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The Efficacy of Anticalculus Mouth Rinse in Moderate Gingivitis Patients with and without Professional Intervention

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Abstract

Aim: Gingivitis has been defined as the reversible dental plaque-induced inflammation of the gingiva without detectable bone loss or clinical attachment loss. It is frequently encountered in dental practice and affected people of all ages and describes the condition of the dental soft tissue. There is always a correlation between the presence of calculus and the prevalence of gingivitis. The aim of this clinical study was to assess the efficacy of anticalculus mouthwash on reduction of plaque and calculus with and without professional intervention. **Materials and Methods:** A total of 40 volunteers with clinical signs of moderate gingivitis were selected and after a washout period of 2 weeks divided into groups, with and without any professional intervention. The patients were instructed to use anticalculus mouth twice daily. Clinical assessment was carried out using the plaque index based on Silness and Loe method, gingival index based on Loe and Silness method, and calculus index of Oral Hygiene Index-Simplified at baseline, 1 month, and 2-month days of the anticalculus mouthwash use. Statistically analysis was carried out using the Kruskal–Wallis and Mann–Whitney test for comparative analysis. **Results:** The study proved that anticalculus mouthwash was effective in lowering all the clinical scores both with and without any professional intervention. However, the optimal results were achieved when combined with professional scaling. **Conclusion:** Anticalculus mouthwash is effective in controlling plaque-induced gingivitis and lowering clinical scores.

Keywords: Anticalculus, calculus, gingivitis, Periogen

INTRODUCTION

Gingivitis has been defined as the reversible dental plaque-induced inflammation of the gingiva without detectable bone loss or clinical attachment loss. It is frequently encountered in dental practice and affected people of all ages and describes the condition of the dental soft tissue.^[1] The etiology of gingivitis is multifactorial and the result of more than one factor acting together. A wide range of factors has been identified as significantly associated with gingivitis including the presence of bacteria biofilm, genetic, socioeconomic, demographic, iatrogenic, and behavioral factors. These factors seem to influence the process, making it difficult to identify the risk factors.^[2,3] The most important factor that has been associated with gingivitis is plaque accumulation on the dental surface, resulting in an inflammatory reaction, with clinical signs of redness, edema, gingival bleeding, and sometimes pain, whereas as the condition persists, those were initially edematous may become more fibrotic.^[2] There is always a

correlation between the presence of calculus and prevalence of gingivitis;^[4] the rough calculus surface may not, in itself, induce inflammation in the adjacent periodontal tissues; instead, it serves as an ideal substrate for subgingival microbial colonization.^[5] In fact, periodontal disease remains the most common cause of tooth loss in the world today; in the United States, it has a prevalence of 30%–50% of the population and can affect up to 90% of the population worldwide.^[6] Periodontitis is initiated by oral biofilm formation if untreated progress to gingivitis further leading to periodontal diseases.^[7] The primary goal of periodontal treatment is to restore the homeostatic relationship between periodontal tissue and its polymicrobial dental plaque community.^[8] Therefore,

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prevention and treatment are primarily aimed at controlling the bacterial biofilm and other risk factors, arresting progressive disease, and restoring lost tooth support.

This study aimed to evaluate whether an anticalculus mouth rinse (Periogen, USA) has the potential effect on already existing gingival index (GI), plaque index (PI), and dental calculus index (CI) in moderate gingivitis patients, both with and without any professional intervention.

MATERIALS AND METHODS

The present study was done in Oral Biology Department and Dental Hygiene Study Program of Faculty of Dentistry after clearance has been granted by Research Ethics Commission of the Faculty of Dentistry, Universitas Gadjah Mada, Indonesia (Approval No. 00467/KKEP/FKG-UGM/EC/2015). All the participants signed the informed patient consent form. Clinical evaluation of the product on the selected participants was carried out according to the guidelines of the Declaration of Helsinki for biomedical research involving human participants. Forty participants with moderate gingivitis were chosen based on determined inclusion criteria as listed in Table 1. All the selected participants in the study randomly divided into two groups, i.e., Group A and Group B. All the participants under Group A went for professional scaling, while no professional treatment was performed for the participants under Group B at the base level.

There was a 2-week washout period before the study when participants only performed mechanical plaque control. Similar medium soft toothbrushes and regular nonmedicated dentifrice were provided to each participant during the washout and study period to maintain the standard protocol. The participants after 2 weeks were further evaluated clinically and then provided with anticalculus oral rinse (Periogen, USA). Participants were directed to rinse twice daily for 1 min along with mechanical plaque control for 2 months. All the clinical parameters, i.e., GI (Loe and Silness method), PI (Silness and Loe method), and CI (Oral Hygiene Index-Simplified) were assessed by trained experienced dental examiner under standard dental office and light source conditions. Statistical analysis was performed using SPSS for Windows (version 22.0; IBM Corp., Armonk, NY, USA).

RESULTS

All the clinical parameters, i.e. Loe and Silness GI, Silness and Loe PI, and CI were recorded under both the groups during the study at baseline, after 1 month, and at the end of study, i.e., at 2 months. By applying Kruskal–Wallis test, there was a highly significant decreased in the mean values of all the clinical parameters, i.e., GI, PI, and CI from baseline to 2 months under both the groups as illustrated in Tables 2 and 3. These results support that Periogen worked significantly to decrease all the clinical parameters.

Table 4 results after applying Mann–Whitney test proved that there was a highly significant difference between mean values

Table 1: Study inclusion criteria

Moderate gingivitis patients
Age group: 17-55 years
Do not have past or recent chronic systemic diseases
Do not recently take medications affecting inflammatory status of gingiva, such as: cholinergic, anticholinergic, antibiotic, anti-inflammatory drugs
Do not wear any type of prosthetic or orthodontic devices
Does not undergone professional prophylaxis last 6 months
Participants should have a minimum of twenty sound permanent teeth with minimum of five teeth to be present in each arch quadrant
No pregnant and lactating women

Table 2: Differences between days of observation among variables in Group A (scaling with Periogen mouth rinse) by Kruskal–Wallis test

Variable	Baseline	1 month	2 months	P
GI	0.83 (0.67-1.00)	0.59 (0.50-0.67)	0.33 (0.2000-0.50)	0.001**
PI	0.52 (0.37-0.77)	0.33 (0.25-0.49)	0.27 (0.16-0.33)	0.001**
CI	0.00 (0.00-0.33)	0.00 (0.16-0.12)	0.00 (0.00-0.00)	0.001**

** $P \leq 0.05$, GI: Gingival index, PI: Plaque index, CI: Calculus index

Table 3: Differences between days of observation among variables in Group B (without scaling and only Periogen mouth rinse) by Kruskal–Wallis test

Variable	Baseline	1 month	2 months	P
GI	0.83 (0.67-1.00)	0.67 (0.54-1.00)	0.67 (0.33-0.83)	0.001**
PI	0.52 (0.37-0.66)	0.35 (0.27-0.54)	0.33 (0.22-0.46)	0.001**
CI	0.33 (0.16-0.67)	0.33 (0.04-0.50)	0.25 (0.00-0.33)	0.001**

** $P \leq 0.05$, GI: Gingival index, PI: Plaque index, CI: Calculus index

Table 4: Differences between variables among groups at 1 month by Mann–Whitney test

Variable	Intervention group, median (interquartile range)		P
	Periogen	Periogen and scaling	
GI	0.67 (0.54-1.00)	0.59 (0.50-0.67)	0.230
PI	0.35 (0.27-0.54)	0.33 (0.25-0.49)	0.389
CI	0.33 (0.04-0.50)	0.00 (0.16-0.12)	0.001**

** $P \leq 0.05$, GI: Gingival index, PI: Plaque index, CI: Calculus index

of parameter, i.e., CI; on the other hand, GI and PI were no significant when Group B compared with Group A at 1 month from baseline. These results suggested that after 1 month, all the participants were the same conditions of their status of either plaque or gingivitis. This point indicates that Periogen could reduce the plaque formation and hence suppress the gingivitis severity. As illustrated in Table 5 with or without scaling, i.e., professional intervention, Periogen mouth rinse

Table 5: Differences between variables among groups at 2 months by Mann–Whitney test

Variable	Intervention group, median (interquartile range)		P
	Periogen	Periogen and scaling	
GI	0.67 (0.33-0.83)	0.33 (0.2000-0.50)	0.008**
PI	0.33 (0.22-0.46)	00.27 (0.16-0.33)	0.032**
CI	0.25 (0.00-0.33)	0.00 (0.00-0.00)	0.001**

**P ≤ 0.05, GI: Gingival index, PI: Plaque index, CI: Calculus index

effectively removes the dental calculus, reduces the plaque formation, and suppresses the gingivitis too in due course of time. However, the results were more promising when synergistic with professional scaling.

DISCUSSION

It is well established that gingivitis and periodontitis are chronic bacterial infections caused by dental biofilms. Periodontitis is caused by subgingival bacterial communities with virulence potential which likely directly cause tissue destruction or trigger destructive immune pathologic host responses which, in turn, lead to periodontal hard- and soft-tissue destruction and eventually loss of teeth.^[9] Dental calculus or tartar is an adherent calcified mass that forms on the surface of teeth and dental appliance through mineralization of bacterial dental plaque in aqueous environment,^[10] and various studies carried out to reveal the presence of calculus have shown that calculus is present in 70%–100% cases of periodontal disease.^[11] The rough calculus surface may not, in itself, induce inflammation in the adjacent periodontal tissues but may serve as an ideal substrate for subgingival microbial colonization.^[5]

Calculus must be detected and removed for adequate periodontal therapy and prophylaxis. Many techniques have been used to identify calculus deposits present on the root surface. The major drawbacks of these techniques include their cost, elaborative setup, technique sensitivity, and the need for re-identification of the calculus before removal.^[12] Hence, in this scenario, the anticalculus oral rinse can play a major role to decrease plaque development by inhibiting crystal growth.

The present study evaluated clinical effects of anticalculus mouth rinse (Periogen) in moderate gingivitis patients with and without any professional intervention for 2-month duration. This result shows that with and without scaling, all the patients under the treatment group observed significant reduction of calculus at the end of the study. In this study, GI level improved by 50.00% and PI level improved by 52.72% when measured from baseline to 2 months and 100.00% was reduction in calculus level index when measured from baseline to 2 months with professional scaling under Group A. In this study, GI level improved by 21.43% and PI level improved by 25% when measured from baseline to 2 months and 36.58% was reduction in calculus level index when measured from baseline to 2 months without any professional intervention under Group B.

This clinical study showed that the presence of tetrapotassium pyrophosphate and sodium tripolyphosphate in mouthwash solution significantly inhibited the development of dental calculus. Thus, the tetrapotassium pyrophosphate and sodium tripolyphosphate treatment formulated with patented balance mixture resulted in a reduction of tartar formation because of reduced calcification of dental plaque.^[13] This was first of its kind study where we assessed the clinical parameters by combination of anticalculus oral rinse (Periogen) along with mechanical plaque control oral hygiene measures without professional intervention. Previous studies also proved the potential benefits of anticalculus oral rinse in preventing and treating periodontal disease with professional prophylaxis, i.e., scaling and root planing. Saini^[13,14] observed similar efficacy of anticalculus oral rinse over 6-month study in gingivitis patients when compared with placebo. A study confirmed that anticalculus rinse was 45% more effective to prevent calculus build up than toothbrushing alone. Tham^[15] performed benzoyl-DL arginine-naphthylamide chairside periodontal test to detect the presence of oral bacteria in plaque. The study concluded that Periogen oral rinse is significantly better in reducing periodontal disease as compared to just using water flosser alone after using for 3 months. Kokovic and Tattan^[16] study the effects of anticalculus oral rinse on dental implants. The study concluded that calculus dissolution-based Periogen® mouth rinse provided clinically significant reduction in calculus formation in participants with zirconium dioxide and titanium dental implants when used twice daily for 6 months as an adjunct to toothbrushing. Cantore *et al.*^[17] in a 3-day plaque accumulation model study indicated that anticalculus oral rinse (Periogen) has equivalent plaque inhibitory action to chlorhexidine. Tandelilin *et al.*^[18] conducted a histopathological study in moderate gingivitis patients and concluded that Periogen mouth rinse significantly proved to switch the Maturation Index and will promote wound healing.

The results of this study may contribute to clinical practice in two ways. First, demonstrating that plaque maturation into calculus can be significantly dropped through incorporation of anticalculus oral rinse in the early stage of gingivitis to prevent the initiation of periodontitis. Second, as periodontal disease is silent disease and most of the clinical factors will be observed by the patients once the disease fully blown, so, in that case, this anticalculus oral rinse will play a significant role to safeguard the periodontal health in between the professional prophylaxis. Another key advantage of anticalculus oral rinse (Periogen), it will not lead to antiadverse effects for prolong use as compare to alcohol-based oral rinse which may lead to multiple side effects.^[19,20] However, more multicentric and longitudinal studies are needed to fully evaluate the potential benefits and challenges of anticalculus oral rinse in periodontal disease.

The strength of this study is that it critically evaluates the clinical efficacy of anticalculus mouth rinse with and without professional intervention. The study is unique and significant as evaluating the anticalculus mouth rinse (Periogen, USA), i.e., based on food ingredients and does not contain any active

alcohol components. This study also highlighted clinical advantages of using anticalculus mouth rinse in routine oral hygiene considering the overall periodontal health benefits as mentioned over both the groups, i.e., with and without professional intervention. However, several limitations must be considered in interpreting the result of the present study. First, the study duration is limited to 2 months, and hence, a longer duration clinical observation will be more effective in evaluating the participant's periodontal health status. Second, multiple periodontal conditions such as periodontitis, aggressive periodontitis, and peri-implantitis should also be studied for understanding the clinical outcome of anticalculus mouth rinse under different periodontal conditions. With an increasing adverse effect of prolonged use of alcohol-based oral rinse, the future of anticalculus rinse will be extremely important in reducing the bioburden of oral health, especially where there is limited access to professional intervention. The optimal oral health benefits will be attained when professional intervention (scaling and cleaning) followed with regular use of anticalculus oral rinse that significantly inhibits the calcification of dental plaque into calculus deposition that serves as a reservoir of pathogenic microbes.

CONCLUSION

Within the limits of this clinical study, it may be concluded that the anticalculus oral rinse (Periogen) used in this study was effective in controlling plaque and calculus with a statistically significant manner both with and without professional intervention when used regularly. However, the comparative analysis between the groups proved that incorporation of anticalculus oral rinse after professional scaling will result the maximum advantage leading into no plaque maturation. Furthermore, it may serve as a natural food ingredient-based mouth rinse alternative for patients who wish to avoid alcohol, artificial preservatives, artificial flavors and colors. Periogen anti-calculus mouthrinse may be useful as a true and natural adjunctive to mechanical therapy in the prevention and treatment of periodontal disease.

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Conflicts of interest

There are no conflicts of interest.

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