generalized gingivitis.

KEYWORDS: Aloe vera, Povidone iodine, Gingivitis, Chlorhexidine Gluconate, Interleukin-6.

INTRODUCTION

Oral infections affecting the gingival and periodontal tissues are caused by bacterial plaque that forms on the hard surface of tooth as well on supra and subgingival tissues in the form of a complex biofilm.[1] Mechanical plaque control is the key in eliminating microorganisms from supra and subgingival tissues around the tooth.[2] Since adequate plaque removal cannot be ensured by mechanical methods alone, use of antimicrobial agents as an adjunct has gained importance.[3] Many synthetic products having antiplaque property have been tried. Chlorhexidine gluconate (CHX), well known for its antiplaque effect on oral tissues has displayed several side effects on prolong use.[4]

Various herbal products have been tried on gingival tissues for anti-plaque activity.[5] Aloe vera belonging to the Aloe cease family has shown several pharmacological actions. Aloe vera has been widely used in reducing gingivitis for its antibacterial, anti-oxidant and anti-inflammatory effect.[6] Povidone iodine is a broad-spectrum antibacterial and antiviral agent that has proved to be effective in reducing the plaque microorganism *in vitro* and exhibit anti-inflammatory properties, both clinically and histologically.[7][8]

Studies comparing the efficacy of Povidone iodine and Aloe vera mouthwash as an adjunct to mechanical therapy are scarce. Hence, this study was conducted to compare and evaluate the efficacy of Povidone iodine and Aloe vera in the treatment of gingivitis with Chlorhexidine.

MATERIALS AND METHODS

Study population: This randomized controlled trial, was conducted at Department of Periodontics, Sri Hasanamba Dental College and Hospital, Hassan, from July 2019 to October 2019, following approval by the ethical committee of the institution. The subjects included in the study were explained about the study protocol and written informed consent was obtained before commencement of the intervention.

Study design: A total of 70 patients were assessed for eligibility criteria for the study, out of which 10 patients were excluded (8 patients did not meet inclusion criteria and 2 patients due to other reasons). Thus, sixty patients were included in the study and divided into three groups randomly using the chit method – Group A received scaling and Aloe vera

mouthwash, Group B received scaling and Povidone iodine mouthwash and Group C received scaling and Chlorhexidine mouthwash. Sixteen patients were lost during follow up period (Flow Chart). The sample size was estimated by considering α error probability of 0.05 and power of the study was 80%, hence, sample size calculated was 15 patients per group. Patients diagnosed with Chronic generalized gingivitis, aged between 18-35 years, full mouth bleeding score ≥ 1, who were not on any antibiotic or anti-inflammatory drug in the preceding 6 months and have not undergone dental treatment for the past three months were included in the study. Patients who were smokers, pregnant or lactating females, allergic to Povidone iodine and Aloe vera or with any systemic diseases/conditions were excluded from the study.

At the baseline, full mouth scaling was performed on all patients. A set of instructions for maintaining oral hygiene were given to all the patients along with the mouthwash of their respective group. The patients were recalled after 30 days from baseline for the follow up.

The clinical parameters, Plaque index (PI),[9] Gingival index (GI)[10] and Sulcular bleeding index (SBI)[11] were recorded at baseline and on 30th day. Microbiological analysis was done by collecting supra gingival plaque sample for gram staining at baseline and 30th day.

Gingival crevicular fluid (GCF) samples were collected at baseline and on 30th day for analysis of Interleukin -6 levels using Human IL-6 ELISA kit (Fine Test®, EH0201).

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS software version 20 and Microsoft excel version 2007. Student paired ‘t’ test was used to compare the mean PI, GI, SBI and IL-6 levels between different time intervals within each study group. Scheffe test was used for inter group comparison of PI, GI, SBI and IL-6 levels among the study groups at different time intervals. Chi square test was used for microbial count analysis between different time intervals within each study group with $p<0.05$ was set as level of significance (P- value).

RESULT

The values of PI, GI and SBI at baseline and at one month time interval are depicted in Table 1. Paired ‘t’ test was performed to compare the mean value of the indices at baseline and at one month period among the study groups. The test results revealed that there was

statistically significant difference demonstrated among Group A, Group B and Group C at baseline and at one month for PI, GI and SBI mean score.(p value<0.001).

The intergroup comparison of clinical parameters of the three groups is depicted in Table 2. Scheffe test was performed for inter group comparison of mean value of the indices at baseline and at one month period among the study groups. The test results revealed that Group A and Group C were significantly effective in reducing the Plaque index score, Gingival index score, Sulcular bleeding score compared to Group B whereas Group A was found to be as effective as Group C in reducing clinical parameters score at a period of one month. Hence it can be inferred that Aloe vera and Chlorhexidine were effective than Povidone iodine in reducing clinical parameters.

The gram positive organism count at baseline and at 1 month in Group A, Group B and Group C are depicted in Graph 1. There was statistical significant difference in the Gram positive organisms score from baseline to one month in the Group A (p<0.001) and Group B (p=0.006). There was no statistical significant difference in the Gram positive organisms score from baseline to 1 month in the Group C (p=0.053).

The gram negative organism count at baseline and at 1 month in Group A, Group B and Group C are depicted in Graph 2. There was statistical significant difference in the Gram negative organisms score from baseline to one month in the Group A (p=0.033), Group B (p=0.008) and group C (p=0.004).

The mean Interleukin-6 (IL-6) levels at baseline and at one month are depicted in Table 3. Paired ‘t’ test was performed to compare the mean IL-6 levels at baseline and at one month among the study groups. The test results revealed that, there was statistically significant reduction in IL-6 levels from baseline to one month in Group A (p= 0.049), Group B (p=0.001) and Group C (p=0.007).

Table 4 depicts intergroup comparison of IL-6 levels of the three groups. The test results revealed that, even though there was marked reduction in IL-6 levels from baseline to one month, there was no statistically significant difference demonstrated among study groups at baseline and at one month interval.

DISCUSSION

The present clinical trial was conducted to evaluate the efficacy of Aloe vera mouthwash and Povidone iodine mouthwash in controlling gingival inflammation and reducing plaque formation.

Aloe vera is known for its anti-bacterial activity and helps in reducing and preventing gingival and periodontal inflammation.[12] It is useful in reducing edema and distension of soft tissues and exhibits antiseptic activity in deep areas of gingival pocket where cleaning could be difficult.[13] Povidone-iodine is a soluble combination of iodine and polyvinyl-pyrrolidone in molecular form. It has bactericidal effect and is effective against most of the bacteria, including destructive periodontal pathogens, protozoa, mycobacteria, viruses and fungi with minimal side effects.[14]

The results of the current study have shown that the mean scores of PI, SBI, GI and IL-6 and microbial count levels at baseline and at one month had consistently decreased to lower values in Group A (Aloe vera mouthwash), Group B (Povidone iodine mouthwash) and Group C (Chlorhexidine mouthwash) which were statistically significant ($p<0.001$) on intragroup analysis. The results from baseline to one month were comparable on intergroup analysis which showed improvement on clinical, microbiological and immunological parameters.

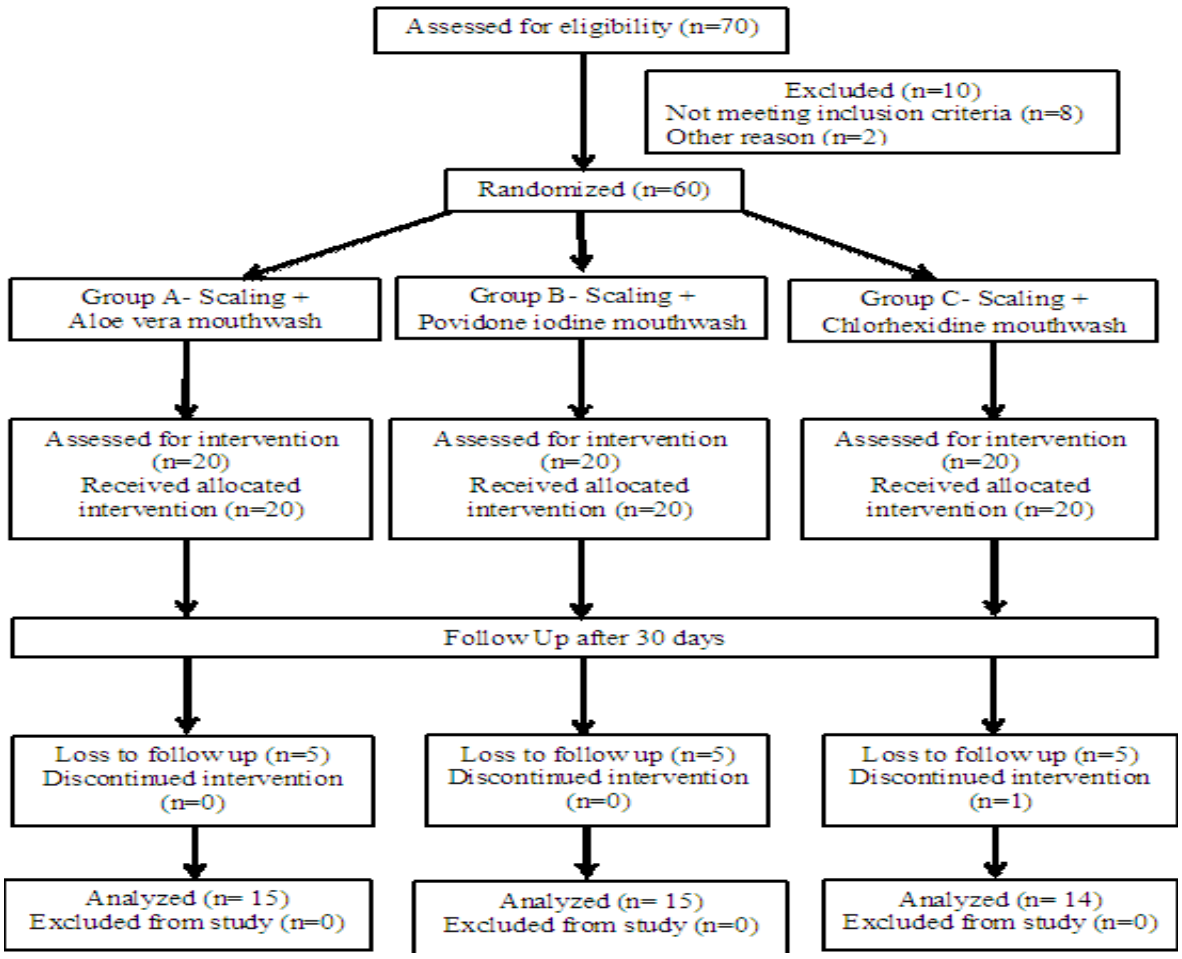
The highest percentage reduction of plaque scores was found in Aloe vera group (42%) followed by chlorhexidine group (41%) and Povidone iodine group (24%) from baseline to 1 month. Similarly, the percentage reduction of Sulcular bleeding scores was maximum in chlorhexidine group (47%) followed by Aloe vera group (45%) and Povidone iodine group (29%) showed the least reduction. The percentage reduction of gingival score was maximum in chlorhexidine group (48%) followed by Aloe vera group (44%) and Povidone iodine group (28%) showed the least reduction.

The results of the study is in accordance with the study conducted by Bhat G et al., which showed that Aloe vera was effective in improving the plaque index scores and gingival index scores from baseline to one month.[15] The improvement in SBI in the study groups could be explained as Aloe vera exhibits antibacterial properties. The results of our study were similar to the findings of Chandrahas B et al., which showed that Aloe vera mouthwash reduced bleeding scores at the end of seven days ($P<0.05$) as adjunct to scaling.[16]

Microbiological assessment was done using Gram's staining method. It can be concluded in our present study that Aloe vera mouthwash and Povidone iodine mouthwash both were effective as antimicrobial agent along with Chlorhexidine. Agarry OO et al. in his study stated that Aloe vera has effective antimicrobial activity against several microorganisms like *Staphylococcus aureus.*[17]

The antimicrobial effect of Povidone iodine as seen in this study is similar to the study by Perayil J et al., which stated Povidone iodine reduced the levels *P. gingivalis* and *T. forsythia* from baseline to at the end of three months.[18] The present study showed there was reduction in IL-6 levels from base line to one month which were statistically significant in the test groups. The study is in accordance with the study by Hajhashemi V et al., who concluded in his study that Aloe vera has wound healing and anti-inflammatory actions.[19]

However, long term clinical trials with larger sample size are required to corroborate the use of Aloe vera as an adjunct to mechanical therapy in the treatment of chronic generalized gingivitis.



Flow Chart: Study design diagram.

Table 1: Comparison of mean scores of PI, GI, SBI among study groups at baseline and at one month.

GROUPS	PARAMETERS	BASELINE	1 MONTH	MEAN DIFF	p value
GROUP A	PI	1.334 ±0.263	0.746±0.200	0.588±0.312	<0.001*
	SBI	1.398±0.290	0.730±0.130	0.668±0.340	<0.001*
	GI	0.697±0.102	0.697±0.102	0.554±0.122	<0.001*
GROUP B	PI	1.265±0.184	0.940±0.073	0.324±0.166	<0.001*
	SBI	1.314±0.215	0.904±0.068	0.410±0.229	<0.001*
	GI	0.907±0.059	0.907±0.059	0.384±0.164	<0.001*
GROUP C	PI	1.335±0.340	0.745±0.273	0.590±0.421	<0.001*
	SBI	1.257±0.146	0.636±0.282	0.620±0.383	<0.001*
	GI	0.626±0.297	0.626±0.297	0.640±0.414	<0.001*

PI- Plaque index, GI- Gingival index, SBI- Sulcular bleeding index, Mean diff -Mean Difference
*P value: level of significance at p < 0.05 was considered statistically significant

Table 2: Intergroup comparison of Clinical parameters of the study groups.

PARAMETERS	GROUP	GROUP	MEAN DIFF	p value
PI	GROUP A	GROUP B	-0.194	0.036*
		GROUP C	0.001	1.000
	GROUP B	GROUP C	0.195	0.039*
SBI	GROUP A	GROUP B	-0.173	0.042*
		GROUP C	0.094	0.383
	GROUP B	GROUP C	0.267	0.001*
GI	GROUP A	GROUP B	-0.210	0.011*
		GROUP C	0.070	0.578
	GROUP B	GROUP C	0.280	0.001*

PI- Plaque index, GI- Gingival index, SBI- Sulcular bleeding index, Mean diff -Mean Difference
*P value: level of significance at p < 0.05 was considered statistically significant

Table 3: Interleukin -6 levels for Group A, Group B, Group C at Baseline and 1 month.

GROUPS	BASELINE	1 MONTH	MEAN DIFF	p value
GROUPA	20.946±18.2766	12.133±6.956	8.8133±15.821	0.049*
GROUPB	19.983±11.4567	9.400±8.408	10.583±10.248	0.001*
GROUPC	22.371±17.0461	7.171±7.0172	15.200±17.699	0.007*

Mean diff -Mean Difference
*P value: level of significance at p < 0.05 was considered statistically significant

Table 4: Intergroup comparison of Interleukin-6 levels of the study groups.

PARAMETER	GROUP	COMP GROUP	MEAN DIFF	p value
IL-6 LEVEL	GROUP A	GROUP B	2.73333	0.611
		GROUP C	4.96190	0.217
	GROUP B	GROUP C	2.22857	0.728

Mean diff -Mean Difference, Comp Group -Comparison Group
*P value: level of significance at p < 0.05 was considered statistically significant

CONCLUSION

In the study, all the groups showed a statistically significant improvement in the clinical, microbiological and immunological parameters. It was found that 99% Aloe vera mouthwash has a better efficacy than 1% Povidone iodine mouthwash and a comparable efficacy with 0.2% chlorhexidine mouthwash. This opens the possibility of using naturally available, herbal products which are cost effective, with least side effects, as substitutes to synthetic chemical products aiding in the treatment of gingivitis.

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