



COMPARATIVE EFFICACY OF ALOE VERA MOUTHWASH AND CHLORHEXIDINE IN PATIENTS WITH MILD TO MODERATE GINGIVITIS.

Dr.Ayesha	(MDS) Post Graduate Student (h.k.e's S.n Dental College & Scientific Resarch Institution)
Dr.Mrs.Veena.A.Patil*	HOD Professor (H.k.e's S.n Dental College & Scientific Resarch Institution)*Corresponding Author
Dr.Mrs. Jayashree.A.Mudda	Professor & principal (H.k.e's S.n Dental College & Scientific Resarch Institution)
Dr. Sobia.Tehseen. Ansari	(MDS) Post Graduate Student (h.k.e's S.n Dental College & Scientific Resarch Institution)
Dr. Savitri Galagali	(MDS) Post Graduate Student (h.k.e's S.n Dental College & Scientific Resarch Institution)

ABSTRACT

Introduction: The pharmacokinetics actions of Aloe vera include anti-inflammatory, antibacterial, antioxidant, immune-boosting and hypoglycemic properties superoxide anion-scavenging activities

Aim and Objectives: To compare the efficacy of aloe vera mouthwash and chlorhexidine in patients with mild to moderate gingivitis. **Methodology:** The Study was conducted for 30 days. The study participants were randomly allocated into 3 study groups (25 in each group) through lottery method. 3 groups include: i) Aloe Vera mouth wash group ii) Chlorhexidine (0.12%) mouth wash and iii) Placebo group. All clinical parameters were recorded at base line, 15 days and 30 days. All participants were given similar set of toothbrush and toothpaste (Sensodent K Toothpaste). Each participant was asked to brush 2 minutes in morning, to nullify any confounding effect of oral hygiene measures. **Result:** There was a progressive reduction in both plaque and gingival index values at subsequent follow ups; but difference in the decrease in scores between aloe vera and chlorhexidine group was not statistically significant by post-hoc test. Hence, both Chlorhexidine and Aloe Vera are equally efficient in treating gingivitis. However, the difference between Aloe vera and the placebo group; and chlorhexidine and the placebo group were statistically significant. **Conclusion:** It can be concluded from the present study that Aloe Vera mouthwash is equally effective as chlorhexidine in reducing plaque and gingivitis without altering the taste.

KEYWORDS : aloe vera, chlorhexidine, plaque score, gingival score

Poor oral health has been incremented as the primary cause of gingivitis. Dental plaques alone can be the major cause of initiation and progression of periodontal diseases. The direct correlation between dental plaques and severity of gingival inflammation or gingivitis was demonstrated. Untreated gingivitis will expose the infected patients to infection and periodontitis. However, gingivitis and its related complications are readily preventable through controlling dental plaques and provision of oral and dental hygiene procedures. Chlorhexidine is considered as the gold standard treatment for controlling the dental plaque and gingivitis due to its efficacy against different kinds of bacteria, fungi, and viruses and so far, no microbial resistance has been reported for it (1,2). Although chlorhexidine has been introduced as the most effective anti-plaque agent, (1,2) but there is no sufficient evidence in regard to its efficacy and safety. Some adverse effects include changing in color of the teeth and mucosa, mucosal desquamation, salivary stones creation, irritation, dryness of mouth, and systemic side effects as the result of swallowing were reported (3,4). Therefore, finding the new alternative mouthwash with undesired side effects is mandatory. The World Health Organization (WHO) has recommended on finding the new natural sources such as the herbal extracts for overcoming on side effects of chemical agents.

Many products derived from plants have been used with great effectiveness for cleaning teeth and as anti-microbial agents. Such products offer a suitable alternative to antimicrobials (5). The greater advantage of using herbal medicine is long term usage of such products possesses lesser chance of side effects (6). Aloe Vera is one such product which

exhibits multiple benefits and has gained considerable importance in clinical research in maintaining health (7).

Aloe Vera is a succulent, cactus like plant belonging to the Aloeaceae family (subfamily of the Asphodelaceae). Among more than 400 aloe species, Aloe barbadensis Miller and Aloe aboerens are the most accepted species for various medical, cosmetic, and pharmaceutical purposes (8,9). Aloe Vera is very complex, which consists of different ingredients including many minerals, enzymes, sugars, anthraquinones, lignin, saponins, sterols, amino acids and salicylic acid. Gjerstad et al. found that the leaves of aloe vera plant contained 99.5% water and remaining protein. Aloe vera has shown its anti-microbial potential against Streptococcus pyogenes and Streptococcus faecalis. Three aloe derivatives from aloe (namely isorabochromone, feruloylaloesin, and p-coumaroylaloesin) showed potent free radical and superoxide anion-scavenging activities. Geetha et al. in 2012 conducted a study on Aloe Vera used it as a medicament in the periodontal pocket. George D, Bhat SS, conducted a compared the antimicrobial efficacy of aloe Vera tooth gel and two popular tooth paste and concluded that aloe Vera tooth gel was as effective as two commercially popular tooth pastes in controlling all the microbes causing the disease (10). Though the medicinal use of Aloe Vera has been reported, not much literature is available regarding its use in the field of dentistry as mouth rinse or mouth wash.

Hence the purpose of this study was to evaluate efficacy of Aloe Vera mouthwash on the dental plaque and gingivitis and comparing it with the bench mark control chlorhexidine and placebo.

MATERIALS AND METHODS

Inclusion Criteria:

1. Plaque score ≥ 1.5
2. Gingival score ≥ 1.5
3. Systemically healthy patients.
4. Patient willing to accept the study related procedure.

Exclusion Criteria:

1. Smokers and tobacco chewers.
2. Endodontically treated sites.
3. Pregnant and lactating women.
4. Previously treated with any root coverage procedures.
5. Mucosal disturbances.
6. Teeth with \geq Grade I mobility

METHODOLOGY:

Total of 45 patients were included in the study who were randomly allocated into three groups aloe-vera group, chlorhexidine group, placebo group. The Three groups formed were i) Aloe Vera mouth wash group ii) Chlorhexidine (0.12%) mouth wash group iii) Placebo group. All three types of mouthwashes were kept in similar container after preparation and same flavor of spearmint was added to each solution to blind the subjects in which group they fall (single blinding). All mouth rinse bottle were coded and was handed over to study participants. All clinical parameters were recorded at base line, 15 days and 30 days. For oral hygiene all participants were given similar set of toothbrush (Oral B Ultra-soft) and toothpaste (Sensodent K Toothpaste, containing potassium nitrate as key ingredient, without any antiplaque agent), each participants were asked to brush 2 minutes in morning, to nullify any confounding effect of oral hygiene measures.

- 1) Group 1 (n=15) - was given Aloe Vera mouthwash and instructed to use 10 ml twice a day for 30 days.
- 2) Group 2 (n=15) was given Chlorhexidine and instructed to use 10 ml twice a day for 30 days
- 3) Group 3 (n=15) was the placebo group and distilled water was given as the mouthwash. They were also instructed to use 10 ml of distilled water twice a day as mouthwash for 30 days.

Preparation of Aloe vera mouthwash

Aloe Vera juice was provided to study participants. Aloe vera juice consisted of 99% aloe juice, 0.2% preservative , 0.001% Spearmint flavor, and sweetened with sorbitol. The placebo solution and the control were taste-matched with identical taste and consistency

Results

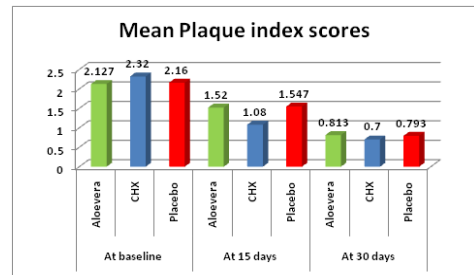
Data analysis

Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables and Graphs. The data was analysed by SPSS (21.0 version). Shapiro Wilk test was used to check which all variables were following normal distribution. Data was normally distributed (p-value was more than 0.05). Therefore, bivariate analyses were performed using the parametric tests i.e. One way ANOVA followed by Post hoc tukey's test (for comparing more than two independent groups), Level of statistical significance was set at p-value less than 0.05

Mean Values of plaque Index of three groups (AV, CHX and placebo) at different time intervals.

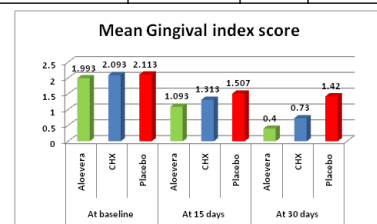
Plaque index	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	Minimum	Maximum
					Lower Bound	Upper Bound	

At Baseline	Aloevera group	15	2.127	.6933	.1790	1.743	2.511	.8	3.3
	Chlorhexidine group	15	2.320	.7321	.1890	1.915	2.725	.8	3.4
	Placebo group	15	2.160	.4672	.1206	1.901	2.419	1.6	3.2
	Total	45	2.202	.6326	.0943	2.012	2.392	.8	3.4
At 15 days	Aloevera group	15	1.520	.9229	.2383	1.009	2.031	.0	2.9
	Chlorhexidine group	15	1.080	.9608	.2481	.548	1.612	.0	2.9
	Placebo group	15	1.547	.5317	.1373	1.252	1.841	.9	2.9
	Total	45	1.382	.8376	.1249	1.131	1.634	.0	2.9
At 30 days	Aloevera group	15	.813	.6390	.1650	.459	1.167	.0	1.9
	Chlorhexidine group	15	.700	.5593	.1444	.390	1.010	.0	1.9
	Placebo group	15	.793	.3770	.0973	.585	1.002	.2	1.5
	Total	45	.769	.5265	.0785	.611	.927	.0	1.9



ANOVA of three study groups for plaquescores ; (ANOVA, p-Value < 0.05*).

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
At baseline	Between Groups	.320	2	.160	.389	.680
	Within Groups	17.289	42	.412		
	Total	17.610	44			
At 15 days	Between Groups	2.060	2	1.030	1.502	.234
	Within Groups	28.805	42	.686		
	Total	30.866	44			
At 30 days	Between Groups	.110	2	.055	.191	.827
	Within Groups	12.087	42	.288		
	Total	12.196	44			



ANOVA of three study groups forgingival index scores ; (ANOVA, p-Value< 0.05*).

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Baseline	Between Groups	.124	2	.062	.106	.900
	Within Groups	24.656	42	.587		
	Total	24.780	44			
15days	Between Groups	1.283	2	.642	1.250	.297
	Within Groups	21.556	42	.513		
	Total	22.839	44			
30days	Between Groups	8.115	2	4.058	9.684	.000
	Within Groups	17.597	42	.419		
	Total	25.712	44			

Post-hoc test for Multiple comparison for Gingival index scores for all groups. (Tukey Post-Hoc Test, p-Value< 0.05*).

Multiple Comparisons							
Tukey HSD							
Dependent Variable	(I) grp	(J) grp	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
At Baseline	Aloevera	CHX	-.1000	.2798		-.780	.580
	Aloevera	Placebo	-.1200	.2798	.904	-.800	.560
	CHX	Placebo	-.0200	.2798	.997	-.700	.660
At 15days	Aloevera	CHX	-.2200	.2616	.680	-.856	.416
	Aloevera	Placebo	-.4133	.2616	.265	-1.049	.222
	CHX	Placebo	-.1933	.2616	.742	-.829	.442
At 30days	Aloevera	CHX	-.3333	.2364	.345	-.908	.241
	Aloevera	Placebo	-1.0200*	.2364	.000	-1.594	-.446
	CHX	Placebo	-.6867*	.2364	.016	-1.261	-.112

*. The mean difference is significant at the 0.05 level.

Discussion

The present study was conducted to assess efficacy of Aloe Vera mouthwash in preventing plaque accumulation and gingival inflammation. Aloe Vera is a good anti-bacterial agent which is said to be very effective against bacteria and preventing gingival and periodontal disease(11). It reduces edema of the soft tissues and hence reduces the bleeding of the gums. It exhibits strong antiseptic action in gingival pockets where normal cleaning is difficult(12,13). Chlorhexidine, sodium hypochlorite, amine fluoride and cetylpyridinium chloride are widely used as mouthwashes and irrigating agents that can inhibit the growth of potentially pathogenic oral bacteria(14). Although these antimicrobial agents are widely used, side effects such as immediate hypersensitivity reactions, toxicity, tooth staining and other side effects have been reported. Moreover, it has been reported that chlorhexidine and sodium hypochlorite possess cytotoxicity toward human periodontal ligament cells, inhibit protein synthesis, and affect mitochondrial activity, thus having detrimental effects on oral tissues(15). The natural phytochemicals isolated from medicinal plants used in traditional medicine have been considered useful alternatives to traditional allopathic drugs. Many medicinal

plants and their products are widely used for prevention and treatment of oral conditions, and among them Aloe Vera is of particular interest and has been used therapeutically. The low plaque index observed in study subjects could be explained by the fact that Aloe Vera is a good antibacterial. Heggers et al. showed its antimicrobial properties against *Candida albicans*, *Streptococcus pyogenes*, *Streptococcus fecalis*(16). Noskova used Aloe Vera to treat early stages of periodontitis and found reduction in the disease activity(17). Both chlorhexidine and aloe Vera mouthwashes had reduced plaque scores significantly. The results of present study are in accordance with Karim et al. who found significant reduction in plaque scores after using Aloe Vera mouthwash for 30 and 22 days⁽¹⁸⁾.

The reduction in gingival index scores can be attributed to components of Aloe Vera. Aloe Vera extracts have shown inhibition of the cyclooxygenase pathway and reduces prostaglandin synthesis from arachidonic acid, thus reducing inflammation. Vitamin C present in Aloe vera is involved in collagen synthesis, increases concentration of oxygen at the wound site because of dilation of blood vessels (19). The results of this study were in agreement with those presented by Bhat et al. who used sub gingival delivery of Aloe Vera gel in chronic periodontitis treatment. There was a significant reduction in gingival index, plaque index.

Furthermore, the results of present study are in agreement with those of Villalobes et al. who observed a significant reduction in plaque and gingivitis after a 30 day use of mouth rinses containing Aloe Vera associated with tooth brushing (20). Also, de Olivera et al. found that both dentifrices containing Aloe Vera and dentifrice containing fluoride resulted in significant reduction of plaque and gingivitis, but no statistical significant difference was observed between them (21). The results were also consistent with Pradeep et al. who found toothpaste containing Aloe Vera showed significant improvement in gingival and plaque index compared with placebo dentifrice⁽²²⁾.

REFERENCES;

- Quintas V, Prada-Lopez I, Prados-Frutos JC, Tomás I. In situ antimicrobial activity on oral biofilm: Essential oils vs 0.2% chlorhexidine. *Clin Oral Investig* 2015;19:97-107.
- Seneviratne CJ, Leung KC, Wong CH, Lee SF, Li X, Leung PC, et al. Nanoparticle-encapsulated chlorhexidine against oral bacterial biofilms. *PLoS One* 2014;9:e103234.
- Gjerme P, Rølla G. The plaque-inhibiting effect of chlorhexidine-containing dentifrices. *Scand J Dent Res* 1971;79:126-32.
- Skoglund LA, Holst E. Desquamative mucosal reactions due to chlorhexidine gluconate. Report of 3 cases. *Int J Oral Surg*
- Saini R, Sharma S, Saini S. Ayurveda and herbs in dental health. *Ayu*. 2011;32:285-6. [PMC free article][PubMed]21. Goodson JM, Offenbacher S, Farr DH, Hogan PE. Periodontal disease treatment by local drug delivery. *J Periodontol*. 1985;56:265-72.
- Taheri JB, Azimi S, Rafieian N, Zanjani HA. Herbs in Dentistry. *Int Dent J*. 2011;61:287-96. [PubMed]
- Newall CA, Anderson LA, Phillipson JD. Herbal medicines a guide for health-care professionals. London: The Pharmaceuticals Press; 1996.
- Eggli U. Illustrated Handbook of Succulent Plants: Monocotyledons. Berlin: Springer-Verlag; 2001. pp. 102-86.
- Grindlay D, Reynolds T. The Aloe vera phenomenon: a review of the properties and modern uses of the leaf parenchyma gel. *J Ethnopharmacol*. 1986;16:117-51. [PubMed]
- Munro CL, Grap MJ. Oral health and care in the intensive care unit: State of the science. *Am J Crit Care* 2004;13:25-3321. Goodson JM, Offenbacher S, Farr DH, Hogan PE. Periodontal disease treatment by local drug delivery. *J Periodontol*. 1985;56:265-72.
- Goodson JM, Offenbacher S, Farr DH, Hogan PE. Periodontal disease treatment by local drug delivery. *J Periodontol*. 1985;56:265-72.

12. Oosterwaal PJ, Mikx FH, Van't Hof MA, Renggli HH. Comparison of the antimicrobial effect of the application of chlorhexidine gel, amine fluoride gel and stannous fluoride gel in debrided periodontal pockets. *J Clin Periodontol.* 1991;18:245-51.
13. Greenstein G, Polson A. The role of local drug delivery in the management of periodontal disease: A Comprehensive review. *J Periodontol.* 1998;69:507-20.
14. Chang YC, Huang FM, Tai KW, Chou MY. The Effect of Sodium Hypochlorite and Chlorhexidine on Cultured Human Periodontal Ligament Cells. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2001;92:446-50.
15. Beaudouin E, Kanny G, Morisset M, Renaudin JM, Mertes M, Laxenaire MC, et al. Immediate hypersensitivity to chlorhexidine: literature review. *Eur Ann Allergy Clin Immunol.* 2004;36:123-6.
16. Heggors JP, Pineless GR, Robson MC. Dermaide aloe/aloe vera gel: Comparison of the antimicrobial effects. *J Am Med Technol.* 1979;41:293-4.
17. Noskov AD. The treatment of periodontosis by injections of aloe extract and their influence on the phosphorus-calcium metabolism. *Stomatologiya.* 1966;45:13-5.
18. Karim B, Bhaskar DJ, Agali C, Gupta D, Gupta RK, Jain A, et al. Effect of Aloe vera Mouthwash on Periodontal Health: Triple Blind Randomized Control Trial. *Oral Health Dent Manag.* 2014;13:14-9.
19. Aggarwal BB, Prasad S, Reuter S, Kannappan R, Yadav VR, Park B, et al. Identification of novel anti-inflammatory agents from Ayurvedic medicine for prevention of chronic diseases: "reverse pharmacology" and "bedside to bench" approach. *Current Drug Targets.* 2011;12:1595-1653.
20. Villalobos OJ, Salazar CR, Sánchez GR. Effect of a mouthwash made of Aloe vera on plaque and gingival inflammation (in Spanish). *Acta Odontol Venez.* 2001;39:16-24.
21. De Oliveira SM, Torres TC, Pereira SL, Mota OM, Carlos MX. Effect of a dentifrice containing Aloe vera on plaque and gingivitis control. A double-blind clinical study in humans. *J Appl Oral Sci.* 2008;16:293-6.
22. Pradeep AR, Agarwal E, Naik SB. Clinical and microbiologic effects of commercially available dentifrice containing aloe vera: a randomized controlled clinical trial. *J Periodontol.* 2012;83:797-804