Effect of Herbal Mouthwash and Chlorhexidine Mouthwash on Antiplaque

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Abstract

Gingivitis was one of the manifestations of an early sign of gum disease occurring once the plaque accumulation found between teeth and gum and this was one of problems remaining in people of all ages. According to a survey of oral health in Thai population by the Ministry of Public Health of Thailand 2014, they said that the prevalence of 15 years old children who develop gingivitis accounted for 53.6 percent. When it came to prevention, gingivitis could be prevented by appropriate mechanical and chemical plaque control. However, a number of studies report that only mechanical plaque control could eliminate plaque ranging from 40 to 50 percent. Therefore, applying both methods could be more effective. Based on several clinical trials, 0.12% chlorhexidine mouthwash was the most widely used over the counter product and being a gold standard mouthwash. The previous study showed that chlorhexidine was effective for antiplaque. However, it also had several side effects in the long term use. Herbs had been widely used in daily products and dentistry as well, as there were many herb supplement products which might cause fewer side effects. This study was aimed to compare the effectiveness of herbal and chlorhexidine mouthwash on antiplaque. Thirty qualified subjects were selected from inclusion criteria. They were assigned to both mouthwashes; Herbal mouthwash and 0.12% chlorhexidine (C-20). Also a dental prophylaxis program was previously provided. Plaque index (PI) were measured in pre-intervention and post-intervention statistical analysis by paired t-test. Additionally, Wilcoxon signed rank test analyzed the pre-intervention and post-intervention between group. Using herbal mouthwash and 0.12% chlorhexidine (C-20) could reduce plaque accumulation statistically significance while the difference between their effects is not statistically significance. In conclusion, the antiplaque effect of herbal mouthwash could be compared to chlorhexidine mouthwash. (p-value > 0.05).

Keywords: antiplaque, herbal, chlorhexidine, mouthwash

1. Introduction

Gingivitis and periodontitis are the two major forms of inflammatory diseases affecting the periodontium. Their etiology is bacterial plaque leading to the destruction of the gingival tissues and periodontal attachment apparatus. The primary therapy aims to eliminate etiologic factors to reduce inflammation. Nowadays, mechanical plaque control and chemical plaque control are two methods that can eliminate the etiologic factors. The mechanical plaque control is the most effective method to reduce the dental plaque but there are a lot of studies showed that tooth brushing only remove about 40 percent to 50 percent of all plaques. Furthermore, mechanical plaque control requires an active cooperation of the patients. Several studies revealed that there was no single oral hygiene method suitable for all patients due to differences in the morphology of the dentition, oral health and the individual's skill. Another way to reduce the dental plaque is chemical plaque control which has property to decreased plaque accumulation. Chemical plaque control is mostly used in dentistry such as chlorhexidine mouthwash which is considered as a gold standard for a plaque control agent. Chlorhexidine has been clinically used as a broad spectrum antiseptic because it is effective against both Gram-positive and Gram-negative bacteria including aerobes, anaerobes, yeasts and fungi. (Eley, 1999) However, chlorhexidine also has certain side effects such as an unpleasant taste, alters taste sensation and produced brown staining on the teeth which are very difficult to remove. Natural or herbal mouthwash, on the other hand, was introduced as a mouth rinse for prevention of plaque. Herbal mouthwashes are reported on the antimicrobial effectiveness against microorganisms with anti-inflammatory effect that was shown to reduce gingival inflammation in an experimental gingivitis protocol (Teh, Rawi, Noor, Taib, & Mohamad, 2005). Natural herbs like aloe vera, glabra, tea polyphenol

etc., have been scientifically proven to be safe and effective medicine against various oral health problems like bleeding gums, halitosis, mouth ulcers and preventing tooth decay. Nowadays, Bambus valguris is a species of bamboo. Which was very famous to grow (Wahab et al., 2010). Bambus vulgaris had endless history for use as the medicine especially in China. The ingredient of bamboo included flavone, phenolic acid, lactones, amino acid and micronutrient. These were helped for fever, epilepsy, alcohol poison, asthma and pain. Moreover, in the case study found that ingredient of bamboo can be antimicrobial (Owokotomo & Owoeye, 2011). In the case study of anti-bacteria and gingivitis found that aloe vera can protect as same as chlorhexidine. The anti-bacteria effect of Aloe vera can inhibit Streptococcus mutans, Streptococcus sanguis, Actinomyces viscosus and Candida albicans reduced gingival index that show anti-inflammatory, antibacterial and wound healing (Karim et al., 2014). Tea polyphenol had an effect in promoting the proliferation of human periodontal ligament fibroblasts.The inhibitory effects of green tea polyphenols on the production of a virulence factor of the periodontal-disease-causing anaerobic bacterium (Lolayekar & Shanbhag, 2012). For this reason, it became popular substantially. Additionally, the adverse effect of herbal mouthwash cannot be found or reported till date (Nagappan & John, 2012).

2. Objective

1. To determine the effect of each mouthwash before and after use on antiplaque
2. To compare the effect of herbal mouthwash and chlorhexidine mouthwash on antiplaque

3. Materials and Methodology

This clinical study was performed at the Faculty of Dental Medicine, Rangsit University with the human ethic number RSEC 43/2559 approved by Ethical Committee of Research Institute of Rangsit University. A total of 30 systemically healthy subjects aged between 18 and 25 years old who had gingivitis with gingival index (Loe & Silness, 1963) within 1.1-2.0 and at least 20 teeth had been recruited. Subjects were equally and randomly assigned into two groups. The different mouthwashes were given to each group and prescribed for use 2 times per day for one month. Then, after the wash-out period, both groups were switched to use another one. Mouthwashes used in this study were 0.12% chlorhexidine-containing mouthwash (C-20 Blue Sally: chlorhexidine gluconate 0.12%) and herbal mouthwash (Bamboo mouthwash). Plaque index was initially measured to be used as baseline values. These indices were measured on the first visits performed with 30-45 days intervals. Exclusion criteria consisted of patients with systemic diseases (Hypertention, Diabetes meatus, Cardiovascular disease) or have a risk of periodontal disease such as diabetes and smoking, Subjects who have any fixed or removable orthodontic appliances or prosthesis had undergone periodontal treatment in the previous 6 months, allergy to any type of the mouthwashes, and mental handicap that could interfere with adequate oral hygiene performance.

Study population

A total of 30 subjects participated in the study received both mouthwashes, which were chlorhexidine -containing mouthwash and herbal mouthwash.

Data collection

Each index was measured by one observer in order to obtain intra-examiner calibration. Standardization of each index was performed by one investigator.

Index

The index used for assessing plaque accumulation was Quigley-Hain plaque index (Quigley-Hain, 1962). The index measures dental plaque that occurs in the areas adjacent to the gingival margin.

3.1 Study timeline

The first visit

- Oral prophylaxis (Scaling) was done for all 30 subjects.
- Oral hygiene instruction included Modified Bass brushing technique with soft toothbrush and fluoride toothpaste.

The second visit

- 30 - 45 days after oral prophylaxis

Clinical periodontal parameter which utilized Quigley–Hain plaque index was assessed on this day. Participants were randomly assigned into two groups; test group and control group. The test group was prescribed the herbal mouthwash. The control group was prescribed the chlorhexidine mouthwash.

All of the mouthwashes were contained in similar colored of bottles but labeled differently and after that randomly administered to the subjects by a blinded operator. The operator merely marked note of the code administered against the subjects' name. The subjects were unaware of which mouthwashes they had been administered. They were asked to rinse with half of the cap of mouthwash for 30 second after meals and before bedtime.

The third visit

- On the 30 days after using the first mouthwash, Quigley–Hain plaque index were assessed. Then the oral prophylaxis (Scaling) was provided again.

The fourth visit

- 30-45 days after oral prophylaxis were done and Quigley–Hain plaque index was assessed as the baseline for another mouthwash, then each group was switched to the second mouthwash.

The fifth visit

- On the 30-45 days after using the second mouthwash, Quigley–Hain plaque index were examined.

3.2 Data Analysis

To compare the effectiveness of two mouthwashes on antiplaque, Quigley–Hain plaque index was used as a dependent variable. The Shapiro-Wilk test was used to distinguish the normal distribution of the data. Since our data showed both normal and non-normal distribution data, the paired t-test which is a parametric test was used to analyze normal distribution data and the Wilcoxon signed rank test was used to analyze non-normal distribution data among the groups. P-value of less than 0.05 would be considered as a statistically significant.

4. Result

Of the 42 candidates, 12 of them did not want to participate or did not comply with the inclusion criteria. Most of the persons did not give a particular reason. The one who did, mentioned that she had a burning sensation of buccal mucosa after using one mouthwash. In addition, two persons moved their living place, and three persons received orthodontic treatment during the study. Therefore, there were 30 subjects remaining to participate the study.

The mean and standard deviation of plaque index for herbal mouthwash and chlorhexidine are presented in Table 1. Subjects in both interventions with the herbal mouthwash and chlorhexidine mouthwash had significantly changed in plaque index after a period of using mouthwashes. None of the subjects had any allergic reaction, discomfort, or signs and symptoms of abnormalities, with an exception of a participant's complaint about burning sensation at buccal mucosa, half of them complained on an unpleasant taste and smell when using the herbal mouthwash. Some complaints about brown grimy strand (diameter about the hairline) came out during the first 2-3 days of using this mouthwash. On the other hand, using chlorhexidine mouthwash, most of the participants had a complaint about an unpleasant taste and feeling of burning or numbness when overtime usage is presented.

The paired t-test revealed different among herbal mouthwash and chlorhexidine mouthwash in antiplaque presented in Table 2. The p-value of less than 0.05 would be considered as a statistically significant, p-value of 0.05 or higher indicates statistically non-significant difference. However, it has shown that neither of the plaque index was statistically significant different since the p-values were all > 0.05 in our study.

Table 1 The mean and standard deviation of plaque index for herbal mouthwash and chlorhexidine and the results of paired t-test and Wilcoxon signed rank test:

Groups	Index	Before-test		After-test		P-value
		Mean	S.D.	Mean	S.D.	
Herbal mouthwash	Plaque index	1.819*	0.679	1.229*	0.706	0.000 μ
Chlorhexidine mouthwash	Plaque index	1.620*	0.578	1.120*	0.451	0.000 π

* Highly statistical significant at p-value of 0.01

μ Wilcoxon signed rank test

π Paired t-test

Table 2: Paired t-test; Comparison of the mean of difference in plaque index among two mouthwashes

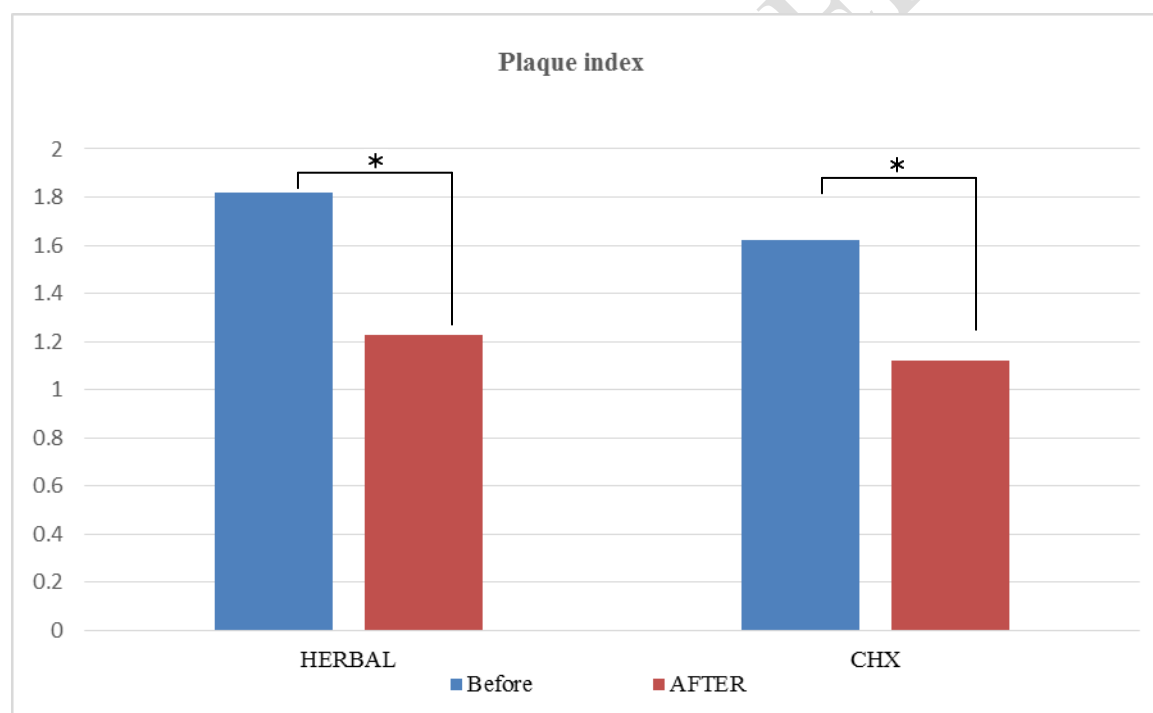| Index		Mean	Sig.
Paired t-test; Plaque index	Herbal mouthwash	0.590	0.497
	Chlorhexidine	0.500	

Figure 1 Comparison the of plaque index for before and after used of herbal mouthwash and chlorhexidine
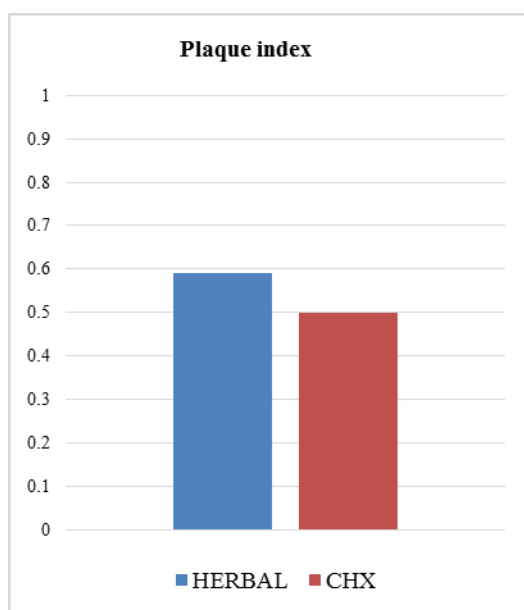*The statistically significant (P value ≤ 0.05)

Figure 2 Comparison of the mean of difference in plaque index among two mouthwashes
The statistically not significant (P value ≥ 0.05)

5. Discussion

Although the oral hygiene self-care such as tooth brushing is the most effective method in controlling the level of plaque but in many individuals, the efficiency and compliance are insufficient. Using chemical agents have been proposed as a potential adjunctive prophylactic method of reducing plaque. Mouth rinse is a chemotherapeutic agent with the active ingredients capable of reducing dental plaque. Chemical agent which is mostly used and considered as a gold standard in reduce plaque accumulation is chlorhexidine. However, it has many side effects such as brown staining on teeth, unpleasant taste, alters taste sensation. (Eley, 1999) The study considered using herbal ingredients instead of chemical substances has been a widely interesting topic for being an alternative product.

The results of our study showed that there was a highly statistical significant decrease in plaque index in herbal mouthwash group and chlorhexidine group. This means that there was a reduction in plaque deposition among those candidates using both of mouthwash. However, when compared between herbal and chlorhexidine mouthwash in decreasing of plaque index, there was no statistically significant. This finding implied that herbal and chlorhexidine mouthwash was not different in reduction of plaque accumulation.

In the previous studies, Priya and colleagues in 2015, comparing the efficacy of chlorhexidine and green tea mouthwashes in the management of dental plaque-induced gingivitis showed a significant decrease in plaque index, gingival index, and bleeding index in both the groups. However, green tea mouthwash resulted in a statistically significant decrease in bleeding index compared to chlorhexidine group (Priya et al., 2015). The study of Gupta et al. (2015) compared the effect of herbal extract mouthwash and chlorhexidine mouthwash on the dental plaque level. The result showed that the Chlorhexidine group shows a greater decrease in plaque score followed by herbal extract, but the result was statistically not significant (Gupta et al., 2015). As the previous studies mentioned above, their results were similar to our study which presented the significant decrease in plaque index and gingival bleeding index in both groups but none of them are differently significant.

The important limitation of this study was a small sample size. However, from the sample size calculation protocol, the number of remaining candidates was enough for data analysis protocol. However, for further studies, with a larger numbers of sample sizes might provide the distribution of the data which could increase the reliability of the study. Another limitation of this study was the ingredients in herbal mouthwash. From the reviewed literatures, there were a lot of herbal components in this mouthwash which

have a benefit in anti-inflammation such as Bambus valguris. Owokotomo and Owoeye in 2011 stated that it could rescue inflammatory condition. Karim et al. (2014) proved the anti-bacteria and anti-gingivitis results as same as chlorhexidine. Glabia root extract was also found to have anti-inflammatory and antioxidant effects (Karaoğul, Parlar, Parlar, & Alma, 2016) or even Polyphenols could inhibit periodontal disease development and progression (Lolayekar & Shanbhag, 2012). The formulation of herbal mouthwash in this study was disclosed by the manufacturer. Therefore, the specific effects of each herbal ingredient were impossible to prove. However, the reported antimicrobial effectiveness was tested against microorganisms.

Within the limitations of the present study, the result of the clinical trial showed no significant difference in reducing plaque accumulation of both mouthwashes. Therefore, either use of herbal mouthwash or chlorhexidine mouthwash was not significantly different in dental plaque reduction.

6. Conclusion

The results reported that herbal mouthwash and 0.12% Chlorhexidine (C-20) could significantly reduce plaque accumulation in each group. When comparing the plaque index scores between groups, the result was not statistically significantly different. It could be concluded that, the result of reduction in plaque accumulation between two groups were not different. As this study had some limitations, therefore the properties of antiplaque of herbal mouthwashes need further studies to confirm that it can be applied as a routine chemical plaque control procedure.

7. Acknowledgement

8. References

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