World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 6.129

EFFICACY OF ANTIMICROBIAL AGENTS IN REDUCTION OF ORAL BIOFILM

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Article Received on 04/10/2019 **Article Revised on 25/10/2019** **Article Accepted on 15/11/2019**

ABSTRACT

Objective: The objective of this article is to compare the antimicrobial activity of commercially available antiseptic mouth rinse and to determine the clinical relevance of the evidence. **Materials and methods:** Two mouth-rinses – Chlorhexidine 2% (CHX) and Listerine mouthwash were used to test among 20 individuals, by dividing them into two groups with 10 members in each group. Each individual were first tested by applying Disclosing agent before and after the use of mouth-rinse to check for plaque accumulation and to determine the amount of plaque reduction. **Result:** CHX 2% is still considered as the gold standard antimicrobial mouthwash because of its broad spectrum of bacterial activity and prolonged substantivity of approximately 12 h. Descriptive statistics including mean and standard deviation were calculated for two groups. T-Test was determined and the result was relatively significant at a value of $P < 0.05$. **Conclusion:** In the present study, Chlorhexidine is considered as most effective anti-microbial agent, compared with Listerine. And Chlorhexidine is best suitable for bed ridden patients compared to other commercially available mouthrinse in order to promote oral health, reducing oral plaque accumulation in them.

KEYWORDS: Chlorhexidine, substantivity, mouthrinse.

INTRODUCTION

The human mouth is generally a host of collection of microorganisms including bacteria, viruses, fungi and protozoa. Dental biofilm is a three-dimensional structure of bacterial communities adhered to the tooth surface The dental bio film forms in a structured way with pioneer species able to colonise pellicle-coated enamel followed by secondary plaque formers such as Fusobacterium nucleatum that have the capability of co-aggregating with a range of other genera and species.[1]

It has become increasingly clear that the oral cavity can act as the site of origin for dissemination of pathogenic organisms to distant body sites, especially in immunocompromised hosts such as patients suffering from malignancies, diabetes, or rheumatoid arthritis or having corticosteroid or other immunosuppressive treatment.[2] A number of epidemiological studies have suggested that oral infection may be a risk factor for systemic diseases. Several antimicrobials have been tested as adjuncts to mechanical plaque control in order to improve the results obtained with oral home care. Chemical antimicrobials can reach difficult-to-clean areas such as interproximal surfaces and can also impact the growth of biofilms on soft tissue.[3]

Mechanical plaque control is not properly practiced by most individuals. A survey conducted in the United Kingdom concluded that an average of one-third of teeth in 72% of all dentate adults examined had visible plaque.[4] Brushing techniques are particularly limited in their access to interproximal plaque of pre-molars and molars, and control of biofilm accumulation on these areas requires additional devices such as dental floss.[5] These agents have a positive track record of safety and their use does not seem to increase the levels of resistant species.[6] The adjunct use of antimicrobial agents might be beneficial for the adjunct control of supragingival biofilms.[7]

Hence the purpose of this study is to compare the antimicrobial activity and effectiveness of Chlorhexidine 2% and Listerine mouth rinse.

METHOD

A total of 20 individuals were selected from Department of Periodontics, Thai Moogambigai Dental College and Hospital, Dr.M.G.R educational and research institute, Chennai, TN, India. Two mouth-rinses – Chlorhexidine 2% and Listerine mouthwash were used to test among 20 individuals, by dividing them into two groups, 10

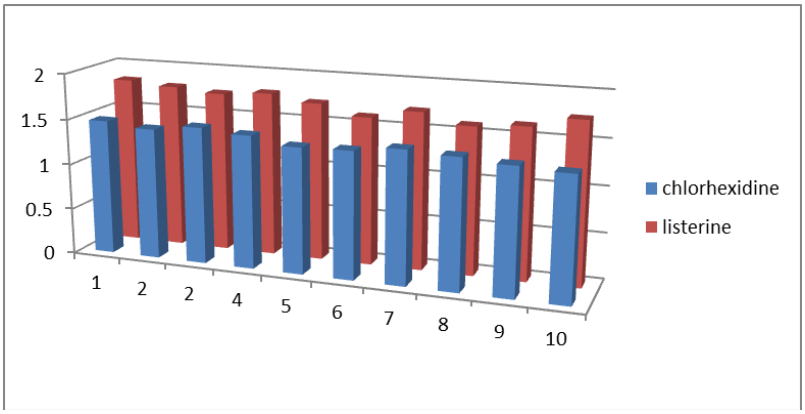
members in each group. Group I tested with Chlorhexidine 2% and Group II with Listerine. The individuals were briefed about the study and the consent was obtained. Ethical committee approval was obtained from university. They were asked to stay away from brushing for 2 days and they were tested for plaque accumulation.

Dental plaque identification with the help of disclosing agents is one of the easiest and fastest ways to diagnose dental plaque. At first the patient is asked to rinse his mouth well to remove all food substance and heavy saliva. Then the water based solution (disclosing agent) is applied cautiously so that the lips don't get stained. And the solution is applied with the help of swab or small cotton pellet. The solution is applied to all the crowns of the teeth. Clean tooth surfaces do not absorb the colouring agent. When the bacterial plaque is present, they absorb the agent and are disclosed. The amount of plaque on the tooth surface is recorded using ramfjord plaque index. And then after half an hour the individual is asked to use a mouthwash and gargle his mouth. The two groups were asked to rinse their mouths for 60 seconds by swish and spit method & they were asked to rinse with 30ml volume of mouthwash. Now again the individual is checked for plaque accumulation using plaque index. They were again tested using disclosing agent. The present value of the plaque index removing the plaque deposits determines the efficacy of Chlorhexidine verses Listerine.

RESULT

According to the results of this study, the full concentration of CHX on microorganisms had higher antimicrobial effect than Listerine. Descriptive statistics including mean and standard deviation were calculated for two groups. T-Test was determined and the result was relatively significant at a value of $P < 0.05$.

Two mouth rinses with consistent antiplaque effect: Chlorhexidine 2% and Listerine mouthwash were used to test among 20 individuals, the results for each individual before and after the use of mouth rinse was examined and the results were calculated by Ramfjord plaque index and statistical analysis was done. Plaque reduction demonstrated a reduction of biofilm of about 1.416% in CHX and 1.719% in Listerine. These results are shown in Graph 1.

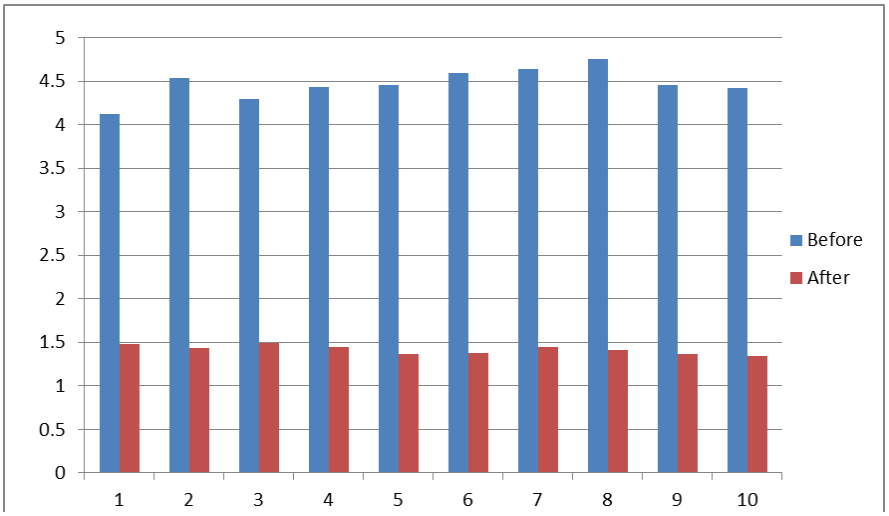


Graph 1: This graph shows that among the 20 individual who participated showed that the reduction of biofilm is greater in CHX. Along x-axis is the number of individuals who participated and along the y-axis is the percentage of plaque accumulation.

Table 1 presents the antiplaque effect before and after the use of CHX in group one with 10 individuals. And the results are tabulated and drawn in graph 2.

Table 1: Antiplaque effect before and after the use of CHX (GROUP 1).

S. No	Name of the patient	Duration	Plaque index	
			Before	After
1.	KOUSALYA	60 sec	4.12	1.48
2.	RAJA	60 sec	4.53	1.43
3.	SAI	60 sec	4.29	1.49
4.	KRIPA	60 sec	4.43	1.45
5.	LAKSHMI	60 sec	4.45	1.37
6.	ADHI	60 sec	4.59	1.38
7.	SESHADRI	60 sec	4.64	1.44
8.	DINESH	60 sec	4.75	1.41
9.	DHANALAKSHMI	60 sec	4.45	1.37
10.	ANUSHA	60 sec	4.42	1.34

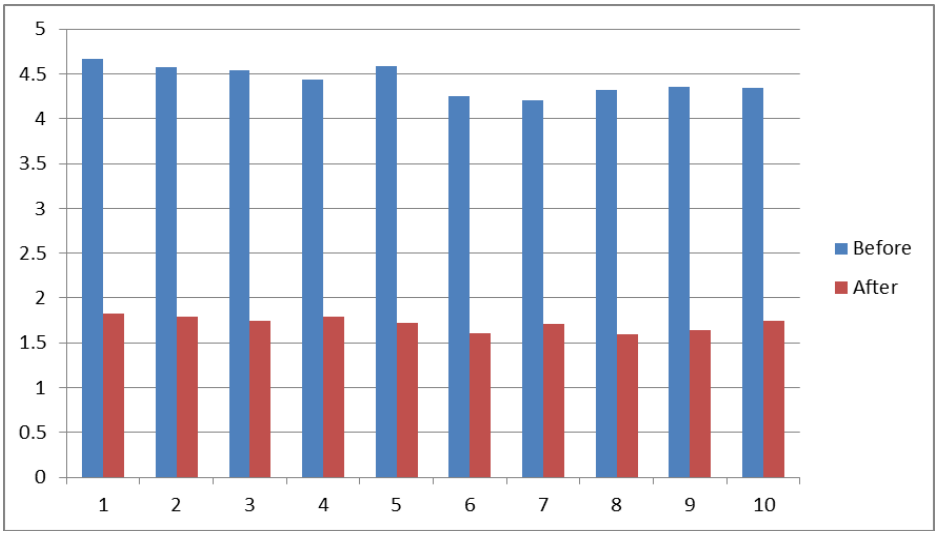


Graph 2: This graph shows the 10 individual who were tested with CHX. Along x-axis is the number of individuals who participated and along the y-axis is the percentage of plaque accumulation.

Table 2 presents the antiplaque effect before and after the use of LISTRINE with 10 individuals. And the results are tabulated and drawn in the graph 3.

Table 2: Antiplaque effect before and after the use of Listerine (GROUP 2).

S. No	Name of the patient	Duration	Plaque index	
			Before	After
1.	SHEELA	60 sec		1.83
2.	GANASEN	60 sec	4.57	1.79
3.	PRIYANKA	60 sec	4.54	1.75
4.	SRINIVASAN	60 sec	4.44	1.79
5.	SRIDHAR	60 sec	4.59	1.72
6.	SANKARAN	60 sec	4.25	1.61
7.	PANDY	60 sec	4.21	1.71
8.	DILIBABU	60 sec	4.32	1.6
9.	ULAGANADHAN	60 sec	4.36	1.64
10.	VINOTH	60 sec	4.34	1.75



Graph 3: This graph shows the 10 individual who were tested with LISTRINE. Along x-axis is the number of individuals who participated and along the y-axis is the percentage of plaque accumulation.

Among the 2 mouth rinses formulations, CHX with active ingredients was found to be more effective. CHX is still considered as the gold standard antimicrobial mouthwash because of its broad spectrum of bacterial

activity and prolonged substantivity of approximately 12 h. Listerine which is considered as an good adjuvant in relation to Chlorhexidine, which is relatively significant on comparison with Listerine.

DISCUSSION

Dental plaque forms naturally on the teeth, in the absence of adequate oral hygiene it can accumulate beyond the levels that are compatible with dental health and at susceptible sites dental caries or periodontal disease or both can occur. Effective removal of dental plaque is one of the main strategies for the prevention of these two diseases.[11] Although many antimicrobial agents would appear to be suitable for plaque control, only few have been found to possess clinical efficacy. This is because many of the antimicrobial agents lack as the property of substantivity and lack efficacy against oral microorganisms.[12]

The analysis of the articles revealed that 0.2% chlorhexidine is more effective as an antiplaque agent than Listerine. In in vitro observation among the seven mouth rinse carried out by Roopavathi Kallahalli Mruthyuenjaya.[8] has proved that CHX is the best anti-microbial mouthrinse. Similarly CHX was significantly better at reducing plaque accumulation than essential oil mouthwash in short-and long-term studies conducted by Neely AL[9] and Zheng CY, Wang ZH investigate the effects of chlorhexidine (CHX), Listerine and Fluoride Listerine on putative root-caries pathogens in the biofilm in the artificial mouth model. The total number of bacteria in the CHX group was significantly lower than in the other three groups (including control). There was no decline in the number of bacteria in the Listerine group. S. mutans was reduced significantly in the CHX group compared with the control group.[10] The present study Chlorhexidine and Listerine which delivers a result of Chlorhexidine showed an increase in removal of plaque, when compared with Listerine, which was similar.

These studies which have been conducted earlier have also proved that CHX to be the best antimicrobial agent when compared to any other mouthwashes.

CONCLUSION

The study between 2 mouthwashes has demonstrated a significant reduction on the amount of plaque in the oral cavity. But CHX 0.2% showed an increase than Listerine in inhibiting sub gingival plaque formation and hence prevents development of periodontal problems and dental cries.

Chlorhexidine is not only an excellent antiplaque agent but it also possesses very good antimicrobial properties. Its broad antimicrobial spectrum can be considered as boon for maintaining overall oral health. The present study had certain limitations as it is not conducted in layer samples. Further Longitudinal studies as a layer sample size could be helpful in determining the effectiveness.

REFERENCES

1. Kumar S, Patel S, Tadakamadla J, Tibdewal H, Duraiswamy P, Kulkarni S. Effectiveness of a mouthrinse containing active ingredients in addition to chlorhexidine and triclosan compared with chlorhexidine and triclosan rinses on plaque, gingivitis, supragingival calculus and extrinsic staining. Int J Dent Hyg, 2013; 11(1): 35–40. doi: 10.1111/j.1601-5037.2012.00560.x.
2. Aspalli S, Shetty VS, Devarathnamma MV, Nagappa G, Archana D, Parab P. Evaluation of antiplaque and antigingivitis effect of herbal mouthwash in treatment of plaque induced gingivitis: A randomized, clinical trial. Journal of Indian Society of Periodontology, 2014; 18(1): 48–52. doi: 10.4103/0972-124X.128208.
3. Bhate D, Jain S, Kale R, Muglikar S. The comparative effects of 0.12% chlorhexidine and herbal oral rinse on dental plaque-induced gingivitis: A randomized clinical trial. Journal of Indian Society of Periodontology, 2015; 19(4): 393–5. doi: 10.4103/0972-124X.153478.
4. Najafi MH, Taheri M, Mokhtari MR, Forouzanfar A, Farazi F, Mirzaee M, et al. Comparative study of 0.2% and 0.12% digluconate chlorhexidine mouth rinses on the level of dental staining and gingival indices. Dental research journal, 2012; 9(3): 305–8.
5. Leyes Borrajo JL, Garcia VL, Lopez CG, Rodriguez-Nunez I, Garcia FM, Gallas TM. Efficacy of chlorhexidine mouthrinses with and without alcohol: a clinical study. J Periodontol, 2002; 73(3): 317–21. doi: 10.1902/jop.2002.73.3.317.
6. Herrera D, Roldán S, Santacruz I, Santos S, Masdevall M, Sanz M. Differences in antimicrobial activity of four commercial 0.12% chlorhexidine mouthrinse formulations: An in vitro contact test and salivary bacterial counts study. J Clin Periodontol, 2003; 30: 307-14. Back to cited text no.
7. Morris AJ, Steele J, White DA. The oral cleanliness and periodontal health of UK adults in 1998. Br Dent J., 2001; 191(4): 186-92.
8. Roopavathi Kallahalli Mruthyuenjaya, Sanjay Venugopal, Chikkanayakanahalli Parashuramayya Sateesh, Darshana Bennadi, BV Renushree Antimicrobial efficacy of commercially available mouthrinses: An in vitro study 10.4103/2319-5932.195841.
9. Neely AL. Essential oil mouthwash (EOMW) may be equivalent to chlorhexidine (CHX) for long-term control of gingival inflammation but CHX appears to perform better than EOMW in plaque control. J Evid Based Dent Pract., 2012 Sep; 12(3 Suppl): 69-72. doi: 10.1016/S1532-3382(12)70017-9.
10. Zheng CY, Wang ZH. Effects of chlorhexidine, listerine and fluoride listerine mouthrinses on four

putative root-caries pathogens in the biofilm. Chin J Dent Res., 2011; 14(2): 135-40.
11. Axelsson P, Albandar JM, Rams TE. Prevention and control of periodontal diseases in developing and industrialized nations. Periodontol, 2002; 29: 235-46.
12. Peck MT, Africa CW, Stephen LX, Johan M, Abdul M. An in-vitro analysis of the antimicrobial efficacy of herbal toothpastes on selected primary plaque colonizers. Int J Clin Dent Sci, 2011; 2: 28-32.