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Comparison of the Effectiveness of Chewing Pineapple and Jicama on Reducing Debris Index in Sidoarjo: A Quasi-Experimental Study

Ayu Pratiwi Trisnawati, Sri Hidayati, Silvia Prasetyowati, and Sunomo Hadi
Department of Dental Health, Health Poltekkes Kemenkes Surabaya, Surabaya, Indonesia

Corresponding author: Ayu Pratiwi Trisnawati (e-mail: pratiwitrisnawati123@gmail.com)

ABSTRACT School-age children aged between 6-12 years are one of the groups most vulnerable to experiencing dental and oral health problems. In school-age children, consuming sticky foods tends to stick to their teeth and can cause dental problems. Debris is food waste that contains bacteria. Different from plaque and white material, debris is easier to clean. Chewing fibrous foods is a natural way to control plaque or debris. Fibrous and watery foods such as pineapple and jicama fruit can clean the surface of the teeth by chewing them. because these fruits have the ability to clean teeth which have self-cleaning capabilities. Research Objective: This study aims to determine the difference in the effectiveness of chewing pineapple and jicama fruit on reducing the debris index in class V students at SDN Pagerwojo Sidoarjo. Method: The type of research carried out was Quasi Experimental with a pretest and posttest design. The subjects of this research consisted of 86 class V students at SDN Pagerwojo. The data collection method uses a debris index inspection sheet by making direct observations of respondents. The data analysis technique used is the Shapiro-Wilk test if the data is normally distributed, if the data is not normally distributed using the Wilcoxson test. Results: The results of the research that has been carried out can be concluded that there is a difference in the effectiveness of chewing pineapple and jicama fruit in reducing index debris, that chewing jicama fruit is more effective in reducing index debris than chewing pineapple fruit.

KEYWORDS Pineapple, Jicama, Debris Index, Fifth grade student

I. INTRODUCTION

Dental and oral health is an important component that supports overall body health. Because good dental health has an impact on body health. Therefore, dental and oral problems must be treated and paid attention to thoroughly because they can have an impact on overall body health. School-age children aged between 6-12 years are one of the groups most vulnerable to experiencing dental and oral health problems [1]. One of the dental and oral health problems that most often occurs in elementary school children is dental caries. Tooth decay occurs due to damage to the hard tooth tissue, which consists of enamel, dentin and cementum [2].

According to 2018 Basic Health Research (RISKESDAS) data, the prevalence of damaged teeth in the 5-9 year age group was 54% and damaged teeth in the 10-14 year age group was 41.4% [3]. In school-aged children, consuming sticky foods such as biscuits, chocolate and caramel which tend to stick to their teeth can cause frequent dental problems. Leftover food stuck between the gingiva and teeth is called debris. Too much debris that is not cleaned immediately can cause dental health problems. Food scraps that have the potential to cause dental caries can remain attached to teeth for a long time and produce acids that have the potential to damage teeth. If food residue around the teeth is not cleaned regularly, this can trigger plaque formation and ultimately result in dental caries [4].

Debris is food waste that contains bacteria, but is different from plaque and white material, which is easier to clean. Foods that have a fiber, hard and rough texture have the ability to inhibit the formation of debris on teeth. Sunarto explained that foods rich in fiber can act as a natural cleaning agent on the surface of the teeth. Fibrous foods such as fruit and vegetables can act as natural cleansers because they indirectly rub the surface of the teeth when chewed. In addition, these fibrous foods contain around 75-95% water, which has cleansing properties because it stimulates saliva production [5]. Based on the results of the initial examination carried out on August 24 2023 with a target of 10 class V students at SDN Pagerwojo Buduran Sidoarjo, the average

Debris Index was equal to 2.07 where this indicates a bad category.

Elementary school age children are children who are in the middle and late childhood, namely between the ages of 7 -12 years. They usually go through a period of learning to count, write and read. At elementary school age there are many developments, including physical development, cognitive development, and social development. Father and mother patterns play a very important role in child development today. The child's physical development, cognitive development, and the development he will experience at the age at which he starts elementary school [6]. In general, school-age children are also more active in determining what food they eat and when they eat it. Children love foods like sweet biscuits, candy and chocolate. Foods with a lot of sugar can cause dental and oral problems. Eating fresh fruit and vegetables that are rich in vitamins, minerals, fiber and water can help clean your teeth more easily [7].

Plaque or debris control can be done by mechanical, chemical and natural methods. Chewing fibrous foods is a natural way to control plaque or debris. Physiologically dense and fibrous foods will make the mouth chew harder. The process of chewing food can increase saliva production. Fibrous and juicy foods such as fruit can clean teeth by chewing them. because fruit has the ability to clean teeth which has the ability to self-clean [8]

According to Wajo (2018), oral hygiene is defined as when the teeth are clean, healthy, free from dirt and plaque on the surface between the teeth. Leftover food or other dirt around the teeth is one of the factors that causes oral disease. Debris is soft food residue that accumulates in the layers around the teeth. Consuming more fibrous and watery foods, such as fruit and vegetables, and mouth, is a natural way to maintain oral health. Fresh fruit and vegetables, which contain lots of minerals, fiber, vitamins and water, naturally increase the intensity of chewing in the mouth and help clean food residue on the teeth [9].

Rough and fibrous foods can make chewing take longer. This chewing movement is very good for gum and tooth health. Chewing stimulates saliva, which can clean teeth. And neutralizes existing acids [10].

Cariogenic foods contain carbohydrates that can be fermented by microorganisms. And it will stay longer in the oral cavity [11]. Children prefer cariogenic foods made from ingredients that are sweet, soft, or easily stick to the teeth, for example candy, chocolate, ice cream, cakes and other foods, which can be easily absorbed into the teeth and cause plaque to form on the surface of the teeth. and trigger caries [12].

World Health Organization (WHO) states that people do not consume enough fruit and vegetables, it is recommended that everyone consume at least 100 grams of fruit and vegetables every day to help prevent disease. Apart from being a source of vitamins. Chewing fruit and vegetables is a natural way to maintain oral hygiene. Chewing can remove stains without damaging tooth enamel and functions as a tooth whitener and toothbrush, and can maintain healthy teeth and mouth [9].

*Self-cleaning*in the oral cavity can occur when chewing food that contains water and fiber, which stimulates saliva flow. Chewing foods that have a hard and rough texture can increase cleaning effectiveness and reduce the retention of food residue in the mouth [4]. For example, pineapple contains 1.4 grams of fiber and 86.37 grams of water for every 100 grams of pineapple flesh [13]. And jicama fruit is a fruit that contains 85.10 grams of water and 5.49 grams of fiber from the weight of the jicama [4].

Pineapple is a fruit that contains fiber and water. Pineapple contains 1.4 grams of fiber and 86.37 grams of water for every 100 grams of pineapple flesh. Pineapples contain chlorine, iodine and phenol which can kill bacteria. Chlorine reacts with water to form hypochlorite, which has bactericidal properties. Iodine is one of the strongest bactericidal substances that kills almost all pathogenic germs quickly. Iodine is thought to have the ability to coagulate proteins. One antiseptic that has bacterial properties is phenol, which works by denaturing bacterial cell proteins [13].

Consuming pineapple directly contains lots of fiber and water which can stop the development of plaque and streptococcus mutans bacteria. According to research obtained by Lucina Yauri, consuming pineapple is effective in reducing the debris index score [14]. The acidic properties of pineapple also increase saliva secretion so that saliva can help prevent plaque and the growth of streptococcus mutans bacteria [15]

Jicama fruit (Pachyrhizus erosus) is a fruit that has a water content of 85.10 grams and a fiber content of 5.49 grams from the weight of the jicama fruit. The liquid contained in it, such as isoflavones, is used as an antioxidant and can reduce bad cholesterol levels. and the fiber contained in it contains ingredients such as calcium, phosphorus and vitamin C. According to research obtained by Andrianton, jicama fruit is effective in reducing debris scores. In order to increase saliva secretion and clean food residue naturally, jicama requires quite hard chewing. Chewing is a movement that stimulates the release of saliva containing anti-bacterial, glycoprotein and calcium [4].

So, this study aims to determine the difference in the effectiveness of chewing pineapple and jicama fruit on reducing dental index debris in class V students at SDN Pagerwojo Sidoarjo in 2023.

II. METHODS

This research was conducted at SDN Pagerwojo Sidoarjo from August 2023 to March 2024. The research used was Quasi Experimental research. With a pre-experimental research plan of two group pretest posttest. collection of debris index data using inspection and observation. The method for collecting data in this research was by gathering

all class V students at SDN Pagerwojo Sidoarjo in a room. Measure the debris index before treatment in both groups.

The calculation of the number of samples needed uses the Slovin formula, which is in accordance with the inclusion criteria, namely all V grade students of Pagerwojo Elementary School and are willing to be respondents in the study.

Gather all fifth grade students at SDN Pagerwojo Sidoarjo in the classroom and explain the objectives and research procedures. Measuring the debris index before being given treatment, the two groups were divided into two pineapple groups containing students from classes VA and B. The yam bean group contained students from classes VB and C, so that the two groups were homogeneous and orderly. The pineapple group is the group that chews pineapple and the jicama group is the group that chews jicama. Instruct the pineapple group to consume pineapple weighing 100 grams by chewing the pineapple using both sides of the jaw alternately 32 times. Measuring the debris index of pineapple clusters after chewing. Instruct the jicama fruit group to consume jicama fruit weighing 100 grams by chewing the jicama fruit using both sides of the jaw alternately 32 times. Measuring the debris index of the jicama group after chewing. Collect data on DI value results and record them on the observation sheet (after treatment). Instruct the jicama fruit group to consume jicama fruit weighing 100 grams by chewing the jicama fruit using both sides of the jaw alternately 32 times. Measuring the debris index of the jicama group after chewing. Collect data on DI value results and record them on the observation sheet (after treatment).

The analysis technique used in this research in data analysis uses the T-test to compare the mean differences between 2 groups with the independent-sample T-test (because it is not paired). Using the Shapiro-Wilk test to test normality. use the alternative Wilcoxon test if the distribution is not normal. The Wilcoxon Signed Ranks Test is a non-parametric statistical hypothesis test that is used when comparing two related samples to see the differences between the paired samples. The Shapiro-Wilk test is a hypothesis test applied to a sample with the null hypothesis that the sample has been generated from a normal distribution.

III. RESULT

A. RESPONDENT CHARACTERISTICS

Based on the data presented in TABLE 1, shows that the results have a significance value of 0.000, which means there is a significant difference between the average before and after chewing pineapple. TABLE 2 shows that the results have a significance value of 0.000, which means there is a significant difference between the average before and after chewing jicama fruit. TABLE 3 It can be seen that as many as 43 students before being given the pineapple chewing treatment had an average debris index of 1.88 in the medium category and this decreased after chewing the pineapple to 1.19 in the medium category. So it can be seen that the debris index decreased by 0.69. Meanwhile, 43 other students before being treated with chewing jicama fruit had an average debris index of 1.92, which decreased after chewing jicama fruit to 1.12 in the medium category. So it can be seen that there was a decrease in the debris index of 0.79.

TABLE 1
Results of measuring the average debris index before and after chewing pineapple

N	Chew Pineapple	Average Debris Index	Sig. (2-tailed)
43	Before	1.88	
	After	1.19	0,000

TABLE 2
Results of measuring the average debris index before and after chewing jicama fruit

N	Chew Jicama fruit	Average Debris Index	Sig. (2-tailed)
43	Before	1.92	
	After	1.12	0,000

TABLE 3
Differences in Debris Index After Chewing Pineapple and Jicama Fruit in Class V Students at SDN Pagerwojo Sidoarjo

Chew	Average Debris Index		
	Before	After	Decline
Pineapple	1.88	1.19	0.69
Jicama Fruit	1.92	1.12	0.79

TABLE 4
Debris Index Analysis Results After Chewing Pineapple and Jicama Fruit

Variable	Mean			
	Before±SD	After±SD	Before And After ±SD	*p value*
Chewing Pineapple	1.88±0.48	1.19±0.48	0.69±0.36	0,000
Chewing Jicama Fruit	1.92±0.52	1.12±0.48	0.79±0.50	0,000

Based on TABLE 4 It can be seen that the mean value before chewing pineapple is 1.88, while after chewing pineapple it is 1.19. Before and after chewing pineapple the result is 0.69 with a p value of 0.000 (p value (sig) < 0.05), so H_1 accepted and H_0 rejected. This means that there is an effect of chewing pineapple on reducing the debris index number in class V students at SDN Pagerwojo in 2024.

TABLE 5
Results of Analysis of Differences in the Effectiveness of Chewing Pineapple and Jicama Fruit in Reducing Debris Index in Class V Students at SDN Pagerwojo Sidoarjo

Variable	*Mean ± SD*	*Sig.(2-tailed)*

After chewing pineapple	1.19 ± 0.48	0.515
After chewing jicama fruit	1.12 ± 0.48	0.515

Based on TABLE 5 The mean debris index after chewing pineapple was 1.19. Meanwhile, the mean debris index value after chewing jicama fruit was 1.12 with significance sig.(2-tailed) = 0.515. So the sig (2-tailed) value is> 0.05, then the hypothesis is rejected. Thus, it was concluded that there was no difference in the effectiveness of chewing pineapple and jicama fruit on the average debris index number for class V students at SDN Pagerwojo Sidoarjo in 2024.

IV. DISCUSSION

Based on the results of measurements after being given treatment for chewing pineapple fruit, it was found that the average student debris index decreased from the medium category to the medium category but there was a decrease in the numbers.

This is in line with Indriana's 2024 research, namely that there were differences in debris index results before and after chewing pineapple for students at SDN 10 Sungai Sapih, Padang City. Because pineapple contains the enzyme bromelain and flavonoids. Pineapples have antibacterial properties that inhibit the growth of bacteria, especially Streptococcus mutans, which is the cause of debris formation. Apart from that, another aspect that plays a role is the presence of citric acid in pineapple, which can stimulate saliva secretion. When saliva production increases, sodium and bicarbonate levels also increase [16].

The decrease in the debris index score after consuming pineapple in this study was most likely caused by the relatively high vitamin C content, namely 47.8 mg per 100 g of pineapple.

Vitamin C is useful for producing collagen, which helps strengthen teeth and reduces the risk of secondary caries in children, as well as stimulating saliva secretion to help reduce debris levels. Apart from that, the citric acid content in pineapple also acts as an antibacterial.

When it comes into contact with debris during the chewing process, citric acid will help break down the adhesion of the debris and stimulate saliva secretion, resulting in a decrease in the debris index score.

In Ziyadah's 2020 research, it was stated that the reduction in the debris index was caused by chewing movements which stimulated the production of more saliva, because the natural property of saliva is to clean teeth from food debris that sticks to the surface of the teeth. Thus, it can be concluded that pineapple is effective in cleaning food debris [17].

In a 2024 study, Indriana stated that consuming fruit as a natural cleaning method can help remove food debris between main meals and snacks, especially before brushing your teeth. Food debris that remains stuck to the teeth before brushing can produce acid with the help of bacteria, which can ultimately cause damage to tooth enamel through the demineralization process. Consuming fruits that are rich in water, fiber and vitamins, such as pineapple, can help reduce this risk[18].

According to Holidina's 2021 research, consuming foods that are rich in fiber and have effective teeth cleaning properties, such as fruit, is an important factor in preventing dental and oral diseases. Apart from being a high source of vitamins, fruit also contains natural fiber. Several fruits have the ability to clean teeth well, including pineapple.

The advantage of chewing pineapple is that it can help clean food that is in the gaps of the teeth so that this can help clean debris that sticks to the surface of the teeth. It can be concluded that chewing pineapple can help students keep their teeth and mouth clean.

The results of the measurements after being given treatment for chewing jicama fruit showed that the average student debris decreased from the bad category to the medium category.

This is in line with Andriatoni's (2019) research where there was a decrease in the debris index in children aged 8-9 years at Adabiah Elementary School, Padang city. Andrianton also stated that consuming jicama can cause a decrease in the debris index because of the high water content in jicama and its fiber content. The fiber contained in jicama will experience friction during the chewing process, so it can remove food debris that sticks to the surface of the teeth and stimulate saliva production for self-cleaning [19]. Apart from containing water and fiber, it also contains isoflavones. The isoflavone liquid in jicama has the ability to inhibit the activity of the glucosyltransferase enzyme, produced by streptococcus mutans, which plays a role in the occurrence of dental caries. The dense consistency of jicama requires vigorous chewing. Repeated chewing will stimulate saliva production, which helps clean the mouth and reduces food buildup.

According to research Holidina 2021 states that consuming foods that are rich in fiber and have effective teeth cleaning properties, such as fruit, is an important factor in preventing dental and oral diseases. Apart from being a high source of vitamins, fruit also contains natural fiber. Several fruits have the ability to clean teeth well, including jicama fruit. The advantage of chewing jicama fruit is that it can help clean food that is in the gaps of the teeth so that this can help clean debris that sticks to the surface of the teeth. It can be concluded that chewing jicama fruit can help students keep their teeth and mouth clean.

The results showed that there was a difference in the effectiveness of chewing pineapple and jicama fruit on the average debris index score for class V students at SDN Pagerwojo 2024. This can be seen where the decrease in the average debris index value after chewing jicama fruit was higher compared to the decrease in the average value of jicama fruit after chewing jicama fruit. Average debris index after chewing pineapple.

The difference in the decrease in debris index status after chewing pineapple and yam fruit occurs because pineapple contains ingredients that produce mechanical effects when

consumed. Consuming pineapple in large quantities has many benefits for dental health. Pineapples can reduce the growth of plaque and streptococcus mutans bacteria, as well as saliva production. Apart from containing fiber and water, pineapple also contains the enzymes bromelain, phenol, chlorine, iodine and citric acid which have the effect of suppressing the growth of plaque and bacteria.

This is in line with Putri's research in 2021. Pineapples contain substances that can maintain bone strength and help digestion. Fresh fruit contains 10% sugar, most of which is sucrose with the remainder being glucose and fructose. Pineapples which are rich in fiber can be believed to increase saliva production, clean teeth and mouth and strengthen gums [20].

This can help clean teeth naturally and reduce the buildup of debris on the teeth. Top of Form Bottom of Form *Self-cleaning* in the oral cavity can occur when consuming foods that are rich in water and fiber, which stimulates the production of saliva to clean teeth. Chewing foods that have a hard and rough texture can also increase cleaning effectiveness and reduce food residue remaining in the mouth. Fiber in food naturally stimulates saliva production, which helps remove food debris stuck in the teeth. The chewing process helps break down large food particles into smaller ones in the mouth. Consumption of pineapple and jicama can both reduce the debris index on the teeth. A significant decrease in the debris index was seen after treatment, but jicama showed a greater average decrease than pineapple.

Jicama also contains antibacterial compounds such as flavonoids containing phenol, which can inhibit the growth of Streptococcus mutans bacteria. These flavonoids can chemically inhibit plaque formation by damaging proteins, enzymes, cell walls and bacterial cell membranes [21].

The results of the two treatments in this study were basically the same in reducing the debris index number before and after chewing fruit, both pineapple and jicama fruit. This is in line with research which states that foods that contain lots of water and fiber, such as jicama, watermelon, papaya, strawberries, apples, pears and pineapple, are effective for maintaining dental hygiene [22].

Consuming pineapple and jicama fruit can both reduce index debris on teeth. A significant decrease in debris index was seen after the treatment was given, however jicama fruit showed a greater average decrease than pineapple fruit.

V. CONCLUSION

Based on the results of data analysis and discussion, the researchers concluded that the average debris index for class V students at SDN Pagerwojo Sidoarjo in 2024 before chewing pineapple was in the medium category, while after chewing pineapple it was in the medium category. The average debris index for class V students at SDN Pagerwojo Sidoarjo in 2024 before chewing jicama fruit was in the bad category, while after chewing jicama fruit it was in the medium category. There is a difference in the effectiveness of chewing pineapple and jicama fruit on the average reduction in debris index in class V students at SDN Pagerwojo Sidoarjo.

Parents and teachers can provide information to children so they can maintain a healthy diet that involves consuming fibrous foods such as pineapple and jicama fruit. This food or fruit is easy to find in the market and is recommended as a substitute for sweet and sticky foods so that children's oral hygiene can remain maintained and healthy.

For future researchers, it is recommended to conduct further research over a longer period of time and consider additional variables, as well as the long-term effects of a diet of many types of fruits and vegetables.

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