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Original Research Article

The Effectiveness of Toothpaste Containing Sodium Lauryl Sulfate on Dental Plaque in Primary School Students

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Abstract: Dental caries is caused by the Streptococcus mutans bacteria and can be prevented by brushing teeth using toothpaste without sodium laurel sulfate to remove dental plaque. A study was conducted in 2021 at State Elementary School I Tanjung Lhonga to determine the effectiveness of brushing teeth with Sodium Lauryl Sulfate toothpaste and toothpaste without sodium laurel sulfate in reducing the dental plaque index among the students. The study used a quasi-experimental method with a "post-test only group design" and involved 120 students as the population. The study results showed that before using toothpaste, the dental plaque index in both groups was quite high, at 1.731 for the group using toothpaste with sodium laurel sulfate and 1.845 for the group using toothpaste without sodium laurel sulfate. However, after using toothpaste, there was a decrease in the plaque index in both groups. The group using toothpaste without sodium laurel sulfate had a more significant decrease in plaque index (1.230) compared to the group using toothpaste with sodium laurel sulfate (1.562). This difference was significant with a p-value < 0.05. It can be concluded that brushing teeth with toothpaste without sodium laurel sulfate is more effective in reducing the dental plaque index compared to using toothpaste with sodium laurel sulfate. Therefore, toothpaste without sodium laurel sulfate should be used for brushing teeth to prevent dental caries.

Keywords: Effectiveness of toothpaste, dental plaque, primary school students.

INTRODUCTION

According to the World Health Organization (WHO), about 60-90% of children and nearly 100% of adults experience dental and oral problems such as cavities, gum inflammation, and periodontal disease [1]. Based on data from the Indonesian Ministry of Health in 2018, the prevalence of dental caries in Indonesia is about 93.4%, while the prevalence of periodontitis is about 81.3% [2]. Infections and diseases in the oral cavity, including dental caries and periodontal disease, can affect general health, such as increasing the risk of cardiovascular disease, diabetes, and cancer [3]. Proper prevention and treatment of dental and oral problems can reduce the risk of complications to overall health and improve a person's quality of life. Dental and oral health is an important aspect of maintaining overall health. Dental plaque is one of the problems that often occur in dental and oral health, especially in children [4]. Dental plaque is formed due to the accumulation of food residues and bacteria on teeth that are not properly cleaned [5]. If not treated quickly, dental plaque can become a major cause of dental and oral health problems such as cavities, gum inflammation, and even permanent damage to teeth. Toothpaste is one of the dental care products that are used to help remove dental plaque and maintain oral hygiene [6]. However, some types of toothpaste contain chemicals such as Sodium Lauryl Sulfate (SLS) that can trigger irritation reactions on the gums and tongue in some sensitive individuals. Research conducted by Tijani and colleagues in 2018 showed that toothpaste containing Sodium Lauryl Sulfate was more effective in reducing dental plaque than toothpaste without Sodium Lauryl Sulfate in primary school students in Nigeria [7]. Research conducted by Aminian and colleagues in 2014 showed that toothpaste containing Sodium Lauryl Sulfate was effective in reducing dental plaque in primary school students in Iran [8]. Research conducted by Abanto and colleagues in 2012 showed that the use of toothpaste containing Sodium Lauryl Sulfate was more effective in reducing dental plaque in children in Peru [9]. Dental plaque is a sticky layer that forms on the surface of teeth consisting of bacteria and their products, which can cause tooth decay and gum disease if not properly

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addressed. Primary school students are an age group that is vulnerable to dental plaque because they are still in the learning stage and not accustomed to maintaining good oral health. Toothpaste containing Sodium Lauryl Sulfate has been widely used as an active ingredient in toothpaste because it can help reduce dental plaque and clean teeth.

However, the use of toothpaste containing Sodium Lauryl Sulfate is also associated with the risk of gum and mouth irritation as well as tooth sensitivity. The province of Aceh is one of the regions in Indonesia that still needs special attention in terms of dental and oral health, where there are still many cases of dental and oral diseases that have not been properly addressed. Factors that influence this include students' lack of knowledge about dental and oral hygiene. Research on the effectiveness of toothpaste containing Sodium Lauryl Sulfate against dental plaque in primary school students in the province of Aceh can provide important benefits to the community. Poor dental and oral health can affect a person's quality of life and can cause many serious health problems. Therefore, this study aims to determine the effectiveness of toothpaste with and without sodium lauryl sulfate content in reducing plaque index in students of STATE ELEMENTARY SCHOOL I Tanjung Lhoknga Aceh Besar."

MATERIALS AND METHODS

This study used a quasi-experimental method with a post-test only group design to evaluate the effects of using toothpaste containing sodium lauryl sulfate and toothpaste without sodium lauryl sulfate on the reduction of plaque index in students at State Elementary School I Tanjung Lhoknga Aceh Besar. The study was conducted from April to August 2021. The population in this study was all students from grade I to grade V at State Elementary School 1 Tanjung Lhoknga Aceh Besar, totaling 120 students. All populations were used as samples, which were divided into two groups.

Group I consisted of 60 students who used toothpaste with sodium lauryl sulfate content, while group II consisted of 60 students who used toothpaste without sodium lauryl sulfate. At the beginning of the study, the researcher measured the plaque index in all students before using toothpaste by examining the four surfaces of the teeth (mesial, distal, lingual, and palatal) and calculating the plaque index score. The plaque index score was categorized as good (0-1), fair (1.1-2), and poor (2.2-3). The data were then collected and compared with the results after using toothpaste containing sodium lauryl sulfate and toothpaste without sodium lauryl sulfate. The results of the study were presented in a table to show the difference in the use of both types of toothpaste.

RESULTS

The effectiveness of brushing teeth with Sodium Lauryl Sulfate toothpaste and toothpaste without sodium laurel sulfate in reducing the dental plaque index in students at State Elementary School I Tanjung Lhonga (table 1).

Table 1: Plaque index data based on the intervention group

Toothpaste intervention	Mean ± SD	Difference Mean ± SD	CI: 95%	p-value
Sodium lauryl sulfate				
Plaque index before	1,73 ± 1,141	0,17 ± 0,493	0,042 s/d 0,297	0,010
Plaque index after	1,56 ± 0,889			
Without Sodium lauryl sulfate				
Plaque index before	1,86 ± 0,693	0,62 ± 0,455		
Plaque index after	1,23 ± 0,089		0,497 s/d 0,732	0,000

The research results indicate that using toothpaste containing sodium lauryl sulfate has a significant effect (p- value < 0.05) on reducing the dental plaque index in students of State Elementary School 1 Tanjong, Lhoknga District, Aceh Besar (p=0.010).

Table 2: The effect of using pasta containing sodium and without sodium on changes in the dental plaque index

Plaque Index	N	Min	Max	mean	Std. Deviasi
Using sodium					
Before	60	0,3	4,0	1,731	1,1406
After	60	0,2	3,5	1,562	0,8895
Without using sodium					
Before	60	0,3	4,0	1,845	0,6930
After	60	0,0	2,8	1,230	0,6942

The research results show that using toothpaste that does not contain sodium laurel sulfate has a significant effect (p-value < 0.05) on reducing the dental plaque index in students at State Elementary School 1 Tanjong, Lhoknga Sub-district, Aceh Besar (p

= 0.000). Currently, there are toothpaste products available in the market without sodium laurel sulfate.

Table 3: Effectiveness after using toothpaste between Saudium Lauryl Sulphate and without Saudium Lauryl Sulfate on changes in dental plaque index

Intervention group	Dental Plaque Index				p-value
	n	Mean ± SD	Difference in Mean ± SD	CI: 95%	
Toothpaste Sodium Lauryl Sulfate	60	1,57 ± 0,889	0,33 ± 0,146	0,43 s/d 0,62	0,025
Toothpaste without Saudium Lauryl Sulfate	60	1,23 ± 0,694			

DISCUSION

The research results show that toothpaste containing sodium lauryl sulfate is effective in reducing dental plaque in elementary school students. Toothpaste containing sodium lauryl sulfate has a significant effect (p-value <0.05) on reducing the dental plaque index in students of STATE ELEMENTARY SCHOOL 1 Tanjong, Lhoknga sub-district, Aceh Besar (p = 0.010). Sodium lauryl sulfate (SLS) is an additive commonly used in dental care products such as toothpaste, as a cleaning and foaming agent. Several studies have been conducted to evaluate the effectiveness of toothpaste containing SLS on dental plaque in elementary school students [10]. Toothpaste containing Sodium Lauryl Sulfate has been widely used as an active ingredient in toothpaste because it can help reduce dental plaque and help clean teeth. However, the use of toothpaste containing Sodium Lauryl Sulfate is also associated with the risk of irritation to the gums and mouth as well as tooth sensitivity. A study conducted in Aceh in 2017 found that toothpaste containing SLS is significantly more effective in reducing dental plaque in elementary school students compared to toothpaste without SLS [11]. This is evidenced by the plaque index measurement results which showed a more significant decrease in plaque scores in the group using toothpaste containing SLS compared to the group using toothpaste without SLS [12]. However, other studies have found different results. A 2013 study conducted in Thailand showed that SLS-free toothpaste is just as effective in reducing dental plaque in elementary school students compared to toothpaste containing SLS. Toothpaste containing sodium lauryl sulfate is more effective in reducing dental plaque compared to toothpaste without it. A study conducted by Sari *et al.*, in 2017 showed that toothpaste containing sodium lauryl sulfate is more effective in reducing dental plaque compared to toothpaste without it [13]. A study conducted by Lestari *et al.*, in 2020 showed that toothpaste containing sodium lauryl sulfate is more effective in reducing dental plaque compared to toothpaste without it [14]. A study conducted by Kurniawan in 2019 showed that toothpaste containing sodium lauryl sulfate is more effective in reducing dental plaque compared to toothpaste without it [15].

CONCLUSION

The plaque index of the students at State Elementary School 1 Tanjung Lhoknga before using toothpaste containing Sodium Lauryl Sulfate was 1.731, and after using it, the plaque index decreased to 1.562. The plaque index of the students at State Elementary School 1 Tanjung Lhoknga before using toothpaste without Sodium Lauryl Sulfate was 1.845, and after using it, the plaque index decreased to 1.230. There was a significant difference in the plaque index of the students at State Elementary School 1 Tanjung Lhoknga before and after using toothpaste containing Sodium Lauryl Sulfate, with a p-value of 0.010. There was also a significant difference in the plaque index of the students at State Elementary School 1 Tanjung Lhoknga before and after using toothpaste without Sodium Lauryl Sulfate, with a p-value of 0.000.

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