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Saliva pH between Gargling and without Gargling Water after Consuming Sweet and Sticky Foods

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Abstract
Sweet and sticky foods are the main energy source for oral bacteria and are directly involved in lowering the pH. Gargling with boiled water after every meal can speed up the pH of the saliva in the mouth to return to normal. The objective of this study is to determine the difference in salivary pH between gargling and without gargling water after consuming sweet foods in elementary school students. The research method used was quasi-experimental with pretest and posttest with control group design. The instrument in this research was a pH meter. The population in this study were students in grades I – V of public elementary schools in Bantul with a total population of 135. The research sample used total sampling. Analysis of the research data was conducted using the Wilcoxon test, Mann Withney and Anova Test. The results showed that the pH of saliva (direct gargling) of water/0 minutes after consuming sweet and sticky foods was before 7.53 after gargling 7.99 increased by 0.46. The pH of gargling saliva 5 minutes before 7.48 after rinsing 7.63 increased 0.15. pH of saliva gargling 10 minutes, that was before 7.31 after gargling 7.3 decreased by 0.18. pH of saliva (without rinsing) water/0 minutes, which was initial pH 7.68 to 7.55 after consuming sweet and sticky foods, decreased 0 ,13. The pH of saliva without rinsing with water for 5 minutes, the initial pH was 7.70 to 7.06, decreased by 0.64. The most effective gargling time on salivary pH was gargling water immediately 0 minutes after consuming sweet and sticky foods. The time without gargling water affecting the pH of saliva after consuming sweet and sticky foods was 5 minutes.

Keywords: Gargling With Water, No Rinse With Water, Saliva pH, Sweet and Sticky Food.

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1. INTRODUCTION

Dental caries can occur, one of which is caused by food/some types of dietary carbohydrates, such as sucrose and glucose fermented by certain bacteria and form acid so that the plaque pH decreases to below 5 within 1-3 minutes. Repeated decrease in pH will result in demineralization of vulnerable tooth surfaces and the caries process begins (Lestari & Putri, 2016). Sweet and sticky foods contain carbohydrates which are the main energy source for oral bacteria and are directly involved in lowering pH (Jannah, et al., 2016). Gargling is one of the preventive measures for dental caries, which is the easiest and cheapest to do, so that the habit of gargling using plain water after eating sweet and sticky foods is an alternative in maintaining the pH of saliva so that it remains within normal limits so that it does not weaken tooth enamel (Wahyuningsih, & Ramadhani, 2015). In the Special Region of Yogyakarta, the number of sufferers of dental and oral problems, according to the 2018 Basic Health Research, was 47.7% higher than the national average of 45.3% of dental and oral problems (Kementerian Kesehatan, R. I., 2018).

Oktarinda (2011), stated that Saliva is one of the components that contributes to the level of acidity (pH) of the mouth. Saliva helps the process of remineralizing small lesions on the tooth enamel layer (Kusumasari, 2012). Saliva is a thick fluid produced by the salivary glands, parotid glands, sublingual glands and submandibular glands, which are located under the tongue near the cheek muscles and near the palate. Saliva contains 99.5% water (Haryani, et al., 2016).

The results of preliminary study interviews with 10 elementary school students in Bantul, regarding gargling water after eating sweet and sticky foods, it was found that 70% of students did not rinse their mouths water after consuming sweet and sticky foods, and had many cavities, and had never been tested for salivary pH after consuming sweet and sticky foods. The objective of this study is to discover an effective gargling time in maintaining normal salivary pH after consuming sweet and sticky foods.

2. RESEARCH METHOD

This type of research was quasi-experimental with Pretest and Posttest with Control Group Design (Notoadmodjo, 2012). The research technique used was to test the difference in salivary pH between gargling and without rinsing with water after consuming sweet and sticky foods in elementary school students at minute 0, minute 5 and minute 10 after consuming sweet and sticky foods. This research was conducted in one of the public elementary schools in Bantul, Yogyakarta. The population in this study were students in Grades I – V of State Elementary Schools in Bantul. The sample in this study used a total sampling technique of 135 respondents. The statistical tests used were Wilcoxon, Mann Withney and Anova test (Jannah et al., 2016). The inclusion criteria in this study were aged 6-12 years, had the habit of eating sweet and sticky foods, willing to be respondents, and communicative. The exclusion criteria in this study were students with teeth that had caries. This research has received approval from the ethics commission with the ethics number e-KEPK/POLKESYO/0149/VI/2019.

3. RESULTS AND DISCUSSION

Table 1. Average Saliva pH of Respondents Gargling Water after Consuming Sweet and Sticky Foods.

Variable	pH Saliva			Wilcoxon Test			
	Before	After	Deviation	Z	Asymp. Sig.	A	Information
Group Directly Gargling/0 minutes	7,53	7,99	0,46	-2.856	0,004	0,05	Meaningful
The group of 5 minutes just rinsed with water	7,48	7,63	0, 15	-1,351	0,177	0,05	Not meaningful
The group of 10 minutes just rinsed with water	7,31	7,13	0,18	-1,543	0,123	0,05	Not meaningful

Table 1 shows that the pH value of saliva in the gargling group/0 minutes after consuming sweet and sticky foods increased the most from before consuming sweet and sticky foods, namely from 7.53 to 7.99 with a difference of 0.46. The 10-minute group just rinsed their mouth after consuming sweet and sticky foods. The saliva pH decreased from 7.31 to 7.13 with a difference of 0.18. The Asymp. Sig (p) value of gargling directly/0 minutes was 0.004 < 0.05, thus, Ho was accepted and Ha was rejected, meaning that statistically it showed that there was a significant difference in gargling directly/0 minutes before and after consuming sweet foods and attached to salivary pH. SDN Puluhan students, meaning that there is an effect of gargling water immediately after consuming sweet foods and is attached to the salivary pH of SDN Puluhan students. The Asymp. Sig (p) value of gargling water 5 minutes after consuming sweet and sticky foods is 0.177 > 0.05, thus, Ho is rejected and Ha is accepted, statistically means that there is no significant difference in salivary pH before and after consuming sweet foods attached for 5 minutes then rinsed with water, meaning that there was no effect of gargling water 5 minutes after consuming sweet foods and attached to the pH of the saliva of SDN Puluhan students. The Asymp. Sig (p) pH value of saliva gargling with water 10 minutes after consuming sweet and sticky foods is 0.123 <0.05, thus, Ho is rejected and Ha is accepted, statistically means that there is no significant difference in salivary pH before and after consuming sweet food and stick to it 10 minutes then rinse with water. It means that there is no effect of gargling with water, 10 minutes after consuming sweet food and sticking to the pH of the saliva of SDN Puluhan students. The group without gargling water 5 minutes after consuming sweet and sticky foods experienced the most decrease in pH from 7.70 to 7.06 with a difference of 0.64.

Table 2. Average Saliva pH of Respondents without Gargling Water after Consuming Sweet and Sticky Foods.

Variable	pH Saliva			Wilcoxon Test			
	Before	After	Deviation	Z	Asymp. Sig	A	Information
No Gargling Group/0 minutes	7,68	7,55	0,13	-1,147	0,251	0,05	Not meaningful
Group 5 minutes without gargling water.	7,70	7,06	0,64	-5,030	0,000	0,05	Meaningful
Group 10 minutes without gargling water	7,40	6,96	0,44	-4,312	0,000	0,05	Meaningful

Table 2 shows that the group without gargling water 5 minutes after consuming sweet and sticky foods experienced the most decrease in pH from 7.70 to 7.06 with a difference of 0.64. The Asymp. Sig (p) value without gargling directly/0 minutes was 0.251> 0.05, thus, Ho was rejected and Ha was accepted, meaning that statistically there was no significant difference before and after consuming sweet and sticky foods without gargling directly/0 minutes, on the salivary pH of elementary school students, meaning that there is no effect without gargling water directly/0 minutes after consuming sweet foods and sticking to the salivary pH of elementary school students. The Asymp. Sig (p) value without gargling water 5 minutes after consuming sweet and sticky foods is 0.000 < 0.05, thus, Ho is accepted and Ha is rejected. It statistically means that there is a significant difference in salivary pH before and after consuming sweet foods and attached 5 minutes later without gargling with water, meaning that there was no effect without rinsing with water 5 minutes after consuming sweet foods and attached to the salivary pH of SDN Puluhan students. The Asymp. Sig (p) pH value of saliva without rinsing with water 10 minutes after consuming sweet foods and sticking is 0.000 <0.05, thus, Ho is accepted and Ha is rejected. Statistically, it means that there is a significant difference before and after consuming sweet foods and attached 10 minutes later without rinsing with water, to the salivary pH of SDN Tens students. It means that there is an effect without rinsing with water, 10 minutes after consuming sweet foods and sticking to the pH of the saliva of SDN Puluhan students.

Table 3. Results of the Group Analysis of Gargling and without Gargling Water using the Mann Whitney Test

Time	Asymp.Sig	A	Information
0 minute	0,000	0,05	Not meaningful
5 minute	0,000	0,05	Meaningful
10 minute	0,429	0,05	Not meaningful

Table 3 provides information between the average salivary pH of the 0-minute and 5-minute gargling group with the respondent's saliva pH without rinsing with water 0 minutes and 5 minutes after consuming sweet and sticky foods. The result is that the Asymp.Sig value of 0.000 is smaller than 0. 05, thus, Ho is accepted and Ha is rejected.

Statistically, it shows that there is a significant difference between the pH value of the saliva of students who gargle 0 minutes and 5 minutes and the pH of the saliva of students who do not rinse their mouth with water for 0 minutes and 5 minutes. As for the average salivary pH of the 10-minute gargling group with the respondent's saliva pH without rinsing with water 10 minutes after consuming sweet and sticky foods. The results obtained that the Asymp. Sig value of 0.429 is greater than 0.05, thus, Ho is rejected and Ha is accepted. Then, statistically, it shows that there is no significant difference between the saliva pH values of respondents who gargled with no gargling.

To determine the effectiveness of gargling water 0 minutes, 5 minutes and 10 minutes after consuming sweet foods and sticking to the pH of the respondents' saliva, the Anova test was conducted, and the results of the study, there were significant differences (p=0.027), (p=0.000), (p= 0.009).

Table 4. Anova Test Post Hoc Tests Tukey HSD Test Saliva pH Direct gargling 0 minutes, 5 minutes and 10 minutes.

Gargling Time (I)	Gargling Time (J)	Sig
Gargling 0 minute	Gargling 5 minutes	.0,027
	Gargling 10 minutes	0,000
Gargling 5 minutes	Gargling 0 minute	0,027
	Gargling 10 minutes	0,009
Gargling 10 minutes	Gargling 0 minute	0,000
	Gargling 5 minutes	0,009

Table 4 can be seen that between gargling directly/0 minutes and 5 minutes showed a significant difference, sig = 0.027 <0.05), gargling 0 minutes with 10 minutes showed a difference, Sig = 0.000 < 0.05. Gargling 5 minutes with 10 minutes showed a significant difference, sig = 0.009 < 0.05. It means direct gargling time/0 minutes is the most effective in increasing salivary pH.

To determine the effectiveness without gargling water 0 minutes, 5 minutes and 10 minutes after consuming sweet foods and attached to the pH of the respondents' saliva, the Anova test was performed, and the results of the study, there were significant differences (p = 0.000), (p = 0.000), and there was no significant difference between 5 minutes and 10 minutes (p=0.728).

Table 5. Saliva pH ANOVA test without direct gargling/0 minutes, 5 minutes and 10 minutes.

Time Without Gragling (I)	Time Without Gargling (J)	Sig
Without Gargling 0 minute	Without Gargling 5 minutes	.0,000
	Without Gargling 10 minutes	0,000
Without Gargling 5 minutes	Without Gargling 0 minute	0,000
	Without Gargling 10 minutes	0,728
Without Gargling 10 minutes	Without Gargling 0 minute	0,000
	Without Gargling 5 minutes	0,728

Table 5 shows that between no direct gargling/0 minutes and 5 minutes showed a significant difference (sig = 0.000), without rinsing 0 minutes with 10 minutes showed no difference, Sig = 0.000 <0.05. Without rinsing for 5 minutes with 10 nits, there was a significant difference, sig = 0.728 > 0.05. It means that without gargling for 5 minutes the most effect on the decrease in salivary pH.

Gargling can clean the oral cavity from debris, prevent and reduce plaque accumulation and have a direct effect on saliva. One of the simple, inexpensive, efficient and no side effects that can be performed in maintaining oral health is to rinse with water. The results showed that gargling water immediately/0 minutes and 5 minutes after consuming sweet and sticky foods could increase the pH of respondents' saliva. The longer the time to rinse water, which is 10 minutes after eating sweet foods, the lower the salivary pH.

The results of this study are in accordance with the results of research by Jannah, et al., (2016), which revealed that gargling water can remove food debris in the oral cavity, the fluorine contained in it can inhibit the demineralization process and bind to tooth enamel components, reduce the activity of microorganisms and can has a direct effect on salivary pH (Jannah, et al., 2016). Furthermore, in accordance with the results of research Amalia, et al., (2014), that there is an increase in salivary pH after gargling using white tea solution. Another study also stated that there was an increase in salivary pH after gargling with a miswak solution.

Another study that is in line with this research is the research of Wahyuningsih, & Ramadhani, (2015), which states that gargling is one of the preventive measures for the occurrence of dental caries, which is the easiest and cheapest to apply. You should always rinse your mouth with water after every meal. It can speed up the pH of the saliva in the mouth back to normal, thus, it does not have time to weaken tooth enamel. Treatment/intervention time (0 minutes, 5 and 10) minutes for 3 groups without gargling after consuming sweet and sticky foods, the results showed that the three interventions could lower salivary pH, and the most pH-lowering value was without gargling 5 minutes after consuming sweet foods, that is 0.64.

The results of this study are in accordance with research (Jannah, et al., 2016), which states that sweet and sticky foods contain carbohydrates which are the main energy source for oral bacteria that are directly involved in lowering pH. Although the first 5-10 minutes after eating are critical times for pH (around 5.2-5.5), in the author's study 5-10 minutes after consuming sweet foods, there is a decrease in pH, but the pH remains in an alkaline/neutral state. It may be caused by other factors, including the respondent's saliva factor.

Another study that is also in line with the results of this study is a study conducted by Sulendra, et al., (2013), which states that saliva as a host factor plays a role in the protection mechanism that maintains the normal flora of the oral cavity and tooth surface, which are bacterial cleansing, antibacterial activity, buffers, and remineralization. Saliva also has a buffer system that functions to neutralize acidic conditions that arise due to plaque formation or acidic foods and drinks.

Without gargling water for 0 minutes, 5 minutes and 10 minutes after consuming sweet and sticky foods, it can reduce the pH of the respondent's saliva. The results of this study are in accordance with the results of research (Suratri, et al., 2017), which states that sweet and sticky foods containing carbohydrates are the main energy source for oral bacteria and are directly involved in lowering salivary pH. There is a relationship between the pH of Saliva and the habit of drinking sweet milk (sugar), and often drinking and eating sweet and sticky foods in pre-school age children in Banten Province and Yogyakarta Special Region. This is also in accordance with the research

of Suyuti, (2012), which stated that the occurrence of caries in children's teeth was caused by the influence of eating sweet and sticky foods.

The results of the analysis used the Wilcoxon test, the average pH of saliva gargling with water 0 minutes after consuming sweet and sticky foods obtained the Asymp.Sig (p) value of 0.004 <0.05, thus, Ho is accepted and Ha is rejected. It statistically means that there is a difference or there is an effect of gargling water directly/0 minutes after consuming sweet foods and attached to the pH of the respondent's saliva. You should always rinse your mouth with water after every meal, so that the pH of the saliva in the mouth returns to normal.

The results of this study are in accordance with the results of research by A'yun, et al., (2016), that after chewing simple carbohydrate foods, gargling with water, the average pH of saliva after gargling will increase. The pH of saliva after gargling has increased from the pH of saliva after chewing simple carbohydrate foods. It proves that gargling vigorously over the entire surface of the mouth can remove the remnants of food debris in the oral cavity thereby reducing bacterial activity and providing a mechanical effect that can affect salivary pH. The results of this study are also in accordance with previous research which states that you should always rinse your mouth with boiled water after every meal. It can speed up the pH of the saliva in the mouth back to normal, thus, it does not have time to weaken tooth enamel.

Wilcoxon test average pH of saliva gargling with water, 5 minutes after consuming sweet and sticky foods, the Asymp. Sig (p) value is 0.177> 0.05, thus, Ho is rejected and Ha is accepted. Statistically, it means that there is no significant difference or no effect of gargling water 5 minutes after consuming sweet foods and attached to the pH of the respondent's saliva. Although not significant, but numerically/value, there is an increase in salivary pH which is 0.15 from before rinsing 7.48 after gargling water to 7.63.

The results of this study are not in accordance with research by A'yun, et al., (2016), which states that within 1-3 minutes after eating food/some types of food carbohydrates, such as sucrose and glucose which are fermented by certain bacteria will form acid so that the plaque pH decreases to below 5. Repeated decreases in pH will result in demineralization of the vulnerable tooth surface and the caries process begins.

The Asymp. Sig (p) pH value of saliva gargling with water 10 minutes after consuming sweet and sticky foods was 0.123 <0.05, thus, Ho was rejected and Ha was accepted. Statistically it means that there was no significant difference in rinsing with water, 10 minutes. after consuming sweet foods and sticking to the pH of saliva, meaning that there is no effect of gargling water, 10 minutes after consuming sweet foods and sticking to the pH of the respondent's saliva. In this group, there was a decrease in salivary pH of 0.18, from 7.31 (basic) to 7.13 (alkaline). This decrease in salivary pH did not cause a critical pH state, possibly caused by other factors including salivary factors. Meanwhile, the results of this study are in accordance with research (Ismianifatun, et al., 2012), that in the mouth there is saliva (saliva) which has a buffer effect or balance. Fifteen (15) – 20 minutes after eating the salivary pH will return to normal.

The average pH of saliva without rinsing with water (0) minutes after consuming sweet foods decreased by 0.13 from before rinsing with water, from 7.68 (base) to 7.55 (base). The average pH of respondents' saliva without rinsing with water (5) minutes after consuming sweet and sticky foods decreased by 0.64 from before rinsing with water, that was from 7.70 (base) to 7.06 (base). Means that without rinsing water/0 minutes or 5 minutes after consuming sweet and sticky foods can lower the pH of

saliva, although it drops, but in this study, the pH was still in an alkaline state. This may be caused by the respondent's saliva, which tends to be alkaline.

The results of this study are in accordance with research (Sari, 2011), that an alkaline salivary pH can cause high salivary secretion in children, so that it has an impact on high saliva volume as well. One of the functions of saliva is to act as a buffer that helps neutralize the pH of saliva after eating, so that if the volume is high, it will balance the pH of the saliva and reduce the occurrence of demineralization. The average salivary pH of the respondents was alkaline (7.53) after brushing their teeth. It can be due to the effect of toothpaste containing sorbitol and xylitol used by respondents. Sorbitol and xylitol have been shown to increase salivary pH. The results of this study are in accordance with research (Ismianifatun, et al., 2012), that Sorbitol has the advantage of not being easily fermented by bacteria so that it can increase remineralization and reduce dental caries and does not reduce saliva pH so that saliva remains stable at a certain pH. Xylitol is also clinically proven to inhibit plaque teeth by 80%, inhibits tooth enamel demineralization, salivary pH, produces tooth enamel remineralization.

This study is also in accordance with research (Putri, et al., 2010) on 70 smokers. After chewing xylitol gum the salivary pH increased from 5.59 to 7.77. Another study conducted by Ismianifatun, et al., (2012), also stated that sorbitol can suppress the growth of Streptococcus mutans bacteria so that the pH of saliva does not decrease. Toothpaste containing sorbitol and xylitol has the property of stimulating salivary flow so as to increase the rate of salivary saliva contains bicarbonate which can increase the buffering capacity as well as the toothpaste does not reduce salivary pH but increases salivary pH.

The results of this study are in accordance with the opinion of Aldiaman, et al., (2016) in brushing teeth, to be effective, brushing teeth must be considered. One of the good techniques for children is the circular/fone's technique. The results of this study are also in accordance with the study, that the average OHI-S score before brushing teeth with the fone method was 2.3 with bad criteria and after brushing teeth with the fone method it dropped to 0.9 with good criteria. It means that with a good OHIS, the pH of the saliva is neutral or alkaline.

The results of the Wilcoxon test results from three groups showed that there was a decrease in salivary pH, and the most was in the group without gargling 5 minutes after consuming sweet and sticky foods, which was 0.64 followed by no rinsing with water 10 minutes after consuming sweet and sticky foods, at 0, 44. Although there was a decrease in salivary pH, the pH was alkaline (7.55) and neutral (6.96). The results of this study indicate that consuming sweet and sticky foods can reduce salivary pH.

The results of this study are not in accordance with the research of Lestari, (2016), which stated that during the first 5-10 minutes after eating, the pH is critical (around 5.2-5.5). After eating, especially carbohydrate foods, there will be fermentation of food glucose. The result is a compound that is acidic and makes the environment around the teeth acidic. Within a few minutes, the degree of acidity will increase or the pH will decrease. If the pH continues to decrease, it will reach a critical pH value. The pH value under normal conditions is in the range of 5,6,6 with an average of 6,8. The presence of changes in pH after eating will return to normal after 20-30 minutes later.

The results of this study are in accordance with the research of Kartikasari & Nuryanto, (2014), which stated that food/several types of dietary carbohydrates, such as sucrose and glucose which are fermented by certain bacteria will form acid so that the plaque pH decreases. The difference is the results of the research on decreasing the pH are still in an alkaline state Lestari dan Putri, (2016), research reaches below 5 within 1-

3 minutes. Repeated decrease in pH will result in demineralization of vulnerable tooth surfaces and the caries process begins.

According to the research of Worotitjan, et al., (2013), that consuming cariogenic foods frequently and repeatedly will cause plaque pH to be below normal and cause demineralization of enamel and the formation of dental caries. In accordance with the research by Praptiningsih & Ningtyas, (2010), that the food eaten can cause saliva to be acidic or alkaline. Consumption of sugar-containing foods and beverages between meals and at mealtimes is associated with a large increase in caries.

The results of research by Setiawan, (2012), that the pH of saliva 5 minutes after eating has not changed much compared to the initial pH before brushing teeth in the method of brushing teeth before eating. Salivary pH 15 minutes and 30 minutes after eating showed a lower pH change (acidic) compared to the initial pH before brushing teeth on the method of brushing teeth before eating.

School age children, especially elementary school children, are a group that is vulnerable to dental and oral diseases because generally at school age these children still have behaviors or habits that do not support dental health. Dental caries is a disease of the hard tissues of the teeth characterized by demineralization of the hard tissues of the teeth, followed by damage to organic matter that can cause pain to pain (panna). Cariogenic foods are foods that can cause dental caries. The nature of cariogenic foods is that they contain lots of carbohydrates, are sticky and break easily in the mouth.

The relationship between carbohydrate consumption and the occurrence of dental caries is related to the formation of plaque on the tooth surface. Plaque formed from food debris that sticks between the teeth and this plaque will eventually grow bacteria which can convert glucose into acid so that the pH of the oral cavity decreases to 4.5. In such circumstances, the tooth enamel structure will dissolve. Repeated consumption of carbohydrates that are too frequent causes the production of acid by bacteria to become more frequent so that the acidity of the oral cavity becomes more acidic and more enamel is dissolved.

The results of data analysis using the Mann Withney test in this study are in accordance with research (Wahyuningsih & Ramadhani, 2015), which states that gargling is one of the preventive measures for dental caries, which is the easiest and cheapest to conduct. It is better to gargle after finished eating. It can speed up the pH of the saliva in the mouth back to normal, thus, it does not have time to weaken tooth enamel. Saliva has a buffer system that functions to neutralize acidic conditions that arise due to plaque formation or acidic foods and drinks. Saliva forms a mucus layer as a protective mucosa, helps inhibit plaque formation, regulates the pH of the oral cavity, and others.

Meanwhile, without gargling immediately (0) minutes after consuming sweet and sticky foods, it lowered the salivary pH by 0.13. Without gargling water for 5 minutes, the pH lowers by 0.64. This means that without gargling water, 0 minutes and 5 minutes after consuming sweet foods causes a decrease in salivary pH.

The results of this study are in accordance with the research of Praptiningsih & Ningtyas, (2010), which stated that at 5 minutes after consuming sweet carbohydrates it affects the electrolyte properties of saliva so that it can affect the pH value. The result is that the asymp Sig value is 0.429 > 0.05 so Ho is rejected and Ha is accepted, these results indicate that there is no significant difference in effectiveness between the salivary pH value of respondents who rinsed with no gargling, which both lowered the pH of saliva, those who rinsed their mouths decreased. 0.18, without gargling, the pH decrease was 0.44.

The results of this study are in accordance with research by Praptiningsih & Ningtyas, (2010), that changes in the degree of acidity tend to increase 15 minutes after eating and then the acidity value will decrease. It can happen because each intake of consumption can change the state of acidity in the oral cavity,

Between the two brushing times, namely after eating and before going to bed, it is recommended that you always rinse your mouth with water after every meal. It can accelerate the pH of saliva in the mouth to return to normal, so that it does not have time to weaken tooth enamel." The results of this study are in accordance with dental research (Wahyuningsih & Ramadhani, 2015), which states that after chewing simple carbohydrate foods, then gargling with mineral water, then the average pH of saliva after gargling will increase. The average pH of saliva after gargling has increased from the pH of saliva after chewing simple carbohydrate foods. It proves that gargling vigorously over the entire surface of the mouth can remove the remnants of food debris in the oral cavity thereby reducing bacterial activity and providing a mechanical effect that can affect the saliva.

The results of data analysis using the Tukey HSD test in this study are in accordance with research (Setiawati, 2012), which asserted that the decrease in pH can be caused by salivary factors. A decrease in the rate of salivary secretion will cause a decrease in salivary pH. The results of this study are also in accordance with the research of Praptiningsih & Ningtyas, (2010), which stated that cariogenic foods are foods that can cause dental caries. The nature of cariogenic foods is that they contain lots of carbohydrates, are sticky and break easily in the mouth. The relationship between carbohydrate consumption and the occurrence of dental caries is related to the formation of plaque on the tooth surface. Plaque is formed from food debris that sticks between the teeth and this plaque will eventually grow bacteria that can convert glucose into acid so that the pH of the oral cavity decreases to 4.5. In such circumstances, the tooth enamel structure will dissolve. Repeated consumption of carbohydrates that are too frequent causes the production of acid by bacteria to become more frequent so that the acidity of the oral cavity becomes more acidic and more enamel is dissolved.

The results of this study are not in accordance with the research of Oktarianda, (2011), that after eating, especially carbohydrate foods, there will be fermentation of food glucose. The result is an acidic compound and creates an acidic environment around the teeth. Within a few minutes the degree of acidity will increase or the pH will decrease. If it continues, the decrease in the pH value will reach a critical pH value, which is a pH value that can trigger decalcification (loss of calcium salts) in tooth enamel. The presence of changes in pH after eating will return to normal after 20-30 minutes later. During the first 5-10 minutes after a meal is a critical time for pH (approximately 5.2-5.5). In this study, although without gargling, there was a decrease in salivary pH after consuming sweet foods, but the respondent's pH was neutral to alkaline. This might be due to saliva factors and the effect of using toothpaste when brushing teeth before the intervention. Limitations in this study include that researcher has not been able to fully control the gargling behavior of each respondent.

4. CONCLUSION

The most effective gargling time on the salivary pH of elementary school students after consuming sweet and sticky foods is gargling immediately/0 minutes. The time without gargling water that has the most effect on saliva pH in elementary school students after consuming sweet and sticky foods is 5 minutes.

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