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Research Paper

## Gargling with Black Tea as an Effort to Increase Saliva pH in Elementary School Students

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### Abstract

**Background:** Tea is an herbal product which has an antibacterial effect and ability to increase saliva pH. black tea contains polyphenols which can help prevent dental caries. The teeth of primary school-aged children are susceptible to caries, and prevention is needed as early as possible. **Objective:** To discover the effectiveness of gargling with black tea to the salivary pH increase on elementary school students. **Method:** This is a quasi-experimental research with the pretest-posttest design with control group. The population in this research was the 2<sup>nd</sup> grade students of State Elementary School are 58 students. Total Sampling was used for the sample collecting. The sample was divided to two groups, namely the treatment group of black tea gargling, and the other is the control group of distilled water gargling. The data analysis used Wilcoxon and Mann-Whitney. **Results:** Based on the results, the average before gargling with black tea was 6.634, and increased to 7.297 after gargling with black tea. The average before gargling with distilled water was 6.648, and 6.669 after gargling with distilled water. The Wilcoxon Test result showed the value of  $p = 0.000 < 0.05$  which means there was a significant difference between before and after gargling with black tea. The Mann-Whitney Test result showed the value of  $p = 0.000 < 0.05$  so there was an effectiveness difference between gargling with black tea and distilled water to the salivary pH increase. **Conclusion:** Gargling with black tea is effective in increasing the salivary pH on elementary school students.

**Keywords:** Gargle, black tea, saliva pH

## INTRODUCTION

Problems with teeth and mouth can be a source of problems or focal infections for other important organs of the body. The dental health problem that is often experienced by the community is dental caries. According to data from the 2018 Basic Health Research, it shows that the prevalence of active caries in the Indonesian population is 88.8%. The prevalence of caries based on the age group of 5-9 years is 92.6%. These data indicate that the prevalence of dental caries in the Indonesian population is still high and requires serious attention from dentists or dental nurses.<sup>1-3</sup>

Saliva plays a role in the process of dental caries because saliva always wets the teeth so that it can affect the environment. Saliva is a complex oral fluid consisting of a mixture of secretions from the major and minor salivary glands in the oral cavity. Saliva has an important impact and role in maintaining and maintaining a healthy environment in the oral cavity. Saliva requires an adequate volume of saliva and an optimal composition of saliva to carry out its defensive function. The volume and composition of saliva is affected by changes in saliva pH. The degree of acidity of saliva can be increased by mechanical, gustatory, olfactory, or pharmacological stimulation.<sup>4-6</sup>

Efforts to neutralize the pH of saliva in the oral cavity can be done by gargling. Currently, there are many developing uses of natural ingredients as active ingredients in mouthwash.

Herbal mouthwash has many benefits, including anti-inflammatory, antimicrobial, anticariogenic. Herbal mouthwash has many advantages over mouthwash made from chemicals. Herbal mouthwash is cheap, easy to prepare at home and safe for daily use because it contains natural ingredients.<sup>7,8</sup>

Tea is an herbal product that has the ability to increase saliva pH and has an antibacterial effect. Tea has antibacterial and anticariogenic effects that can reduce the acidity of saliva and plaque so that it is effective in preventing caries. Black tea contains compounds to prevent dental and oral diseases by inhibiting the formation of dental plaque. Black tea has antimicrobial, anticariogenic and therapeutic effects against several diseases. Black tea contains polyphenols that can help prevent dental caries. Black tea has a bitter taste so that it can stimulate the speed of salivary secretion, increase saliva volume and increase saliva pH.<sup>8-10</sup>

## MATERIALS AND METHODS

This research is a quasi experiment study using a pretest-posttest control group design. In this study, the subjects were divided into two groups, namely the treatment group (gargling with black tea brewed water) and the control group (gargling with distilled water). The treatment group and control group were compared, by conducting an initial examination (pretest), then given treatment, and carried out a final examination (posttest). This research was conducted on 2nd grade students of SDN 1 Padokan. The sampling technique in

this study used a total sampling of 58 students.

The research variables were gargling with black tea as an influence variable and salivary pH as an affected variable. Analysis of the data used is Wilcoxon and Mann-Whitney.

## RESULT

**Table 1. Frequency distribution of respondent characteristics**

No.	Variable	N	Percentage (%)
1	<b>Age</b>		
	8 years	52	89.7
	9 years	6	10.3
	total	58	100
2	<b>Gender</b>		
	Male	30	51.7
	Female	28	48.3
	total	58	100

Table 1 shows that most respondents in the study were from the age of 8 years (89.7%) with male gender, namely 30 respondents (51.7%).

**Table 2. Average saliva pH in the intervention group and control group**

Group	Before	After	$\Delta$ Mean
Intervention	6.63	7.29	0.66
Control	6.64	6.66	0.02

Table 2 shows that the average value of saliva pH before gargling in the intervention group was 6.63 and after being given the intervention, gargling with black tea steeped water was 7.29, so the difference before and after the intervention was 0.66. While the average value of saliva pH before rinsing in the control group was 6.64 and after being treated with distilled water gargling it became 6.66 so that the difference before and after being treated was 0.02.

**Table 3. Wilcoxon test results saliva pH in the intervention and control group**

Group	N	Positive Ranks	Negative Ranks	p-value
Intervention	29	29	0	0.000
Control	29	3	0	0.083

Table 3 shows that the salivary pH value in the intervention group was 0.000 ( $p < 0.05$ ), meaning that there was a significant difference in salivary pH before and after gargling with black tea steeped water. Meanwhile, the salivary pH in the control group was 0.083 ( $p < 0.05$ ), meaning that there was no significant difference before and after gargling aqua distillate.

**Table 4. Mann-Whitney test results difference in saliva pH in the intervention and control group**

Group	$\Delta$ Mean	p-value
Intervention	0.66	0.000
Control	0.02	

Table 4 show the results of the analysis using the Mann-Whitney pH difference in saliva gargling with black tea and distilled water obtained a p-value of 0.000 ( $p < 0.05$ ), so it

was concluded that there was a significant difference between gargling with black tea and aqua distillate.

## DISCUSSION

The results of the study based on table 1, the frequency distribution of respondents based on age. The smallest number of respondents was 8 years old, namely 52 respondents (89.7%) and 9 years old, namely 6 respondents (10.3%). In table 2, it is known that there are 30 male respondents (51.7%) more than female respondents, namely 28 respondents (49.3%). According to Ningsih research, the average salivary pH of 7-9 years old has acidic pH criteria and is at high caries risk due to a lack of understanding of children and parents about maintaining oral and dental health. Elementary school age children have a penchant for consuming cariogenic snacks, especially foods that are sweet, sticky, and easily attached to the teeth, resulting in a decrease in salivary pH which can increase the risk of dental caries.<sup>11,12</sup>

Table 2 shows the difference in the mean scores of the intervention group and the control group. In the intervention group, the average salivary pH value increased before and after gargling black tea from 6.63 to 7.29, there was a difference of 0.66. In the control group the average value of salivary pH increased before and after gargling with distilled water from 6.64 to 6.66, there was a difference of 0.02. The difference in gargling aquades is smaller than black tea. The change in the mean salivary pH value in the intervention group was greater than in the control group. This means more improvement in the intervention group with black tea gargling. Black tea can inhibit acid formation, inhibit the activity of glucosyltransferase enzymes from *Streptococcus mutans* and bacteria in plaque and can prevent a decrease in salivary pH and can increase salivary pH. Black tea contains polyphenols which are compounds that can prevent dental caries. Polyphenols in black tea in the form of catechins consist of epigallo-catechin (EGC) and epigallo-catechin gallate (EGCg) compounds.<sup>9,13</sup>

The results of the Wilcoxon difference test in table 3 show before and after gargling. The intervention group showed a value of 0.000 ( $p < 0.05$ ). This means that there is a significant difference before and after gargling with black tea steeped water. Wilcoxon's results in the control group showed a value of 0.083 ( $p < 0.05$ ), meaning that there was no significant difference before and after gargling with aqua distillate. This shows that gargling black tea is more effective than gargling with distilled water. An increase in saliva pH occurs due to an increase in saliva secretion. An increase in salivary secretion causes an increase in bicarbonate ions so that the saliva pH will increase. Increased saliva secretion can occur due to mechanical and chemical stimulation of the salivary glands. The high polyphenol content in black tea causes a bitter taste as well as catechins that are anti-microbial and fluorine which can inhibit caries-causing bacteria so that it can increase the pH of saliva. This is in accordance with the Amerongen theory, salivary pH is influenced by the rhythm of day and night, diet, stimulation of secretion speed. The rate of secretion directly affects the degree of acidity in the mouth. The speed of secretion can be stimulated by stimuli in the form of sweet, bitter, sweet, salty, spicy.<sup>8,14,15</sup>

The results of the Mann-Whitney test in table 4 of the difference in salivary pH gargling with black tea and distilled water obtained a value of 0.000 ( $p < 0.05$ ), so it was concluded that there was a significant difference in salivary pH between gargling with black tea and aqua distillate.

## CONCLUSION

Based on the results of the study, it can be concluded that there is gargling black tea is effective in increasing salivary pH in

elementary school students.

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## CONFLICT OF INTEREST

The authors declare that they have no conflict interests.

## ETHICAL CLEARANCE

All participants were signed the informed consent prior to the data collection.

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