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ORIGINAL ARTICLE

Effectiveness of two commercially available mouth rinses on plaque and gingivitis – A comparative study

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ABSTRACT:

Introduction: There are many bacteria that are present in the mouth which cannot be eliminated properly with daily routine brushing and can still be present in the preservation of healthy dental and periodontal tissues. The development of gingivitis begins with plaque build-up and the end result will be periodontitis. The human mouth is considered as the mirror of the body and the health of the oral cavity is directly related to the individual's systemic health. Periodontitis or the disease affecting the periodontium is the most frequent oral diseases in the world. It includes a bacterial inflammatory process in the periodontal tissue that results from the accumulation of dental plaque on the external surface of the tooth. It is widely accepted theory in dentistry that plaque containing a combination of pathogenic micro-organisms is a principal etiological factor which is directly associated with periodontal disease. Active agents that have shown effective in clinical trials include chlorhexidine and an oral rinse containing phenolic compounds (Listerine). Recently, the American Dental Therapeutics has adopted "guidelines for acceptance of chemotherapeutic products for the control of supragingival dental plaque and gingivitis", So far, only 2 agents have been recognised by this council: Chlorhexidine and Listerine. **Materials and Methodology:** Among 180 subjects, 88 males and 92 females were included and all of whom were in the age group of 21-35 years. The subjects had a published high standard of oral hygiene and gingival health, with the probing depths of more than 2mm. The status of the periodontium at time of selection as well as the age range of the individuals was quite similar in all groups. The subjects were divided into 3 groups. Group A, Group B and Group C. All of the above group consisted of 60 subjects each. Group A (n=60)-Rinsed with 0.9% sterile saline solution. Group B (n=60) - Rinsed with Phenolic compound (Listerine) Group C (n=60) - Rinsed with 0.2% Chlorhexidine digluconate. Since the study has a double-blind design, all solutions had the uniform colour and were kept in the same kind of bottle. The manufacturers were requested to give the examiner the same colour for all the 3 formulations. **Results:** Table 1 displays the age distribution among the subjects in the age range of 21 – 35 years. The samples were age matched with P value being P=0.158. Table 2 depicts the gender distribution in Group A, Group B, Group C. Males and females were equally matched and has a P> 0.05. Table 3 shows comparison of plaque scores between the three groups after the first week. Plaque score is reduced in Group C and group B than Group A in second, third and fourth week consecutively but reduction of plaque score is higher in Group C than Group B whose significance is showed by Tukey test. Table 4 throws the comparison of gingival scores between the three groups after the first week. Gingival score is reduced in Group C and group B than Group A in second, third and fourth week continuously but reduction of plaque is higher in Group C than Group B whose significance is showed by Tukey test. **Conclusion:** This study concluded that both a 0.2% chlorhexidine and a phenolic mouth rinse significantly reduced plaque growth and gingival inflammation when compared to a placebo mouth rinse. But the chlorhexidine rinse was more effective against plaque regrowth than the phenolic rinse. The role of mouth rinses as an adjuvant to normal oral hygiene needs reassessment and reassurance given the paucity of data reiterating the long-term unsupervised use of these products mostly.

Keywords: mouth rinse, chlorhexidine, listerine, anti-plaque, gingivitis

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INTRODUCTION

There are many bacteria that are present in the mouth which cannot be eliminated properly with daily routine brushing and can still be present in the preservation of healthy dental and periodontal tissues.[1] The development of gingivitis begins with plaque build-up and the end result will be periodontitis.[2] In this criterion, much research has investigated the efficacy of several types of mouthwash, which are designed to improve plaque build-up and lowers the development of gingivitis. Mouth rinses containing alcohol, as well as essential oils (E.O.), have been shown to offer beneficial effects on plaque and gingivitis index, where it seems to significantly improve oral health six months after use.[3,4] There are variety of mouthwashes containing natural compounds (NCCM) versus E.O. mouthwash (Listerine®) demonstrated their great effectiveness for plaque control.[4,5]

The human mouth is considered as the mirror of the body and the health of the oral cavity is directly related to the individual's systemic health. Periodontitis or the disease affecting the periodontium is the most frequent oral diseases in the world. It includes a bacterial inflammatory process in the periodontal tissue that results from the accumulation of dental plaque on the external surface of the tooth. It is widely accepted theory in dentistry that plaque containing a combination of pathogenic micro-organisms is a principal etiological factor

which is directly associated with periodontal disease. Although mechanical plaque control can effectively prevent gingivitis if judiciously applied, the wide spread of gingivitis existing in the general population suggests that additional measures may prove beneficial and inevitable. Chemotherapeutic agents have also been shown to be useful adjuncts to daily oral home care in the control of plaque and gingivitis.[6]Early in the 1960's, the preventive and therapeutic studies of oral antimicrobials began to shift from caries, which was beginning to respond dramatically to fluorides, to gingivitis and periodontitis - where plaque and calculus were considered the dominant etiologic factor in periodontal diseases. The plaque and mineral deposits (calculus) were the target and a number of antimicrobial agents were examined to test their effectiveness.

Active agents that have shown effective in clinical trials include chlorhexidine and an oral rinse containing phenolic compounds (Listerine). Recently, the American Dental Therapeutics has adopted "guidelines for acceptance of chemotherapeutic products for the control of supragingival dental plaque and gingivitis", So far, only 2 agents have been recognised by this council: Chlorhexidine and Listerine. The efficacy of Chlorhexidine and Listerine was compared in a study in which these mouthrinses were used as supplements to routine tooth cleaning measures. The maintenance of satisfactory standards oral hygiene for quite a long period of time by mechanical tooth cleansing measures are mostly laborious and efforts have therefore been made to utilize various chemical agents incorporated in mouth rinses and dentifrices as anadjunctive tool in the control of supragingival plaque.[2] Hence, this study is helpful in evaluating the efficacy of two commercially i.e., chlorhexidine and Listerine available oral rinses on plaque and gingivitis.

MATERIALS AND METHODOLOGY

175 patients were included in this double blinded, parallel study. Study participants include those reported to the OPD in the Hospital. The study was carried out for a 2months period. The following inclusion and exclusion criteria were used for the study.

Inclusion criteria Patients with all 32 permanent teeth with the age group ranges from 21 – 35 years were considered. Exclusion criteria include those patients with systemic diseases were not considered. Grossly decayed, fully crowned or restored and orthodontically bonded teeth were excluded from the study. Subject with destructive periodontal disease or those under antibiotic or anti-inflammatory coverage were excluded from the study.

Among 180 subjects, 88 males and 92 females were included and all of whom were in the age group of 21-35 years. The subjects had a published high standard of oral hygiene and gingival health, with the probing depths of more than 2mm. The status of the periodontium at time of selection as well as the age range of the individuals was quite similar in all groups. The subjects were divided into 3 groups. Group A, Group B and Group C. All of the above group consisted of 60 subjects each. Group A (n=60)-Rinsed with 0.9% sterile saline solution. Group B(n=60) - Rinsed with Phenolic compound (Listerine) Group C(n=60)-Rinsed with 0.2% Chlorhexidine digluconate. Since the study has a double-blind design, all solutions had the uniform colour and were kept in the same kind of bottle. The manufacturers were requested to give the examiner the same colour for all the 3 formulations. The study was basically conducted in 2 phases:

- **Pretreatment phase**–It extends for a period 2 weeks. All the subjects were subjected to a thorough oral prophylaxis (scaling and rubber cup polishing) before entering into this phase to remove all plaque, calculus and extrinsic tooth stains. A period of two weeks was allowed to obtain realistic and objective levels of plaque and gingival health. Oral hygiene instructions were given by the chief examiner to all subjects in order to standardize the oral hygiene protocols. Similar brush and paste were provided to all the subjects. All subjects were continued to practice regular, non-supervised oral hygiene. All were therefore placed in a same scenario at day 14-scaling, polishing, new toothbrush and identical dentifrice
- **Treatment phase**– This part of the phase lasted for 28 days. Subjects were startedwith a regimen of rinsing with 10 mL of the assigned products for 60 seconds(1minute) twice daily, starting from the day 1 of the treatment phase. 10mL graduated dispenser were provided to all the study participants. The subjects were asked to rinse twice daily, once in the morning soon after breakfast and in the night, after dinner and before going to bed. The rinses were given to the study subjects for duration of one week in calibrated quantities. For the entire study period, the rinsing was unsupervised. The subjects were asked to maintain a data chart of these unsupervised rinsing. Subjects were examined on the dental chair by the investigator.

Plaque Index (Turesky Modification of Quigley Hein Plaque Index(1970) Gingival Index (Loe and Silness) (1967). Subjects were screened at 0,7,14,21 and 28 days, Examination was carried out by a single investigator.

Chi square test has been used to find the homogeneity of gender distribution and lost to-follow up distribution between three groups, ANOVA has been used to find the significant change detected in plaque and gingival index between three groups with Post hoc Turkey test has been carried out to find pair wise significance. The statistical software namely SPSS

11.0 and Microsoft word and Excel have been used to generated graphs, tables etc.

RESULTS

Table 1 displays the distribution of ageamong the all subjects in the age range of 21 – 35 years. The samples were age matched with P value being P=0.158.

Table 2 depicts thedistribution of gender in Group A, Group B, Group C. Males and females were equally matched and has a P> 0.05.

Table 3 shows plaque scores comparison between the three groups after the first week. Plaque score is reduced in Group C and group B than Group A in second, third and fourth week consecutively but reduction of plaque score is higher in Group C than Group B whose significance is showed by Tukey test.

Table 4 throws gingival scores comparison between the three groups after the first week. Gingival score is reduced in Group C and group B than Group A in second, third and fourth week continuously but reduction of plaque is reportedly higher in Group C than Group B. Their significance is evaluated by Tukey test.

Table 1: Shows the age distribution of the group between ages 21-35 years. Samples are aged matched with P=0.158

Groups	Age in years	
	Range	Mean±SD
Group A	21-35	28.96 ±4.30
Group B	21-35	27.98 ± 4.39
Group C	21-35	27.42 ± 3.95

Table 2: Shows the gender distribution were equally matched p>0.05)

Groups	Gender	
	Male	Female
Group A	30 (50%)	30 (50%)
Group B	30 (50%)	30 (50%)
Group C	29 (48%)	31 (52%)

Table 3: Shows statistical analysis of reduction of plaque scores in Group C and Group B when compared to Group A after 1st week onwards however reduction of plaque is higher in group C than Group B in 2nd, 3rd, & 4th week subsequently.

Groups	Plaque index Mean ± SD			P - value
Baseline	Group A	Group B	Group C	
Week – 1	0.32±0.08 (0.15-0.47)	1.59±0.39 (0.95-2.18)	0.35±0.09 (0.13-0.97)	0.174
Week – 2	1.15±0.13 (0.94-1.39)	1.05±0.15(0.77-1.33)	0.98±0.39(0.31-1.56)	0.0177
Week – 3	1.57±0.35 (0.97-2.21)	1.30 ± 0.25(0.78-1.79)	0.87±0.31c (0.33-1.34)	<0.001
Week - 4	1.54±0.37 (0.95-2.18)	0.99 ± 0.23(0.62-1.33)	0.59±0.20c (0.23-0.93)	<0.001

Table 4: compare of gingival index between three groups showing a significant reduction of gingival scores in Group C and Group B when compared to Group A after 1st week onwards however reduction of plaque is higher in group C than Group B in 2nd , 3rd , & 4th week subsequently.

Groups	Plaque index Mean ± SD			P - value
	Group A	Group B	Group C	
Baseline	0.15±0.03 (0.04-0.16)	0.13±0.05 (0.03-0.22)	0.13±0.06 (0.03-0.26)	0.257
Week – 1	0.37±0.11 (0.15-0.58)	0.36±0.13 (0.13-0.62)	0.25±0.13(0.04-0.43)	<0.001
Week – 2	0.44±0.17 (0.19-0.80)	0.43±0.15 (0.17-0.71)	0.31±0.19(0.02-0.62)	<0.001
Week –3	0.53±0.19 (0.19-0.85)	0.49±0.19 (0.22-0.80)	0.37±0.19(0.08-0.71)	<0.001
Week – 4	0.58±0.21 (0.18-0.89)	0.55 ±0.16(0.27-0.80)	0.43±0.22(0.08-0.80)	<0.001

DISCUSSION

The major etiological factors that play a key role in initiation and progression of periodontal disease is the bacterial plaque. The role of microorganisms in the onset of gingivitis and evolution of periodontitis increased dramatically following the recognition of bacterial plaque as the major aetiology of chronic gingivitis. The relationship between themicro-organisms with periodontal disease has been established long ago. Based on the strong association between certain micro-organisms and periodontal diseases, the use of antimicrobial agents for the management has been increasing constantly.Most of the times, chemical therapy has been used

successfully as an adjunct to mechanical therapy.[8] Since its conception, chlorhexidine has proven its effectiveness beyond any arguments and the different formulations of chlorhexidine are used regularly for both general dental practice and teaching institutions.

In the pharmaceutical practice, chlorhexidine has been identified as the gold standard with which the efficacy of various other antiplaque agents is measured since it has set the benchmark in the effectiveness.[9] However the present study is a double-blind study, it was compulsory to ask all participants to use mouthwashes with same instructions, even if not according to the manufacturer'sprecautions. The result obtained was, both Listerine and Chlorhexidine groups showed a significant reduction in plaque accumulation as compared in the placebo group from second week onwards.

There had already beenfew studies on chlorhexidine and phenolics to make general observations. Chlorhexidine gluconate had created considerable interest in the dental fraternity since its introduction as a 20% mouthrinse in an experimental gingivitis study. It literally prevented plaque accumulation or development of gingivitis over the 21-day period even with no oral hygiene. The many subsequent studies have been reviewed in numerous publications. The acceptance by the Council on Dental Therapeutics was based on the 6-month studies that followed the Council's guidelines and used a mouthrinse containing 0.12% chlorhexidine gluconate.

Food and drug organisation has accepted selling the mouth rinse on prescription basis. In one of the studies, school children aged 10 to 12 years, plaque was reduced by 16% and gingivitis by 67% compared to placebo. In a second study performed on adults showed that plaque was reduced in 61% and gingivitis in 39%.[6] Listerine which is a combination of phenol related essentialoils is the prototype offirst-generation antibacterial mouthrinse. It gained a positive applauded from W.D. *Miller* as a "very useful and active antiseptic" against oral bacteria a century ago. Mouthrinses have not been taken seriously by the dental profession. The conventional wisdom considered them as cosmetic adjuncts with transitory effects.[10]

Although numerous antiplaque, anti-gingivitis studies have been conducted with first generational agents, the largest amount of work has been presented with Listerine antiseptic mouth rinse. Short term studies in the early 1970s and long term in the 1980s lead to acceptance by the council of Dental Therapeutics. In the long-term studies, the reduction of plaque varied from 14% to 34% when compared to placebo and the reduction in gingivitis ranged from 22% - 34%. There were no mucosal aberrations or development of extrinsic stainsobserved in these studies. Some patients noted with initial burning sensation but they got accommodated usually within few days after use.[11] In general, the level of reduction in plaque and gingivitis seen with chlorhexidine is higher than that noted for the phenolic mouth rinses. This must be balanced against the characteristic discolouration of chlorhexidine to form a yellowish-brown stain on teeth and tongue, on composite restorations and on artificial teeth. Even after 20 years of research on analogues and modifications in formulation, staining seems to be a problem. The stain and calculus resulted from chlorhexidine, is of course reversible by professional prophylaxis and hence it is only a intermittent deterrent but it pose some concern to few people.[1]

The study sample was obtained from a homogenous population based on age. During the course of this study, it was imperative that there was very little knowledge about the influence of mouthrinses on plaque and gingivitis. The data from this study is completely relatable with the findings from several studies and confirm that both Chlorhexidine and Listerine are highly efficacious in reducing plaque and gingivitis, but Chlorhexidine is proven to be a step further better than Listerine.[11] The findings from the previous study demonstrated the beneficial effects of chlorehexidine digluconate and Listerine antiseptic in terms of plaque inhibitionin this study. This finding from the previous study demonstrated that the 0.2% chlorhexidine rinse possess greater oral hygiene benefits than the phenolic rinse.[1] The data of this study also correlated with the above results. In a previous study, the mean GI scores at day 21 in the chlorhexidine group were significantly lower than the scores in the placebo group.[9] This study also supported the similarresults. In a previous study it was observed that the 0.12% chlorhexidine digluconate was superior to Listerine in its ability to maintain optimal gingival health during the entire three weeks of mouth rinse use.[13] A similar results were found in this study as well. The result of a previous study depicted that Listerine antiseptic mouth rinse significantly reduced the development of plaque and gingivitis at 1, 6 and 9 months, as compared to its water control.[14] The feedings of this study also represented the same factor.

CONCLUSION

This study concluded that both a 0.2% chlorhexidine and a phenolic mouth rinse significantly reduced plaque growth and gingival inflammation when compared to a placebo mouthrinse. But the chlorhexidine rinse was more effective against plaque regrowth than the phenolic rinse. The role of mouthrinses as an adjuvant to normal oral hygiene needs reassessment and reassurance given the paucity of data reiterating the long-term unsupervised use ofthese products mostly.

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