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The Effectiveness of Drinking Green Tea on Blood Pressure, Flow Rate, and Salivary pH of Young Adult Women

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ABSTRACT
The most important content of green tea is polyphenol catechins, a very complex compound that is useful in reducing blood pressure and increasing salivary flow and pH. This study aims to determine the effect of drinking green tea on blood pressure, flow rate, and pH of saliva in young adult women. Method: This research is Experimental Design with Pre Test and Post Test Control Group Design. Measurement of blood pressure using a sphygmomanometer while measuring the flow rate and pH of saliva using salivary pots and pH meters Hanna instrument. The results have a significant effect ($p < 0.05$) on decreasing blood pressure, and increasing salivary flow and pH after drinking green tea in young adult women. The conclusion is green tea has a good influence on blood pressure, flow rate, and salivary pH.
KEYWORDS: Green tea, blood pressure, salivary flow rate, salivary pH, young adult women

I. INTRODUCTION

Young adult women are very high consumers of sweet foods and drinks. According to WHO, the age category for young adult women is 17-25 years. Young adulthood is the age that has experienced the final adolescent phase. In this phase, the consumption of food ingredients that are cariogenic increases so that it can reduce the flow rate and pH of saliva because the metabolism of acid production increases by oral bacteria.

Salivary flow rate is related to blood pressure. In patients with high blood pressure conditions can affect the salivary glands in secreting a small amount of saliva with thicker saliva characteristics. The research results show that the use of green tea affects a person's blood pressure. Theanine properties contained in tea can affect the peripheral nervous system and peripheral blood vessels so that it functions to provide a calming effect on a person's mental condition by lowering blood pressure. Catechins in tea can also lower blood pressure by inhibiting the activity of Angiotensin Converting Enzym (ACE), which is an enzyme that catalyzes the formation of compounds that cause high blood pressure.

The increase in salivary flow rate is also related to salivary pH. Increasing the rate of secretion will increase the salivary pH. Vice versa, a decrease in the rate of secretion will decrease the salivary pH because the quantitative and qualitative arrangement of electrolytes in saliva determines the pH and buffer capacity. Therefore, mthe majority of hypertensive patients have an acidic salivary pH.The research results are knownthere were 84 people (84%) hypertensive patients had an acidic salivary pH while in normotensive patients only 19 people (19%) had an acidic salivary pH so it was found that the majority of hypertensive patients had an acidic salivary pH.

Tea is one of the most popular drinks in the world. Most of the tea plants grown in Indonesia are of the Assamica variety, which has a higher catechin content than the tea plants grown in Japan and China. Tea is a drink that is popular with Indonesian people. Tea is not only a drink but also used in medicine. The types of tea that are often consumed are green tea, black tea, and oolong tea, all of which come from the leaves of the Camellia Sinensis plant. Green tea has better health benefits because green tea is made by inactivating the oxidase/phenolase enzymes present in fresh tea leaves, namely by heating or steaming using hot steam, so that the enzymatic oxidation of the catechins in the tea leaves can be prevented.

The properties of green tea come from the chemical compounds contained in Tuh iephenol group (catechin), non-phenol group (L-Theanin), aromatic group and enzymes. The role of the use of green tea in oral health has effective antibacterial properties and can reduce the acidity of salivary pH.Green tea also has the ability to increase salivary secretion and increase salivary pH. The content of catechins in this tea creates an astringent feeling which can stimulate the central nervous system resulting in an increase in salivary secretion. The stimulation that occurs is mechanical

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stimulation accompanied by tasting (bitter taste) of green tea extract.

The purpose of this study was to determine the effect of drinkingtehgreen on blood pressure, flow rate, and salivary pH in young adult women.

II METHOD

This research has received ethical permission from the Research Ethics Study Team at the University of North Sumatra with number .This type of research is experimental with the design used is the pre test and post test control group design.This study was conducted on 18 young adult female patients with an age range of 17-25 years.This experimental design was carried out by carrying out initial measurements or observations before and after treatment. The sampling technique in this study used non-probability sampling purposive sampling based on the list or inclusion and exclusion criteria that had been diset. The inclusion criteria were physically healthy patients, patients aged 17-25 years, patients not experiencing systemic diseases, patients not allergic to tea.

The tea used is a type of green tea with Juma Green Tea products from Sidamanik, North Sumatra. Ingredients for drinking green tea with a concentration of 0.25% are prepared by dissolving 250 mg of dry green tea powder in 100 ml of water at 80C. Blood pressure, flow rate and salivary pH were measured before and after the patient drank green tea.

Prior to treatment, blood pressure was measured using the auscultatory method using a sphygmomanmeter, after which saliva was taken with the subject being instructed to sit quietly in an upright position and slightly bowing his head when collecting saliva. The salivary method uses the draining method, in which the saliva is allowed to drip through the lower lip into the sampling tube. Subjects were instructed to spit at the end of the collection duration for 5 minutes and salivary pH was immediately measured using a pH meter (Hanna Instrument). This research was conducted in the morning until 12 noon.

Then the patient was instructed to drink green tea while gargling and then swallowing it. This method is carried out so that mechanical stimulation is effective when taking saliva. After finishing drinking green tea, immediately take saliva to see the flow rate and pH of saliva for 5 minutes. The method used is the same as before. Then after 30 minutes blood pressure was measured after drinking green tea because the metabolism of green tea in the body can be done after 30 minutes of consuming green tea.

The results of the data were analyzed using SPSS version 17.0. The test used was the Wilcoxon test to determine whether or not there was a significant effect before and after drinking green tea on blood pressure, flow rate and salivary pH in young adult women.

III RESULTS

The average difference in blood pressure before and after drinking green tea can be seen in Table 1. It appears that the highest average values of systolic and diastolic blood pressure were before drinking green tea. The average value of systolic and diastolic blood pressure after drinking green tea decreased. This shows that there is a significant effect of drinking green tea in reducing systolic (p=0.010) and diastolic (p=0.030) blood pressure.

From Table 2 and Table 3 it can be seen that the difference in the increasing in salivary flow rate and pH after drinking green tea. The average value of salivary flow rate and pH before drinking green tea increased after drinking green tea. This shows that there is a significant effect (p = 0.00) on the average flow rate and salivary pH before and after drinking green tea.

Table 1: Average Blood Pressure Before and After Drinking Green Tea

Blood pressure	Mean N = 18	Significance (p)
Systolic before	107,778	p = 0.010
Systolic after	101,056	
Diastolic before	75,000	p = 0.030
Diastolic after	73,000	

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Table 2: Average Saliva Flow Rate before and after drinking Green Tea

Saliva Flow Rate	Mean N=18	Significance (p)
Before	2.167	p = 0.00*
After	3,333	

Table 3: Average Saliva pH before and after drinking Green Tea

Saliva pH	Mean N=18	Significance (p)
Before	6,867	p = 0.00*
After	7,278	

IV DISCUSSION

This study is a clinical trial to determine the effect before and after drinking green tea with a concentration of 0.25% in young adult women. The observation results showed a decrease in systolic and diastolic blood pressure,increase in salivary flow rate and pH after drinking green tea. The Wilcoxon test results showed that there was a significant effect on reducing blood pressure and increasing salivary flow rate and pH before and after drinking green tea.

The occurrence of pdecrease in systolic and diastolic blood pressureinThis research is supported by research conducted by Putra showing the results that green tea lowers systolic blood pressure. Negishi's research found that giving green tea polyphenols (3.5 g/L catechins, 500 mg of flavonoids) significantly reduced blood pressure, both systolic and diastolic.

Green tea's ability to lower blood pressure can be seen from the results of measurements in the treatment group which showed a significant change in the average systolic pressure from 107.778 to 101.056 and the average diastolic pressure from 75.000 to 73.000. The chemical content of green tea is the same as that contained in fresh tea leaves, namely polyphenolic compounds (flavonols, flavanols, flavones, flavanones, isoflavones, anthocyanins), theophylline, theobromine, vitamin C, vitamin E, vitamin B complex, as well as a number of minerals such as fluorine, phosphorus, calcium, strontium, Fe, Zn, Mg, and Mo. The type of tea that turns out to have the highest benefit as a relaxant is green tea, because green tea contains catechins and L-theanine. The content of L-theanine in green tea is the greatest compared to other tea variants.

The results of research conducted by Afifah et al showed that tea brewed at 80ºC for 5 minutes can increase a person's α brain waves. L-theanine functions as a calming effect by increasing α waves which trigger a person to relax and lower blood pressure and pulse. L-theanine causes neurochemical effects in the brain within 30 minutes after consumption.

L-theanine is an amino acid compound in green tea that acts as a relaxant. This substance has a relaxing effect on the body as a whole, both relaxing the brain and muscles. Relaxed conditions can be triggered by L-theanine because this compound can penetrate the blood-brain barrier which triggers an increase in gamma-amino-butyric acid (GABA) activity, increases serotonin and dopamine production, and inhibits glutamate action.[12]Research shows that L-theanine can increase levels of GABA, an important 'inhibitory neurotransmitter' in the brain that helps regulate nerve transmission. Nervous transmission activation increases especially when under stress. This can be inhibited by increasing GABA and can produce a relaxing effect. The production of serotonin and dopamine can also affect psychological and physiological reactions in stressful conditions, because these two compounds are neurotransmitters that trigger relaxed conditions and can improve mood. The role of L-theanine is to inhibit the work of glutamate which acts as a brain neurotransmitter for nerve transmission. L-theanine causes neurochemical effects in the brain within 30 minutes after consumption.

The content of catechins in tea also has the ability to inhibit the formation of the enzyme angiotensin transferase. As we know, ACE acts as the formation of angiotensin II which will affect blood vessels, namely by vasoconstriction and reducing salt and water excretion in the kidneys, resulting in increased blood pressure. By inhibiting ACE by the catechins in green tea, the process will be hampered so that blood vessels can dilate. resulting in decreased total peripheal resistance (TPR), besides that water and salt excretion in the kidneys will also decrease so that cardiac output decreases and blood pressure falls. The catechins in green tea are also capable of blocking α-1 adrenergic receptors which will inhibit the secretion of adrenaline and noradrenaline. This

process will result in vasodilation of blood vessels which can lower a person's blood pressure.

The content of catechins in this tea creates an astringent feeling which can stimulate the central nervous system resulting in an increase in salivary secretion.Amerongen stated that the speed of salivary flow can be increased by mechanical stimulation (rinsing) and stimulation of taste in the presence of a bitter taste from catechins. Supported by research by Masaomi et al. showed that there was a significant effect of the effect of green tea on pH and salivary flow rate. The research results show that gargling green tea can increase the pH and flow rate of saliva. Increased salivary flow also causes bacterial metabolic results and bacterial toxic substances to dissolve or be swallowed so that the balance of the oral cavity environment is maintained.

The increase in salivary flow rate in all groups was possible due to mechanical stimulation and taste. It is suitable that the speed of salivary flow can be increased by mechanical stimulation (rinsing) and stimulation of taste in the presence of the bitter taste of green tea polyphenols. Mechanical stimulation occurs through receptors found in the muscles of mastication, the temporomandibular joint, and the mucosa of the oral cavity which detect muscle movement and transmit impulses to the parasympathetic nervous system resulting in an increase in salivary secretion.

V CONCLUSION

In this study, the average volume of saliva without stimulation was within normal criteria. According to Amerongen, the maximum volume of saliva produced by mechanical simulation is ± 0.85 ml/minute. The average volume of saliva after stimulation obtained in this study is close to this value. The results of statistical tests in this study showed that there was a significant difference in the increase in salivary flow rate.

The increase in salivary flow rate and pH in the group that gargled with green tea was due to green tea being alkaline so that it could neutralize acids in saliva. This is in accordance with Murphy's statement that green tea is alkaline so it can maintain the acid-base balance of body fluids. An increase in pH occurs when there is an increase in salivary secretion due to an increase in the amount of bicarbonate ions which is directly proportional to the rate of salivary secretion, especially from the parotid gland. Increasing the speed of salivary secretion will increase the salivary pH. Vice versa, a decrease in the rate of secretion will decrease the salivary pH because the quantitative and qualitative arrangement of electrolytes in saliva determines the pH and buffer capacity.

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