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# The Effect of Triphala and Chlorhexidine Mouthwash on Dental Plaque and Gingival Inflammation: An Open Labelled Clinical Study.

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**Abstract**

Mechanical removal of plaque by means of brushing and flossing is time consuming and is also technique sensitive. Hence effective plaque control of 100% may not be rendered always by these techniques. Adjuncts in the form of medication or mouthwashes are always recommended to assist tooth brushing in plaque control. The use of herbal mouthwashes has been a boon to control the oral health related problems. Triphala is one of the best known combinations used for various ailments in Ayurveda. The present study was aimed at comparing chlorhexidine and Triphala- as anti-plaque agent and for treating gingivitis among adult patients. 210 patients randomly were divided into the following 3 groups-

Group 1- Chlorhexidine (0.2%)

Group 2- Triphala (0.6%)

Group 3- Control group with no mouthwash

The examinations were done at baseline, 7 days and at 15 days using the Gingival index and plaque index. Chi Square test was done to compare the inter and intra group findings using SPSS   22.0    (IBM    Analytics, New            York, U.S.A). Even though higher percentage of patients showed greater improvement with Group 2 intervention than group 1, the difference was not found to be statistically significant after 7 days of observation. After 15 days, the Group 2 patients showed lesser plaque accumulation compared to Group 1, yet this difference was not found to be statistically significant. With respect to gingivitis, even though more patients were showed improvement with respect to group 2 than group 1 after 7 days and 15 days of observation, the difference was not found to be significant. Overall, the intervention with Triphala provided better results than with chlorhexidine, but this was not statistically significant.. Triphala and chlorhexidine help assisting tooth-brushing for control of plaque and resultant gingivitis. Triphala can be used as a substitute to avoid the side effects of the long term use of chlorhexidine. Triphala can be used with no side effects as a treatment modality among cases with gingivitis and for plaque control..

**Keywords:** Chlorhexidine, Gingivitis, Plaque, Triphala

## 1. Introduction

The Indian distribution of medical and dental care is uneven in nature with limited accessibility to especially dental treatments for the population concentrated in the rural areas. The financial burden

coupled with lack of knowledge and interest regarding good oral health is a major contributing factor to the occurrence of various diseases. Home based care as a part of maintenance and prevention stands out to be the only effective way out.[1] Dental caries and gingivitis are universal problems that have a higher prevalence across the globe. According to Loe H et al the accumulation of microbial plaque causes gingivitis. The removal and further control of this accumulation helps to resolve the lesions.[2] The presence of the local irritating factor- plaque; renders the gingival tissue in a constant state of inflammation resulting in gingivitis, characterized by bleeding from gums, swelling and at times in severe cases- pus discharge. This when left untreated can proceed to periodontitis.[3-5] Mechanical plaque removal by means of brushing along with flossing is time consuming and is also technique sensitive. Hence effective plaque control of 100% may not be rendered always by these techniques. Adjuncts in the form of medication or mouthwashes are always recommended to assist tooth brushing in plaque control. Conventionally chlorhexidine is used as an antiplaque agent, but it has its own draw backs related to staining of teeth and also resistance developed by the microbes after prolonged usage.[4] Herbal mouthwashes have the ability to sustain themselves and to avoid these long standing complications. The use of herbal mouthwashes has been a boon to control the oral health related problems. Triphala is one of the best known combinations used for various ailments in Ayurveda.[1] Triphala Mouthwash is contains a combination of traditional botanicals essential oils which gives a freshness to ones breath. It is an Ayurvedic traditional formulation and comprises of three fruits; namely- amla, harada, and behada. It is sweetened with xylitol, that is not a decay promoting agent. Instead its s use as plaque controlling agent. The present study was aimed at comparing chlorhexidine and Triphala- as anti-plaque agent and for treating gingivitis among adult patients.

## 2. Materials and Methods

The study was conducted as per the Helsinki declaration (World Medical Assembly) and all norms involving human studies were duly followed.

Inclusion criteria-
• Healthy patients above 18 years of age.
• No presence of active dental caries.
• Presence of moderate or higher form of gingivitis.
• Patients who had not received any form of therapy for the same complaint in the past 3 months.
• Patients who were willing to provide a written informed consent.

Exclusion criteria-
• Patients with systemic illnesses
• Patients with active carious lesions
• Presence of only mild gingivitis
• Patients with partial dentures
• Patients below 18 years of age

There were total of 210 patients recruited for the study that reported from January to March 2021, and were randomly divided into 3 groups of 70 patients in each.

Group1 – Chlorhexidine group (0.12% concentration)
Group2- Triphala Mouthwash (Himalaya company) (0.6% concentration)
Group3- Control group with no mouthwash

The plaque score of all the participants in the 3 groups was recorded (Sillness and Loe 1964).[6] The baseline scores of gingival index (Loe H and Sillness J 1963) [7] were recorded for all the patients and they were categorised into moderate and severe gingivitis. Oral prophylaxis was carried out. Group 1 patients were asked to use chlorhexidine mouthwash (Colgate company, 0.12% concentration) twice daily. Group 2 patients were asked to use Triphala Mouthwash (0.6% concentration) and Group 3 patients were kept as controls with no mouthwash. An evaluation of the patient was made at 7 days and 15 days. The plaque and gingival index of the patients were recorded again during the follow- up. The data collected were entered in Microsoft excel and cleaned. SPSS 22.0 (IBM Analytics, New York, U.S.A) was used for statistical analysis. Chi- square test was carried out for comparison. All p values less than 0.05 was considered to be statistically significant.

## 3. Results

Table 01 shows the overall demographic data of the participants.

|  | Number | Percentage |
|---|---|---|
| **Age** |  |  |
| 18- 30 years | 70 | 33.3 |
| 31- 40 years | 50 | 23.9 |
| 41- 50 years | 70 | 33.3 |
| 51 and above | 20 | 9.5 |
|  |  |  |
| **Religion** |  |  |
| Hindu | 123 | 58.6 |
| Muslims | 80 | 38.1 |
| Christians | 07 | 3.3 |
|  |  |  |
| **Gender** |  |  |
| Male | 134 | 63.8 |
| Female | 76 | 36.2 |
|  |  |  |
| **Level of education** |  |  |
| Graduate | 100 | 47.6 |
| Post graduate | 20 | 9.5 |
| Primary schooling | 90 | 42.9 |
|  |  |  |

Table 01: Overall demographic data of the participants

Table 02 shows the distribution of the participants of all the 3 groups based on the baseline scores of plaque index and gingival index.

|  | Group1 | | Group 2 | | Group 3 | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Plaque index** | N | % | N | % | N | % | N | % |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Good | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| Fair | 34 | 48.6 | 32 | 45.7 | 34 | 48.6 | 100 | 47.6 |
| Poor | 36 | 51.4 | 38 | 54.3 | 36 | 51.4 | 110 | 52.4 |
| Total | | | | | | | 210 | 100 |
| **Gingival index** | | | | | | | | |
| Mild gingivitis | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| Moderate gingivitis | 27 | 38.6 | 23 | 32.9 | 23 | 32.9 | 73 | 34.8 |
| Severe gingivitis | 43 | 61.4 | 47 | 67.1 | 47 | 67.1 | 137 | 65.2 |
| Total | | | | | | | 210 | 100 |

Table 02: Distribution of the participants of all the 3 groups based on the baseline scores of plaque index and gingival index

There were more participants whose plaque score was in the range of poor across all the 3 groups. Also higher percentage of patients had severe gingivitis compared to moderate amount of gingivitis (Table 01). After 7 days, when the patients were examined again, there was higher percentage with plaque scores falling in the range of Good and fair compared to the baseline. There were comparatively more patients in group 3 with a higher amount of plaque accumulation compared to the other 2 groups. Also more patients had mild to moderate gingivitis compared to the baseline. The group 3 patients showed higher percentage in the moderate and severe gingivitis range (Table 03).

| | Group 1 | | Group 2 | | Group 3 | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Plaque index** | N | % | N | % | N | % | N | % |
| Good | 20 | 28.6 | 22 | 31.4 | 10 | 14.2 | 52 | 24.8 |
| Fair | 38 | 54.3 | 42 | 60.0 | 35 | 50.0 | 115 | 54.7 |
| Poor | 12 | 17.1 | 06 | 8.6 | 25 | 35.7 | 43 | 20.5 |
| | | | | | | | 210 | 100 |
| **Gingival index** | | | | | | | | |
| Mild gingivitis | 50 | 71.4 | 56 | 80.0 | 42 | 60.0 | 148 | 70.5 |
| Moderate gingivitis | 20 | 28.6 | 14 | 20.0 | 25 | 35.7 | 59 | 28.1 |
| Severe gingivitis | 00 | 00 | 00 | 00 | 03 | 4.3 | 03 | 1.4 |
| | | | | | | | 210 | 100 |

Table 03: Distribution of the patients based upon the plaque and gingival scores after 7 days of intervention

After 15 days, when the comparison was carried out, there was not much difference observed between the group 1and group 2 patients (Table 04).

| | Group 1 | | Group 2 | | Group 3 | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Plaque index** | N | % | N | % | N | % | N | % |
| Good | 56 | 80.0 | 60 | 85.8 | 12 | 17.1 | 128 | 60.9 |
| Fair | 14 | 20.0 | 10 | 14.2 | 35 | 50.0 | 59 | 28.1 |
| Poor | 00 | 0.0 | 00 | 0.0 | 23 | 32.9 | 23 | 11.0 |
| | | | | | | | 210 | 100 |

| Gingival index | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mild gingivitis | 59 | 84.3 | 63 | 90.0 | 44 | 62.9 | 166 | 79.1 |
| Moderate gingivitis | 11 | 1.6 | 07 | 10.0 | 23 | 32.9 | 41 | 19.5 |
| Severe gingivitis | 00 | 00 | 00 | 00 | 03 | 4.3 | 03 | 1.4 |
| | | | | | | | 210 | 100 |

Table 04: Distribution of the plaque and gingival score based on observations after 15 days post intervention:

When the scores were compared for group 1 for the 3 observations, we observed that, there was a statistically significant improvement in the number of Group 1 patients after 7 days and 15 days with respect to lower plaque accumulation ($\chi2$= 9.1429, p-value =0.002497). But no difference was seen between 7 days and 15 days observations. With respect to Group 2, there were more patients who showed significant decrease in plaque accumulation compared to the baseline after 7 days and this was statistically significant ($\chi2$= 137.5, p= <0.00001). There was no difference between the observations of 7 and 15 days. When the gingivitis was compared for group1 and group 2; after 7 days with baseline, there was a significant improvement and this difference was found to be statistically significant respectively. There was no difference between the observations of day 7 and 15 in both the groups. Inter group comparison was made between the plaque scores for Group 1and 2. Even though higher percentage of patients showed greater improvement with Group 2 intervention than group 1, the difference was not found to be statistically significant after 7 days of observation ($\chi2$=2.2952, p= 0.317392). After 15 days, the Group 2 patients showed lesser plaque accumulation compared to Group 1. There were higher patients in group 1 whose plaque score was in the range of fair compared to the group 2, yet this difference was not found to be statistically significant. With respect to gingivitis, even though more patients were showed improvement with respect to group 2 than group 1 after 7 days and 15 days of observation, the difference was not found to be significant ($\chi2$=1.3984, p=0.236984; $\chi2$=1.02, p= 0.31251). There was comparatively higher percentage of people showing improvement in both the interventional groups than the controls with no intervention at 7 days and 15 days of observation. Overall, the intervention with Triphala provided better results than with chlorhexidine, but this was not statistically significant.

## 4. Discussion

The present study focused on the effectiveness of Triphala and Chlorhexidine mouthwashes as an adjunct in reducing gingival inflammation and to control plaque in adult patients. It was a parallel single blinded controlled study. We observed that All the literature till date has reported the mean effect in reduction of plaque and gingival scores, but we calculated the overall effect on the entire group of participants as a pilot run for a larger community based trial. Sushruta Samhita states that triphala has hemostatic, anti-inflammatory, analgesic, and wound-healing properties. Haritaki is effective in gingival bleeding, ulcers as well as dental caries. Amalaki is rich in Vitamin C that further assists in preventing and controlling gingival bleeding.[8] 0.12% Chlorhexidine mouth rinse can provide an important adjunct to the prevention and control of gingivitis but it cannot be safely used for a

longer duration of time and may develop complications like allergic reactions. Its effectiveness is due to its substantivity within the oral cavity and its both bacteriostatic as well as bactericidal activity.[2] Triphala has been found to be effective in inhibition of bacterial growth that is a part of dental plaque, very safely when absorbed on to the tooth surface.[9] The presence of free radicals help to deliver this action. Similar to our findings, another study reported that the percentage change in the gingival index scores of groups with Triphala and chlorhexidine were not significant. But contrary to our findings, there was a significant plaque reduction reported in the same study.[10] According to an Indian study, Triphala was effective in reducing incipient dental caries as well as microbial growth, plaque and gingivitis.[11] But its effectiveness over chlorhexidine was not statistically significant, similar to our study findings. Compared to the commercial ones, Triphala is much cheaper and can be easily used over a long duration.[11] Studies report the significant difference post rinsing with Chlorhexidine mouthwash compared to baseline, similar to our study findings with respect to plaque reduction as well as gingivitis.[12,13] Table 5 enlists the outcome of other studies similar to the present study findings.

| Sr No | Author, year | Study method | Conclusion |
|---|---|---|---|
| 1. | Srinagesh and Pushpanjali (2011)[14] | 57 cases who wererandomly allocated into 3 groups: 1) 15 ml of 6% triphala mouthwash; 2) 15 ml 0.2% chlorhexidine 3) Control with no intervention. Colony count of Mutans streptococci (MS) was done. | After using mouthwash for 15 days, an 83% and 80% reduction and at 45 days a 67% and 65% reduction in salivary MS colony count was observed in the triphala and chlorhexidine groups, respectively (P = 0.0001). The control group showed an increase of 3% in MS colony count at 15 days and a reduction of 7% at 45 days. (P = 0.116). |
| 2. | Narayan and Mendon (2012)[15] | Thirty subjects underwent four consecutive experimental phases with four treatments: Triphala, Hi Ora, Chlorhexidine and Colgate Plax for 28 days. Assessment of Plaque index was done | Triphala, Hi Ora and Chlorhexidine reduced de novo plaque formation to a greater extent than the colgate plax mouthwash (p < 0.05). |
| 3. | Srinagesh J, Krishnappa P, Somanna SN | Sixty undergraduate student volunteers aged between | The triphala group showed a 17% and 44% |

| | | | |
|---|---|---|---|
| | (2012)[16] | 18 and 25 years were randomly allocated into three study groups. (a) 6% triphala mouthwash, 15 ml twice a day; (b) 0.2% chlorhexidine mouthwash, 15 ml twice a day (active control group); (c) passive control group asked to rinse with plain water, twice a day. The oral streptococci colony forming units/ml (CFUs/ml) was assessed by inoculating blood agar with saliva samples at the end of 48 h and at 7 days. | reduction, while the chlorhexidine group showed 16% and 45% reduction at the end of 48 h and 7 days (P < 0.001). The reduction in CFUs/ml seen in triphala group closely paralleled that of chlorhexidine group. |
| 4. | Chainani SH, et al (2014)[17] | 120 qualifying boarding-school students aged 13-16 years were randomised into three groups: 10% triphala, 0.2% chlorhexidine and negative control. The study was conducted in 3 phases of 1-month duration each and a washout period of 15 days. During the experimental period, subjects rinsed with the allocated mouthrinse once daily for 30 days under supervision. The plaque and gingival status was assessed using the Turesky modification of the Quigley and Hein plaque index (QHI) and the gingival index (Löe and Silness) at baseline and at the end of each phase | Triphala and chlorhexidine yielded a significant reduction in plaque and gingival index scores as compared to negative control (P < 0.001). No significant difference was found between the scores obtained with triphala and chlorhexidine mouthwashes. |
| 5. | Naiktari RS, et al (2014)[18] | In a double-blind, randomized, multicenter clinical trial, 120 patients | There was no significant difference when the efficacy of triphala was |

| | | | |
|---|---|---|---|
| | | were equally divided into three groups. Patients in group A were advised to rinse their mouths with 10 mL of distilled water, group B with 0.2% chlorhexidine, and group C with triphala mouthwash for 1 minute twice daily for two weeks. The plaque index (PI) and the gingival index (GI) were recorded on the first and the fifteenth day. | compared with 0.2% chlorhexidine. |
| 6. | Bhattacharjee R, et al (2015)[19] | A randomized, double-blinded, controlled trial, with a total of 60 school children (n = 30 in each group; triphala and chlorhexidine groups). Plaque and gingival indices were used to evaluate baseline and follow-up plaque and gingivitis. | Both chlorhexidine and triphala groups showed significantly lower mean gingival and plaque index scores at follow up than baseline (P < 0.001). There was no significant difference in the percentage change in the mean gingival index between the two groups (P = 0.826). The percentage change in the mean plaque index was significantly higher in the chlorhexidine group compared to the triphala group (P = 0.048). |
| 7. | Pradeep AR, et al (2016)[20] | Ninety individuals with chronic generalized gingivitis were randomly assigned to three groups: 1) group I, placebo mouthwash; 2) group II, TRP mouthwash; and 3) group III, chlorhexidine (CHX) mouthwash. All individuals were instructed to rinse with their | All three groups showed gradual reduction in PI, GI, and OHI-S levels from baseline to 7, 30, and 60 days. There was also significant reduction in microbial counts in all groups at all time intervals except in group I. A significant difference was noticed with respect |

| | | respective mouthwash twice daily. 1) Plaque index (PI); 2) gingival index (GI); 3) oral hygiene index-simplified (OHI-S); and 4) microbiologic colony counts were recorded at baseline and at 7, 30, and 60 days. | to reduction in PI, GI, OHI-S, and microbiologic counts in group I compared with groups II and III. |
|---|---|---|---|
| 8. | Baratakke SU, et al (2017)[21] | A double blinded parallel arm randomised control trial was done among 60 participants aged 18-24 years. Participants were randomly allotted to three groups with 20 participants in each group of 0.6% triphala, 0.12% chlorhexidine and control group. | No significant difference was found between the plaque and gingival scores obtained with triphala extract and chlorhexidine mouth rinse. |
| 9. | Mamgain P, et al (2017)[22] | A randomized sample of 60 patients with plaque induced gingivitis were enrolled and divided equally into 2 groups. Group A was given Triphala and Ela decoction and Group B Chlorehexidine mouthwash for 21 days twice daily. Gingival inflammation index, plaque index with Organoleptic rating was recorded at baseline, 14th day and 21st day. | On comparing the Gingival index for group A with group B the reduction from baseline to 14 day was 31.95% and 38.62 % respectively while from baseline to 21 day was 69.95 % and 68.57% respectively. Halitosis Percentage reduction at 14th day from base line was 33.33% and 38.18%; at 21 day from baseline 66.66% and 72.72% respectively for group A and group B. No statistical significant difference for intergroup comparison was found |
| 10 | Padiyar B, et al (2018)[23] | 60 children between 9 to 12 years were allocated randomly into the following | Streptococcus mutans count was significantly reduced in the |

| | | groups- triphala mouthwash, chlorhexidine mouthwash, garlic extracts mouth-wash, and distilled water mouthwash. The assessment comprised of decayed, missing, and filled teeth (dmft)/decayed, missing, filled surface (dmfs) and DMFT/DMFS, plaque index, and S. mutans count at 1, 15, and 30 days. | Chlorhexidine group by the end of 15 days. All the 3 mouthwashes were equally effective in reducing the microbial count by 15 days of use. |
|---|---|---|---|
| 11 | Penmetsa GS, et al (2019)[24] | 60 patients were randomly allocated into three study groups: Triphala mouthwash (Group A), Aloe vera mouthwash (Group B), and Chlorhexidine mouthwash (Group C). 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 bleeding index (BI) were recorded at baseline, 15 days, and 30 days, respectively. | Triphala group effectively demonstrated a higher reduction in GI and BI index scores compared to A. vera group (P ≤ 0.005) and the effect is equivocal to the reduction seen with Chlorhexidine group. However, no statistically significant difference was observed between the mouthwashes in reduction of PI scores (P > 0.005). |
| 12 | Deshpande MA, et al (2021)[25] | Twenty-seven children with a mild ID were randomly divided into two groups: A - Triphala and B - placebo group. Toothwipes were given to caregivers of children belonging to the respective groups, and were instructed to use them 1 h after their meals, twice a day for 7 days. | Triphala group showed a statistically significant reduction of S. mutans after 48 h and 7 days. |

| | | Simplified Plaque index was recorded and plaque samples were collected for microbiological examination at baseline, 48 h, and 7 days. | |
|---|---|---|---|

We also observed that the mouthwash was well received since it was cheap and easily accessible and affordable to the patients. With lesser complications, long term use of Triphala can be a common community intervention for prevention of plaque accumulation and gingivitis. Long term studies are essential for establishing the different concentrations and the dose response relationship of Triphala with respect to the periodontal tissues.

## 5. CONCLUSION

Within the limitations of the study, we can clearly state that-

1.Triphala and chlorhexidine help as an adjunct to tooth-brushing for control of plaque and resultant gingivitis.

2.0.6% of Triphala is as effective as 0.12% of chlorhexidine.

3.The mouthwash being cheap and easily available can be a substitute for chlorhexidine.

**Clinical significance of the study:**

Triphala is equally effective as a plaque controlling agent. It can be used easily and for a long term due to the advantages of no side effects and no bacterial resistance as compared to chlorhexidine mouthwash.

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