

Comparative Evaluation of Anti-Plaque Efficacy of Probiotic, Aloe Vera and 0.2% Chlorhexidine Mouthwash: A Randomized Controlled Trial

Dr. Shashank Battula¹, Dr. Hidayathulla Shaikh², Dr. MD. Zabirunnisa Begum³,
Dr. G. Anvesh⁴, Dr. Lahari G⁵

¹Department of Public Health Dentistry,
Lenora Institute of Dental Sciences, Dr. NTR University, Rajanagaram, Rajahmundry, East Godavari District,
Andhra Pradesh, 533294.

Corresponding Author: Dr. Shashank Battula

DOI: <https://doi.org/10.52403/ijhsr.20241126>

ABSTRACT

Introduction: Supra-gingival plaque control is fundamental for the prevention and management of periodontal diseases. However, significant proportions of individuals fail to practice high standards of plaque removal. Anti-microbial mouth rinses limit the accumulation of dental plaque with a primary objective of controlling the development and progression of periodontal diseases. Chlorhexidine has earned eponym of gold standard to treat or prevent the periodontal diseases. However, it has been reported that there have been side effects due to long term use. Hence alternative mouthwashes have been used for preventing periodontal diseases.

Aim: To compare the Anti-Plaque efficacy of Herbal, Probiotic, and Chlorhexidine mouth wash

Materials and Methods: In the present clinical trial 30 subjects above 18 years were selected and randomly divided into 3 groups Group 1: Aloe vera Mouth wash, Group 2: Probiotic Mouth wash, Group 3: Chlorhexidine Mouth wash. Before the intervention baseline scores were recorded and anti-plaque efficacy was evaluated by using Plaque Index (PI) and Gingival Index (GI) at the end of 1st and 2nd week. Subjects were instructed to use their respective mouth wash 10ml 1:1 dilution twice daily for about 14 days. Data obtained was subjected to statistical analysis.

Results: There was marked reduction of plaque and gingival scores from baseline to 14 days for both the groups when compared with the chlorhexidine group. There is a significant reduction in the plaque scores from baseline to 1st week, and baseline to 2nd week in the aloe vera group with p-value 0.001*, and 0.001* which is statistically significant. Whereas, in probiotic group there is a significant reduction of the plaque scores from baseline to 1st week, baseline to 2nd week, and from 1st week to 2nd week (p-value=0.04*,0.001*,0.001* respectively). In chlorhexidine group the significant reduction of plaque score is seen in the 1st week and the 2nd week (p-value=0.007*). There was a highly significant difference of the mean plaque scores between the 3 groups. Whereas, significant difference of the mean gingival scores was seen between the probiotic and chlorhexidine groups.

Conclusion: Herbal and probiotic mouth washes can prove to be effective alternatives to chlorhexidine.

KEYWORDS: Anti-plaque, Efficacy, Herbal, Probiotic, Chlorhexidine

INTRODUCTION

Oral health is of the utmost importance to all people. Oral hygiene habits are taught in childhood itself. The most reliable and recognized methods of maintaining oral hygiene in the world are mechanical methods of cleaning teeth.

Tooth brushing, when accomplished properly, results in effective plaque control. However, mechanical plaque control methods have certain inherent limitations as it does not have access to interdental areas and brush ends does not engage the gingival sulcus.¹ However, adjuvants to reduce plaque buildup and maintain oral hygiene have been sought. Oral hygiene practices using chemo-mechanical methods reduces the incidence of plaque-related diseases by reducing the plaque accumulation.

Dental plaque is defined as a structured, resilient, yellow-grayish substance that adheres tenaciously to the intraoral hard surfaces, including removable and fixed restorations.¹⁰ Plaque is composed of bacteria in a matrix of salivary glycoproteins and extracellular polysaccharides.

Dental plaque by far has proven to be a paramount factor in the initiation and progression of gingival and periodontal disease. Plaque reduction has been the hallmark of preventive dentistry since the advent of antibiotics and realization that bacteria are possible causative agents of major dental diseases: Caries and Periodontal disease.

Tooth brushing when accomplished properly results in effective plaque control.¹ These mechanical methods mostly depend on the skills and technique of the individual carrying out the procedures.⁵ Thus, chemical plaque control can be used as an adjunct to mechanical plaque control procedures.

Mouthwashes are a simple and widely accepted method to deliver the anti-microbial agent which can be used by the patient as an oral hygiene aid. Chlorhexidine has earned eponym of gold

standard to treat or prevent the periodontal diseases.³ However, it has side effects due to long term use such as loss of taste sensation, discoloration of tooth, oral ulcerations, paresthesia, parotid swelling.² Considering these limitations alternative mouthwashes have been introduced into dentistry including herbal and probiotic mouthwashes. Natural herbs when used in mouthwashes, have shown significant advantages over the chemical ones. Probiotics another potential of anti-plaque activity have been reported to have beneficial effects of oral health.

Aim of the study:

The present study was aimed to compare the anti-plaque efficacy of herbal, probiotic, and chlorhexidine mouthwash

MATERIALS & METHODS

The present study was a double blinded, parallel designed clinical trial carried out in the Department of Public Health Dentistry, Lenora Institute of Dental Sciences. Ethical clearance was obtained from the Institutional Ethical Committee, and informed consent was taken from all the participants of the study.

Sample size was estimated using the data from the previous studies. Using the G power statistics keeping the α or type I error =0.05, and the Power of the study $1-\beta$ =0.80, the sample size was 27 which was rounded off to 30 participants.

Participants were randomly allocated into 3 groups using the table of random numbers and the allocation concealment was carried out using sealed opaque envelop method. The three groups formed were Group (i) Aloe vera mouthwash, Group (ii) Probiotic mouthwash, and Group (iii) 0.2% Chlorhexidine mouthwash. The double blinding was achieved by dispensing each mouthwash in the containers with markings of code on bottles corresponding to the type of mouthwash. Only the statistician was aware of the codes and their interpretation

and thus which participant was allocated to which group.

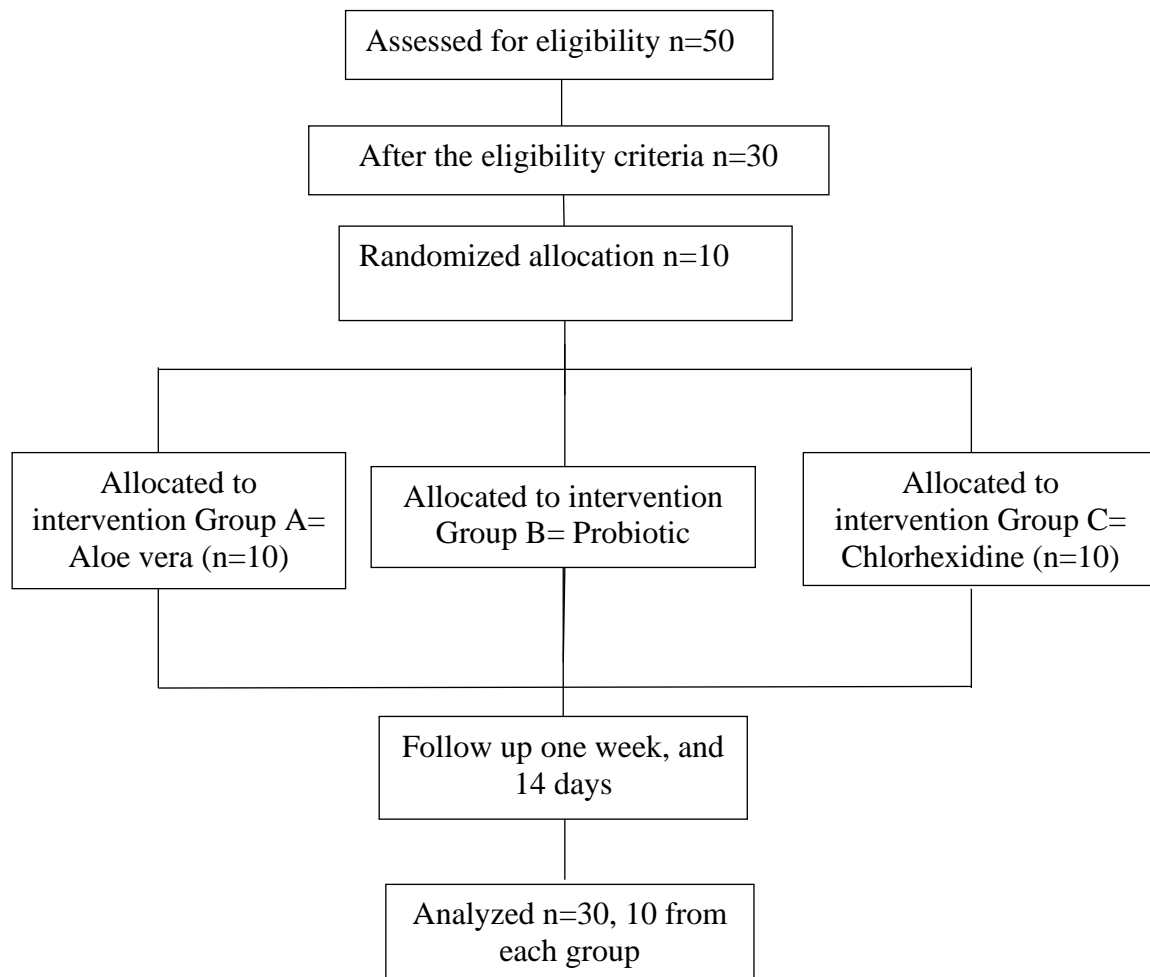
Inclusion Criteria:

1. Participants who are free from systemic conditions
2. Participants who do not receive any antibiotic therapy

Exclusion Criteria:

1. Participants who are unwilling to participate
2. Participants who are smokers and consuming tobacco products
3. Participants with severe malalignment of tooth, and with orthodontic appliances.

After fulfilling of the inclusion and exclusion criteria, the patients were randomly divided into 3 groups.



Group A were dispensed with Aloe vera mouthwash (Brand: Nature sure Aloe vera Mouth wash). Participants were instructed to use 10ml of mouthwash twice a day for 14 days.

Group B were dispensed with Probiotic mouthwash (Brand: Perfora Probiotic Alcohol-free mouthwash). Participants were instructed to use 10ml of mouthwash twice a day for 14 days.

Group C were dispensed with Chlorhexidine mouthwash (Brand: Generic Chlorhexidine

Mouthwash IP 0.2%). Participants were instructed to use 10ml of mouthwash twice a day for 14 days.

The subjects were asked not to eat or drink anything for next half an hour to achieve the effect of the mouthwash. The subjects were instructed to withdraw the use of mouthwashes and report immediately if they experienced any side effects due to the use of mouthwashes. All the subjects were asked to report to the Department of Public

Health Dentistry on the seventh day and 14th day for the recording of the variables. Clinical parameters such as gingival index and plaque index were recorded at baseline, one week, and 14 days. Instruments used were mouth mirrors, periodontal probe, explorer.

STATISTICAL ANALYSIS

The data obtained was subjected to statistical analysis using Statistical package of social sciences (SPSS version 25). Paired t-tests and repeated measures of ANOVA tests were used for analysis, p-value=0.05 is taken to be significant

RESULT

Participants strictly followed the protocol of the study, and no systemic side effects were observed in those subjects. The mean age of the study participants was 21±1.1.

Table 1 shows the paired t-test for the plaque scores of the three groups. This shows that there is a significant reduction in the plaque scores from baseline to 1st week, and baseline to 2nd week in the aloe vera group with p-value 0.001*, and 0.001* which is statistically significant, but there is no significant difference is seen from 1st week to 2nd week. Whereas, in probiotic group there is a significant reduction of the plaque scores from baseline to 1st week, baseline to 2nd week, and from 1st week to 2nd week (p-value=0.04*,0.001*,0.001*

respectively). In chlorhexidine group the significant reduction of plaque score is seen in the 1st week and the 2nd week (p-value=0.007*).

Table 2 shows the paired t-test for the gingival status of the three groups. Among the aloe vera group only during the baseline and the 2nd week there is significant reduction in the gingival score with p-value 0.03*, and between 1st and 2nd week, and from baseline to 1st week there is no significant reduction. Among the probiotic group the significant reduction of the gingival score is seen in baseline to 1st week, and baseline to 2nd week (p-value=0.02*,0.002* respectively). In chlorhexidine group there is no significant reduction of gingival score during baseline to 1st week, but there is a significant reduction during baseline to 2nd week, and from 1st week to 2nd week (p-value=0.007*,0.04* respectively).

Table 3 shows the repeated measures of ANOVA test for difference between mean plaque scores of 3 groups. This shows that there was a highly significant difference of the mean plaque scores between the 3 groups. Table 4 shows the repeated measures of ANOVA test for difference between the mean gingival scores of 3 groups. This shows that there was significant difference of the mean gingival scores between the probiotic and chlorhexidine groups.

Paired t-test (Plaque)

| | PAIR | MEAN±SD | T-VALUE | sig |
|-----------------------|--|-----------|---------|---------|
| ALOEVERA | BASELINE-1 st Week | 0.23±0.15 | 4.6 | 0.001* |
| | BASELINE -2 nd Week | 0.33±0.21 | 4.8 | <0.001* |
| | 1 st Week -2 nd Week | 0.10±0.17 | 1.7 | 0.107 |
| PROBIOTICS | BASELINE-1 st Week | 0.18±0.24 | 2.3 | 0.45 |
| | BASELINE -2 nd Week | 0.37±0.25 | 4.5 | 0.001* |
| | 1 st Week -2 nd Week | 0.19±0.11 | 5.01 | <0.001* |
| CHLOROHEXIDINE | BASELINE-1 st Week | 0.58±1.38 | 1.3 | 0.219 |
| | BASELINE -2 nd Week | 0.73±1.42 | 1.6 | 0.139 |
| | 1 st Week -2 nd Week | 0.15±0.13 | 3.5 | 0.007* |

Paired t- Test (Gingiva)

| | PAIR | MEAN±SD | t-VALUE | sig |
|-----------------------|--|-----------|---------|--------|
| ALOEVERA | BASELINE-1 st Week | 0.08±1.13 | 1.9 | 0.087 |
| | BASELINE -2 nd Week | 0.14±0.17 | 2.4 | 0.34 |
| | 1 st Week -2 nd Week | 0.06±0.15 | 1.2 | 0.260 |
| PROBIOTICS | BASELINE-1 st Week | 0.19±0.22 | 2.6 | 0.02* |
| | BASELINE -2 nd Week | 0.24±0.17 | 4.2 | 0.002* |
| | 1 st Week -2 nd Week | 0.05±0.15 | 1.04 | 0.322 |
| CHLOROHEXIDINE | BASELINE-1 st Week | 0.07±0.13 | 1.6 | 0.132 |
| | BASELINE -2 nd Week | 0.14±0.12 | 3.5 | 0.007* |
| | 1 st Week -2 nd Week | 0.07±0.09 | 2.3 | 0.04* |

Repeated Measures of ANOVA (Plaque)

| | F | Sig |
|----------------------|--------|--------|
| Aloe vera | 12.516 | 0.003* |
| Probiotic | 15.102 | 0.002* |
| Chlorhexidine | 5.609 | 0.30 |

Repeated Measures of ANOVA (Gingiva)

| | F | Sig |
|----------------------|-------|-------|
| Aloe vera | 3.01 | 0.106 |
| Probiotic | 8.450 | 0.01* |
| Chlorhexidine | 6.263 | 0.02* |

DISCUSSION

A good oral hygiene paves its way for preventing periodontal diseases. A variety

of adjuncts to the classical mechanical debridement are being used for the treatment and prevention of progression of

periodontal diseases. One of the adjuncts which is easily accessible to the patients and simple in its use are the mouthrinses. Of all the mouthrinses available, chlorhexidine is considered as the “gold standard” till date.³ Chlorhexidine is a bisbiguanide antiseptic that has a broad antimicrobial action, including a wide range of Gram-positive and Gram-negative bacteria.²

Aloe vera is a potential anti-microbial agent which is said to be very effective in fighting the bacteria and preventing gingival and periodontal diseases. It reduces edema of the soft tissues and consequently reduces the bleeding of the gums. It exhibits strong antiseptic action in gingival pockets where normal cleaning is difficult.¹¹

Probiotics are considered as living microbes which are beneficial to human body. They were first used for the treatment of gastrointestinal diseases. Now, during these recent years of research, it has been observed that it can be used in the prevention of periodontal diseases.¹ Their main potential of “recolonizing the healthy bacteria” is being used in the management of periodontitis

The present study compared the efficacy of aloe vera, probiotic, and chlorhexidine mouthwashes on oral health using two variables, viz. Plaque Index, and Gingival Index.

The results obtained showed there is a significant improvement in gingival bleeding and plaque accumulation after 14 days in all the groups. As evident from the results of this study, there was no significant difference between GI and PI scores of the 3 groups at pre-rinsing stage.

The present study is in accordance with the study conducted by Purunaik S et al. that showed probiotic mouth rinse was significantly more effective than chlorhexidine at the end of 14th day with the significance of 0.002.⁷

The study conducted by Mishra R et al., showed that the maximum reduction in PI was seen with chlorhexidine rinse, followed by herbal mouthwash and minimum in probiotic mouthwash at the end of one week

which is contrast to the present study (0.219 at the end of first week).⁴

The results of present study are in accordance with Karim et al. who found significant reduction in plaque scores after using Aloe Vera mouthwash (0.001).⁶

Chlorhexidine till date is the proven most effective anti-plaque agent. Its efficacy can be attributed to its bacteriostatic and bactericidal properties. However, its prolonged use is limited due to local side effects including extrinsic tooth and tongue brown staining, taste disturbance, enhanced supragingival calculus formation, and desquamation of the oral mucosa.

Aloe Vera is a potential anti-bacterial agent which is very effective in fighting the bacteria and preventing gingival and periodontal disease. Probiotics were defined as “living microorganisms that, given in sufficient quantities, bring health benefits to the host.”¹ Probiotics also serve as a good alternative as they can be concomitantly beneficial for oral as well as systemic health.

The antiplaque activity of the Probiotic mouth rinse may be achieved in various ways, such as reducing the adhesion of bacteria to the tooth surface, inhibiting the growth and proliferation of microorganisms on the tooth surface, inhibiting the formation of the intercellular plaque matrix, modifying plaque biochemistry to reduce the formation of cytotoxic product, and modifying plaque ecology to a less pathogenic flora.¹²

CONCLUSION

Thorough plaque removal remains the mainstay for the maintenance of oral health and prevention of progression of periodontal diseases. Aloe vera and Probiotic mouthwashes can be used as an adjunct to mechanical plaque control and prevention of gingivitis. However, owing to the side effects reported due to the use of chlorhexidine mouth rinse, aloe vera and probiotic mouthwash have a good biocompatibility and well acceptance, they

can be effectively used as an alternative to chlorhexidine mouth rinse.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Asha Prabhu et al., 2019, Comparative Evaluation of a Probiotic Mouthwash Versus a Chlorhexidine Mouthwash on Plaque Inhibition and Gingival Inflammation post Non-Surgical Periodontal Therapy. *Int J Recent Sci Res.* 10(05), pp. 32595-32599.
2. Parwani SR, Parwani RN, Chitnis PJ, Dadlani HP, Sai Prasad SV. Comparative evaluation of anti-plaque efficacy of herbal and 0.2% chlorhexidine gluconate mouthwash in a 4-day plaque re-growth study. *J Indian Soc Periodontol* 2013;17(1):72-77.
3. Akkaloori A, Al Shayeb M, Raman P, Punnoose K, Pattanaik P, Preethanath RS, Babu J S, Swarnalatha C, Nayyar AS. Evaluation of efficacy of hi-ora mouthrinse as against 0.12% chlorhexidine in treatment of patients with chronic gingivitis: A randomized-controlled trial. *J Datta Meghe Inst Med Sci Univ* 2022;17 (3):579-583
4. Mishra R, Tandon S, Rathore M, Banerjee M. Antimicrobial, and plaque inhibitory potential of herbal and probiotic oral rinses in children: A randomized clinical trial. *Indian J Dent Res.* 2014; 25:485-92.
5. Nadkerny PV, Ravishankar PL, Pramod V, Agarwal LA, Bhandari S. A comparative evaluation of the efficacy of probiotic and chlorhexidine mouthrinses on clinical inflammatory parameters of gingivitis: A randomized controlled clinical study. *J Indian Soc Periodontol* 2015; 19:633-639.
6. Bushra Karim, Dara John Bhaskar, Chandan Agali et al. Effect of Aloe vera Mouthwash on Periodontal Health: Triple Blind Randomized Control Trial. *Oral Health Dent Manag* 2014;13(1):14-9
7. Purunaik S, Thippeswamy HM, Chavan SS. To evaluate the effect of probiotic mouthrinse on plaque and gingivitis among 15-16-year-old school children of Mysore city, India- randomized controlled trial. *Glob J Med Res.* 2014;14:9-14
8. Vaish S, Ahuja S, Dodwad V, Prakash H. Comparative Evaluation of 0.2% Chlorhexidine Versus Herbal Oral Rinse on Plaque Induced Gingivitis. *I Indian Assoc Public Health Dent* 2012; 19:55-62.
9. Malhotra R, Grover V, Kapoor A, Saxena D. Comparison of the effectiveness of a commercially available herbal mouthrinse with chlorhexidine gluconate at the clinical and patient level. *J Indian Soc Periodontol* 2011; 15:349-52.
10. Nair AA, Malaiappan S. The Comparison of the Antiplaque Effect of Aloe vera, Chlorhexidine and Placebo Mouth Washes on Gingivitis Patients. *J. Pharm. Sci. & Res.* 2016; 8 (11): 1295-1300.
11. Vangipuram S, Jha A, Bhashyam M. Comparative efficacy of aloe vera mouthwash and chlorhexidine on periodontal health: A randomized controlled trial. *J Clin Exp Dent.* 2016;8(4): e442-7.
12. Harini, PM; Anegundi, RT1. Efficacy of a probiotic and chlorhexidine mouth rinses: A short-term clinical study. *Journal of Indian Society of Pedodontics and Preventive Dentistry* 28(3): p 179-182.

How to cite this article: Shashank Battula, Hidayathulla Shaikh, MD. Zabirunnisa Begum, G. Anvesh, Lahari G. Comparative evaluation of anti-plaque efficacy of probiotic, aloe vera and 0.2% chlorhexidine mouthwash: a randomized controlled trial. *Int J Health Sci Res.* 2024; 14(11):241-247. DOI: [10.52403/ijhsr.20241126](https://doi.org/10.52403/ijhsr.20241126)
