

Comparative Evaluation of Chlorhexidine and Hydrogen Peroxide Mouth Wash among Patients with Gingivitis

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Abstract:- Goals and Purpose: The purpose of this study was to compare the effectiveness of chlorhexidine (CHX) and hydrogen peroxide (H₂O₂) mouthwash on individuals with chronic periodontitis. **Materials and Procedures** A total of 51 patients with advanced gingivitis were selected. Three groups of subjects were created and distributed evenly. SRP and 0.2% CHX gluconate mouthwash were administered to Group I twice daily for 14 days. Scaling and root planning (SRP) was administered to patients in Group II in addition to 1.5% H₂O₂ mouthwash over a 14-day period, while SRP was administered to patients in Group III. Patients in all groups had their gingival index and plaque index measured on days 0, 7, and 14, respectively. Using Student's paired and unpaired 't' and oneway ANOVA (Analysis of Variance) tests, the statistical analysis for comparisons between and within groups was carried out. Statistics were considered significant at P values less than 0.05. R (version 4.1.2) is used to conduct the complete analysis. **Results:** The gingival plaque index was significantly reduced by both CHX gluconate and H₂O₂ mouthwashes, but not as much as in the control group. Combining mouthwash with 0.2% CHX gluconate was an efficient treatment for participants with severe SRP in lowering the gingival index and plaque index. **Conclusion:** CHX gluconate was found to be more effective than H₂O₂ at reducing plaque and gingival index.

Keywords:- Chlorhexidine gluconate, gingivitis, hydrogen peroxide.

I. INTRODUCTION

Periodontal diseases are infections of the structures surrounding the teeth. These include the gingiva, the cementum that covers the root, the periodontal ligament and the alveolar bone.

Approximately 95% of the Indian population suffers from periodontal disease. In the earliest stage of periodontal disease, gingivitis, affects only gingiva. In more severe forms of the disease, all of the supporting tissues are involved. The etiology of dental disease mainly involves dental plaque.¹

It is widely acknowledged that dental plaque plays a part in the development of dental disorders. As a result, one important objective of periodontal therapy is the treatment and prevention of gingivitis.

There is proof that bettering oral hygiene and gingival health has been linked to a drop in the prevalence of periodontal disease.

The mainstay of primary and secondary prevention of periodontal diseases is the control of supragingival plaque, which involves mechanical and chemical plaque control as first line options. This is because plaque-induced gingivitis always precedes the occurrence and recurrence of periodontitis,² and prevention of periodontal disease, including gingivitis and periodontitis, has been defined as a multistage process.

Until now, mechanical cleaning has been the most popular technique for reducing supragingival plaque, and it works well in regions where plaque deposits may be accessed.

There is evidence to suggest that the majority of patients may not have the motivation or skills necessary to use oral hygiene tools including toothbrushes, dental floss, toothpicks, and interdental brushes. Inadequate oral hygiene is a concern for some groups of people, such as those who are temporarily impaired, such as non-ambulatory patients and handicapped people. Thus, it would be desirable to find a different approach to plaque control. Chemical control may therefore be necessary.

It has been demonstrated that the antibacterial mouthwash chlorhexidine (CHX) dramatically lowers gingival inflammation, plaque, and gingival bleeding indices. Schroeder originally looked into the CHX's ability to prevent plaque in 1969. At pH values higher than 3.5, it is a strong base, dicationic, and bisbiguanide antiseptic. It is an antiplaque and an antigingivitis agent because it prevents the buildup of plaque. Gram-positive and gram-negative bacteria as well as yeast are bactericidal to CHX (such as those responsible for oral candidiasis). Its substantivity is what gives CHX its outstanding antiplaque effect and makes it the gold standard.⁵

H₂O₂ was used for the first time in dentistry in 1913. It has oxidising properties. The release of oxygen is the currently recognised mechanism for its antibacterial action, and both gram-positive and gram-negative pathogens exhibit harmful effects. H₂O₂ has been demonstrated to pierce the biofilm's protective slime matrix and to debride the bacterial cell walls.⁶

The goal of the current study was to assess the effects of mouthwash containing 1.5% hydrogen peroxide and 0.2% chlorhexidine gluconate on gingivitis.

II. MATERIALS AND METHODS

This 15 days duration study was conducted in the department of Periodontics, AJ Institute of Dental Sciences. A total of 51 subjects participated in the study. The patients were informed about the study and a written consent was obtained. Clearance was obtained from the institutional ethical clearance committee.

Inclusion criteria for selection of the participants were aging between 18 to 25 years, having minimum of 20 teeth, plaque score of >2 (Silness and Loe index) and Gingival score of >2 (Loe and Silness index).

The exclusion criteria were history of systemic diseases, history of antibiotic or periodontal therapy in the past 3 months, history of any allergy, using any other chemotherapeutic anti plaque or anti gingivitis agents or products, severe malalignment of teeth, undergoing orthodontic treatment, full mouth fixed partial dentures or removable partial dentures.

III. METHODOLOGY

According to the plaque index and gingival index, baseline information on the plaque and gingival status was evaluated.

After receiving instruction in the modified Bass technique for brushing teeth, all participants were randomly divided into three groups with 17 people in each group:

- Group A – SRP + 0.2% chlorhexidine gluconate mouthwash (experimental group)
- Group B – SRP + 1.5% Hydrogen peroxide mouthwash (experimental group)
- Group C – Scaling and root planning alone.

Allocation concealment was done about the mouthwashes that were given to the participants using a numerical code to represent the mouthwash.

MOUTHWASH 1 for 0.2% chlorhexidine gluconate mouthwash

MOUTHWASH 2 for 1.5% Hydrogen peroxide mouthwash

The mouthwashes (110 milliliters) were then distributed among the participants during each successive visit. Written instructions regarding the use of the mouthwash was provided to the participants.

All the participants were instructed to rinse twice daily with 5 ml of the allocated mouthwash (undiluted) for 30 seconds, after 30 minutes of toothbrushing. Subsequent rinsing with water was not allowed for 20 minutes, after mouthwash use. They were provided with measuring cups with 5 ml marking in order to use the correct volume of mouthwash. The mouth rinsing was performed at home.

For the control group, scaling and root planning was done. However, no mouthwashes were dispensed in this group.

All the participants were asked to brush their teeth with a soft nylon toothbrush and a nontherapeutic, low-abrasive dentifrice. Participants were instructed to visit back at the 7th and 15th day for subjective examination. At both the recall visits, plaque and gingival indices were recorded. The participants were instructed to follow the routine plaque control measures as before including the use of mouthwash.

IV. STATISTICAL ANALYSIS

Student's paired and unpaired 't' tests as well as oneway ANOVA (Analysis of Variance) tests were used in the statistical analysis for inter- and intra-group comparison. A statistically significant P value was defined as less than 0.05. The R (version 4.1.2) programming language was used for the entire analysis.

V. RESULTS

At baseline no significant difference is observed in the PI and GI in all the three groups ($p > 0.05$).

In Group I, baseline to seven days and baseline to fourteen days are compared, and it is seen that the PI value decreases from 2.32 0.30 to 1.25 0.23 at seven days and from 0.88 0.24 at the end of fourteen days, respectively. The GI value, meanwhile, decreases from 2.32 0.30 to 1.28 0.28 at 7 days to 0.83 0.21 at the end of 14 days, respectively. From baseline to 14 days, the overall percentage reduction in PI was 62.06%, and the reduction in GI was 64.22%. When an intragroup comparison for Group I was conducted, it was discovered that there was a statistically significant difference between baseline and day seven for both PI and GI ($p < 0.0001$). Both PI and GI showed statistically significant differences between baseline and 14 days and between 7 and 14 days ($p < 0.0001$).

When baseline to 7 days and baseline to 14 days in Group II are compared within that group, it is seen that the PI value decreases from 2.27 0.27 to 1.38 0.27 at 7 days to 0.98 0.19 at the end of 14 days, respectively. In addition, the value of GI decreases from 2.27 0.27 to 1.38 0.30 to 0.97 0.25 at the end of 14 days, correspondingly. The overall percentage decline in PI was 56.82% from baseline to 14 days, and the percentage decline in GI was 57.27%. There is a statistically significant difference ($p < 0.0001$) between the baseline and the treatment group in Group II for both PI and GI.

When baseline to 7 days and baseline to 14 days are compared within Group III, the PI value decreases from 2.39 0.30 to 1.58 0.20 at 7 days and from 1.22 0.21 at the end of 14 days, respectively. The GI value, meanwhile, decreases from 2.39 0.30 to 1.57 0.24 at 7 days to 1.24 0.22 at the end of 14 days, respectively. From baseline to 14 days, the overall percentage reduction in PI was 48.95%, and from baseline to 14 days, the overall percentage reduction in GI was 48.11%. When PI and GI are compared within Group II, a statistically significant difference (p

0.0001) is discovered from baseline to 7 days and baseline to 14 days.

When Group I and Group II were compared at the baseline, after 7 days, and at the end of 14 days, there was no discernible difference between the two groups. There is a noticeable difference for both at 7 and 14 days when comparing Group I and Group III with Group II and Group III. Both groups I and II exhibit a considerable reduction in PI and GI after 14 days, however when group II's side effects are taken into account, group I is the more effective therapy.

Table 1: Descriptive Statistics

	Baseline	7 days		14 days		% reduction from baseline to 14 days	
		GI	PI	GI	PI	GI	PI
Group I							
Mean	2.32	1.28	1.25	0.83	0.88	64.22%	62.06%
SD	0.30	0.28	0.23	0.21	0.24		
Group II							
Mean	2.27	1.38	1.38	0.97	0.98	57.27%	56.82%
SD	0.27	0.30	0.27	0.25	0.19		
Group III							
Mean	2.39	1.57	1.58	1.24	1.22	48.11%	48.95%
SD	0.30	0.24	0.20	0.22	0.21		

Table 2: PI and GI

	Baseline-7 day		Baseline-14 day		7 day-14 day	
	PI	GI	PI	GI	PI	GI
Group I						
Mean Difference	1.06235294	1.03235294	1.43882353	1.48588235	0.37647059	0.45352941
SD	0.24848364	0.23631	0.2247744	0.2104477	0.17510501	0.14084305
P Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Group II						
Mean Difference	0.89647059	0.89647059	1.29058824	1.29647059	0.39411765	0.4
SD	0.18698065	0.24178868	0.1782018	0.27515771	0.13906198	0.21213203
P Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Group III						
Mean Difference	0.81176471	0.81764706	1.16470588	1.15294118	0.35294118	0.33529412
SD	0.23948474	0.21861866	0.2498529	0.22670919	0.16999135	0.12217394
P Value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Table 3: Inter group Comparison (P values)

	Baseline	7 day		14 day	
		GI	PI	GI	PI
Group I Vs Group II	0.6699	0.3557	0.16504	0.07284	0.16327
Group I Vs Group III	0.4865	0.0032	0.00013	0.0000055	0.000085
Group II Vs Group III	0.24989	0.04403	0.019569	0.00316	0.00162

Table 4: Analysis of Variance

	Baseline	7 day		14 day	
	PI and GI	PI	GI	PI	GI
F value	0.6778	8.1661	4.8461	11.5983	13.7567
P value	0.5125	0.0009	0.0121	0.0001	0.0000

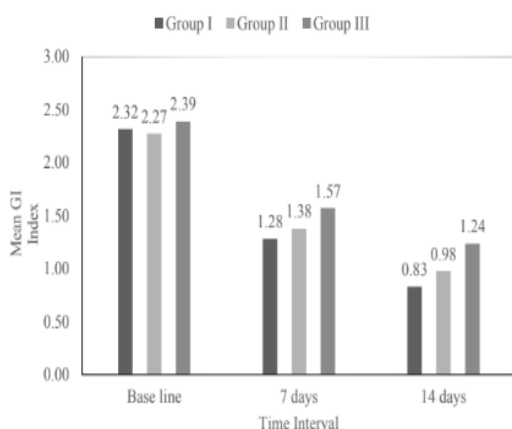


Fig. 1: Mean GI Score

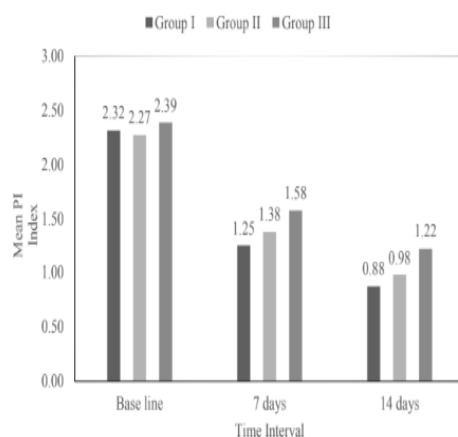


Fig. 2: Mean PI Score

VI. DISCUSSION

It is commonly recognised that dental plaque and gingivitis are related, and over time, professionals have emphasised how important it is to eliminate plaque efficiently. Mechanical plaque removal utilising a range of tools is still the main and most common way to avoid plaque and maintain good dental health. It has been discovered that chemical plaque control using a variety of chemotherapeutic medications is favourable and sought as an addition to mechanical techniques..⁹

Since it has had the greatest degree of success, chlorhexidine is currently the standard by which other potential antiplaque medications are assessed..⁹

Chlorhexidine (CHX) digluconate, which has been used as a potent, all-purpose antiseptic agent in medicine since 1950, is one of the most frequently used chemicals. It clearly has an antibacterial effect on fungi, certain viruses, and both Gram positive and Gram negative bacteria. It has also been demonstrated that CHX has a great affinity for oral surfaces and can halt the development of bacterial plaque for a number of hours. Additionally, CHX is a positively charged cationic bisbiguanide that can bind to a variety of negatively charged surfaces, including mucous membranes, the salivary pellicle on teeth, and a number of the bacteria, extracellular polysaccharides, and glycoproteins that make up the biofilm on tooth surfaces.

In vitro investigations show that low concentrations of CHX damage the cell membrane and allow low molecular weight chemicals to evade the bacteria. On the other hand, as the concentration of CHX rises, the proteins in the cytoplasm of the exposed bacteria precipitate and

coagulate. These properties prevent the growth of biofilms and restrict their spread..⁵

Hydrogen peroxide (H_2O_2) has been used in dentistry for more than 70 years, either on its own or in combination with salts. Therapeutic H_2O_2 administration requires mechanical access to subgingival pockets to prevent periodontal disease. Additionally, the antimicrobial qualities of H_2O_2 given topically promote wound healing following gingival surgery. The majority of subjects have been demonstrated to respond well to H_2O_2 concentrations above 1%.

H_2O_2 has a wide range of antibacterial activity since it is active against bacteria, yeasts, fungus, viruses, and spores. Another oxidant that has been utilised to manage plaque is H_2O_2 . Drugs that oxygenate the tissues can be utilised to treat acute ulcerative gingivitis and reduce supragingival plaque..⁶

The goal of the current study was to examine the effects of mouthwashes containing 0.2% chlorhexidine gluconate, 1.5% hydrogen peroxide, and scaling and root planing on gingivitis.

This study shows that all three groups show statistically significant decreases in both PI and GI scores on the 7th and 14th day of intragroup comparison.

However, in the intergroup comparison, neither Groups I nor II showed a statistically significant drop; only Group I did.

As a further form of SRP, rinsing with CHX can help achieve beneficial clinical results in the treatment of chronic periodontitis, according to the findings of the current experiment. The study's conclusions state that

Hasturk et al.'s study, which shown that H₂ O₂ mouthwashes decrease gingival inflammatory symptoms, produced similar results.¹³ Subgingival irrigation with 3% H₂ O₂ may assist to lessen gingival bleeding and control inflammation, according to a study by Sahebjam et al. The gingival index is dramatically reduced when CHX or H₂O₂ are added to SRP.¹⁴

Gusberti found that patients who rinsed with 0.12% chlorhexidine experienced a 95% reduction in gingivitis, a 100% reduction in bleeding sites, and an 80% reduction in plaque scores compared to patients who rinsed with a placebo. In contrast, as compared to the placebo group, the group using 1% hydrogen peroxide showed no discernible reduction in plaque scores, a negligible 15% reduction in gingivitis incidence, and a 28% reduction in bleeding sites. Plaque indexes between the study groups did not significantly differ since all patients received patient education and motivation. All groups were given instructions on maintaining good oral hygiene and preventing plaque.¹⁵

VII. CONCLUSION

The results of the current study demonstrate that

- There were no significant baseline differences in either PI or GI between the three groups.
- When intragroup comparisons were done for all three groups from baseline to 7 days and baseline to 14 days, the values of both PI and GI decreased.
- No statistically significant differences were found for either group at the baseline, 7 days, or 14 days when Group I and Group II were compared across groups. • After 14 days, PI and GI significantly decrease in both groups I and II. When comparing the mean differences, it can be seen that group I exhibits a greater difference than group II.

Within the limitations of this study, it can be concluded that both CHX and H₂O₂ can both be utilized as with SRP in patients with severe gingivitis. However, CHX outperforms H₂O₂ in terms of effectiveness. Further studies to clarify the effect of CHX, as well as H₂O₂, mouthwashes are recommended.

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