Research Article

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Comparative Microbiologic Study on the Efficacy of a Fluoride Dentifrice Probiotic: Comparative Analysis

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ABSTRACT

Background: Optimum fluoridation is a crucial public health strategy to prevent and control dental caries. There are various options available for adding fluoride, including drinking water, milk, salt, varnish, and more. However, fluoride toothpaste is widely preferred for maintaining consistently low fluoride levels in the oral environment. The study sought to assess the effectiveness of the treatment in preventing tooth decay and enhancing the overall oral health of the participants within a 45-day timeframe.

Material and Methods: A total of sixty study participants were divided into two groups, with thirty participants in each group. One group was assigned to the test, while the other served as the control. While the control group continued using their regular toothpaste, the test group switched to the probiotic toothpaste for a period of 30 days. Saliva samples were evaluated for Streptococcus mutans colony forming unit (CFU/ml of saliva) at Various Interval.

Results: Toothpaste had a significantly higher anti-cariogenic effect in the test group compared to the control group, as evidenced by the S. Mutans count.

Conclusion: There was a decrease in the microbial salivary counts of the study population who used probiotic toothpaste. Similarly, various boundaries demonstrated a significant improvement in oral cleanliness with regards to reducing plaque.

Keywords: Fluoride Dentifrice, Plaque, Probiotic, Streptococcus Mutans.

INTRODUCTION

The mouth cavity of a healthy adult houses approximately 400 microbial species that coexist as commensals. An increase in cariogenic bacteria is the result of an imbalance in the oral ecosystem, which can be caused by factors such as dietary habits, inadequate oral hygiene, or underlying health issues. The primary cause of tooth decay is the presence of cariogenic bacteria, such as Lactobacillus acidophilus and Streptococcus mutans. These microbes have the ability to convert sucrose into a substance called glucan, which is sticky and promotes the formation and adhesion of plaque biofilm. Tooth decay develops when the bacteria in dental plaque break down the sugars in food, resulting in the production of lactic acid.[1-3]

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Optimum fluoridation is a crucial public health strategy to prevent and control dental caries, which is the most prevalent non-communicable illness worldwide. There are various options available for adding fluoride, including drinking water, milk, salt, varnish, and more. However, fluoride toothpaste is widely preferred for maintaining consistently low fluoride levels in the oral environment. It is crucial to emphasize the importance of affordable, high-quality toothpaste as a key component of the WHO-endorsed Basic Package of Oral Care.[4-6]. They play a vital role in preventing gastrointestinal diseases. Lactobacillus and Bifidobacteria are the two most commonly used probiotics.[6,7]

Previous research suggests that taking probiotic supplements could potentially reduce the risk of developing tooth cavities. In these trials, researchers have discovered that certain bacteria known to cause tooth decay, such as S. mutans, were found to be less common. Probiotics and their products possess antimicrobial activity and the ability to resist pathogen colonization. These substances enhance the immune system and can help increase the activity of white blood cells and the production of IgA. Probiotics also play a role in enzyme synthesis and function.[8] Additionally, they have antigenic properties. The study sought to assess the effectiveness of the treatment in preventing tooth decay and enhancing the overall oral health of the participants within a 45-day timeframe.

MATERIALS AND METHODS

This study included 60 patients in a study conducted at a single center, using a single-blinded design. Participants were selected from the outpatient clinic of the Department of Oral Medicine and Radiology following committee approval and obtaining their signed informed consent.

Requirements for being included

1. Individuals who are in good health and fall between the ages of 18 and 65.

2. Maintaining good dental health without any untreated or active cavities.

Criteria for Exclusion

People who have severe periodontal pockets, chipped teeth, profound cavities, and faulty restorations.

2. Participants who received professional fluoride therapy or a combination of antibiotics and antibacterial agents in the previous month.

3. People with bridge work or orthodontic equipment that may hinder the examination.

4. If individuals have a significant psychiatric disorder, engage in excessive drinking or smoking, have a systemic illness, suffer from eating disorders, have a chronic disease, are pregnant or lactating, have experienced a heart attack in the past six months, use a pacemaker, have uncontrolled metabolic disease, or have any condition that necessitates frequent or ongoing use of pain relievers, anti-inflammatory drugs, or antihistamines.

A total of sixty study participants were divided into two groups, with thirty participants in each group. One group was assigned to the test, while the other served as the control. While the control group continued using their regular toothpaste, the test group switched to the probiotic toothpaste for a period of 30 days.

Every participant was taught the proper brushing technique and advised to brush their teeth twice a day with a pea-sized amount of toothpaste.

Microbiological Analysis Sampling

The participants submitted two milliliters of saliva in a sterile plastic container to the Lab for an estimate of the S. mutans colony count at the time of reporting. Following a 48-hour incubation period and identification in Malditoff culture medium, S. mutans was cultivated in aerobic media and subjected to analysis. After two days in the lab, reports on these subjects were collected, with the S.mutans count represented as colony forming units (CFU) /ml. Both groups were assessed for the parameters.

SPSS software Version 21.0 was used for analysis in the study. Salivary S. mutans counts at the three time evaluations were compared using a Paired T-test and a One-Way ANOVA to analyze the mean differences.

RESULTS

During a thirty-day period, the study aimed to evaluate the effectiveness of the anticariogenic agent and its impact on the oral health of the participants. The study involved sixty participants who were divided into two groups: a test group and a control group, each consisting of thirty individuals. While the control group maintained their usual toothpaste, the test group opted for the probiotic toothpaste for a duration of thirty days following its initial introduction.

Group I, the test group, consists of the probiotic dentifrice. In Group II, no intervention was provided (the control group). After thirty days, the results presented in table 1 showed that the toothpaste had a significantly higher anti-cariogenic effect in the test group compared to the control group, as evidenced by the S. Mutans count.

Table 1: Evaluation of anticariogenic activity of probiotic toothpaste by assessing S.mutans count

CFU	0	1	2	3	4	5
TEST (30 Days)	0	6	16	8	0	0
CONTROL (30 Days)	0	6	24	0	0	0

DISCUSSION

For this study, the researchers wanted to evaluate the impact of three potential anticaries agents - fluoride, xylitol, and live bacteria - on the caries-causing bacteria found in saliva. It is believed that S. mutans and Lactibacillus bacteria, which produce acid, are the primary contributors to dental caries. According to the World Health Organization (WHO) and the Food and Agricultural Organization (FAO) of the United Nations.[9,10]

In comparison to the benchmark group, the experimental group demonstrated a clear reduction in the number of province framing units of S mutans after 30 days. The decrease in the number of S mutans in the province is due to the increase in the concentration of bacillus coagulans in the oral cavity in individuals using the probiotic toothpaste. The decrease in S mutans is also observed in the other clinical parameters evaluated in the patients of the experimental group. The decrease in S mutans was due to reduced plaque build-up in the test population. A more comprehensive list of tips for improving oral hygiene was provided.

Xylitol is a naturally occurring five-carbon sugar polyol that has been recognized for its properties for over a century. It has been widely studied over the past 40 years for its impact on dental caries. It is commonly found in fruits, vegetables, and berries, and can also be synthetically produced from plant materials rich in xylan, such as birch and beechwood. Ever since a study conducted in Turku, Finland, in 1970, which examined the effectiveness of xylitol in reducing dental plaque, xylitol has been extensively researched and widely recognized as a natural sweetener approved by the US Food and Drug Administration (FDA) and the American Academy of Pediatric Dentistry.[11,12]

Describing the beneficial effects of xylitol, which helps prevent the breakdown of sucrose into acid, promotes pH balance, and also has anticavity and antimicrobial properties. Sodium monofluorophosphate, which serves as a source of fluoride, acts as a crucial ingredient. The presence of fluoride has a positive impact on preventing tooth decay and promoting long-term dental health. The benefits of xylitol and fluoride in toothpaste have long been documented. The effectiveness of fluoride in preventing tooth decay is well-established. One of the counter caries substances that is widely recognized is F-dentifrices.[13,14]

Toothpastes containing fluoride have proven effective in reducing caries in many developed nations. It is recommended that individuals of all ages use toothpastes that contain fluoride.13 Fluoride is abundant in the mouth and can easily be absorbed by the body due to its solubility in ionic (free) form (F-of NaF) or in ionizable form (MFP). The bioavailable type of fluoride ensures the effectiveness of the anticaries action. Xylitol is a natural sugar substitute that is commonly used as a sweetener. The American Institute of Pediatric Dentistry (AAPD) recommends the use of xylitol to prevent tooth decay. Clinical trials have documented the impact of xylitol products on S. mutans. According to a recent study conducted in a laboratory setting, there is evidence suggesting that

xylitol toothpastes may have the ability to prevent tooth decay.

CONCLUSION

This study aimed to investigate the effects of fluoride, xylitol, and probiotics on salivary S. mutans levels and oral cleanliness. Based on the results obtained, there was a decrease in the microbial salivary counts of the study population who used probiotic toothpaste. Similarly, various boundaries demonstrated a significant improvement in oral cleanliness with regards to reducing plaque. It could be recommended as an effective toothpaste, especially for individuals who are at a higher risk for cavities.

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