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ORIGINAL RESEARCH

The effect of cardamom herbal mouthwash with 0.2% chlorhexidine on the plaque index and gingivitis index

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Abstract

Background: Mouthwashes are used to chemically control dental plaque and reduce the level of gingivitis in patients with periodontitis. The side effects of chemical mouthwashes have led to the increasing use of herbal mouthwashes. The aim of this study was to have the effect of cardamom herbal mouthwash with 0.2% chlorhexidine on plaque index and gingival inflammation index.

Materials and Methods: This clinical trial study, investigated the number of 23 patients with gingivitis among the patients referred to the Department of Periodontics, Islamic Azad University of Isfahan. After the initial registration of the indicators (plaque index and Gingival index), each of the patients randomly received a coded mouthwash bottle that could be 0.2% chlorhexidine mouthwash, cardamom mouthwash, or placebo. The patients were instructed to mouthwash and hold 15cc of each given mouthwash twice a day after brushing their teeth for 30 seconds, for two weeks. At the end of the second week, the patients were recalled, and their plaque index and inflammation index were recorded again. Data were analyzed with statistical tests of analysis of variance and Kruskal-Walis(α=0.05).

Results: The plaque index and gingival Index in the chlorhexidine and cardamom groups were not statistically significant ($p>0.05$). A significant difference was observed between the placebo group ($p<0.05$), as the chlorhexidine and cardamom group showed a significantly greater effect than the placebo.

Conclusion: The effect of cardamom herbal mouthwash on plaque index and gingival index was similar to chlorhexidine 0.2%.

Keywords: Gingivitis; Dental Plaque Index; Salvia officinalis; Mouthwashes

Introduction

Periodontal disease is one of the most common infectious diseases (1). It is a type of destructive inflammatory disorder that is started by bacteria and causes tooth-supporting tissue loss. Although gingival inflammation is a mild and reversible form of periodontal disease, severe periodontitis causes permanent damage to tooth-supporting tissues, including alveolar bone, which leads to tooth loss if left untreated (2).

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Dental plaque is the main factor in the development and continuation of periodontal disease, and there is a close relationship between periodontal destruction and dental plaque (3). Plaque control methods play an important role in the prevention of periodontal diseases. Also, the plaque removal method should be effective and frequent (4). Although paying attention to the mechanical control of plaque is important to prevent plaque accumulation, it is not enough alone. Chemical control of dental plaque is an adjunctive treatment that may facilitate the removal of microbial plaque, prevent microbial plaque accumulation, and potentially reduce dependence on mechanical oral care methods (5). Chemical plaque control methods include mouthwashes, toothpaste, gels, sprays, washes, and lozenges, and using mouthwashes is the most common method of chemical plaque control (6). The anti-plaque properties of mouthwashes are

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performed by bactericidal and bacteriostatic effects, separating microorganisms from tooth surfaces, loosening their attachment to these surfaces, and decreasing tooth surface tension (7). Chlorhexidine is the gold standard of anti-plaque mouthwash among different mouthwashes (8, 9). Of course, its long-term use is limited due to complications such as increased calculus formation, changes in the color of teeth and restorations, and changes in the sense of taste (10).

Compared to chemical substances, herbal mouthwashes have more suitable conditions due to having natural compounds in terms of compatibility with the body's physiology and less possibility of poisoning, and when natural plants are used in mouthwashes, they have shown significant advantages over chemical plants (11, 12). In the results of many studies on the effect and comparison of Herbal mouthwash and chemical mouthwashes on dental plaques, gingival inflammation, oral infections, and oral fungal, it has been shown that most Herbal mouthwashes have the same and sometimes better effect than chemical mouthwashes (13-15).

The cardamom plant, with the scientific name Elettariacardamomum, is an aromatic plant that is traditionally used as a culinary ingredient (16, 17) and is used to treat many disorders, including asthma, dyspepsia, and congestive jaundice (18). Cardamom has various medicinal properties such as antioxidant, anti-inflammatory, anti-cancer, and antimicrobial activities (19-21). Regarding oral infections, the antibacterial activity of cardamom essential oil against streptococcus mutans, the most important caries bacteria, has already been reported (22, 23). Also, cardamom essential oil destroys S. mutans biofilm (22).

Considering the increasing popularity of Herbal mouthwash due to their minor side effects if used correctly (19) and the side effects of chemical mouthwashes, the purpose of this study was to compare the effect of anti-plaque and anti-inflammatory effect of cardamom herbal mouthwash with 0.2% chlorhexidine.

Materials and Methods

This study is a double-blind interventional clinical trial with ethical code IRCT20220525054989N1 24. In this study, a patient referred to the periodontics department of the Faculty of Dentistry of Islamic Azad University of Isfahan (Khorasgan) with gingivitis who had symptoms of gingival inflammation, including gingival discoloration, bleeding on probing without attachment loss, and alveolar bone resorption on probing were selected.

As an inclusion criteria patients should had no history of systemic diseases and must not have taken any drugs that cause hyperplasia and gingival bleeding in the last 6 months. Patients with periodontitis and receiving periodontal treatments, smokers, pregnant women, patients with a previous history of treatment in the last 6 months, and patients with a history of allergy to cardamom were excluded from the study.

After initial examinations and obtaining written consent from the patients, the demographic information of the patients and gingival indices, including plaque index (PI) based on Silness and Leo index and gingival inflammation index (GI) based on Loe & sillness index were recorded (24).

Three identical bottles without names were coded as A, B, and C. Code A contained the contents of cardamom mouthwash, code B contained chlorhexidine, and C placebo. The study was double blinded as the patients and the person providing the bottles had no knowledge of the contents inside. After the initial registration of the indicators, each of the patients randomly received a coded bottle.

The patients were instructed to use 15 cc of the contents of the bottle twice a day for two weeks (after brushing their teeth), and after 30 seconds, they would throw the mouthwash out of their mouths and then refrain from eating and drinking for one hour. The patients were asked to continue their oral hygiene as before. After the end of the second week, the patients were recalled, and their plaque and inflammation indexes were recorded (25). After completing the study, phase 1 treatment was performed for the patients.

To prepare mouthwash, green cardamom was washed with sterile distilled water, dried in air for 2 days, and then extracted and stored in closed bottles. Next, 20 cc of cardamom extract was added per 100 cc of water, and an emulsifier was used to keep the oil extract and water together. They remained untouched for 24 hours to reach a concentration of 0.5%. Then, color and essential oil were added if needed. The mouthwash was prepared in an oily form to have a greater effect. All work steps were done under the supervision of the pharmacist consultant (26).

To analyze the data, after controlling the normality of the data by the Shapiro-Wilk test, the analysis of variance, Kruskal-Wallis, Mann-Whitney, and LSD tests were used. The tests were performed at an error level of 0.05 using SPSS software version 26.

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Results

According to the analysis of variance (ANOVA), there was no significant difference between the three groups of chlorhexidine, cardamom, and placebo in the mean plaque index before treatment (P=0.800). However, after 2 weeks of treatment, the mean plaque index significantly differed between the three groups (P<0.01) (Table 1).

Table 1. The mean index of plaque and gingivitis in three groups of chlorhexidine, cardamom, and placebo

groups		Before treatment	After treatment
		Mean ± SD	Mean ± SD
Plaque Index (PI)	chlorhexidine	72.97 ± 15.26	37.07 ± 18.07
	cardamom	73.22 ± 14.06	45.44 ± 14.44
	water(placebo)	63.06 ± 22.74	48.09 ± 21.66
Gingival Index (GI)	chlorhexidine	2.25 ± 0.89	0.63 ± 0.74
	cardamom	2.0 ± 0.93	1.0 ± 0.93
	Water (placebo)	1.88 ± 0.83	1.63 ± 0.74

In a pairwise comparison of the groups, the results of the LSD test showed that there was a significant difference between the two groups of chlorhexidine and water (placebo) (P < 0.001) and the group of cardamom and water (placebo (P = 0.01) and the best improvement was first in the chlorhexidine group, then in the cardamom group, and then in the water group (Figure 1).

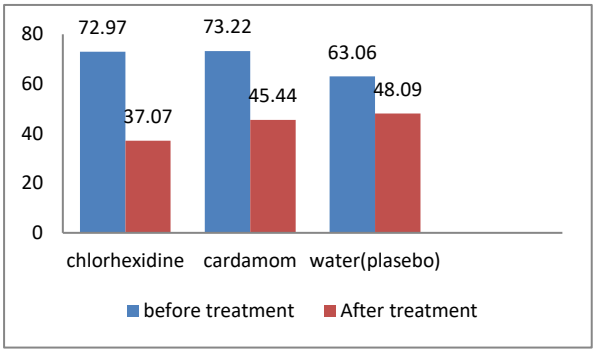

Figure 1. Comparison of the studied groups based on plaque index

According to the Kruskal-Wallis test, there was no significant difference in the mean gingival inflammation before treatment between the three chlorhexidine groups, cardamom, and water (P=0.800). Also, after 2 weeks of treatment, there was a significant difference in the mean plaque index between the three groups (P= 0.01) (Table 1). Comparing the two groups, the results of the Mann-Whitney test showed that there was a significant difference between the two groups of chlorhexidine and water (placebo) (P = 0.005) and the group of cardamom and water (placebo (P = 0.037) and the best improvement was first in the chlorhexidine group, then in the cardamom group, and then in the water group (Figure 2).

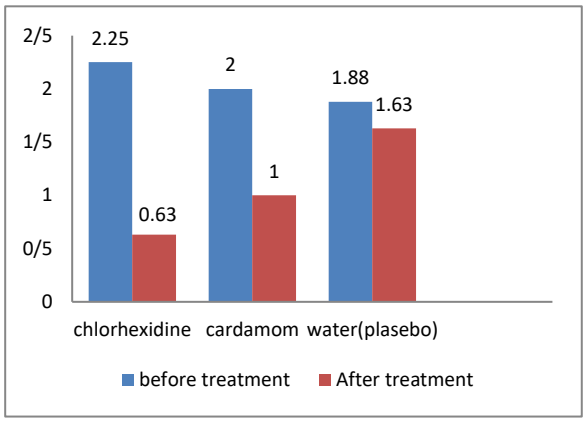

Figure 2. Comparison of the studied groups based on gingival inflammation

Discussion

According to the results of the present study, the greatest effect on the plaque index was related to chlorhexidine mouthwash, then cardamom mouthwash. In Singh et al.'s study (27), Herbal mouthwash containing cardamom has anti-plaque properties. Still, it is less effective than chlorhexidine, but there is no significant difference between the two mouthwashes investigated. Mufti et al., (28) also confirmed the effect of mouthwash containing cardamom in removing microbial plaque and high antibacterial properties. The antibacterial effect of Herbal mouthwash containing cardamom against peri pathogens was similar to chlorhexidine. Dahigaonkav et al. (29) and Saviuc et al. (30) also stated that cardamom extract is effective in treating gingival and dental infections, and cardamom can be used as an

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effective ingredient in Herbal mouthwash to reduce microbial plaque. Therefore, it can be concluded that cardamom is an effective substance in removing bacteria and reducing the pathogenicity of microbial plaque. In the study conducted by Pathan et al. (31), mouthwash containing cardamom also greatly reduced microbial plaque. Still, there is no difference between mouthwashes (chlorhexidine and Herbal mouthwash) regarding antibacterial activity.

According to the results of the present study, the improvement rate of gingival inflammation index in patients in the chlorhexidine group was higher than that of cardamom mouthwash. Bhat et al (32) concluded in their research that Herbal mouthwash and chlorhexidine have an equal effect in reducing plaque and gingivitis. Herbal mouthwash can be a good alternative to chlorhexidine. While there are side effects for long-term use of chlorhexidine, Herbal mouthwash does not have any side effects and causes a burning sensation only in small cases.

Among other benefits of using Herbal cardamom mouthwash, include the elimination of bad breath caused by microorganisms (29), reduction of nitric oxide (NO) production in peritoneum macrophages (33), treatment of periodontal infections (34), usability in common kinds of toothpaste (35), better acceptance by patients (23) and the absence of gingival discoloration of teeth (30). Of course, in reports, the possibility of allergy in people has been stated, and a small number of cases have been reported in this regard (36). Aspalli et al. (24) stated in their study that Herbal mouthwash (containing cardamom) is effective in the treatment of plaque-related gingivitis and can be used as an adjuvant treatment (SRP) with minimal side effects.

Also, due to the role of bacteria in dental plaque and gingival inflammation, studies have investigated the antibacterial effect of cardamom extract, which has shown favorable results on the effect of cardamom mouthwash on pathogenic bacteria. For example, Souissi et al (34) stated in their study that cardamom mouthwash can prevent plaque formation by inhibiting streptococcus mutans and candida albicans. Its extract has good antibacterial properties against Staphylococcus aureus, Candida albicans, Saccharomyces cerevisiae, and Streptococcus mutans. Compared to chlorhexidine, herbal mouthwash has more suitable conditions due to its natural compounds in terms of adaptation or physiology of the body and less possibility of poisoning (35). Considering the fewer side effects of Herbal mouthwash compared to chemical compounds, greater compatibility with the body's physiology, and the absence of poisoning, it seems that using this mouthwash can maintain a suitable level of oral and dental health in patients undergoing fixed orthodontic treatment. Since chlorhexidine contains 12% alcohol, it may be contraindicated in some patients (pregnant women). According to existing reports, cardamom mouthwash can significantly reduce the number of caries-causing microorganisms around brackets (18).

According to the results of the present study and considering the antibacterial properties of cardamom, it is possible to use this plant in mouthwashes, so reputable health and pharmaceutical brands worldwide are currently using it in mouthwashes and other health materials. This antibacterial power of cardamom makes it possible to have a favorable and effective effect on dental plaque and gingival inflammation. It is far more effective in controlling and treating periodontal disease. Also, considering the non-color ability and change of tooth color regarding the use of this mouthwash, as well as its fragrance and the same effects as the golden standard of mouthwashes (chlorhexidine), it can be a suitable alternative for public use.

Conclusion

The effect of Herbal cardamom mouthwash on plaque index and gingival inflammation index is similar to 0.2% chlorhexidine. Therefore, in the use of mouthwashes, the benefits and side effects of each mouthwash (herbal or chemical) should be considered when prescribing.

Conflict of Interests: The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial in this article

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