The Effect of Cucumber Fruit (Cucumis Sativus L) on pH Saliva at The Rapha-EL Orphanage Foundation

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ABSTRACT

Increasing the pH of saliva will affect oral health. One way to increase the pH of saliva is to chew fruit that is fibrous, crunchy and contains lots of water. The research objective was to determine the effect of cucumber on salivary pH at the Bina Mandiri Social Orphanage. This type of research is a one group pretest and posttest group design. The study population was the children at the Rapha-EL Orphanage Foundation. The sample size is determined based on the Roscoe formula of 20 people. Methods of data collection by measuring the pH of saliva before and after chewing cucumbers using a digital pH meter. The data that has been collected, then analyzed by paired t test. The results showed that there was a difference in the average pH of saliva before and after chewing cucumber (p = 0.001). The conclusion is that there is an effect of chewing cucumber on increasing the pH of saliva in children at the Rapha-EL Orphanage Foundation.

1. Introduction

Oral health is a condition that shows that in the mouth such as debris, tartar, and plaque. If oral hygiene is neglected, plaque will form on the teeth and will spread to the entire surface of the teeth1.

Maintenance efforts that can be made to maintain healthy teeth and mouth by means of mechanics, chemis, and modification of mechanical and chemical methods. Currently, to clean teeth and mouth using a mechanical method, namely by brushing the teeth. In addition, other additional maintenance efforts that support natural teeth cleaning can be done by eating fruits.2

Saliva is a thick fluid which is produced by the salivary glands, parotid glands, sublingual glands, and submandibular glands located under the tongue, near the cheek muscles, and near the palate (palate) in the mouth. 99.5% of the saliva content is water, while other substances consist of calcium, phosphorus, sodium, magnesium3.

The main function of the salivary glands is to secrete saliva into the oral cavity to help protect the mouth, maintain the condition of the mouth, digest food, and kill bacteria in the mouth. If there is no saliva or the amount of saliva drops drastically and stops protecting the teeth, the bad thing that will happen is reduced cleaning activity from bacteria and food traces from the mouth, reduced buffer due to changes in acid in the mouth, so that oral activity becomes more acidic. One way to measure the degree of acid or base is the Potential of Hydrogen (pH) Afrina et al (2018). The
average normal pH in saliva is 6.7. Several factors can cause changes in saliva, such as microorganisms present in the oral cavity, average salivary flow rate, and salivary buffer capacity. To control the pH, volume, and thickness of saliva to remain normal, adequate nutrition is needed and the food in the oral cavity contains vitamin C so that the viscosity of saliva is lower, besides that by chewing food that contains lots of water, it can control the pH that exists in the mouth which also affects the pH of saliva.

Fruits that are watery and fibrous and contain vitamin C when eaten and chewed can help clean teeth and mouth because they stimulate the secretion of Khasanah’s saliva. According to McDonald and Avery, fruits that are watery and fibrous can result in self-cleansing of the teeth (self-cleansing effect) because when chewing the fibers shift so that the fibers release food debris that sticks to the surface of the teeth with this chewing stimulates salivary secretion. Fruits that contain water, contain vitamin C and have high fiber, one of which is cucumber (Cucumis sativus L) so that by consuming cucumbers, the pH of saliva can be affected.

Cucumber (Cucumis sativus L) comes from the northern part of India then entered the Mediterranean region, namely China in 1882 Decondolle put this plant into the list of native plants of India and in China cucumber was only known 2 century AD. This type of cucumber is a type of wild cucumber known as the scientific name Cucumis Hardwichin Royle. Although cucumber is not a native plant in Indonesia, cucumber fruit is very well known in Indonesia and can be found easily in all corners of Indonesia. The content contained in cucumber is protein, fat, calcium, phosphorus, iron, carbohydrates, vitamin A, vitamin C, vitamin B1, vitamin B2, vitamin B6, potassium, sodium, and water.

Based on the description above, the researchers were interested in conducting research on the effect of cucumber fruit (Cucumis sativus L) on increasing salivary pH at the Rapha-El Orphanage Foundation.

This research is a pre-experimental study with one group interpretation and posttest group design. This research was conducted at the Rapha-El Orphanage Foundation. This research has received approval from the Ethics Commission with Letter Number: 021 / KEPK / UNPRI / IV / 2021

The population of this study were children at the Rapha-El Orphanage Foundation. The reason for choosing the research population of children at the Rapha-El Orphanage Foundation was for the homogeneity of the research because the Rapha-El Orphanage Foundation had the same life pattern.

The sample size is determined based on the Roscoe formula that for simple experimental research, the number of sample members is between 10-20 and in this study, the sample size was 20 people.

In this study, the tools and materials used were: digital pH meter, plastic container, plastic mouthwash, measuring cup, mask, gloves, and tissue.

The research procedures were as follows: Distributing informed consent and research explanation to respondents, the sample was instructed to rinse with mineral water for 30 seconds, measure the initial saliva pH score before chewing cucumber fruit treatment, giving cucumber 25 grams to chew for 1 minute then swallowed, The pH measurement of saliva after chewing cucumber, before and after chewing was collected using the spitting method for 5 minutes. Saliva is collected in a plastic container, the saliva flow rate is obtained by measuring the volume of saliva in ml / minute, and recording the saliva pH results using a digital pH meter.

And as for the data analysis carried out in this study is the Univariate Analysis and Bivariate Analysis. This univariate analysis was conducted to describe the research variables by creating a frequency distribution table and data distribution. And bivariate analysis was carried out on two variables to determine the existence of a relationship or correlation and difference.

3. Result and discussion

The results of the study on age characteristics showed that the majority of respondents were 14-16 years old, as many as 11 people (55%), while only 9
respondents aged 11-13 years (45%). In terms of gender, the results showed that the majority of the sample were women, namely 12 people (60%), while the sample was male only 8 people (40%).

The results of the research on the average pH of saliva before and after chewing cucumbers in children at the Rapha-El Orphanage Foundation showed that the average pH of saliva before chewing cucumbers was 6.94 ± 0.53 and after 7.44 ± 0.42. From these results it can be stated that there is an increase in the pH of saliva after chewing cucumbers in children at the Rapha-El Orphanage Foundation.

The results showed that the average pH of saliva before chewing cucumber was 6.94 ± 0.53 and after 7.44 ± 0.42 with an average difference of 0.50 ± 0.11. Obtained p value = 0.001 which means that there is a significant difference in the average pH of saliva before and after chewing cucumber. From these results it can be stated that there is an effect of chewing cucumber on increasing the pH of saliva in children at the Rapha-El Orphanage Foundation.

This study was conducted to determine the effect of cucumber (Cucumis sativus L) on the pH of saliva in children at the Rapha-El Orphanage Foundation. Before chewing a cucumber, first measure the pH of the saliva. The results of salivary pH measurements before chewing cucumber were 6.94 ± 0.53 and after 7.44 ± 0.42.

Cucumber is a crunchy fruit that works like a natural toothbrush and teeth whitener. The liquid released by the cucumber contains a sufficiently acidic solution. Based on the results of the study, there was an increase in the saliva pH of the respondents after chewing cucumbers. The results of this study are in line with research conducted by which stated that before chewing cucumbers, the average pH of the respondents saliva was 6.7 and afterwards it was 6.8.

The results of the study from are also in accordance with this study which reported that after chewing cucumber showed an increase in salivary flow rate and pH.

Saliva is a complex oral fluid. A combination of various fluids and components that are excreted into the mouth. The normal pH value for saliva is 6.7 to 7.4. The pH value of saliva will change after consuming food. The increase in the pH of saliva after chewing cucumbers in this study may be caused by the high water content of cucumbers, namely 96.2%. Fruits that contain water when eaten and chewed can help clean teeth and mouth which is known as a self-cleansing effect because it can stimulate salivary secretion which affects the pH of saliva.

The above statement is supported by the results of the statistical analysis of the paired t test which shows that there is an effect of cucumber on the increase in salivary pH in children at the Rapha-El Orphanage Foundation. From the results of this study, it can be seen that there is an increase in salivary pH after consuming cucumber with an average increase of 0.5 ± 0.11. An increase in salivary pH after consuming cucumber fruit was also obtained from the results of research conducted by Haryani et al (2016) which stated that there was an effect of chewing cucumber on salivary pH.

Fruits that contain fiber, water and vitamin C such as cucumbers can affect the pH of saliva, help clean teeth and mouth because they stimulate salivary secretion, and have a taste that can stimulate saliva to secrete more saliva and make saliva viscosity lower. In addition, foods that require high chewing power or foods that taste quite striking can increase saliva flow by stimulating saliva to excrete more saliva than in unstimulated conditions so that the pH of saliva in the mouth can change and also change its composition. This is in line with the statement of Mori et al. (2012) that chewing activity is regulated by the parasympathetic nervous system, which is activated by the plastic organ, which can trigger the production of large volumes of saliva.

Saliva contains substances including antibacterial substances, glycoprotein compounds, calcium, and fluoride. The acidic condition of the oral cavity can facilitate the growth of Streptococcus mutans and Lactobacillus bacteria which will lead to demineralization of the tooth surface so that caries formation can occur. Saliva has the ability to regulate the balance of the salivary buffer, so as to minimize acid-base and clean acids produced by microorganisms.
so as to prevent demineralization of tooth enamel\textsuperscript{10}.

Sharma et al (2012) reported that cucumber has a strong antacid effect against acids. In addition, cucumber fruit also contains phytochemicals such as alkaloids, flavonoids, tannins, saponins, vitamins A, B3, B5, B6, B7, D and K\textsuperscript{14,15}. These contents are proven to have hypoglycemic effects, pH neutralizing effects, and antibacterial effects against cariogenic bacteria such as S. mutans\textsuperscript{16,17,18,19,20}. From the results of this study, it was found that the pH of saliva before chewing cucumber was acidic and after the pH was alkaline. Thus, from the results of this study it was shown that chewing cucumber can prevent dental caries.

| Characteristics of Respondents | n  | %   |
|-------------------------------|----|-----|
| **Age (years old)**           |    |     |
| 11-13                         | 9  | 45.0|
| 14-16                         | 11 | 60.0|
| **Gender**                    |    |     |
| Male                          | 8  | 40.0|
| Female                        | 12 | 60.0|
| **Total**                     | 20 | 100 |

Table 2 Average pH of saliva before and after chewing cucumber for children at the Rapha-EL orphanage foundation

| Respondents | pH saliva chewing cucumber fruit |
|-------------|----------------------------------|
|             | Before  | After  |
| 1           | 7.6     | 7.6    |
| 2           | 6.9     | 6.8    |
| 3           | 6.0     | 6.5    |
| 4           | 6.4     | 6.9    |
| 5           | 7.9     | 7.6    |
| 6           | 7.5     | 7.9    |
| 7           | 7.7     | 7.9    |
| 8           | 7.0     | 7.8    |
| 9           | 7.5     | 7.9    |
| 10          | 6.8     | 7.9    |
| 11          | 7.0     | 7.3    |
| 12          | 6.1     | 6.8    |
| 13          | 6.8     | 7.4    |
| 14          | 7.2     | 7.7    |
| 15          | 6.4     | 7.3    |
| 16          | 6.9     | 7.5    |
| 17          | 7.1     | 7.8    |
| 18          | 6.4     | 7.4    |
| 19          | 6.9     | 7.6    |
Table 3 Difference in average pH of saliva before and after chewing cucumber fruit in children at the Rapha-EL orphanage foundation.

| pH of saliva | x ± SD   | Mean diff | P value |
|--------------|---------|-----------|---------|
| Before       | 6.94 ± 0.53 | -0.50 ± 0.11 | 0.001   |
| After        | 7.44 ± 0.42 |           |         |

4. Conclusion

The conclusion in this study is that there are differences in the average pH before and after chewing cucumbers and there is an effect of chewing cucumbers on increasing the pH of saliva in children at the Rapha-El Social Orphanage Foundation.

5. References

6. Khasanah, U. 2013. Differences in the pH of saliva after consuming oranges and pears in the third semester students of the Yogyakarta Dental Nursing Department of Health Polytechnic. KTI
7. Margareta, S. 2012. 101 Tips and Natural Therapies for White and Healthy Teeth. Yogyakarta: Smart Library.
8. Haryani, W., Siregar, I., Ratnaminingtyas, L.A. 2016. Cucumber and Tomato Fruit Increase the Degree of Acidity (pH of Saliva) in the Oral Cavity. J Health Research, 5 (1), 21-24.
9. Nugraha, C. 2012. Difference in fluoride levels and acidity of saliva after using toothpaste containing herbs and non-herbs in children. KTI
10. Hidayat, S., Adhani, R., Arya, I.W. 2014. Difference in pH of saliva brushing teeth before and after consuming sweet and sticky foods. Measurement using a pH meter for children aged 10-12 years at SDN Melayu 2 Banjarmasin. Dentino (Jur. Ked. Gigi), 2 (1), : 39-45.
11. Khasanah, U. 2013. Differences in the pH of saliva after consuming oranges and pears in the third semester students of the Yogyakarta Dental Nursing Department of Health Polytechnic. KTI
12. Andrie, K.L., Napitupulu, M., Jannah, N. 2015. Responses of Cucumber Plants (Cucumis sativus L.) to Different Types of Poc and Concentrations. AGRIFOR Journal, 14 (1), 15-26.
13. Ishak., Dahria, M., Gunawan, R. 2019. Application of the Dempster Shafer Method to Diagnose Cucumber Disease. J-Sisko Tech, 2 (1), 76-83.
14. Margareta, S. 2012. 101 Tips and Natural Therapies for White and Healthy Teeth. Yogyakarta: Smart Library.
15. Ramadhani, S., Chairani, S., Hestiningsih, T. 2019. Effects of Chewing Cucumber (Cucumis sativus) on Saliva Flow Rate and pH. BDJ, 3 (2), 92-5.
16. Afrina., Chismirina, S., Amirza, N.S. 2018. Change In Saliva Ph Before and After Consuming Banana “Buah Pisang Ayam” on Unsyiah Dental Student Grade 2014. Cakradonya Dent J, 10(1), 44-8.
17. Hans, R., Thomas, S., Garla, B., dkk. 2015. Effect of Various Sugar Beverages on Salivary pH, Flow Rate, and Oral Clearance Rate amongst Adult. Hindawi Journal, 1(1), 1-6.
18. Cahyati, W.H. 2013. Consumption of Papaya (Carica papaya) in Lowering Debris Index. J Public Health, 8 (2), 127-36.
19. Imo, C., Shaibu, C., Yusuf, K.S. 2019. Nutritional Composition of Cucumis sativus L. and Solanum melongena L. Fruits. African J of Pharmaceutical Research & Development, 11(2), 145-50.
20. Maheshwari, R.K., Mohan, L., Malhotra, J., dkk. 2014. Invigorating Efficacy of Cucumis sativus for Healthcare and Radiance. IJCPS, 2(3), 737-44.
21. George, D.E., Shetty, R., Shetty, P.J., Gomes, L.A. 2017. An In Vitro Study to Compare the Effect of Different Types of Tea with Chlorhexidine on Streptococcus mutans. J of Clinical and Diagnostic Research, 11(9), ZC05-ZC07.
22. Sharma, S., Dwivedi, J., Paliwal, S. 2012. Evaluation of Antacid and Carminative Properties of Cucumis sativus Under Simulated Conditions. Der Pharma Chem, 4(1), 234- 9.
23. Sharmin, R., Khan, M., Akhter, M., dkk. 2012. Hypoglycemic and Hypolipidemic Effects of Cucumber, White Pumpkin and Ridge Gourd in Alloxan Induced Diabetic Rats. J Sci Res, 5(1), 161-70.
24. Subramaniam, P., Eswara, U., Reddy, K.R.M. 2012. Effect of Different types of Tea on Streptococcus mutans: An In Vitro Study. Indian J Dent Res, 23, 43-8.