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by Iik Bhakti Wiyata Kediri Perpustakaan 1

Submission date: 08-Jan-2024 10:45AM (UTC+0700)

Submission ID: 2212762299

File name: WJARR-2023-1465_-_S1_Kebidanan_Bhakta.pdf (712.81K)

Word count: 2866

Character count: 14736



(RESEARCH ARTICLE)



Effect of consuming original yogurt on changes in saliva pH in the oral cavity

Yanuar Kristanto ^{1,*}, Natasya Ayu Aprilia Putri ², Bambang Sumaryono ³ and Endah Kusumastuti ⁴

¹ Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Institute of Health Science Bhakti Wiyata, Kediri, East Java, Indonesia.

² Faculty of Dentistry, Institute of Health Sciences Bhakti Wiyata, Kediri, East Java, Indonesia

³ Department of Oral Pathology and Maxillofacial, Faculty of Dentistry, University of Airlangga, Surabaya, East Java, Indonesia.

⁴ Department of Oral Diseases, Faculty of Dentistry, Institute of Health Science Bhakti Wiyata, Kediri, East Java, Indonesia.

World Journal of Advanced Research and Reviews, 2023, 19(01), 1045–1050

Publication history: Received on 12 June 2023; revised on 19 July 2023; accepted on 21 July 2023

Article DOI: <https://doi.org/10.30574/wjarr.2023.19.1.1465>

Abstract

Background: Dental caries occur due to a dynamic demineralization process that happens when calcium and phosphate ions are dissolved and carbohydrates are fermented by microorganisms in the mouth, leading to a decrease in saliva pH. Saliva production occurs as a response to stimuli such as tasting and chewing food. Saliva contains oral cavity bacteria, cervical gingival fluid, and leftover food, known as whole saliva. Normally, saliva pH ranges from 6.8-7.2 and can decrease if someone consumes foods and drinks containing sucrose. One way to reduce the risk of dental caries is by consuming original yogurt. Yogurt contains probiotic bacteria, namely *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, which act as inhibitors of cariogenic bacteria growth. The calcium content in yogurt helps in the tooth remineralization process.

Purpose: This study aims to determine the effect of consuming original yogurt on changes in saliva pH in the oral cavity.

Methods: This research is pre-experimental with pretest and posttest design. The research sample consisted of 30 dental students from the Faculty of Dentistry, Institute of Health Sciences Bhakti Wiyata Kediri in 2019, 2020, 2021 and 2022, who met the sample criteria.

Results: Data were analyzed using the parametric Paired T-Test hypothesis test, with a significance value of 0.000.

Conclusion: Original yogurt consumption has an impact on changes on salivary pH in the oral cavity.

Keywords: Caries; Saliva; pH of Saliva; Original Yogurt; Original Yogurt on Saliva pH

1. Introduction

Dental caries is a common oral health problem in the community, both in children, adults, and the elderly. Dental caries can damage the hard tissues of the teeth, including enamel, dentin, and cementum[1]. Caries is also caused by the dynamic demineralization of the decomposition of calcium and phosphate ions, as well as the fermentation of carbohydrates by microorganisms in the mouth which results in a decrease in salivary pH, resulting in erosion of the enamel caused by acidic conditions[2]. There are other factors that cause dental caries, namely the host, microorganisms, food (substrate) and time[3].

*Corresponding author: Yanuar Kristanto

Saliva is an exocrine fluid found in the mouth in contact with the mucosa and teeth. Saliva is produced during meals which is a response to stimuli in the form of chemical stimulus and mechanical stimulus. About 93% of major salivary glands have a large role in salivary secretion compared to minor salivary glands. When saliva comes into direct contact with the oral cavity, it will mix with cervical gingival fluid, mucus from the pharynx and nasal cavity, and food debris which is referred to as whole saliva [4].

pH (Potential of Hydrogen) is a unit used to measure the degree of acidity in the oral cavity. This pH value indicates the concentration of hydrogen ions in cells and body fluids. Normally, the pH of saliva ranges from 6.8-7.2 and can decrease if a person consumes foods and drinks containing sucrose. If the pH of saliva drops to less than 5.5, the condition is very critical and can cause demineralization of the teeth due to the activity of bacteria that cause dental caries, such as *Streptococcus mutans* and *Lactobacillus*. Some factors that affect the decrease in salivary pH include the speed of salivary secretion, the buffering capacity of saliva, the rhythm of day and night, and the types of food and drinks consumed [5].

The most common way to reduce the risk of dental caries is to regularly brush your teeth at least 2 times a day and rinse your mouth using a mouthwash solution [6]. One drink that can help reduce the occurrence of dental caries is Original Yogurt. This yogurt contains probiotic bacteria that can inhibit the growth of cariogenic bacteria and the sour taste in yogurt can help increase salivary pH [7].

Original yogurt is made from fermented milk with the help of probiotic bacteria, namely *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. These bacteria act as inhibitors, especially in preventing the growth of cariogenic bacteria and protecting teeth and supragingival plaque growth. The calcium content in yogurt can help in the process of tooth remineralization. The total lactic acid in yogurt is 0.85-0.95% with a pH range of 3.8-4.5 [8].

The calcium content in yogurt can help the remineralization process of the teeth. Vitamins C and D in yogurt help in stimulating chemical stimulus, thus helping in increasing the salivary flow rate. When the salivary flow rate increases, the pH content in the saliva will also increase [9]. In flavored yogurt, it has the same content as original yogurt, but in this flavored yogurt there is additional fruit juice, fruit pulp or other fruit parts as flavor, color and aroma [10].

Based on the above background, the researcher wants to know the effect of consuming original yogurt on changes in salivary pH in the oral cavity.

15 2. Material and methods

2.1. Material

The materials used in this study were original yogurt and mineral water. The tools used in the study include masks, handsoons, tissues, digital pH meters, saliva collection containers, yogurt measuring cups, stopwatches, and stationery.

2.2. Methods

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This research design is included in the pre-experimental design using pre-test and post-test design. Sample collection and pH measurement were carried out at the Microbiology Laboratory Room of the Bhakti Wiyata Institute of Health Sciences Kediri on March 11, 2023. Techniques in this study using purposive sampling technique. The population in this study were 30 students taken from the Class of 2019, 2020, 2021 and 2022 at the Faculty of Dentistry, Bhakti Wiyata Institute of Health Sciences, Kediri.

The study procedure began by:

- At the time of the research, the first step was to select respondents who fit the research inclusion criteria.
- Health screening of respondents for safety, health and convenience in the study.
- Fill out an informed consent sheet, as proof that the respondent has agreed and participated in this study with several procedures that have been explained.
- Preparation of tools and materials to be used in the research to be used.
- The research time for collecting respondents' saliva was carried out at 08:00-10:00 WIB in the Microbiology Laboratory room of the Bhakti Wiyata Institute of Health Sciences.
- Respondents were instructed 1 hour before the study not to consume food and drinks before the study.

- Respondents were instructed to rinse 220 ml mineral water first for ± 2 minutes. Wait for ± 5 minutes, then instruct the respondent to sit comfortably, wait for saliva to collect in the bottom area of the mouth. At the time of saliva collection, respondents were prohibited from talking.
- Instruct the respondent to spit into the prepared glass container. The saliva collection technique used is the draining method.
- The respondent's saliva was then measured using a digital pH meter to determine the pH value of the respondent's saliva after gargling mineral water.
- Respondents were given 50 ml of yogurt and instructed to let it sit for 30 seconds in the mouth and then swallow it.
- Wait for ± 5 minutes, instruct the respondent to sit comfortably with their head slightly bowed and reduce swallowing and speaking movements.
- Then collect the respondent's saliva with the same method, namely the draining method. Instruct the respondent to spit into a glass container that has been prepared.
- The respondent's saliva was then measured using a digital pH meter to determine the pH value of the respondent's saliva after consuming yogurt.
- Respondents were instructed to rinse their mouths with 220 ml of mineral water for 30 seconds. This is done to clean the remaining yogurt contained in the oral cavity.
- Recording results before and after treatment on the research form.
- Data processing and analysis.

3. Results and discussion

This study was conducted to determine changes in salivary pH before and after consuming original yogurt.

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Table 1 Characteristics of respondents based on age

No.	Age	Frequency	Percentage (%)
1.	19	3	10%
2.	20	5	16.66%
3.	21	10	33.33%
4.	22	8	26.67%
5.	23	1	3.33%
6.	24	2	6.67%
7.	30	1	3.33%
Total		30	100%

Based on table 3.1, It can be seen that most of the respondents are 21 years old with a total of 10 and the percentage is 33.33%, while the ages of 23 and 30 are 1 respondent with a percentage of 3.33%.

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Table 2 Characteristics of respondents based on gender

No.	Gender	Frequency	Percentage (%)
1	Male	4	13.33%
2	Female	26	86.67%
Total		30	100%

Based on table 3.2, It can be seen that most of the respondents were female with 26 respondents and a percentage of 86.67%, while male respondents amounted to 4 respondents with a percentage of 13.33%.

Table 3 Mean values of pretest and posttest data of salivary pH

	N	Mean
Pretest	30	6.49
Posttest	30	6.88

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Based on table 3.3, It can be seen that the average pH value of saliva before (pretest) and after (posttest) is given the treatment of consuming original yogurt. The average pH value of saliva before treatment was 6.49 and after treatment was 6.88.

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Table 4 Shapiro Wilk Normality Test

	Statistic	df	Sig.
Shapiro Wilk Test Pretest	0,971	30	0.556
Posttest	0,935	30	0.067

Based on table 3.4, the normality test results obtained using the Shapiro Wilk normality test, it can be concluded that the significance value for pretest and posttest data is normally distributed because the resulting significance value is greater than the sig. or $p > 0.05$.

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Table 5 Paired T-Test Hypothesis Test

	Paired Differences				t	df	Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower				Upper
Pretest- Posttest	0.39533	0.15682	0.02863	0.45389	0.33678	13.808	29	0.000

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Based on table 3.5, the results of hypothesis testing using the Paired T-test parametric test, it can be seen that the significance value of 0.000 is smaller than the sig. or $p < 0.05$, meaning that there is a significant difference between the groups before and after consuming original yogurt.

The data in table 3.1, illustrates the characteristics of respondents based on age, where the most respondents were at the age of 21 years, while the least were at the ages of 23 and 30 years. This can be caused by the age factor which is one of the factors that affect salivary pH, as well as respondents selected based on batches that have different ages in each batch. As for other factors that influence changes in salivary pH in the age group, namely where as you get older, the salivary flow rate will decrease and result in the pH content in the saliva will also decrease.

Data table 3.2 shows the characteristics of respondents based on gender, the number of female respondents was 26 and the number of male respondents was 4. The difference in the number of respondents can be caused by the inclusion criteria that have been set, namely respondents do not smoke and do not drink alcohol. Another influence that is the difference in salivary pH from the gender group, namely in the female group often have hormonal disorders when experiencing menstruation or other factors.

The research listed in table 3.3 shows that the average pH value of saliva before consuming original yogurt is 6.49 while after consuming original yogurt is 6.88. With these results, it can be concluded that there was an increase in salivary pH value after respondents consumed original yogurt. This study also shows that the distribution of salivary pH values of respondents before consuming original yogurt is normal. The increase in salivary pH value after consuming original yogurt can be explained by the content of probiotic bacteria such as *Lactobacillus bulgaricus* and *Streptococcus*

thermophilus in the yogurt. Probiotic bacteria can inhibit growth of bacteria that cause dental caries, and help prevent the process of tooth demineralization by helping to increase the pH value of saliva [7].

The results of this study aim to determine the effect of salivary pH before and after consuming original yogurt has increased. This study uses the Paired T - test parametric hypothesis test using a ratio data scale. Based on the Paired T - test test states that the significance value of $p < 0.05$, so that statistically indicates a change in salivary pH before and after consuming original yogurt in students of the Faculty of Dentistry, Bhakti Wiyata Institute of Health Sciences Kediri. The results of this study are in accordance with the hypothesis, namely there is an increase in salivary pH in the oral cavity after consuming original yogurt.

pH of the respondent's saliva after consuming original yogurt became neutral. This is due to the content of probiotic bacteria such as *Lactobacillus bulgaricus* and *Streptococcus thermophilus* which have a bactericidal effect, thus helping reduce plaque formation on the teeth. The calcium content in yogurt can help in the process of tooth remineralization. This finding is in line with previous research showing that consuming yogurt can prevent dental caries [11].

4. Conclusion

From the results of research that has been conducted on students of the Faculty of Dentistry of the Bhakti Wiyata Institute of Health Sciences Kediri batch 2019, 2020, 2021 and 2022 at the Microbiology Laboratory of the Bhakti Wiyata Institute of Health Sciences Kediri, it can be concluded that there is an effect of consuming original yogurt on increasing salivary pH in the oral cavity.

Compliance with ethical standards

Acknowledgments

The study did not receive any funding. Thank you to all those who have supported the implementation of this research.

Disclosure of conflict of interest

The authors of this manuscript do not have any financial or personal conflicts of interest.

Statement of ethical approval

The study received ethical approval by Health Research Ethics Commission of the Faculty of Dentistry, Bhakti Wiyata Institute of Health Sciences, Kediri (151/FKG/EP/II/2023).

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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