

How to Cite:

Eldarita, E., Khasanah, F., Suharjono, S., Hidayati, S., Purwati, D. E., & Wibowo, H. (2022). When is the right time brush the teeth to neutralize the acidity of Saliva after eating a snack. *International Journal of Health Sciences*, 6(S10), 703–709.
<https://doi.org/10.53730/ijhs.v6nS10.13589>

When is the right time brush the teeth to neutralize the acidity of Saliva after eating a snack

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Abstract--In Indonesia, there is a change in diet due to refined carbohydrates, a type of food that is favoured and consumed by children. If we do not brush our teeth right away, the rest of the food is turned into acid by bacteria and causes dental caries. This study aims to determine the most appropriate time for brushing teeth to neutralize the acidity of Saliva after consuming a snack. Research design Quasi-Experimental One Group Pre and post-test design by involving the entire population of 60 people. Data analysis using the Wilcoxon test to prove the effect of before and after brushing teeth

after a snack and Friedman's test to see the effect on the treatment time group. The results of the study are the degree of acidity (pH) of Saliva pre and post brushing teeth 5 minutes after eating an average of 5.85 decreased by 5.60, 15 minutes after eating an average of 5.78 increased by 6.02, and 30 minutes after eating an average of 5.68 increased by 6.10. Before brushing teeth in groups 5, 15, and 30 minutes after a snack, there was no effect on the salivary pH *p-value* > 0.05. After brushing the teeth of groups 5, 15, and 30 minutes after a snack, there was an effect of time on the salivary pH *p value* <0.05. This study concludes that to obtain neutral criteria on Saliva, the recommended time to brush the teeth is 15 minutes after consuming a snack.

Keywords---brushing teeth, Saliva PH, time, refined carbohydrates.

Introduction

In Indonesia, there is a change in diet due to the increasing use of refined carbohydrates, known as confectionery, chocolate, and other foods that contain sucrose ¹. This type of food is much loved and consumed by children, generally easily attached to the tooth surface. If it is not cleaned immediately after eating these types of food, the remaining food is converted into acid by bacteria in the mouth and causes dental caries ^{2,3}. Therefore it is recommended to clean the rest of the food is one of them by brushing ⁴. The recommendation to brush teeth after eating is the most accessible prevention to do to get a neutral criterion for the degree of salivary acidity. However, maximum results are difficult to obtain either from dental hygiene or from other damage factors ⁵. Sriyono (2005) states that in addition to brushing, frequency and time of cleaning the teeth are very influential ⁶. The time to brush our teeth has been done immediately after consuming a snack. Nowadays, the loss of time is starting to be studied because it found that pain primarily initiates many pain complaints due to abrasion or tooth erosion. If ignored, these complaints continue to the stage of pulp tissue damage. However, no previous research has proven the dangers of brushing the teeth directly after eating. It is also not known when the most appropriate time lag between eating snacks and brushing teeth minimizes the risk of tooth decay. For this reason, it is necessary to conduct in-depth research on when is the right time to brush our teeth after eating a snack.

Research Materials and Methods

This research was conducted in 2020 in an elementary school in the hamlet Gatak Village Sidoluhur Godean Sleman, Yogyakarta, Indonesia, using Quasi-Experimental *One Group Pre and post-test design* with a total population of 60 people. The entire population was used as a subject research ⁷. Research subjects were given sweet food treatment in biscuits, then the salivary pH was measured before brushing teeth. Furthermore, the subject was instructed to brush his teeth with three different periods, namely the first day of brushing his teeth 5 minutes after eating biscuits. On the second day, 15 minutes after eating biscuits, they were instructed to brush their teeth for 30 minutes. The data were analysed using the *Wilcoxon* test to prove the difference in the degree of acidity of the Saliva pe

and post brushing teeth after consuming a snack. The degree of acidity of Saliva was measured using a pH meter with a measurement scale between 5.0 to 7.8. Friedman's test was conducted to determine the effect on the treatment time group.

Ethical considerations

This research has received approval to be carried out (ethical clearance) from the Health Research Ethics Committee of the Yogyakarta Ministry of Health Poltekkes Kemenkes Yogyakarta with the number: e-KEPK/POLKESYO/0560/VIII/2020

Result

This section describes the study results, presented in 3 tables in a table of the frequency distribution of respondents' salivary pH before and after brushing their teeth measured at three different times, data analysis using the Wilcoxon Friedman's test. The results of the study the degree of acidity (pH) of Saliva before brushing within 15 minutes after eating snacks showed the highest results on acid criteria (50%) and after brushing teeth on neutral criteria (68%) with a mean before which was 5.78 and after 6.02 with a standard deviation 0.885 before brushing and 0.567 after brushing. Table 2 describes the effect of time before and after brushing teeth 15 and 30 minutes after eating a snack on salivary pH ($p < 0.05$). The results of the Wilcoxon test showed a decrease in Saliva pH 5 minutes before and after brushing teeth after eating snacks in 20 respondents and an increase in 14 respondents with a p -value > 0.05 . There is no effect before and after brushing teeth 5 minutes after a snack on salivary pH.

Saliva pH 15 minutes before and after brushing teeth after eating snacks showed a decrease in 10 respondents and an increase in 23 respondents with a p -value < 0.05 . There is an effect of time pre and post brushing teeth 15 minutes after a snack on the saliva pH of respondents. Saliva pH 30 minutes before and after brushing teeth after eating shows a decrease in Saliva pH in 12 respondents and an increase in 22 respondents with a p -value < 0.05 . so it can be concluded that there is a significant difference between saliva pH before and after brushing teeth 30 minutes after eating. Analysis of the data using Friedman's test found no significant effect between the time groups of 5, 15, and 30 minutes after consuming snacks before brushing teeth on salivary pH with a significance value of 0.63. The pH of Saliva after brushing their teeth after consuming food after eating snacks based on the time difference of 5 minutes, 15 minutes, and 30 showed a significant difference with a significance value of 0.00. The group that brushed their teeth 5 minutes after eating snacks still showed the highest amount of acidic salivary pH of the respondents. At 15 minutes showed that the pH of neutral Saliva was at the highest frequency, while at the time of brushing teeth, after 30 minutes, the pH of acids and bases was almost balanced, and the neutral pH fell back to 18%.

Discussion

Sriyono (2005) stated that after eating, the oral cavity condition would turn sour, which will last for the first 5 minutes⁶. The results of this study are consistent

with those expressed by Kasuma (2015) that the factors which may affect the pH of Saliva in the Saliva are the degree of acidity and capacity of buffer saliva that influenced the changes, for example, caused by the rhythm of day and night, diet and stimulation of salivary secretion ⁸. A carbohydrate diet will decrease buffering capacity, while a diet rich in vegetables and protein increases. In this study, the diet consumed when snacking was sweet food.

The pH of the respondent's Saliva 15 minutes after chewing sweet snacks before brushing their teeth main was on the acid criteria (50%) possibly due to the length of time food remains in the oral cavity that was not cleaned that were in contact with bacteria. This condition, in line with the opinions of Oktarianda (2011), stated that after eating carbohydrate foods, will be fermentation of glucose foods that produce compounds are acids that make the environment around the atmospheric tooth acid and within a few minutes of acidity will increase, or saliva pH decreased ⁹. The results of this study are in line with research by Asridiana and Thioritz (2019) on the effect of consuming sweet and sticky foods on salivary pH, where it is proven that there is an effect of consuming sweet and sticky foods on salivary pH in students of SDN Mamajang Makassar ¹⁰. The oral cavity condition after a person eats usually turns sour and lasts for the first 5 minutes. When brushing teeth is done, it will cause the tooth layer to erode. Clean tooth surfaces pre and post-eating are not expected to become a place for bacterial colonization. Although they are still present, in terms of quantity, hoped that there will be a reduction, one of the causes of bacterial bonding on the mucous membrane is a medium that allows bacteria to stay⁶.

The result of this study is the pH of Saliva after brushing teeth 15 minutes after eating snacks, indicating reduced salivary pH criteria of acid and increasing the number of salivary pH criteria neutral. According to the researchers, the possibility for action brushing teeth affects the salivary pH changes in both criteria for basic, neutral, or acid that occurs due to mechanical movements made while brushing teeth or rinsing the mouth when brushing teeth time. The relationship between salivary pH and the secretion rate occurs after mechanical stimulation, and salivary pH rises rapidly after light stimulation and ranges from pH 6.0 to 7.4 ⁸. The results of the research conducted are in line with the results of the research conducted by Praptiningsih, R., S., and Ningtyas, E., (2020), where it was proven that the salivary pH after brushing teeth after eating the respondent who has a salivary pH of acid criteria is at least 20 % ¹¹.

The pH of the respondent's Saliva 30 minutes after chewing snacks in the form of sweet foods before brushing teeth was mainly on the acid criteria (53%), probably due to the longer food residue consumed during snacks. In this case, sweet and sticky foods in the oral cavity, not cleaned in contact with bacteria, cause a continuous accumulation of plaque. Sweet and sticky foods containing carbohydrates are the primary energy source for bacteria in the oral cavity and directly lower the pH¹². Asridiana (2019) states that the current oral condition after a meal will be more acidic than before eating food, especially sweets and sticky ¹⁰. The ability of bacteria to metabolize food into acid is more significant than before eating because of favorable environmental conditions, and the number of bacteria in the oral cavity is much higher. According to Sriyono (2005), the change in pH after eating will return to normal after 20-30 minutes ⁶.

The results showed that the last type of food consumed by the respondent before the saliva measurement was a diet rich in carbohydrates resulting in an increase in the metabolism of acid production by bacteria and an increase in the production of alkaline substances 8. The results in line with the research of Praptiningsih, S., R., (2014), on the effect of the method of brushing teeth before eating on the number of bacteria and pH of Saliva, the salivary pH 5 minutes after chewing food did not show much change when compared to the initial pH. Before brushing teeth^{11,13}. The results of this study are in line with the research of Triswari and Pertiwi 2017 where the average salivary pH in the group who brushes their teeth is higher than the group that does not brush their teeth ^{14,15}.

The results in line with previous research conducted by Hidayat, S., (2014) on children aged 10-12 years at Banjarmasin, which showed that there were differences in the pH of the Saliva of children who brushed their teeth before and after consuming sweet and sticky foods that measured using a pH meter ^{12,16}.

Conclusion

The conclusion is that there is no effect of brushing teeth on salivary pH at 5 minutes after eating, but 15 and 30 minutes have an effect. There is no effect of the difference in time before brushing teeth, but there are differences in the time of brushing teeth after a snack on salivary pH.

Declaration of Competing Interest

The authors have no conflicts of interest relevant to this article.

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Table 1
Frequency Distribution of Respondents Saliva pH Before and After Brushing Teeth at 5 Minutes, 15 Minutes and 30 Minutes After Eating Snacks

pH Saliva	5 Minutes				15 Minutes				30 Minutes			
	Before		After		Before		After		Before		After	
	f	%	f	%	f	%	f	%	f	%	f	%
Acid	30	50	37	62	30	50	9	15	32	53	25	42
Alkali	17	28	10	17	15	25	10	17	9	15	24	40
Neutral	13	22	13	21	15	25	41	68	19	32	11	18
Mean	5.85		5.60		5.78		6.02		5.68		6.10	
Deviation Std	0.988		0.887		0.885		0.567		0.89		1.085	

Table 2
Wilcoxon Test Results Effect of Time Before and After Brushing Tooth on Saliva pH

Tested data	Changes in pH saliva	Frekuensi (N)	p
After 5 minutes	Decrease	20	0.08
	Increase	14	
After 15 minutes	Decrease	10	0.03
	Increase	23	
After 30 minutes	Decrease	12	0.01

Increase

22

Table 3
Friedman test results before and after brushing teeth 5 minutes, 15 minutes, and 30 minutes after eating snacks on the ph of Saliva.

Tested Data	<i>p</i>
Saliva pH before brushing teeth 5 minutes, 15 minutes, and 30 minutes after eating snacks	0.63
Saliva pH after brushing teeth 5 minutes, 15 minutes, and 30 minutes after eating snacks	0.00