

Efficacy of Different Concentrations of Chlorhexidine Mouthwash on Plaque Accumulation and Periodontal Parameters

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Abstract

Background and aims. Dental plaque and gingivitis were controlled by administration of chemical agents such as chlorhexidine (CHX) which is recognized as a gold standard of chemical agents. The aim of this study was to compare the effects of two mouthwashes (0.2% CHX and Kin Gingival) on clinical parameters.

Materials and methods. A total of 88 subjects were included in this interventional–experimental study. The subjects were divided into two groups of 44 (group 1: 0.2% CHX and group 2: Kin Gingival). The study involved no mechanical plaque control methods. Patients used the mouthwashes twice a day for two weeks. Clinical parameters included plaque index (PI), gingival index (GI), probing depth (PD) and bleeding on probing (BOP), which were measured before and after the use of mouthwashes. The results were analyzed by Man-Whitney U and chi-squared tests. Statistical significance was set at $P < 0.05$.

Results. The results indicated that PI, GI and PD significantly decreased in group 2 (Kin Gingival) in comparison with group 1 (0.2% CHX) ($P < 0.05$). However, the two mouthwashes did not differ significantly from each other in relation to BOP ($P > 0.05$).

Conclusion. Based on the results it can be concluded that Kin Gingival and 0.2% CHX mouthwashes decrease the clinical parameters in patients significantly. However, Kin Gingival is more effective than 0.2% CHX, which might be attributed to the synergic antibacterial potential of Kin Gingival ingredients like sodium fluoride.

Key words: Chlorhexidine, mouthwash, gingival parameters.

Introduction

Periodontitis is caused by bacteria which are found in dental plaque.^{1,2} Periodontal treatment

is focused on elimination of bacteria via mechanical means such as scaling and root planing (SRP). These methods, however, are difficult, time-consuming and

sometimes unsuccessful but could decrease or remove specific periodontal pathogens.³

Over the last two decades, treatment of local bacterial infections associated with gingivitis and periodontitis has been undertaken by locally delivered, anti-infective pharmaceutical agents. Chlorhexidine (CHX) is one of the most broadly used pharmaceutical products to control plaque and gingivitis. Many researchers have reported that CHX is safe and effective in inhibiting and controlling plaque formation, elimination of dental plaque, and preventing and decreasing gingivitis and its severity.⁴⁻⁶ CHX destroys the bacterial cell membrane by creating a leak or precipitating the cellular components.⁷ The antibacterial activity of CHX is related to the cationic molecule which is quickly contacted by negatively charged cell surface of bacteria. Then the integrity of the bacterial membrane cell is changed and severe membrane damage occurs.⁸ Also, some studies have evaluated the effect of CHX rinses, gels and varnishes on caries progression and treatment of periodontitis.⁹⁻¹² On the other hand, the side effects of CHX have been assessed^{13,14} and new mouthwashes as alternative products have been suggested. Kin Gingival (Kin, Spain) is a novel alcohol-free mouthwash that could prevent dental plaque formation and gingivitis; CHX is its principal ingredient. This product is composed of 0.12 g of chlorhexidine gluconate, 0.05 g of sodium fluoride, 0.06 g of sodium saccharin and 100 mL of excipient. Yousefimanesh et al compared antibacterial properties of three mouthwashes (Kin gingival, Behsa and Boht) and concluded that the Kin Gingival mouthwash was more effective than others.¹⁵ In addition, the manufacturer claims that Kin Gingival has positive clinical effects in comparison with CHX. Since on a small number of comparative studies have been undertaken on these mouthwashes, this study was designed to evaluate their effect on periodontitis.

Materials and Methods

Sample Size Determination

In this study, α error was accepted at 0.05 and the power of study was 80%. We considered 3 units for increasing the mean of PI. Totally 44 subjects were selected randomly for each group, from those referring to the Department of Periodontics, Faculty of Dentistry, Tabriz University of Medical Sciences. The patients included in this study signed an informed consent form and the study was conducted in compliance with the Iranian Registry of Clinical Trials (IRTC: TBZMED.rec.1393.444).

Inclusion criteria in this study were as follows:¹⁶ Patients with generalized mild to moderate chronic periodontitis, clinical attachment loss less than 5 mm at 30% of sites, clinical attachment loss less than 5 mm at 30% of sites, age over 15 years (due to puberty hormones). Exclusion criteria consisted of pregnancy, smoking, scaling and root planing during the previous 12 months before the baseline examination, systemic diseases, and allergy to 0.2% CHX.

The following clinical parameters were analyzed before and after administration of mouthwashes: plaque index with the use of disclosing agents according to Loe and O'Leary,¹⁷ gingival index according to Loe,¹⁸ probing depth, bleeding on probing (detected 30–60 seconds after insertion of probe into the periodontal pocket).

The participants were instructed on how to use the mouthwash. Group 1 used 0.2% CHX and group 2 used Kin Gingival mouthwash twice a day for two weeks.¹⁹ Intra-examiner calibration was carried out by examination of 5 patients twice, 48 hour apart before initiation of the study. Calibration was accepted if measurements at baseline and 48 hour were similar up to 1 mm at the 90% level.

Statistical analysis was carried out with descriptive statistical methods (mean \pm standard deviation) and Man-Whitney U and chi-squared tests using SPSS 13. Statistical significance was defined at $P < 0.05$.

Results

Of 88 patients, 51 subjects were male (58%) and 37 were female (42%). The majority of the patients (44.3%) were in the 51–60-year age group (Tables 1 and 2).

Table 3 shows the clinical parameters after use of Kin Gingival and 0.2% CHX. According to the results after use of Kin Gingival, PI, GI, PD and BOP decreased. In addition, after use of 0.2% CHX, PI, GI, PD and BOP decreased. Comparison of means \pm SDs of PI, GI and PD between the two groups

Table 1. Frequency of patients with respect to gender

	Number	%
Male	51	58
Female	37	42
Total	88	100

Table 2. Frequency of patients with respect to age

Age group	Number	%
15–30	7	7
31–50	30	34
51–60	39	44.3
>60	12	14.7
Total	88	100

Table 3. clinical parameters after usage of Kin gingival and CHX 0.2% and comparison the parameters

		Group 1: 0.2% CHX				Group 2: Kin Gingival				Comparison between groups	
		min	max	mean ± SD*	difference	min	max	mean ± SD*	difference	P < 0.05	
PI (%)	b**	51.7	79.3	68.4±5.2	- 4.2	43.3	86.4	74.3±8.4	- 4.9	Significant	
	t [#]	49.4	78.8	64.2±6.7		39.4	73.7	69.4±5.6			
	b**	1	3	2.1±0.03		0	3	1.4±0.11			
GI	t [#]	0	3	1.6±0.16	- 0.5	0	2	0.76±0.06	- 0.64	Significant	
	b**	2.5	5.5	4.2±0.41		3.5	6	4.9±0.61			
PD (mm)	t [#]	2	4.5	3.7±0.43	- 0.5	3.25	5.5	4.2±0.56	- 0.7	Significant	
		BOP (-)		BOP (+)		BOP (-)		BOP (+)			
BOP		%	NO.	%	NO.	%	NO.	%	NO.	-12	Non-significant
	b**	70.5	31	29.5	13	15	38.6	29	66		
	t [#]	47.8	21	52.2	23	27	61.4	17	34		

*standard deviation, **baseline, #treatment after two week

showed statistically significant differences ($P < 0.05$) but decreases in BOP between the two groups were not significant

Discussion

Mouthwashes are used for the chemical control of plaque. Among the mouthwashes, CHX has antibacterial effects against a wide array of gram-positive and gram-negative bacteria and is recognized as the gold standard for anti-plaque agents.²⁰ CHX is available in several forms such as digluconate, acetate and hydrochloride salts that are soluble in water. The side effects of CHX are related to discoloration of the teeth, restorative materials and dorsum of the tongue. Also, taste disturbances have been reported.²¹

Recently a new mouthwash formulation referred to as Kin Gingival has been marketed in Iran. The manufacturer claims that this product has more positive clinical effects than CHX. In this study, the effect of these two mouthwashes was evaluated on 88 patients with periodontitis. The results showed that PI, GI and PD decreased after the use of these two mouthwashes for 2 weeks. Statistical analysis exhibited significant differences between these parameters, with Kin Gingival exhibiting better effects than 0.2% CHX on the parameters. This positive effect may relate to sodium fluoride ingredient of Kin Gingival. BOP in the two groups decreased but insignificantly.

In the same study, anti-plaque efficacy of Kin Gingival and Epimax mouthwashes was evaluated. Both these mouthwashes have 0.12% CHX and 0.05% sodium fluoride in their composition. The mean plaque index of the whole mouth, and mandibular and

the posterior region plaque were lower after using Kin Gingival compared to the Iranian product. These results indicated the positive effect of Kin Gingival, consistent with our results.²² However, Franco et al evaluated the effect of two CHX rinsing solutions (0.12% and 0.2%) on plaque and gingival bleeding and found no significant differences between the indexes evaluated.²³ In line with our results, comparison of antibacterial effects of different CHX mouthwashes (Livar, Behsa, Boht) was investigated on common oral microorganisms in vitro. The results showed that Kin Gingival mouthwash was effective than Behsa and Boht on oral microbial flora and was suggested to be used for chemical inhibition of plaque.¹⁵ Evaluation of clinical and microbiological variations related to CHX chip in chronic periodontitis patients showed that changes in GI, PD and clinical attachment level scores in selected teeth within the groups at different time intervals were significant ($P < 0.001$). This study suggested that local drug delivery via CHX chip improves the advantage of scaling and root planing in the treatment of chronic periodontitis.²⁴ Furthermore, clinical evaluation of periodontal tissue after treatment of 40 patients by drugs containing CHX indicated that CHX should be most frequently utilized as a drug adjunct for the treatment of classic periodontitis, particularly in forms that can be administrated directly into periodontal pockets.²⁰

Conclusion

Based on the results, it can be concluded that Kin Gingival and 0.2% CHX mouthwashes decrease PI, GI and PD indexes in patients significantly. However, the effect of Kin-gingival is more positive than 0.2% CHX which is related to the synergic effect of

Kin Gingival ingredients such as sodium fluoride.

Conflict of interests

No potential conflict of interests relevant to this article is reported.

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