Evaluation of the Efficacy of Herbal Mouthwash /Chlorhexidine Rinse as a Co-Adjuvant in the Treatment of Chronic Generalized Gingivitis. - A Randomized Controlled Trial.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

The aim of the study was to evaluate the efficacy of Chlorhexidine and herbal mouthwash as a co-adjuvant in the treatment of chronic gingivitis. A total of 60 subjects aged 18-45 years were divided into two groups : Group A (Chlorhexidine) and Group B (Herbal) were asked to rinse with their respective mouthwash two times daily for one month after brushing. Oral prophylaxis was done prior to the start of the use of both the mouthwashes. Plaque and gingivitis assessment were carried out using the Plaque index (Sillness and Loe,1964), Gingival index (Loe and Sillness,1963) and Oral hygiene index at baseline ,7th,14th and 28th day and the data obtained was subjected to statistical analysis. There was statistically significant reduction in plaque and gingival scores after 30 days in both the groups A and B. Both 0.2% chlorhexidine gluconate and Herbal mouthwashes can be effectively used as an adjunct to mechanical plaque control in the prevention of plaque and gingivitis. However, owing to the side effects reported due to the use of chlorhexidine mouth rinse and biocompatibility and well acceptance of Herbal mouthwash by the subjects, it can be effectively used as an alternative to chlorhexidine mouth rinse

Keywords: Plaque induced Gingivitis, chlorhexidine mouthwash, herbal mouthwash, gingival index, Plaque index.

Introduction

Since the dawn of history gingival and periodontal diseases, in their various forms have afflicted the humans as a major health issue in different populations for a long time.[1] Dental caries, periapical infections and gingival diseases are the most prevalent oral problems associated with dental plaque in human beings with the plaque being the foremost etiologic factor for initiating gingival inflammation. To maintain good oral health plaque control forms the mainstay in prevention of oral disease.[2] Maintaining an effective plaque control is the cornerstone of any attempt to prevent and control periodontal disease.[1]First indispensable phase of periodontal therapy is scaling and root planning.[3] For proper mechanical plaque control dynamic participation of an individual is must.[1]A combination of oral hygiene instructions and mechanical professional tooth cleaning at proper intervals can almost completely prevent the development of gingivitis.Various methods of plaque control include both mechanical method (toothbrushes, floss) as well as the chemical methods (mouthwashes).Chemical antiplaque agents present in mouth rinses or dentrifices therefore should reach these soft tissue surfaces ,improving the control of biofilm growth on these surfaces and delaying microbial accumulation on teeth.[3]

Mouthwashes are liquids which contain anti-inflammatory, antimicrobial, and analgesic action. A mouthwash is a medicated liquid which is held in the mouth and swished by the action of perioral musculature to eliminate the oral pathogens.[4]Mouth rinses have the ability to deliver the therapeutic effect all over the tooth surface including interproximal areas in which even toothpastes are not much effective. There are two types of mouthwashes –chemical and herbal. Chlorhexidine mouthwash comes under chemical and those derived from plant extracts having anti –microbial property are herbal mouthwash. Chlorhexidine ,a cationic bisbiguanide, is regarded as a "gold standard" anti plaque agent.[5] It has a promising substantivity and broad spectrum antibacterial activity.[5] The need for frequent application of chlorhexidine and its undesirable side effects such as brown staining of teeth and transient impairment of taste sensation, has encouraged search for alternatives which are more appropriate. This led to the introduction of various herbal products in dentistry which besides having no major side effects, are cheap and locally available.[6] Herbal preparation in this study is made from a combination of natural herbs with beneficial properties of anti cariogenic and anti-plaque due to the presence of Pilu (Salvadorapersica) 5mg, antibacterial, anti-inflammatory, and immunity booster due to Bibhitaka (Terminalia bellerica) 10 mg, antioxidant, antimicrobial, and plaque inhibiting properties due to Nagavalli (Piper betle) 10 mg. Essential oils of Gandhapura taila , antimicrobial, anti-inflammatory, and analgesic properties and Oil extracted from Ela (Elettaria cardamomum) antiseptic that is known to kill bacteria-producing bad breath. Peppermint satva acts as a natural mouth freshener and Yavani satva (Trachyspermum ammi) 0.4 mg also has antimicrobial properties.12 Salvadora persica is one among the most commonly used antibacterial agent in traditional ayurvedic medicine. Its role as an anti-plaque agent has been reported extensively.Natural herbs when used in mouthwashes, have shown significant advantages over the chemical ones. These herbal mouthwashes are gaining popularity as they contain naturally occurring ingredients called as Phytochemicals that achieve the desired antimicrobial and anti-inflammatory effects.

Herbal formulations may be more appealing because they work without alcohol, artificial preservatives, flavours or colors.[7]

The main purposes of using mouthwashes are that it can be used at home as a routine to maintain good oral hygiene and mouthwashes also provides anti-inflammatory and anti microbial activity.

The aim of the study was to evaluate the efficacy of Chlorhexidine and herbal mouthwash as a co-adjuvant in the treatment of chronic gingivitis.

Materials and Methods

The present study was designed and conducted in the Department of Periodontology at Himachal Dental College, Sundernagar,

Himachal Pradesh. India. 60 subjects within the age group of 20-45 years with clinical signs and symptoms of chronic plaque induced gingivitis were selected from the dental OPD. Approval from the Institutional Ethics Committee of Himachal Dental College, Sundernagar was obtained before initiating the study. An informed consent was obtained from all the participants.

The study was carried out by a single investigator who was trained and calliberated. In order to bring the plaque and gingival scores to baseline, thorough oral prophylaxis was performed on all subjects before the start of the study. Two groups were made comprising of 30 subjects each, Group A (0.2%Chlorhexidine) and Group B (Herbal mouthwash) were asked to rinse with their respective mouthwash with 10 ml of allotted mouth rinse two times daily after meals for 30 seconds after 30 minutes of brushing. After the mouthwash rinse, the subjects were not allowed to subsequent rinse with water.

The subjects were randomly assigned to one of the 2 treatment groups i.e. 0.2% chlorhexidine and Herbal mouthwash and were followed for a period of 4 weeks.

Subjects selected were under the inclusion criteria of having a minimum of 22 teeths. Criteria for exclusion were subjects with a history of systemic diseases, antibiotic and periodontal therapy in past month and subjects allergic to the test product. Subjects having severe malalignment of teeth, orthodontic appliances fully crowned teeth and removable partial denture were also excluded from the study.

A study flowchart comprising of case sheet performa was prepared and mean index score of plaque, gingival and oral hygiene index were recorded at baseline,7 th ,14th and 28 days.

Statistical Analysis

The three variables of interest for this clinical trial were the plaque index, gingival and oral hygiene index. The preferred statistical analysis, were compared in comparison of mean scores by the independent samples t test.

Mean index values within the subjects were calculated for buccal, lingual and interproximal sites for each index at each time point. The percentage change in mean index from baseline was calculated for each subject for each follow up measurement.

Mean differences between test and control sites were compared using student't'-test. The mean difference was compared between different durations using ANOVA (analysis of variance).The results were statistically significant *at p<0.05*.

Results

At the end of the study, all 60 subjects had used the prescribed mouthwashes for a period of one month.

Gingival Index

Table 1: Intergroup comparison of Gingival Index

	Herbal		Chlorhexidine				
	Mean	SD	Mean	SD	T	df	Sig. (2- tailed)
Baseline	0.20	0.04	0.22	0.05	-1.247	28	0.223
7th Day	0.19	0.04	0.20	0.05	-0.837	28	0.41
14th Day	0.18	0.04	0.18	0.06	0.00	28	1.00
28th Day	0.17	0.04	0.12	0.04	3.229	28	0.003

P < 0.001- Highly significant, p < 0.05-Significant, p > 0.05 Not significant (NS)The descriptive summary of gingival Index obtained with two different mouth wash is presented in table 1. For both types of mouth wash, the GI showed a declining trend from baseline to 28th day, during the follow-up period. Maximum values of GI were obtained at baseline and minimum was obtained on 28th day. For Herbal group, the mean GI at baseline (0.20±0.04) was slightly lower than the baseline mean for chlorohexidine group (mean 0.22 ± 0.05) and the difference appeared to be statistically non – significant t(28) = -1.247, p =0.22. In contrast, the mean obtained at 28th day for Herbal group (0.17 ± 0.04) was higher than the mean GI obtained at 28th day for Chlorhexidine group (0.12 ± 0.04) and this difference appeared to be highly statistically significant. The mean GI obtained at 7th and 14th day, for both mouth wash groups showed intermediate values and intergroup differences did not show any statistically significant differences.

Figure1: Comparative Representation of GI for two type of mouthwash at different time interval
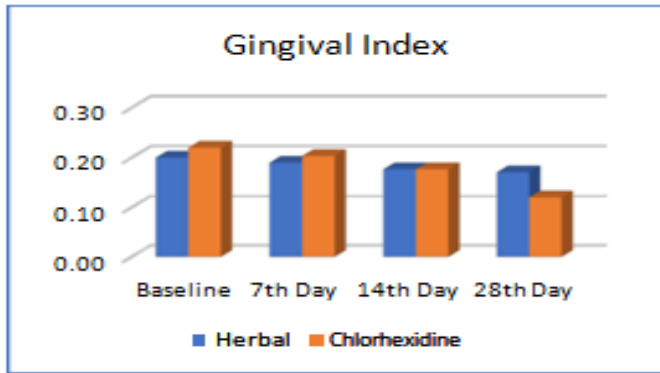

Figure 2: Line diagram of GI for two type of mouthwash at different time interval.
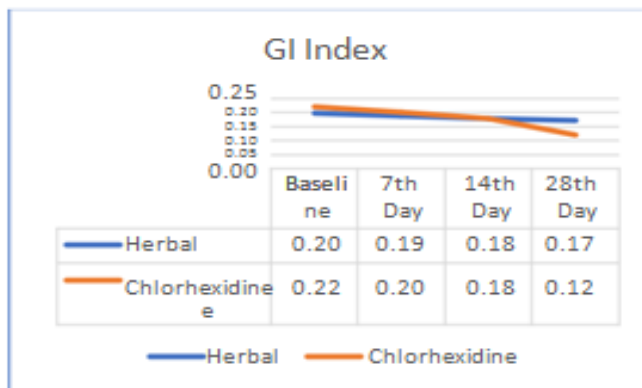

Table 2: Intra group paired comparison for gingival Index in Herbal and Chlorohexidine group

Mouth wash	Paired group	Paired Differences				
		Mean	SD	t	df	Sig. (2- tailed)
Herbal Group	Base vs 7th Day	0.010	0.028	1.38	14	0.19
	7th day vs 14th Day	0.013	0.030	1.74	14	0.10
	14th day vs 28th day	0.006	0.058	0.40	14	0.70
Chlorohexidine	Base vs 7th Day	0.017	0.036	1.78	14	0.10
	7th day vs 14th Day	0.027	0.050	2.09	14	0.06
	14th day vs 28 days	0.057	0.059	3.70	14	0.00

p< 0.001- Highly significant, p < 0.05-Significant, p > 0.05 Not significant (NS)

Intra group paired comparison for gingival Index in Herbal and Chlorohexidine group is summarized in table 2. The differences between the mean values of GI obtained for different paired time intervals, viz, baseline and 7th day, 7th day and 14th day and 14th and 28th were 0.010, 0.013 and 0.006 respectively and none of these differences appeared to be statistically significant.
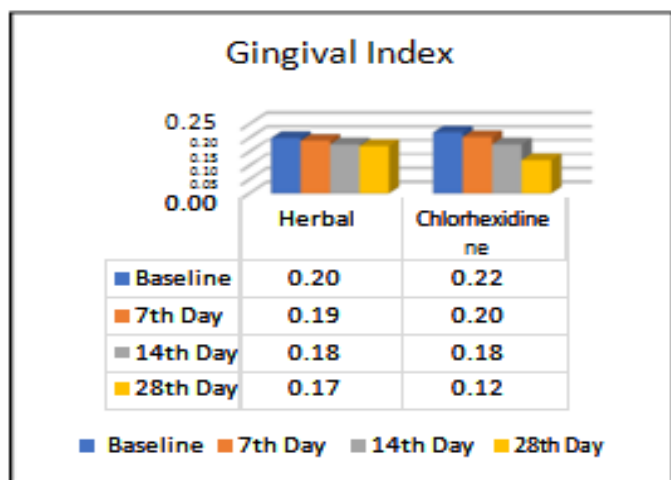
In Chlorohexidine group, the difference between the mean of GI between at baseline and 7th day was 0.017 which was not statistically significant (t(14)= 1.78, p = 0.10. Similarly, difference between the mean obtained at 7th and 14th day was 0.027 which was also not statistically significant, (t (14)) = 2.09, p = 0.06. However, difference between the mean obtained at 14th and 28th day (0.067) was highly statistically significant (t(14) = 3.70, p = 0.00.

Figure 3

Plaque Index

Table 3: Intergroup comparison of Plaque Index

Time	Herbal		Chlorhexidine				
intervals	Mean	SD	Mean	SD	t	df	Sig. (2-tailed)
Baseline	0.83	0.15	0.78	0.21	0.747	28	0.461
7th Day	0.73	0.20	0.58	0.16	2.264	28	0.032
14th Day	0.56	0.16	0.29	0.11	5.672	28	0.000
28th Day	0.43	0.17	0.17	0.08	5.217	28	0.000

P < 0.001- Highly significant, p < 0.05-Significant, p > 0.05 Not significant (NS)

The descriptive summary of Plaque Index (PI) obtained with two different mouth wash is presented in table 3. For both types of mouth wash, the PI showed a declining trend like GI, Figure 4. Comparative Representation of PI for two type of mouthwash at different time interval from baseline to 28th day, during the follow-up period. Maximum values of GI were obtained at baseline and minimum was obtained on 28th day.

For Herbal group, the mean GI at baseline (0.83 ± 0.15) was higher than the baseline mean for chlorohexidine group (mean 0.78 ± 0.21) and the difference appeared to be statistically non – significant t(28) = 0.747, p=0.461.

Figure 4
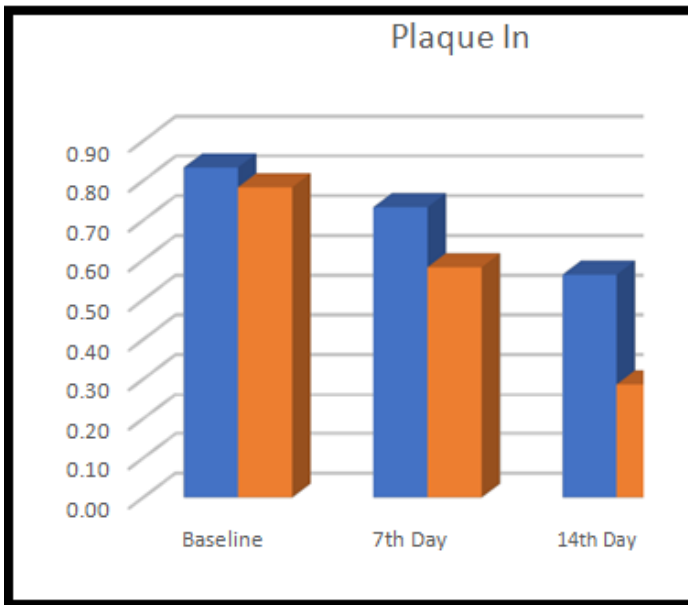
The minimum value of PI for herbal group which was obtained at 28th day follow-up (0.43 ± 0.17) was much higher than the mean PI obtained at 28th day for Chlorohexidine group (0.17 ± 0.08) and this difference appeared to be highly statistically significant, t(28) = 5.217, p = 0.000.

7th day PI value for herbal group (0.73 ± 0.20) was higher than chlorohexidine group (0.58 ± 0.16) and this difference appeared to be statistically significant, t(28) = 2.26, p = 0.03.

Similarly, the 14th day PI value for herbal group (0.56 ± 0.16) was higher than chlorohexidine group (0.29 ± 0.11) and this difference appeared to be highly statistically significant, t(28) = 5.6, p = 0.000.
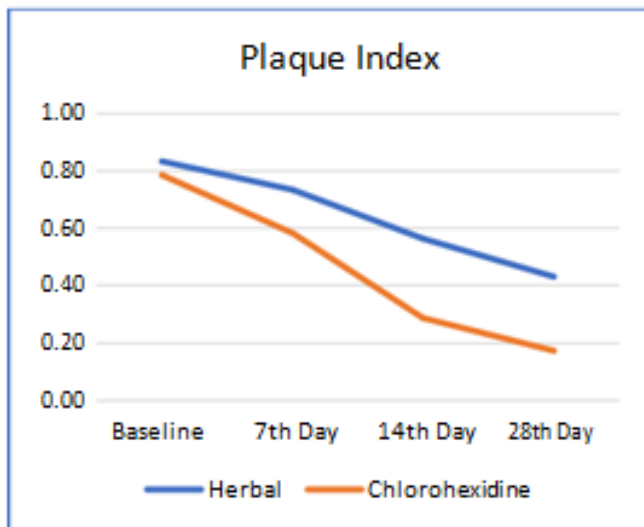
Figure 5: Line diagram of PI for two type of mouth wash

at different time interval

Table 4: Intra group paired comparison for PLAQUE Index in Herbal and Chlorohexidine group

Mouthwash type	Paired group	Paired Differences				
		Mean	SD	t	df	Sig. (2-tailed)
Herbal	Base vs 7th Day	0.100	0.16	2.45	14	0.03
	7th day vs 14th Day	0.170	0.25	2.68	14	0.02
	14th day vs 28th day	0.133	0.15	3.40	14	0.00
Chlorhexidine	Base vs 7th Day	0.201	0.199	3.91	14	0.002
	7th day vs 14th Day	0.295	0.167	6.83	14	0.00
	14th day vs 28th day	0.113	0.099	4.43	14	0.001

$P < 0.001$- Highly significant, $p < 0.05$-Significant, $p > 0.05$ Not significant (NS)time intervals, viz, baseline and 7th day, 7th day and 14th day and 14th and 28th for both the mouth wash groups were highly statistically significant.

Figure 6
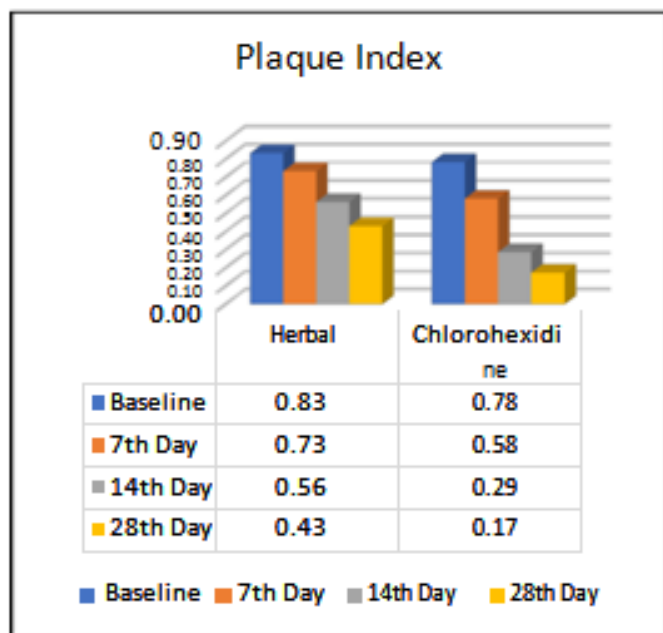
The descriptive summary of Oral Hygiene Index (OHI) obtained with two different mouth wash is presented in table 5. The mean OHI for herbal group at different time intervals were higher as compared to Chlorohexidine group.

Like GI and PI, the OHI also showed a declining trend from baseline to 28th day, maximum values of mean OHI were obtained at baseline and minimum values were obtained at 28th day for both mouth wash groups.

Mean OHI at baseline for herbal group (3.14±0.61) did not differ significantly from that of Chlorohexidine group (mean 3.03 ± 0.54).

Figure 7: Comparative Representation of OHI for two type of mouthwash at different time interval
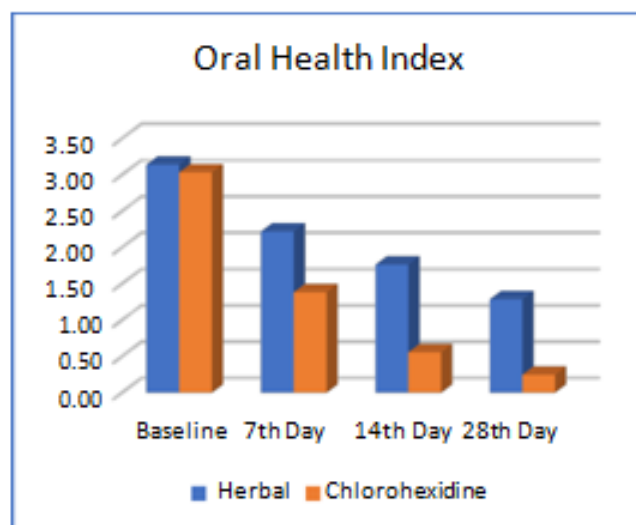
Mean OHI at 7th day for herbal group (2.22 ± 0.37) was higher than chlorohexidine group (1.38 ± 0.29) and this difference appeared to be highly statistically significant, $t(28) = 6.91$, $p = 0.00$.Mean OHI at 14th day for herbal group (1.76 ± 0.69) was higher than chlorohexidine group (0.29 ± 0.11) and this difference also appeared to be highly statistically significant, $t(28) = 5.91$, $p = 0.000$.Similarly, mean OHI at 14th day for herbal group (1.29 ± 0.59) was higher than chlorohexidine group (0.25 ± 0.21) and this difference also appeared to be highly statistically significant, $t(28) = 6.41$, $p = 0.000$.
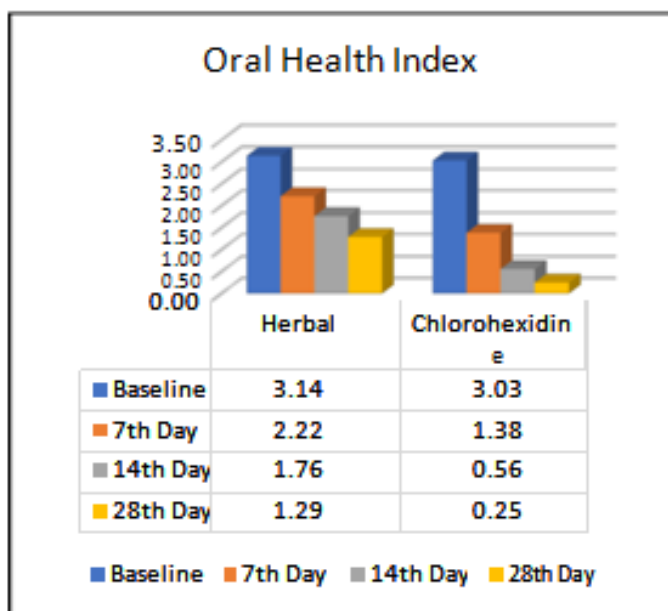
Intra group paired comparison for Oral hygiene Index in Herbal and Chlorohexidine group is summarized in table 6.In Herbal group, the mean differences between baseline and 7th day and 7th and 14th day were 0.92, $(t(14)) = 4.74$, $p = 0.00$; 0.46, $(t(14)) = 2.41$, $p = 0.03$ respectively, and these differences were highly statistically significant. However, the mean differences between 14th and 28th day, mean difference. Intra group representation of Oral Hygiene Index in Herbal and chlorohexidine group.

Figure 8: Line diagram of PI for two type of mouthwash at different time interval

Oral Health Index
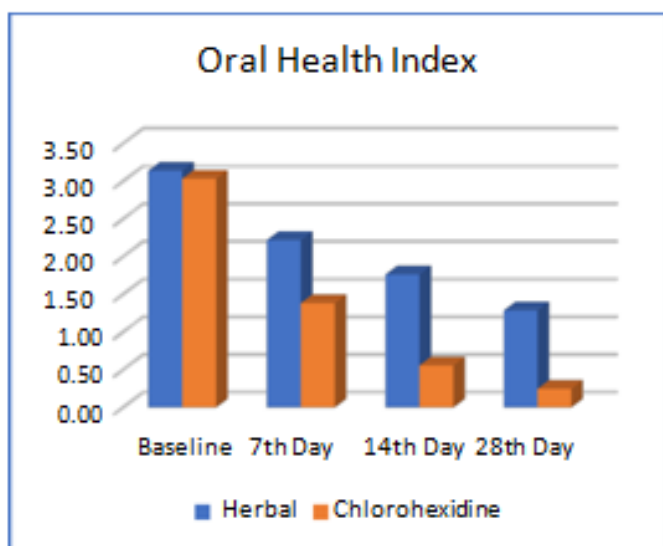
0.48, (t(14)) = 2.06, p = 0.06) did not appeared to be statistically significant. After application of Chlorohexidine, the OHI has decreased from baseline to 28th day. The differences obtained between the mean values of OHI for all paired time intervals, viz, baseline and 7th day, 7th day and 14th day and 14th and 28th were highly statistically significant.

Figure 9

Oral Health Index

	Herbal	Chlorohexidine
Baseline	3.14	3.03
7th Day	2.22	1.38
14th Day	1.76	0.56
28th Day	1.29	0.25

Discussion

Chemical plaque control is considered to be an adjunct to mechanical oral hygiene practices.Human dental plaque is one of the ecosystems in which a maximum number of microorganisms are observed. The plaque biofilm has been attributed to as one of the main etiologic factor for the two most common oral diseases; dental caries and periodontal diseases.According to some invitrostudies, antimicrobial agents have the ability to reach the interproximal area that are difficult to clean and inhibit the bacterial growth.Several chemical plaque control agents are used in which chlorhexidine is considered as gold standard.Complete inhibition of bacterial accumulation by chlorhexidine mouthwash has been reported by Schiott.10The reduction in amount of plaque found to be statistically significant (p=0.000) well corroborates with the results obtained in the previous studies carried out by Loe and Lang etal.11According to another study by Bagachi et al where the evaluation of the efficacy of commercially available herbal mouthwash on dental plaque and gingivitis was done by double-blinded parallel randomized controlled trial technique. In this study 90, nursingstudents were randomly divided into three groups: A - Chlorhexidine, B - Hiora, and C - distilled water, respectively. The groups were asked to rinse their respective mouthwash twice daily for 21 days. Plaque and gingivitis were evaluated using Turesky et al. modification of Quigley hein PI (1970) and modified GI by Lobene et al. (1986), respectively. The results of this study showed a statistically significant reduction in plaque and gingival score from the baseline to 21 days. Chlorhexidine was proved to be the best and Hiora mouthwash also showed gradual improvement from baseline to 21 days and no improvement was seen in Group C which was done using distilled water.12In a study done by Chatterjee et al., 2011 herbal oral rinse is equally effective in reducing periodontal indices as CHX. However, there is not enough statistically significant evidence to suggest that herbal oral rinse had a greater effect in reducing gingival index scores14.Also an in vitro study was done by Arabaci et al.

which showed that chlorhexidine has genotoxic and cytotoxic effects on human lymphocytes.15In this study ,intra and inter comparison of the groups were done. Significant results were seen in chlorhexidine mouthwash when compared to herbal mouthwash. This can be attributed to anti-bacterial property of CHX. CHX attacks the bacterial cell membrane, causing leakage and/or precipitation of thecellular contents. Specifically, it binds to salivary mucins, which reduces pellicle formation and inhibits plaque colonization. It also binds to bacteria and hinders their adsorption onto the teeth.Both the mouthwashes showed improvement in the mean scores of OHI-S, PI and GI after 7 days of use.Studies conducted by Rahmaniet al.16 and Ghazi et al. who compared the anti-plaque and antigingivitis effect of a mouthwash containing S. persica with 0.2% chlorhexidine and showed improvement in both plaque and gingival index (GI) scores. At the end of 7th day almost reduction in the amount of plaque ,debris and gingivitis was found in both the groups.Chlorhexidine is effective against an array of microorganisms including Gram-positive and Gram-negative organisms, fungi, yeast and viruses. It is bacteriostatic at low concentration and bactericidal at high concentrations. The ability of an oral rinse to be retained in the oral cavity and maintain potency over an extended length of time has been debated. Lang stated the substantivity of an antimicrobial agent needs sufficient contact time with a microorganism in order to inhibit or kill it.17CHX, with a substantivity of 12 h is considered to be highly effective; whereas, the substantively of herbal mouth rinse is unknown.

Conclusion

Both 0.2% chlorhexidine gluconate and herbal mouthwashes can be effectively used as an adjunct to mechanical plaque control in the prevention of plaque and gingivitis. However, owing to the side effects reported due to theuse of chlorhexidinemouthrinse and biocompatibility and well acceptance of herbal mouthwash by the subjects, it can be effectively used as an alternative to chlorhexidinemouthrinse.

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