



(RESEARCH ARTICLE)



Effect of consuming young coconut water (*Cocos nucifera*) on saliva pH levels in the oral cavity

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Abstract

including lubrication, fluid balance, prevention of pathogenic bacteria, and maintenance of oral pH to prevent cavities. The balance between acidity and alkalinity in saliva is very important for the function of the oral cavity, with a normal pH range of 6.8 to 7.0. In Indonesia, young coconut water is a drink that is often consumed and easily available with a pH of around 5.5, containing potassium, sodium, calcium, vitamin C, and reducing sugars.

Purpose: This study aims to determine the impact of consuming young coconut water (*Cocos Nucifera*) on the pH level of saliva 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: Young coconut water consumption has an impact on changes in the salivary pH level in the oral cavity.

Keywords: Young coconut water; Saliva; Saliva pH; Demineralization; Coconut Water on Saliva pH.

1. Introduction

Saliva is a biological fluid synthesized by the major and minor salivary glands in the oral cavity. The major salivary glands, which include the parotid, submandibular and sublingual glands, work together with the minor salivary glands scattered throughout the mouth to produce and release saliva[1]. The role of maintaining oral health is held by saliva because saliva contains organic and inorganic components that can affect the balance of microorganisms in the oral cavity. Saliva plays an important role in the formation of dental caries, as it constantly wets the teeth and affects the oral environment. The pH of healthy saliva is usually at 6.8-7.2[2].

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Salivary pH is a measure of the level of acidity in the oral cavity that is measured using saliva to determine whether the environment is acidic or alkaline. Factors such as circadian rhythm, salivary buffering capacity, carbohydrate diet, and reaction rate stimuli can affect the degree of acidity and salivary buffering capacity. Salivary acidity (pH) has an important role in maintaining the appearance of teeth by enhancing the process of tooth remineralization. A decrease in salivary pH can lead to a process of tooth de-mineralization. This remineralization process helps reduce the likelihood of dental caries [3].

Decrease in salivary pH levels can lead to demineralization of tooth structure, while an increase in pH levels can increase bacterial production and calculus formation. Saliva consists mostly of 99% water and about 1% organic and inorganic components, electrolytes, antimicrobial substances, mucus, and enzymes. Its role is to lubricate oral tissues, prevent dehydration, stabilize the oral environment to maintain an optimal pH balance, and prevent demineralization. Maintaining a balanced salivary function is important, and salivary acidity should be optimally balanced[4].

Various methods are carried out in reducing the risk of dental caries formation, including by utilizing various kinds of plants and materials from nature. Indonesia has many types of plants that can be used as natural remedies, one of which is coconut[5]. In Indonesia, coconut is a fruit that is often consumed and easy to find. The fruit of the coconut tree, scientifically known as *Cocos Nucifera*, consists of coconut meat and water, which is enclosed by a hard shell and coated with coconut fibers. Coconut water, which has a pH of about 5.5, is a sterile beverage free from contamination[6].

Coconut water contains all B group vitamins, except vit B6, and vit B12. There are 6.00 mcg of folic acid and 5.8 milligrams of vitamin C, the mineral content in 1 cup is calcium 57.6 milligrams, iron 0.7, magnesium 60 milligrams, potassium 600 milligrams, and zinc 0.2 milligrams. Young coconut water contains nutrients such as minerals, vitamins, amino acids, organic compounds and inorganic compounds that are important for the body. The main mineral content present, potassium plays a pivotal role in the flavor of young coconut water. Young coconut water also contains calcium ions, protein, phosphorus, carbohydrates and sugars that are also present in saliva and help the remineralization process[7]. Oral bacteri metabolism can be prevented by the presence of mannitol content contained in young coconut water[8]. Young coconut water also contains calcium ions, protein, phosphorus, carbohydrates and sugars which are also present in saliva and help the remineralization process[6].

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

2. Material and methods

2.1. Material

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

2.2. Methods

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 330 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:

- The initial step of the research procedure was to select respondents who fit the research inclusion criteria.
- Health screening of respondents for safety, health and comfort in research.
- Respondents are given an explanation in advance about the research procedures that will be carried out.
- Respondents who have agreed to the research procedure can sign informed consent.
- 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.
- Salivary pH measurements were taken using a digital pH meter. Acidic pH ranges from 1-6, neutral pH is 7 and alkaline pH ranges from 8-14.

- Next, data was collected before treatment (pretest) using the passive drooling method to determine the pH of saliva before treatment[9]
- Respondents were instructed to rinse 100 ml of mineral water first.
- After waiting for \pm 5 minutes, the respondent's saliva was collected using the passive drooling method by means of saliva that had been collected at the bottom of the mouth and then instructing the patient to spit into the measuring cup.
- The respondent's saliva was then measured using a pH meter to determine the pH level of the respondent's saliva before consuming young coconut water.
- Recording pretest results on the research form.
- Respondents were given 180 ml of coconut water and instructed to let it sit for 30 seconds in the mouth and then drink it up.
- After waiting for \pm 5 minutes, the respondent's saliva was collected using the passive drooling method by means of saliva that had been collected at the bottom of the mouth and then instructing the patient to spit into the measuring cup[9].
- The respondent's saliva is then measured using a pH meter to determine the pH level of the respondent's saliva after consuming young coconut water.
- Respondents were instructed to rinse 100 ml of mineral water for 30 seconds and then spit it out to clean the remaining coconut water that was still in the respondent's oral cavity. Furthermore, data collection was carried out after treatment (posttest) to determine changes in the pH level of the respondent's saliva after being treated.
- Recording posttest results on the research form.

3. Results and discussion

This study was conducted to determine changes in salivary pH before and after consuming young coconut water.

Table 1 Characteristics of respondents based on age

No.	Age	Frequency	Percentage (%)
1.	19	3	10%
2.	20	5	16,66%
3.	21	11	36,66%
4.	22	7	23,33%
5.	23	1	3,33%
6.	24	2	6,66%
7.	30	1	3,33%
Total		30	100%

Based on table 3.1, It can be seen that most of the respondents were 21 years old, totaling 11 respondents with a percentage of 36.66%, while 23 years old and 30 years old were 1 respondent with a percentage of 3.33%.

Table 2 Characteristics of respondents based on gender.

No.	Gender	Frequency	Percentage %
1	Male	4	13.33%
2	Female	26	86.66%
Total		30	100%

Based on table 3.2, It can be seen that the respondents were mostly female respondents totaling 26 respondents with a percentage of 86.66% and male respondents totaling 4 respondents with a percentage of 14.4%.

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

	Mean	N
Pretest	6.79	30
Posttest	6.19	30

Based on table 3.3, it can be seen the average pH value of saliva before (pretest) and after (posttest) given the treatment of consuming young coconut water (*Cocos Nucifera*). The average salivary pH value before treatment was 6.79 and after treatment was 6.19.

Table 4 Shapiro Wilk Normality Test.

Shapiro Wilk Test		Statistic	df	Sig.
	Pretest	0.968	30	0.475
	Posttest	0.956	30	0.246

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 $p > 0.05$.

Table 5 Levene Test Homogeneity Test.

Levene Statistic	df1	df2	Sig.
,369	1	58	0.546

Based on table 3.5, the homogeneity test results obtained using the Levene Test homogeneity test, it can be concluded that the significance value for pretest and posttest data has a homogeneous data variance because the resulting significance value is more than the sig. or $p > 0.05$.

Table 6 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	0.60233	0.31335	0.05721	0.48532	0.71934	10.528	29	0.000

Based on table 3.6, the significance value obtained based on the paired t-test is 0.000. The significance value of $p < 0.05$ means that there are changes in salivary pH levels before and after consuming young coconut water (*Cocos Nucifera*).

The data in table 3.1, the characteristics of respondents based on age are most at the age of 21 years and least at the age of 23 and 30 years, this is because the factors that affect the salivary flow rate are one of them, namely the age of the respondents taken in this study based on generations with different ages in each generation.

Based on research that has been conducted in table 3.2, the characteristics of respondents based on gender, it is found that female respondents are more numerous with 26 people and male respondents are 4 people. This is because according to the inclusion criteria, it states that respondents do not smoke and drink alcoholic beverages so that more female respondents are found than male respondents.

Based on table 3. the average value of salivary pH levels before consuming young coconut water is 6.79 and salivary pH levels after consuming coconut fruit water is 6.19, this shows a decrease in salivary pH levels before and after consuming young coconut water. salivary pH in respondents decreased because young coconut water (*Cocos Nucifera*) has a low

pH level of 5.5 and also because of the content of acidic ions such as vitamin C, lactic acid, and reducing sugars consisting of fructose, glucose, and amino acids [2].

The results of the study to determine the effect of salivary pH before and after consuming young coconut water (*Cocos Nucifera*) decreased. This study uses a parametric hypothesis test Paired T-Test using a ratio data scale. Based on the Paired T-Test test that the significance value $p < 0.05$ so that the conclusion that can be drawn is that there are changes in salivary pH levels before and after consuming young coconut water 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 are changes in salivary pH before and after consuming young coconut water.

Consuming young coconut water can affect the pH of saliva to decrease. The decrease in salivary pH after consuming young coconut water is because young coconut has an acidic pH of 5.5 and has ions in it that have acidic properties such as vitamin C, total solids or reduced sugar consisting of fructose, glucose and amino acids. Organic acids in coconut water greatly affect the decrease in salivary pH. The more sources of organic acids that are metabolized by the body, the more the salivary pH decreases[10].

4. Conclusion

The results of research conducted on students of the Faculty of Dentistry, Bhakti Wiyata Institute of Health Sciences, Kediri class of 2019, 2020, 2021, 2022 in the microbiology laboratory of the Bhakti Wiyata Institute of Health Sciences, Kediri can be concluded that there is an effect of consuming young coconut water on reducing salivary pH in the oral cavity.

Compliance with ethical standards

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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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