



## Effect of Gargling of Young Coconut Water on Saliva pH of Elementary School Children in Batua Village, Makassar City

Syamsul Burhan

Health Polytechnic of the Ministry of Health Makassar, Indonesia

Corresponding Author: Syamsul Burhan



### Article Info

#### Article history:

Received 07 January 2020

Received in revised form 16 January 2020

Accepted 23 January 2020

#### Keywords:

Gargling

Young Coconut Water

Saliva pH

Children

### Abstract

Various ways have been done to reduce the risk of caries including by utilizing a variety of plants and plants one of which is young coconut water. This study aims to determine the effect of gargling young coconut water on saliva pH, knowing the pH of saliva before and after gargling young coconut water and to determine the effect of gargling old coconut water on salivary pH. This research method is Pretest and Post-test research design. This study aims to examine the pH of saliva before and after treatment. Retrieval of data is done by purposive sampling technique. The results showed that gargling young coconut water could affect the pH of saliva, gargling young coconut water could reduce the pH of saliva, gargling young coconut water lowered the pH of saliva compared to gargling old coconut water. We recommend that you rinse water after consuming young coconut water or old coconut water.

### Introduction

Dental caries is an infectious disease that destroys tooth structure. These diseases cause cavities. if left untreated, this disease can cause pain, dental dating, infections, various dangerous cases, and even death. This disease has been known since the past, various evidence has shown that this disease has been known since the Bronze Age, Iron Age, and Middle Ages (Silverstone, 1981). The increased prevalence of caries is largely influenced by changes in diet. Now, dental caries has become a disease that is spread throughout the world.

There are several ways to classify dental caries. Although what appears to be different, risk factors and caries development are almost similar. At first, the location of caries may appear like a chalky area but develop into a brown hole. Although caries may be seen with the naked eye, radiographic assistance is sometimes needed to observe areas in the tooth and determine how far the disease is damaging teeth.

Of the hundreds of bacterial species in the oral cavity, some of which are known as streptococcus mutans (SM), are caries-causing organisms in tooth enamel because they are attached to enamel, produce acids, thrive in areas rich in sucrose, and produce bacteriocin as a substance that is rich in substances can eliminate his competitive bacteria.

These bacteria play an important role in the formation of caries in the oral cavity, by attaching plaque to the surface of the enamel accompanied by nutrients (sucrose) from the food leftovers that are eaten with the help of bacteria converted into nitric acid which subsequently demineralises the tooth structure in the tooth enamel within a period of time certain changes into caries. Saliva plays an important role in the process of caries formation,

an adequate function of saliva is important in defense against caries attacks. Salivary protection mechanisms, including caries removal, buffer action, anti-microbial, and remineralization (Lisnayetti, 2017).

Now various ways have been done to reduce the risk of caries. Among them by utilizing various plants and plants that we can find around us. Among the use of young coconut water, where we know together with coconut plants can be used all parts of the leaves to the roots of the plant. Young coconuts are very easy to find and are found in Indonesia, especially in southern Sulawesi. On the fruit, there is meat and coconut water. Prof. Dr. F. G. W. Narno (2002) writes in his book, Coconut water contains 46 calories per cup (1 cup = - / + 230 ml) and 2 grams of protein. The salt content of sodium or sodium is relatively very high, which is about

252 mg. Likewise, with fiber that reaches 3 grams, the total fat content is very low, which is around 0.5 grams with 0.4 saturation. Coconut water contains all of the B group vitamins, except for vit B6, and vit B12. There are 6.00 mcg of folic acid and 5.8 mg of vitamin C, the mineral content in 1 cup is calcium 57.6 mg, iron 0.7, magnesium 60 mg, potassium 600 mg, and zinc 0.2 mg.

Nutrient content in young coconut water such as vitamins, amino acid minerals, organic and inorganic content needed by the body, coconut water also contains calcium, phosphorus, protein, carbohydrate and sugar ions. these ingredients have in common the contents that exist in saliva that can help the remineralization process (Santoso, 1996). In a previous study conducted by Shandy Hidayat and his two colleagues at the Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin, which used sweet and sticky foods containing carbohydrates and sugars such as those contained in young coconut water were proven to increase salivary pH (Calbom & Calbom, 2008).

For this reason, this research will explain and explain whether the effect of gargling young coconut water on saliva pH, knowing the pH of saliva before and after gargling young coconut water, as well as knowing the effect of gargling old coconut water on salivary pH.

## Methods

This type of research is experimental with a Pretest-Posttest research design. This study aims to examine the pH of saliva before and after treatment. Data is collected by using purposive sampling technique (sample criteria have been determined). The population in this study were all grade 5 students of SD Inpres Tello Baru II in Batua Village, Manggala District, Makassar City. The sample of this study was obtained from a population of 39 children in grade 5 of SD Inpres Tello Baru II in Batua Village, Manggala District, Makassar City. This research is located at SD Tpres Baru II Elementary School in Batua Village. Manggala District, Makassar City. The raw data that has been obtained is then processed using the SPSS (Statistical Package for Social Science) program which is generally used to analyze data. The statistical test used was a paired t-test to see differences in salivary pH changes before and after rinsing young coconut water.

## Results and Discussion

Table 4.1 Salivary pH Distribution in Respondents Before Gargling Coconut water

saliva pH	Total (n)	Precentage (%)
Acid	17	57
Neutral	10	33
Base	3	10
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Data Processing result, 2019

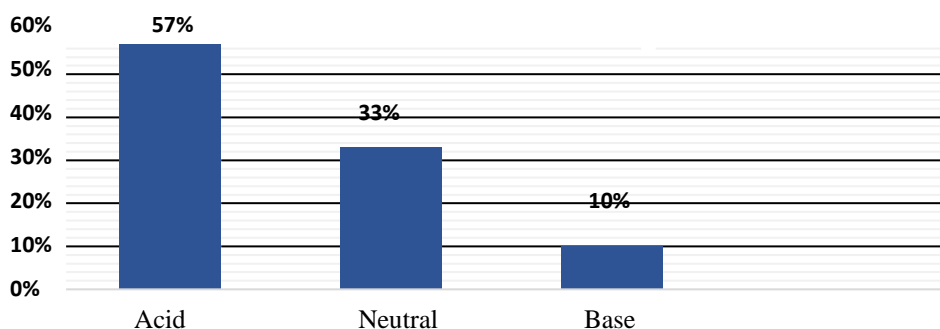


Figure 4.1 Salivary pH Distribution of Respondents Before Gargling Young Coconut Water.

Table and figure 4.1 show that 17 respondents (57%) had salivary pH in acidic criteria, 10 respondents (33%) were in neutral criteria, and 3 respondents (10%) were in basic criteria before gargling young coconut water.

Table 4.2 Salivary pH Distribution of Respondents After Rinsing Young Coconut Water

pH saliva	Total (n)	Percentage (%)
Acid	30	100
Neutral	-	-
Base	-	-
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Data Processing Result, 2019

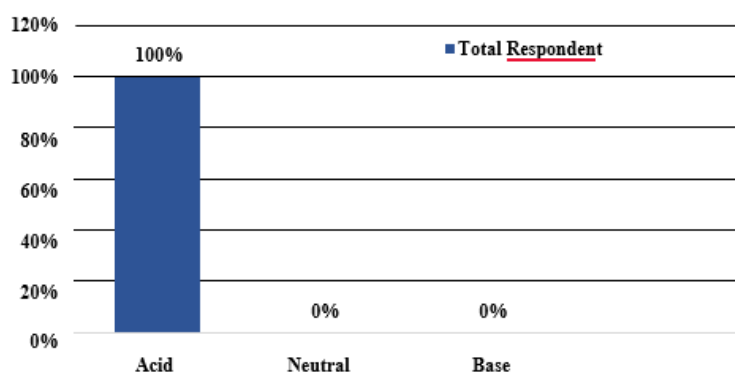


Figure 4.2 Salivary pH Distribution of Respondents After Gargling Coconut water.

Table and figure 4.2 show that 30 respondents (100%) had salivary pH in acidic criteria, and without respondents (0%) who were in neutral and basic criteria after gargling young coconut water.

Table 4.3 Salivary pH Distribution in Respondents Before and After Gargling Young Coconut Water

Criteria	Before Gargling		After Gargling	
	Total(n)	Percentage (%)	Total (n)	Percentage (%)
Acid	17	57	30	100
Neutral	10	33	-	-
Base	3	10	-	-
<b>Total</b>	<b>30</b>	<b>100</b>	<b>30</b>	<b>100</b>

Source: Data Processing Result, 2019

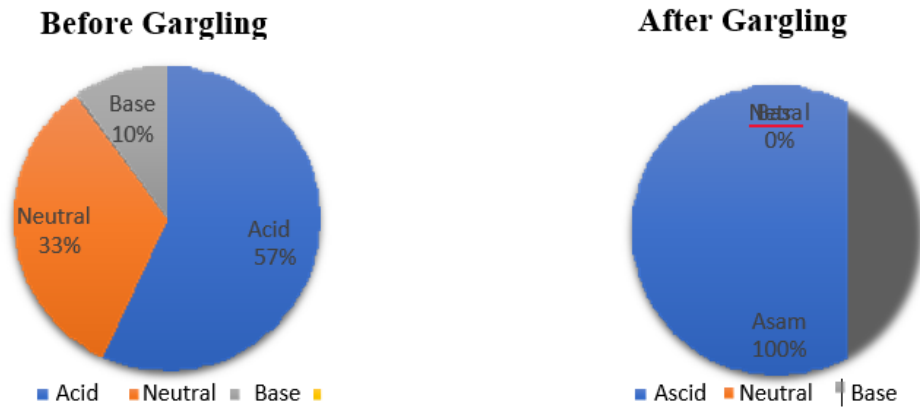


Figure 4.3 Salivary pH Distribution of Respondents Before and After Gargling of Young Coconut Water

Table and figure 4.3 show that there is a difference between salivary pH before and after rinsing young coconut water, before rinsing acidic saliva pH by 17 respondents (57%), with neutral criteria as much as 10 respondents (33%) and basic criteria by 3 respondents (10%), and after rinsing there was a change in salivary pH with acid criteria of 30 respondents (100%), neutral criteria without respondents (0%), and alkaline criteria without respondents (0%).

Table 4.4 Descriptive Statistics of Young Coconut Water

	N	Minimum	Maximum	Mean	Std. Deviation
pH Saliva before Gargling young coconut water	30	6.15	7.38	6.6757	.30247
pH Saliva after Gargling young coconut water	30	5.07	6.83	5.7273	.44118
Valid N (listwise)	30				

Source: Data Processing Results, 2019

The table above explains the general description of saliva about the data used in research with the treatment of Young Coconut Water. The pH level before rinsing young coconut water from 30 samples obtained an average of 6.6757 with a standard deviation of 0.30247. The pH value after rinsing young coconut water from 30 samples obtained an average of 5.7273 with a standard deviation of 0.44118.

Table 4.5 Results of Analysis of T-Test for Young Coconut Water

	Paired Differences			T	Sig. (2-tailed)
	mean	Std. Deviation	95% Confidence Interval of the Difference		
			lower		

Pair 1	Before gargling Young Coconut Water - After gargling Young Coconut Water	.94833	.43390	.78631	1.11035	11.971	.000
-----------	--	--------	--------	--------	---------	--------	------

Source: Data Processing Results, 2019

The table above explains the results of a comparison test between the pH value before rinsing young coconut water and after rinsing young coconut water. The results of changes in pH before and after gargling young coconut water obtained an average of 0.94833. This average value indicates a change in the value of pH before and pH after rinsing coconut water which shows a decrease in pH. The t-test value in the table is 11,971 with sig. 0.000 < 0.05 which explains that there is a significant or significant difference between the pH before rinsing young coconut water and the pH after rinsing young coconut water.

Whereas when gargling young coconut water is compared with gargling old coconut water with the same sample that takes place at different times namely the number of samples examined as many as 30 people from the total sample of 39 students should be grade 5 elementary school. With the same location, Tello Baru II Elementary School in Batua Village, Manggala District, Makassar City. From the sample of 30 students the following results were obtained:

Table 4.6 Distribution of Saliva pH in Respondents Before Gargling Old Coconut Water

pH saliva	Total (n)	Percentage (%)
Acid	9	30
Neutral	18	60
Base	3	10
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Data Processing Result, 2019

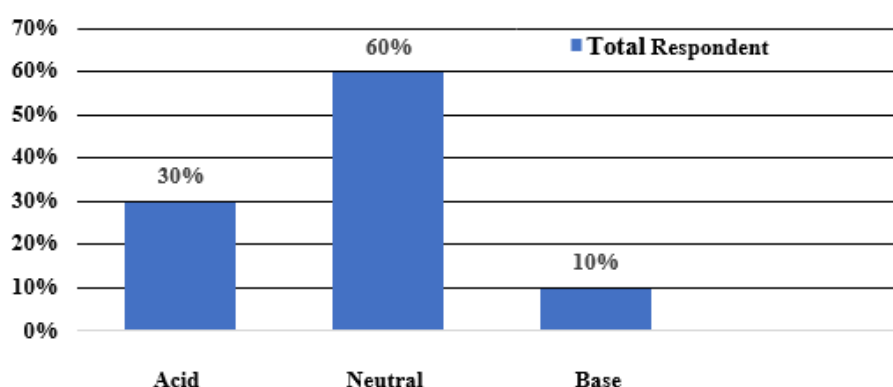


Figure 4.4 Distribution of Saliva pH in Respondents Before Gargling Old Coconut Water

Table and figure 4.4 show that 9 respondents (30%) had salivary pH in acidic criteria, 18 respondents (60%) were in neutral criteria, and 3 respondents (10%) were in alkaline criteria before gargling old coconut water.

Table 4.7 Salivary pH Distribution of Respondents After Gargling Old Coconut Water

pH saliva	Total (n)	Percentage (%)
Acid	25	84
Neutral	4	13
Base	1	3
<b>Total</b>	<b>30</b>	<b>100</b>

Source: Data Processing Result, 2019

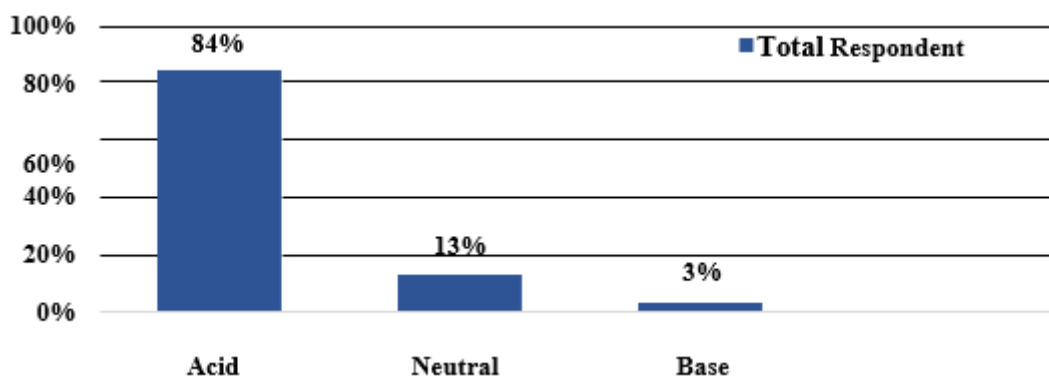


Figure 4.5 Salivary pH Distribution of Respondents After Gargling Old Coconut Water

Table 4.6 and figure 4.5 show that 25 respondents (84%) had salivary pH in acidic criteria, 4 respondents (13%) were in neutral criteria and 1 respondent (3%) in alkaline criteria after gargling young coconut water.

Table 4.8 Salivary pH Distribution in Respondents Before and After Gargling of Old Coconut Water

Criteria	Before Gargling		After Gargling	
	Total (n)	Percentage (%)	Total (n)	Percentage (%)
Acid	9	30	25	84
Neutral	18	60	4	13
Base	3	10	1	3
<b>Total</b>	<b>30</b>	<b>100</b>	<b>30</b>	<b>100</b>

Source: Data Processing Result, 2019

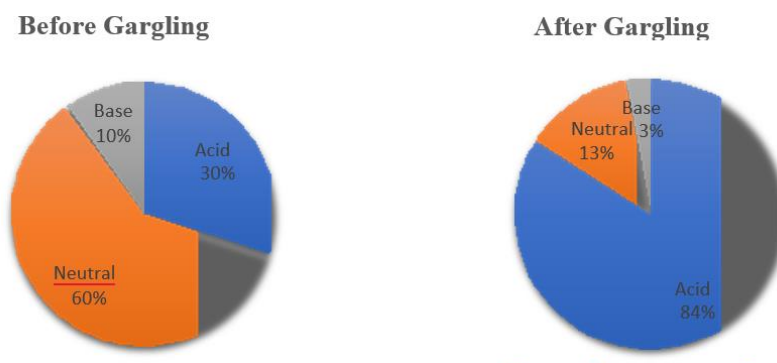


Figure 4.6 Salivary pH Distribution of Respondents Before and After Gargling of Old Coconut Water

Table and figure 4.8 show that there is a difference between salivary pH before and after gargling old coconut water, before gargling salivary acid pH as much as 9 respondents (30%), with neutral criteria as many as 18 respondents (60%) and basic criteria as many as 3 respondents (10 %), and after rinsing there was a change in salivary pH with an acidic criterion of 25 respondents (84%), a neutral criterion of 4 respondents (13%), and a baseline criterion of 1 respondent (3%).

Table 4.9 Descriptive Statistics of Old Coconut Water

	N	Minimum	Maximum	Mean	Std. Deviation
pH Saliva Before Gargling Old Coconut	30	6,36	7.46	6.9060	.31572
pH Saliva After Gargling Old Coconut	30	5.39	7,33	6.1847	.48662
Valid N (listwise)	30				

Source: Data Processing Result, 2019

The table above explains a simple description of the data used in the study with the treatment of gargling old coconut water. The pH level before rinsing old coconut water from 30 samples obtained an average of 6.9060 with a standard deviation of 0.31572. As for the pH value after rinsing old coconut water from 30 samples obtained an average of 6.1847 with a standard deviation of 0.48662.

Table 4.10 Results of Analysis of Old Coconut Water T-Test

		Paired Differences				t	Sig. (2- tailed)
		mean	Std. Deviation	95% Confidence Interval of the Difference			
				Lower	upper		
Pair 1	Before gargling old coconut water - After gargling old coconut water	.72133	.45236	.55242	.89025	8.734	.000

Source: Data Processing Result, 2019

The table above explains the results of a comparison test between the pH value before rinsing old coconut water and after rinsing old coconut water. The results of changes in pH before and after gargling old coconut water obtained an average of 0.72133. This average value indicates a change in the value of pH before and pH after gargling old coconut water which shows a decrease in pH. The t-test value in the table is 8.734 with sig. 0.000 <0.05 which explains that there is a significant or significant difference between the pH before rinsing old coconut water and the pH after rinsing old coconut water.

Based on the t-test output table between the change in pH value by drinking young coconut water and the pH of drinking old coconut water. Detailed comparisons are presented in the following table:

Table 4.11 Results of T-Test Analysis Comparison of Young Coconut Water and Old Coconut Water

Treatment	Average value	Sign
Changes in pH using young coconut water	0,94833	0,000
Changes in pH using old coconut water	0,72133	0,000

Source: Data Processing Result, 2019

Changes in pH value by rinsing young coconut water and pH rinsing old coconut water. Changes in pH using young coconut water with an average value of 0.94833 changes with sig. 0.000 <0.05, while the change in pH uses old coconut water with an average value of change of 0.72133 with a sig value. 0,000 <0.05.

From the results of the study with the title of the effect of gargling young coconut water on saliva pH in grade 5 children of SD Inpres Tello Baru II in Batua Village, Manggala District, Makassar City. Where in Table and Figure 4.3 shows that the distribution before (pretest) and after rinsing young coconut water as many as 17 respondents (57%) had salivary pH in acidic criteria and after gargling young coconut water increased to 30 respondents (100%) had salivary pH in acid criteria, 10 respondents (33%) who were in the neutral criteria before gargling young coconut water, and as many as 3 respondents (10%) who were in the alkaline criteria turned acidic or decreased in number after gargling young coconut water.

This means that all respondents (30 people) after gargling young coconut water are in acidic criteria, the results show there is a decrease in pH or an increase in the amount of pH toward acid, the results of this study are in line with the results of the Mokoginta study (2017), in line with the results of the study conducted by Kusumawardani et al (2017). Where respondents experienced a decrease in salivary pH after gargling young coconut water. Food and drinks consumed can cause saliva to be acidic or basic. Gargling with young coconut water can reduce the pH of saliva. The decrease in pH after rinsing coconut water due to young coconut water has a low pH of 5.5, and the contents of the ions in it are acidic such as vitamin C, total solids or lactic acid, and reducing sugars consisting of fructose, glucose, and amino acids.

Organic acids found in coconut water can affect changes in salivary pH. The more sources of organic acids that can be metabolized, the lower the pH of saliva (Mokoginta et al., 2017). Acidic foods or drinks can cause a decrease in salivary pH, whereas carbohydrates and sugar in coconut water are deformed by bacteria which then produce acids and cause salivary pH to fall. This proves that the calcium content of 248mg / 250ml coconut water is inadequate to increase the pH of saliva. This amount is far less than the calcium content in other calcium-containing foods such as cheese that is equal to 714mg / 100g which has been proven to increase salivary pH after consumption of soft drinks (Kusumawardani et al., 2017).

Kidd and Bechal (1993) Say the food we consume daily can affect changes in salivary pH in the oral cavity, especially foods that are acidic will tend to cause changes in salivary pH to go down and be acidic as well. In addition, the results of carbohydrate metabolism by microorganisms in the oral cavity will also produce acids that will trigger the process of demineralization of enamel and dentin, which will lead to caries. Acid production from



microorganisms that exist in dental plaque will continue during the process of carbohydrate metabolism. Stephan's curve shows a sharp decrease in the acidity of dental plaque after carbohydrate consumption. Plaque bacteria will ferment carbohydrates (especially sugar and starch) and will produce acids, H<sup>+</sup> ions in acids will replace Ca bonds in the hydroxyapatite in enamel.

The degree of acidity of the pH (Potential of Hydrogen) and the salivary buffer capacity is determined by the quantitative and qualitative arrangement of electrolytes in the saliva mainly determined by the bicarbonate arrangement, because the bicarbonate arrangement is very constant in the saliva and originates from the salivary glands. Saliva in normal condition between 6.7-7.3, acid <6.7 and base > 7.3 if the oral cavity is low pH will facilitate the growth of acidogenic germs such as *Streptococcus mutans* and *Lactobacillus* (Arpa & Jubhari, 2017).

Tooth decay is caused by several types of acid-producing bacteria that can damage due to carbohydrate fermentation reactions including fructose, sucrose, and glucose (Loesche, 2007). The acid produced affects tooth minerals so they become sensitive at low pH. A tooth will experience demineralization and remineralization. When the pH drops below 5.5, the demineralization process becomes faster than remineralization. This causes more tooth minerals to melt and make holes in the teeth (Rahmawati et al., 2014).

From the results of table 4.4 shows the amount of pH level data before gargling young coconut water from 30 samples obtained an average of 6.6757 with a standard deviation of 0.30247. As for the pH value after rinsing young coconut water from 30 samples obtained an average of 5.7273 with a standard deviation of 0.44118. This average value indicates a change in the pH value before rinsing and the pH after rinsing young coconut water which shows a decrease in the pH of saliva.

The test results compare the pH values in table 4.5 between before gargling young coconut water and after gargling young coconut water. The results of changes in pH values before and after gargling coconut water obtained an average of 0.94833. This average value indicates a change in the value of pH before and pH after gargling coconut water which shows a decrease in pH. The t-test value in the table is 11,971 with sig. 0.000 <0.05 which explains that there is a significant or significant difference between the pH before rinsing young coconut water and the pH after rinsing young coconut water.

Whereas when gargling young coconut water is compared with gargling old coconut water, which has been written previously in Table and Figure 4.8 which shows that before gargling old coconut acid salivary pH was 9 respondents (30%) after gargling old coconut water had increased by 25 respondents (84%), neutral criteria as many as 18 respondents (60%) before gargling old coconut water and after gargling decreased by 4 respondents (13%), then basic criteria as many as 3 respondents (10%) before gargling old coconut water and after gargling old water Old coconuts also decreased by 1 respondent (3%). So it can be seen that there is a change indicating a decrease in pH towards the acid.

The results of the comparison of pH values between before gargling old coconut water and after gargling old coconut water are the results of changes in pH values before and after gargling old coconut water obtained an average of 0.72133. This average value shows the change in pH value before rinsing old coconut water and the pH after rinsing old coconut water which shows a decrease in pH value. The t-test value in the table is 8.734 with sig. 0.000 <0.05 which explains that there is a significant or significant difference between the pH before rinsing old coconut water and the pH after rinsing old coconut water.

Based on the t-test output table between changes in pH value with rinsing young coconut water and pH rinsing old coconut water. Changes in pH using young coconut water with an average value of 0.94833 changes with sig. 0.000 <0.05, while the change in pH uses old coconut water with an average value of change of 0.72133 with a sig value. 0,000 <0.05.

A detailed comparison is obtained that the treatment given using young coconut water gives a change in pH value more than using old coconut water. This happens because the pH of young coconut water is more acidic (4.22) than old coconut water (4.93).

The results of the study stated that after gargling both young coconut water and old coconut water can reduce the pH of saliva which leads to acid. And in addition, the findings in this study indicate that salivary pH is more decreased (acidic) when gargling with young coconut water compared to gargling old coconut water.

## Conclusion

Based on the results of research on the effect of gargling young coconut water on saliva pH in children in Batua Village, Manggala District, Makassar, it can be concluded that gargling young coconut water can affect salivary pH, gargling young coconut water can reduce salivary pH, gargling young coconut water further decreases the pH of saliva compared gargling old coconut water.

## References

- Arpa, S., & Jubhari, E. H. (2017). Sifat saliva dan hubungannya dengan pemakaian gigi tiruan lepasan. *MDJ (Makassar Dental Journal)*, 6(2).
- Calbom, C., & Calbom, J. (2008). *The Coconut Diet: The Secret Ingredient that Helps You Lose Weight While You Eat Your Favorite Foods*. Grand Central Life & Style.
- Kidd, E. A. M., Joyston-Bechal, S., & Beighton, D. (1993). Microbiological validation of assessments of caries activity during cavity preparation. *Caries Research*, 27(5), 402-408.
- Kusumawardani, C., Leman, M. A., & Mintjelungan, C. N. (2017). Pengaruh air kelapa terhadap peningkatan pH saliva. *e-GiGi*, 5(1).
- Lisnayetti, L. (2017). Perbedaan pH Saliva Berkumur Dengan Obat Kumur Yang Mengandung Daun Sirih Dan Obat Kumur Yang Mengandung Povidone Iodine Pada Siswa MTSN 1 Bukittinggi. *Menara Ilmu*, 11(74).
- Loesche, W. (2007). Dental caries and periodontitis: contrasting two infections that have medical implications. *Infectious disease clinics of North America*, 21(2), 471-502.
- Mokoginta, Z. P. (2017). Pengaruh Berkumur Air Kelapa Muda Terhadap Ph Saliva. *Pharmacon*, 6(1).
- Rahmawati, I., Said, F., & Hidayati, S. (2015). Perbedaan pH Saliva Antara Sebelum Dan Sesudah Mengonsumsi Minuman Ringan (Studi pada Siswa Kelas II dan III Madrasah Ibtidaiyah Zam-Zam Zailani Banjarbaru Kalimantan Selatan Tahun 2014). *Jurnal Skala Kesehatan*, 6(1).
- Santoso, U., Kubo, K., Ota, T., Tadokoro, T., & Maekawa, A. (1996). Nutrient composition of kopyor coconuts (*Cocos nucifera* L.). *Food chemistry*, 57(2), 299-304.
- Silverstone, L. M. (1981). *Dental Caries Aetiology, Pathology And Prevention*. Macmillan International Higher Education.