

Comparison of Chewing Rubber Candy Containing Xylitol and Sorbitol to pH Increasing Saliva

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Abstract:-

Background: Saliva is one of the important factors in maintaining dental and oral health which plays a role in the protective function. The protective function is carried out by increasing salivary secretion which can be measured by flow velocity, volume, pH and viscosity.

Objective: The purpose of this study was to determine the comparison of chewing gum containing xylitol and sorbitol to increase salivary pH in students of the Department of Dental Health, Poltekkes, Ministry of Health, Palembang.

Methods: This research is a quantitative research with a quasi-experiment method. In taking samples used purposive sampling technique. Research data collection was carried out by measuring the pH of saliva using a pH meter.

Results: The results showed that the chewing gum group containing xylitol had an average increase in salivary pH of 1.828, the chewing gum group containing sorbitol had an average increase in salivary pH of 1.632 and the chewing gum group containing a combination of xylitol and sorbitol had an average increase The pH of saliva is 1.803.

Conclusion: It can be seen that the increase in the average salivary pH was the highest in the chewing gum group containing xylitol.

Keywords:- Salivary pH, xylitol and sorbitol gum, salivary pH increase.

I. INTRODUCTION

Saliva is an important factor in maintaining a healthy dental and oral health which plays as a protective function. The protective function is carried out by increasing salivary secretion which can be measured through flow rate, volume, pH and viscosity. If without saliva, every time we eat an acidic environment will be formed which will support the growth of *Streptococcus mutans* bacteria which can causes various dental problems, especially dental caries (Rodian, et al, 2011 in Tridiananda et al., 2019).

Research from Somani et al., (2020) in(Nuranisyah et al., 2021)showed that there was an increase in salivary pH after consuming sugar-free gum (xylitol) because when patients chewing sugar-free gum, the increased volume and flow of saliva helps to dilute and wash away acids in plaque that can initiate the demineralization process.

Meanwhile, another study has concluded that chewing sorbitol gum after eating can significantly reduce the occurrence of dental caries(Ramayanti & Purnakarya, 2013).

Based on the background above, the researcher is interested in conducting research between xylitol, sorbitol and a combination of xylitol and sorbitol with the title "Comparison of Chewing Gum Containing Xylitol and Sorbitol on Increasing Saliva pH in Students of the Department of Dental Health, Poltekkes Kemenkes Palembang"

II. METHOD

In this study conducted research that is experimental. The research used quasi-experimental as the design of research. Sampling was carried out using a purposive sampling technique using the Federer formula.

The study was conducted by measuring the pH of the respondent's saliva before and after chewing gum between groups of xylitol chewing, sorbitol chewing and combining both of xylitol and sorbitol chewing.

Data analysis in this study was using univariate analysis and bivariate analysis with the One Way Anova test on independent variables.

III. RESULTS

This study was conducted with the aim of knowing which increase in saliva was more effective from various types of xylitol and sorbitol gum and the combination of xylitol and sorbitol. This research was conducted in March 2022 for students majoring in Dental Health at the Palembang Ministry of Health Polytechnic. The population is 233 students and the sample is 30 students.

Group	N	Mean Saliva pH		Difference
		Before	After	
Chewing Gum Contains Xylitol	20	4,860	6,688	1,828
Chewing Gum Contains Sorbitol	20	4,992	6,624	1632
Chewing Gum Contains a Combination of Xylitol and Sorbitol	20	4,808	6,611	1,803

Table 1: Saliva pH Distribution Before and After Chewing Gum Containing Xylitol and Sorbitol and aCombination of Xylitol and Sorbitol

Source :Primary Data, 2022

Table 1 shows that there was an increase in salivary pH in students after chewing gum with different types.

Variable	N	Means	std. Deviation	Minimum	Maximum
Saliva pH Before Chewing Gum Contains Xylitol	10	4,860	0.35852	4.47	5.43
Saliva pH After Chewing Gum Contains Xylitol	10	6,688	0.26732	6.30	7.14

Table 2: Saliva pH Measurement Before and After Chewing Gum Containing Xylitol

Source :Primary Data, 2022

Based on table 2 it can be seen that the average salivary pH before chewing gum containing xylitol is 4.860. It turned out that there was an average increase in salivary pH after chewing gum containing xylitol by 6,688.

Variable	N	Means	std. Deviation	Minimum	Maximum
Saliva pH Before Chewing Gum Contains Sorbitol	10	4,992	0.39696	4.39	5.77
Saliva pH After Chewing Gum Contains Sorbitol	10	6,624	0.26916	6.05	6.91

Table 3: Saliva pH Measurement Before and After Chewing Gum Containing Sorbitol

Source :Primary Data, 2022

Based on table 5.3 it can be seen that the average salivary pH before chewing gum containing sorbitol is 4.992. It turned out that there was an average increase in salivary pH after chewing gum containing sorbitol of 6.624.

Variable	N	Means	std. Deviation	Minimum	Maximum
Saliva pH Before Chewing Gum Contains a Combination of Xylitol and Sorbitol	10	4,808	0.61463	4.03	5.88
Saliva pH After Chewing Gum Contains a Combination of Xylitol and Sorbitol	10	6,611	0.38324	6.03	7.13

Table 4: Saliva pH Measurement Before and After Chewing Gum Containing a Combination of Xylitol and Sorbitol

Source: Primary Data, 2022

Based on table 4 it can be seen that the average salivary pH before chewing gum containing a combination of xylitol and sorbitol is 4.808. It turned out that there was an average increase in salivary pH after chewing gum containing a combination of xylitol and sorbitol of 6.611.

Before carrying out the one way ANOVA test, the Shapiro Wilk normality test and homogeneity test were carried out first. The results of the Shapiro Wilk normality test are as follows:

Group	Shapiro-Wilk		
	Statistics	Df	Sig.
Saliva pH Before Chewing Gum Contains Xylitol	0.878	10	0.124
Saliva pH After Chewing Gum Contains Xylitol	0.959	10	0.770
Saliva pH Before Chewing Gum Contains Sorbitol	0.954	10	0.718
Saliva pH After Chewing Gum Contains Sorbitol	0.883	10	0.143
Saliva pH Before Chewing Gum Contains a Combination of Xylitol and Sorbitol	0.907	10	0.259
After Chewing Gum Contains a Combination of Xylitol and Sorbitol	0.950	10	0.672

Table 5: Shapiro Wilk Normality Test

Source: Primary Data, 2022

Based on table 5 it can be seen that the sig value in each group is > 0.05 , so the data is normally distributed. In addition, a homogeneity test was also carried out which obtained the following results:

Levene Statistics	df1	df2	Sig.
2,307	5	54	0.057

Table 6.Homogeneity Test

Source: Primary Data, 2022

Based on table 5.6, a significance value (Sig) of 0.057 is obtained. Because the significance value is $0.057 > 0.05$, it can be concluded that the types of gum in the three groups being compared are the same or homogeneous. So that the assumption of homogeneity in the one way ANOVA test is fulfilled.

The results of the one way ANOVA test are as follows:

	Sum of Squares	df	MeanSquare	Sig.
Between Groups	46,379	5	9,276	0.000
Within Groups	8,592	54	0.159	
Total	54,971	59		

Table 7: ANOVA Test Results

Source: Primary Data, 2022

Based on table 7, the results of the ANOVA test showed that there were differences between the study groups, indicated by a sig value < 0.05 . These results show significant results.

After carrying out several tests above, a comparison was made in each group of different chewing gums, the following results were obtained:

(I) Type of Gum	(J) Types of Chewing Gum	Mean Difference (IJ)	Sig.
After Chewing Gum Containing Xylitol	After Chewing Gum Containing Sorbitol	0.064	0.721
	After Chewing Gum Contains Xylitol and Sorbitol	0.077	0.668
After Chewing Gum Containing Sorbitol	After Chewing Gum Containing Xylitol	-0.064	0.721
	After Chewing Gum Contains Xylitol and Sorbitol	0.013	0.942
After Chewing Gum Contains Xylitol and Sorbitol	After Chewing Gum Containing Xylitol	-0.077	0.668
	After Chewing Gum Containing Sorbitol	-0.013	0.942

Table 8: Results Multiple Comparisons

Source :Primary Data, 2022

Based on table 8 the results of the comparison between each group show sig > 0.05 , it can be seen that each group has a different average but there is no significant difference from each group.

IV. DISCUSSION

Based on **table 1**, there was an increase in chewing gum containing xylitol the average salivary pH is 1.828. There was an increase in chewing gum containing sorbitol the average salivary pH is 1.632. Meanwhile there is an increase in chewing gum containing a combination of xylitol and sorbitol the average salivary pH is 1.803. on the **table 2** it can be seen that the average pH of saliva before chewing gum containing xylitol is 4.860 ± 0.35852 and the average salivary pH after chewing gum contains xylitol is 6.688 ± 0.26732 . Meanwhile in **table 3** can be seen that the average salivary pH before chewing gum containing sorbitol is 4.992 ± 0.39696 and the average pH of saliva after chewing gum contains sorbitol 6.624 ± 0.26916 . Also in **table 4** can be seen that the average pH of saliva before chewing gum containing a combination of xylitol and sorbitol is 4.808 ± 0.61463 and the average salivary pH after chewing

gum containing a combination of xylitol and sorbitol is 6.611 ± 0.38324 . So it is known that the highest increase in average salivary pH occurred after chewing gum containing xylitol. This is in accordance with the research of Zuliani et al., (2019) which stated that the effect of xylitol gum is very good for oral health. Xylitol has a sweeter and more enjoyable taste than other sugars such as sorbitol.

In Arista et al.'s research, (2018) states that the activity of chewing xylitol gum will produce saliva in the mouth. Increased saliva production can reduce food residue deposits and reduce bacterial populations, besides that saliva production can neutralize acid and prevent tooth loss above 40%. There are seven advantages of xylitol compared to other sweeteners. These advantages are that xylitol cannot be fermented by bacteria in the mouth, can help inhibit the growth of dental caries, increases saliva production, helps reduce plaque growth, has a pleasant enough taste without leaving an unwanted aftertaste, can replace fluoride in paste products teeth and more importantly produce lower calories compared to sucrose or sugar.

Chewing xylitol gum elicits a chewing reflex. Xylitol causes a mechanical stimulus and can stimulate salivary secretion. Salivary secretion due to a simple reflex response, namely chewing xylitol gum will cause a stimulus in the mouth whose impulses are sent through the afferent nerves to the salivatory nucleus, whereas as a result of the reflex response, the aroma of xylitol gum is obtained which causes a stimulus to the special organ of smell, the impulse will be delivered to the olfactory tract and then sent through two pathways, the first is the limbic system to find out whether the stimulus is pleasant or not, the second is to the cerebral cortex and then to the thalamus then to the salivatory nucleus. Stimulated salivary secretion will cause the flow rate of saliva to be faster which will result in an increase in saliva volume. Increasing the volume and speed of salivary flow will affect the concentration of salivary components, thereby increasing sodium and bicarbonate, this will increase the salivary pH.

Among the chewing gum groups that were practiced, chewing gum containing xylitol resulted in an average increase in salivary pH higher than chewing gum containing sorbitol and chewing gum containing a combination of xylitol and sorbitol.

The results of the one way ANOVA test showed that there was a "difference in the average increase in salivary pH between chewing gum containing xylitol, sorbitol and a combination of xylitol and sorbitol in students of the Department of Dental Health, Poltekkes Kemenkes Palembang". This is indicated by the p value which is less than 0.05, namely 0.000. Then H_0 was rejected so that it can be concluded that there is an average difference in the increase in salivary pH between chewing gum containing xylitol, sorbitol and a combination of xylitol and sorbitol in students of the Department of Dental Health, Poltekkes Kemenkes Palembang. This is due to the different content in each gum.

V. CONCLUSION

Based on the results of the study it can be concluded as follows:

- The average pH of saliva before chewing gum containing xylitol is 4.860 and the average salivary pH after chewing gum contains xylitol is 6.688.
- The average pH of saliva before chewing gum containing sorbitol is 4.992 and the average salivary pH after chewing gum contains sorbitol 6.624.
- The average pH of saliva before chewing gum containing a combination of xylitol and sorbitol is 4.808 and the average salivary pH after chewing gum containing a combination of xylitol and sorbitol is 6.611.
- There is a comparison of the average increase in salivary pH before and after chewing different gum. There was an increase in chewing gum containing xylitol the average salivary pH is 1.828. There was an increase in chewing gum containing sorbitol the average salivary pH is 1.632. Meanwhile there is an increase in chewing gum containing a combination of xylitol and sorbitol the average salivary pH is 1.803. So it is known that the

increase in the average salivary pH was highest in the group of chewing gum containing xylitol.

VI. SUGGESTION

- Further research needs to be carried out using different measurement time ranges, so that changes in salivary pH can be seen before and after being given different types of chewing gum in different measurement time ranges with this study.
- Further research needs to be carried out using other sugar-free chewing gums, so that the best type of gum can be seen in increasing salivary pH.
- It is hoped that the results of this study can be useful as information material for further research so that it will help other researchers in conducting their research.
- It is better to use a pH meter according to the number of groups present. If there are 3 different groups, use 3 pH meters to make the measurement more effective.

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