Research Article

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Effect of Propolis-based Mouthwash as an Adjunct in the Treatment of Chronic Generalised Gingivitis

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ABSTRACT

Introduction: Various plaque control methods are employed in the treatment of gingivitis which is a plaque-induced recurring condition. However, it is also preventable and reversible. Propolis, a naturally-occurring bee product, possesses variety of biological and pharmacological properties viz. anti-inflammatory, antimicrobial, antiparasitic, antiviral, immunostimulatory, fungicidal, and antiulcer proving it to be helpful in wound healing.

Objective: To assess the effectiveness of Propolis mouthwash in chronic generalised gingivitis and also compare Propolis mouthwash with Chlorhexidine mouthwash among Nepali population.

Materials and Method: This non-randomised intervention study was conducted at the Department of Periodontics, KIST Medical College and Teaching Hospital from March 30, 2022 to June 14, 2022 after ethical clearance. It included 30 systemically healthy patients with chronic generalised gingivitis utilising convenience sampling technique. They were divided into two groups (15 participants in each group) and advised to use Propolis containing mouthwash and 0.2% Chlorhexidine mouthwash two times in a day. Plaque index (PI) and gingival index (GI) were assessed on Ramjford teeth at baseline and at five days interval. The level of significance was $P < 0.05$. Results were interpreted after statistical analysis using SPSS v.21.

Result: Paired t-test analysis showed that the observed differences in PI and GI before and after using Propolis mouthwash and Chlorhexidine mouthwash were statistically significant ($P < 0.05$). However, PI and GI between two mouthwashes did not show any significant difference.

Conclusion: Within the limitations of current study, it was observed that using Propolis mouthwash improved the gingival index and plaque index and its effect was comparable to Chlorhexidine.

Keywords: Chlorhexidine; gingivitis; mouthwash; propolis.

INTRODUCTION

Gingivitis is a preventable and reversible condition that is plaque-induced and often recurring. Dental plaque is the important aetiological factor responsible for gingivitis which when left untreated can progress to periodontitis and tissue destruction.[1,2] Various methods of mechanical and chemical plaque control are employed in treatment of gingivitis. Propolis is a naturally-occurring bee product consisting chiefly of wax and plant extracts.

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It is used to seal the hive and protect bee colony against invasion and infection, providing bees with an 'immune system.' Propolis possesses a variety of biological and pharmacological properties viz. anti-inflammatory, antimicrobial, antiparasitic, antiviral, immunostimulatory, fungicidal, antiulcer, cytostatic, and hypotensive proving it to be helpful in wound healing.[3]

The beneficial aspects of propolis include prevention of dental caries; reduction of oral mucositis resulting from chemotherapy; oral cancer; gingival and periodontal diseases; plaque inhibition and anti-inflammatory; as a constituent of dentifrice to control oral microbiota; as an effective transport medium for increasing periodontal ligament cell viability of avulsed teeth; direct pulp capping; and as an analgesic.[4] Hence, the present study was carried out to assess the effectiveness of Propolis mouthwash in chronic generalised gingivitis and also to compare Propolis mouthwash with Chlorhexidine mouthwash among a sample of Nepali population.

MATERIALS AND METHOD

A non-randomised intervention study (non-randomised trial) was conducted at the Department of Periodontics, KIST Medical College and Teaching Hospital, Imadol, Lalitpur, Nepal. Data collection was done prospectively from March 30 to June 14, 2022 after getting ethical approval from the Institutional Review Committee (KIST-IRC, Ref. 2078/79/66). Only those patients who provided consent were included using convenience sampling. Sample size was calculated using the following formula:

Sample Size (n) = $n=2(Z_{\alpha}+Z_{1-\beta})^2\sigma^2/d^2$;

where, $\sigma = 0.5$; $Z_{\alpha} = 1.96$ at confidence interval = 95%; $Z_{1-\beta} = 0.84$ at 80% power; d = 0.6 (mean difference from the previous study).[5] Total sample size calculated was 10.88 ≈ 11. However, keeping 30% (11*0.30 = 3.3) loss to follow-up, 15 (11 + 3.3 = 14.3 ≈ 15) participants in each group were evaluated for the study.

Thirty systemically healthy patients (age 18-50 years) with chronic generalised marginal gingivitis (mild to moderate) were selected and enrolled in the study. Exclusion criteria were: history of increased sensitivity to Propolis or honey combinations, inability to comply with the follow-up visit requirements, patients receiving concurrent antibiotic treatment for any other purpose or antibiotic use over the past two weeks, patients undergoing treatment for chronic generalised marginal gingivitis, pregnancy or lactation, systemic conditions those are aetiologic or predisposing to chronic gingivitis, periodontal surgery in the preceding three months, teeth or supporting structures "with any other painful pathology or defect parameters noted," patients with missing index teeth, severe gingivitis, and history of using mouthwash in the previous month.

Demographic data including age and gender were obtained using a self-reported questionnaire. The participants were divided into two groups conveniently. Group A were advised to swish and spit 10 ml of Propolis containing mouthwash two times in a day, first in the morning and second before going to bed. Propolis mouthwash was imported by investigators for research purpose at their own expense. Similarly, participants in Group B were advised 0.2% Chlorhexidine mouthwash and were given the same instructions. The instructions to use the mouthwashes were also provided to patients in written form. Participants were taught and instructed to brush their teeth with modified bass method by using same kind of toothbrush and toothpaste (toothbrush and toothpaste were provided by the investigator to the participants) during the study period. Silness and Loe Plaque Index (PI) and Loe and Silness Gingival Index (GI) were assessed on Ramfjord teeth (16, 11, 24, 36, 41, and 44; according to two-digit tooth numbering system) at baseline followed by full mouth scaling. The participants were then advised to use respective mouthwashes adjuncts as per the instructions. The PI and GI were assessed for the second time on Ramjford teeth at a five days interval. Indicators of plaque and gingival indices were determined by Williams periodontal probe. The collected data were recorded to compare the conditions between pre- and post- mouthwash use.

Mean and standard deviation were reported for quantitative variables in the descriptive statistics section. The level of significance was $P < 0.05$. After the statistical analysis using IBM SPSS Statistics for Windows, version 21 (IBM Corp., Armonk, N.Y., USA), the results were interpreted.

RESULT

All the patients who were selected for the study successfully completed the study protocol. The two mouthwashes were found to be equally effective in decreasing the plaque index and gingival index.

The mean for PI was reduced from baseline value of 6.16±0.94] to 3.34 ±0.31 and similarly the mean for GI also reduced from baseline value of 6.04 ±0.72 to 3.38 ±0.27 after using Propolis based mouthwash. The mean for PI and GI came down from baseline value of 6.95 ±1.69 to 3.47 ±0.75 and 6.14 ±1.11) to 3.46 ±0.48 respectively after using Chlorhexidine mouthwash.

Paired t-test analysis showed that the observed differences in PI and GI before and after using Propolis mouthwash were statistically significant. Also, a significant difference was observed for PI and GI before and after using Chlorhexidine mouthwash (Table 1, 2).

Independent t-test was done to compare the PI (P 0.361) and GI (P 0.127) between Propolis-based mouthwash and Chlorhexidine mouthwash respectively that did not show any significant difference between two mouthwashes (Table 3, Figure 1, 2).

Table 1: Plaque index and gingival index values before and after using propolis-based mouthwash.

	Plaque index (Mean±SD)	Gingival index (Mean±SD)
Before	6.16 ±0.94	6.04 ±0.72
After	3.34 ±0.31	3.38 ±0.27
Difference	2.82 ±0.80	2.65± 0.61
P value	0.022	0.027

Paired t-test.

Table 2: Plaque index and gingival index values before and after using chlorhexidine mouthwash.

	Plaque index (Mean±SD)	Gingival index (Mean±SD)
Before	6.95 ± 1.69	6.14 ± 1.11
After	3.47 ± 0.75	3.46 ± 0.48
Difference	3.47± 1.09	2.68 ± 0.86
P value	<0.001	0.007

Paired t-test.

Table 3: Comparison of effect of propolis and chlorhexidine mouthwash on plaque index and gingival index.

Variable	Propolis (Mean±SD)	Chlorhexidine (Mean±SD)	P value
Plaque index	2.82 ± 0.80	3.47 ± 1.09	0.361
Gingival index	2.65 ± 0.61	2.68 ± 0.86	0.127

Independent t-test.

Figure 1: Intraoral appearance at five days interval after use of disclosing agent in propolis group.

Figure 2: Intraoral appearance at five days interval after use of disclosing agent (chlorhexidine group).

DISCUSSION

The present study evaluated the effect of Propolis mouthwash on plaque accumulation and on the gingival health of individuals who had gingivitis by comparing the plaque and gingival indices at baseline and at five days interval. The results showed that both Propolis and Chlorhexidine mouthwashes created significant improvements on gingival and plaque indices.

The current study is consistent with Anauate-Neotto et al. where GI and PI before-and-after using Propolis and Chlorhexidine mouthwashes was statistically significant and using mouthwash reduced both of them. Their results showed that Propolis mouthwash significantly reduces the Papillary Bleeding Index.[6]

A study by Tanasiewicz et al. also confirmed the findings of the current study. Their results showed that using hygiene products containing Propolis in individuals with gingivitis was effective, removed the plaque and improved the marginal periodontium.[7] Koo et al. carried a study to evaluate the effect of the experimental mouthrinse containing propolis which reduced the insoluble polysaccharide (IP) concentration in dental plaque by 61.7% compared to placebo ($P < 0.05$) on three-day dental plaque accumulation.[8]

However, findings from this study are not consistent with some studies. A meta-analysis by Hwu et al. found that Propolis reduced the plaque but it was not statistically significant. This could be attributed to different protocols regarding the consumption duration or frequency as well as concentration of the mouthwash used.[9]

In the present study, there was no significant difference in the plaque and gingival scores between Propolis and Chlorhexidine mouthwashes. Few other studies[5,10,11] also reported comparable results on Plaque index and two studies[11,12] found comparable results in reducing gingival inflammation between the two groups. However, a study by Krishna et al. in 2019 found Propolis-based mouthwashes superior to Chlorhexidine in reducing plaque.[4] Current study is similar to the study done by Dehghani et al. in 2019 which showed no significant differences between three evaluated oral health indices (the PI, GI, and Community Periodontal Index) after using mouthwash, where it could be noted that the Propolis mouthwash had almost the same outcomes of Chlorhexidine.[5] Conversely, other studies reported Chlorhexidine being superior to Propolis-based mouthwashes in reducing dental plaque.[13]

Even though Chlorhexidine mouthwash is considered as the gold standard antiplaque agent,[14] long-term use of Chlorhexidine has been linked with numerous adverse effects such as staining of teeth, salivary calculus formation, and rarely transient dulling of taste sensation.[15] Hence, there has been many attempts by pharmaceutical companies to formulate natural-derived oral care products.[16]

Over the past few years, an alternative approach in natural products as possible antibacterial agents for oral health maintenance formulations has increased.[12,17] In recent decades, Propolis has been considered as a medicine. The antibacterial, antifungal, antiviral, antitumor, immunomodulatory, and anti-inflammatory properties of Propolis have been studied and reported extensively.[18-20] The chemical composition of Propolis includes 50% resin, 30% wax, 10% aromatic and essential oils, 5% pollen, and 5% other constituents.[21-23] The flavonoids are the main biologically dynamic constituents of Propolis extracts, suggesting homogeneity of Propolis preparations, making their use harmless compared to many other synthetic products.[24]

The limitations of the present study include smaller sample size, long-term effects of the mouthwash, longer duration of mouthwash consumption and use of more sensitive microbiological analysis techniques like polymerase chain reaction in future investigations.

CONCLUSION

Considering the limitations of the current study, it seems that using Propolis mouthwash improved the gingival index and plaque index and its effect was comparable to Chlorhexidine. Based on the findings, use of Propolis mouthwash has a desirable effect on gingival health of patients with mild to moderate gingivitis with no side effects reported. Thus, switching back to natural resources, Propolis seems to be a promising alternative for the control of gingival inflammation.

Conflict of interest: None.

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