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Original Research Article

Assessment of Antiplaque Properties of Herbal Toothpaste Containing Propolis: A Randomized Clinical Study

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Conflict of interest: Nil

Abstract

Aim: The aim of this study was to evaluate the antiplaque efficacy of an herbal toothpaste containing propolis in comparison with a control group

Material & Methods: A single-blind parallel clinical trial including 80 patients (40 females and 40 males)was conducted in Department of Dentistry. All subjects were given verbal and written information about the study.

Results: Out of 80 subjects, 40 were males and 40 were females with mean age of 22.76±1.44 years. There was no significant difference in the mean MGMPI scores between the three groups (Propolis, Dabur, Pepsodent) at baseline. But when they were compared after 24 h significantly (P = 0.01) highest mean MGMPI score was observed in Pepsodent group (45.40±5.08) followed by Dabur (39.51±2.29). Propolis showed significantly least mean MGMPI score (36.74±2.40) after 24 h. On comparing the mean difference (baseline and 24 h) of the three groups, significantly (P = 0.01) lowest mean difference was elicited by Propolis group.

Conclusion: The herbal toothpaste containing propolis was more effective in reducing plaque accumulation in comparison with the control group. Considering the effect of propolis-containing toothpastes on the reduction of dental plaque accumulation, these can be used as an effective oral hygiene product.

Keywords: Dental Plaque, Herbal, Oral Hygiene, Toothpastes, Propolis.

Introduction

Dental caries (particularly during childhood) and periodontal diseases are the most common oral cavity diseases. A positive correlation has been found between the number of Streptococcus mutans (S. mutans) in dental plaque and the development of dental caries. Furthermore, dental plaque bacteria are known as the major etiologic factors of marginal periodontitis. [1,2] Maintenance of proper oral hygiene is one of the most important measures for controlling gingivitis, periodontitis, and dental caries.1 Self-performed mechanical plaque removal is one of the most accepted methods of controlling plaque and gingivitis but most people experience difficulty in maintaining adequate levels of plaque control; therefore, chemical agents that could supplement patient-dependent mechanical plaque removal have been studied in different essays. [3,4] Over the last several years, a worldwide tendency has been noted towards the use of natural products due to their pharmacological effect on caries prevention. [2] Herbex (Parmoon, Tehran, Iran) is a natural product formulated to maintain oral health, which contains propolis extract, Glycyrrhiza glabra, Satureja, Dianthus, Myrtus communis, and Eucalyptus. [5]

Propolis, also known as bee putty5 or bee glue [2], is a natural resinous mixture produced by honeybees collected from buds and exudates of certain trees and plants and stored inside beehives. This substance has been widely consumed in medicine due to its multidirectional biological properties. Apart from antibacterial activity [6,7], various studies have demonstrated that propolis has other beneficial properties, such as antioxidant, antifungal, antiviral [8,9], anti-inflammatory, cytostatic, and cariostatic properties.2,10 It also accelerates epithelial repair and controls dentinal hypersensitivity. [11] Additionally, the anti-proliferative action of propolis has been observed in human tumor cell lines. [5,12] More recently, Propolis has been used for treating different diseases and inflammatory conditions as both local and systemic applications. [13] Propolis is available in the world markets in different forms as capsules, lozenges, tincture, and cream and recently added to the list are mouth rinses and toothpastes.

Based on literature reports showing that propolis resin is a product with anti-inflammatory and bactericidal activity, several in vitro and some in vivo studies [14-16] have been conducted in America, Australia, United Kingdom, and Europe and especially in Eastern Europe. [17-20] Only a few studies have been conducted to assess the effects of propolis on oral health.

Considering the properties of propolis, the aim of this study was to evaluate the antiplaque efficacy of a propolis-based herbal toothpaste as a clinical study.

Material & Methods

A single-blind parallel clinical trial including 80 patients (40 females and 40 males) was conducted at Department of Dentistry at Anugrah Narayan Magadh Medical College and Hospital,Gaya, Bihar, India.(Jan 2021 to December 2021). All subjects were given verbal and written information about the study.

Inclusion Criteria

- Age- 24-30 years old, who volunteered to participate in the study and agreed to continue oral hygiene using the prescribed toothpaste, were included.

Exclusion Criteria

- Participants who met the exclusion criteria, such as having periodontal pockets with a depth of more than 3 mm, having orthodontic appliances, having a history of smoking, xerostomia, and systemic diseases, having untreated dental caries, and having a history of using Herbex mouthwash or toothpaste.

Sample Selection

A convenient sample of 80 patients comprising of both males and females was selected.

Informed consent

After explaining the purpose and detailed procedure of the study, a written informed consent was obtained from all the subjects, prior to the beginning of the study.

Training and calibration

All the examinations were carried out by a single examiner. Before the commencement of the study, the examiner was standardized and calibrated for Modified Gingival Marginal Plaque-Index (MGMPI) in the Department of Dentistry by a senior faculty member to ensure uniform interpretations, understandings, and application of the codes and criteria to be observed and recorded and to ensure consistent examination. The examiner first practiced the index on a group of 10 subjects. Then the examiner applied the criteria by examining a group of 10 subjects, twice on successive days. The intra examiner reliability was assessed using Kappa statistics, which was found to be 90%.

Materials used in the study

- Forever Bright Tooth gel (containing Propolis) (forever living products)
- Pepsodent
- Dabur Toothpaste (Dabur India Ltd.)
- Disclosing agent (The Bombay Burmah Trading Corporation India, Ltd.)

Methodology

Before starting the study, oral prophylaxis was performed. All subjects were given a washout product, Regular Flavour toothpaste and a soft manual toothbrush, with the instructions to use only these products and to brush twice daily for the washout period (1-week). After the washout period was complete subjects reported to the Department of Dentistry and were randomly allocated to three groups of 10 participants each. Each group was randomly assigned to one of the three toothpastes (1 – Forever Bright Tooth gel, 2 – Pepsodent, 3 – Dabur toothpaste). Randomization was performed using lottery method. Then they were made to brush with Colgate Regular Toothpaste for 1-min followed by 1-min brushing with assigned test product. All products were blinded to both the subject and the examiner by way of an over-wrap. After this, all teeth were disclosed with disclosing agent. The Xu and Barnes probe [21] was gently placed along the margin of the gingiva, and the baseline MGMPI plaque scores were recorded. Subjects were then refrained from oral hygiene for 24 h, and were recalled to be re-disclosed and re-measured for plaque formation. The above-mentioned procedure was repeated after a washout period (2 weeks) in accordance with the crossover design, so that all three products could be tested on each subject. To ensure allocation concealment, the allocation methods were not revealed to the examiner. A statistician was not directly involved in recruiting patient generated the randomization sequence. Recruitment and assignment of patients to their groups was carried out by the trial coordinator.

Statistical Analysis

Data were analysed using SPSS 18 software (SPSS Inc., Chicago, IL, USA). The normal distribution of data was analysed using Shapiro –Wilk test. Due to in all groups, quantitative variables were analysed by parametric tests, such as independent t –test, and the mean and standard deviation (SD) were reported. $P>0.05$ was considered statistically significant.

Results

Table 1: Distribution of study subjects

Groups	Male	Female	Mean±SD
Propolis	40	40	22.76±1.44
Pepsodent			
Dabur			

Out of 80 subjects, 40 were males and 40were females with mean age of 22.76±1.44 years.

Table 2: Comparative assessment of the mean MGMPI scores at baseline and 24 h and their differences for each of three toothpastes

Groups	Baseline (mean ± SD)	24 h (mean ± SD)	P	Difference (mean ± SD)
Propolis	16.74±1.24	38.72±2.40	0.01	21.98±1.16
Pepsodent	16.32±1.36	45.40±5.08	0.01	29.08±3.72
Dabur	16.54±1.26	39.51±2.29	0.01	22.96±1.03
P Value	0.79	-	0.01	-

There was no significant difference in the mean MGMPI scores between the three groups (Propolis, Dabur, Pepsodent) at baseline. But when they were compared after 24 h significantly (P = 0.01) highest mean MGMPI score was observed in Pepsodent group (45.40±5.08) followed by Dabur (39.51±2.29). Propolis showed significantly least mean MGMPI score (36.74±2.40) after 24 h. On comparing the mean difference (baseline and 24 h) of the three groups, significantly (P = 0.01) lowest mean difference was elicited by Propolis group.

Discussion

Dental caries (particularly during childhood) and periodontal diseases are the most common oral cavity diseases. A positive correlation has been found between the number of Streptococcus mutans (S. mutans) in dental plaque and the development of dental caries. [22] Furthermore, dental plaque bacteria are known as the major etiologic factors of marginal periodontitis. [22,23] Maintenance of proper oral hygiene is one of the most important measures for controlling gingivitis, periodontitis, and dental caries. [22] Self-performed mechanical plaque removal is one of the most accepted methods of controlling plaque and gingivitis but most people experience difficulty in maintaining adequate levels of plaque control; therefore, chemical agents that could supplement patient-dependent mechanical plaque removal have been studied in different essays. [24,25] Over the last several years, a worldwide tendency has been noted towards the use of natural products due to their pharmacological effect on caries prevention. [23] Herbex (Parmoon, Tehran, Iran) is a natural product formulated to maintain oral health, which contains propolis extract, Glycyrrhiza glabra, Satureja, Dianthus, Myrtus communis, and Eucalyptus. [26]

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Fereidooni et al [31] investigated the effect of toothpastes containing propolis on plaque control and stated that the propolis toothpaste caused more reduction in dental plaque compared to the regular toothpaste; the results are in line with those of the present study. Akca et al [32] conducted a study in order to compare the antimicrobial effectiveness of ethanolic extract of propolis (EEP) with CHXgluconate in planktonic and biofilm states of oral microorganisms. The results of the study revealed that propolis was more effective in inhibiting Gram-positive bacteria in comparison with Gram-negative bacteria in their planktonic state. Also, it was indicated that propolis was as effective as CHX in the biofilm state, which is an

indicator of the antiplaque efficacy of propolis and supports the results of the present study. Actual mechanism involved behind the antimicrobial activity of propolis extracts needs to be researched. Research on microbial biofilms is proceedings on many dimensions, with specific focus on elucidation of the genes specifically expressed by biofilm-associated organisms, assessment of different control approaches for either preventing or remediating biofilm colonization of medical devices, and development of new methods for evaluating the efficacy of these treatments. [33]

Conclusion

The herbal toothpaste containing propolis was more effective in reducing plaque accumulation in comparison with the control group. Considering the effect of propolis-containing toothpastes on the reduction of dental plaque accumulation, these can be used as an effective oral hygiene product.

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