

# The Effect of Cucumber Juice on Blood Pressure, Study on Medical Students of Syiah Kuala University

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## ABSTRACT

Normal blood pressure is systolic blood pressure <120 mmHg and diastolic pressure <80 mmHg. There are two abnormalities in blood pressure, hypertension or high blood pressure and hypotension or low blood pressure. The most common case is hypertension with a very high number of deaths in the world. One way to help lower blood pressure is consuming cucumber juice. This study aims to determine the effect of cucumber juice with sugar and cucumber juice without sugar to blood pressure in medical students of Universitas Syiah Kuala. This type of research is an experimental study with a pre-experimental one group pre and post-test design. This study used non-probability sampling technique with purposive sampling method. The data were processed using independent T-test statistics on 88 research samples. The results of the reduction in systolic blood pressure are at 15 minutes (p-value 0.139), 30

minutes (p-value 0.656), and 60 minutes (p-value 0.904). Then the results of the decrease in diastolic blood pressure are at 15 minutes (p-value 0.603), 30 minutes (p-value 0.678), and 60 minutes (p-value 0.637). From these results obtained p-value > 0.05, which means there are differences in the insignificant effect of cucumber juice with a mixture of sugar and cucumber juice without sugar mixture.

**Keywords:** blood Pressure, Cucumber (*Cucumis sativus* L), medical students

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DOI: 10.5530/srp.2019.1.43

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## INTRODUCTION

Normal blood pressure is <120 mmHg for systolic blood pressure and <80 mmHg for diastolic pressure. There are two abnormalities in blood pressure, namely hypertension (high blood pressure) and hypotension (low blood pressure).<sup>(1)</sup>

The most common case is hypertension with a very high number of deaths in the world. Data from the *World Health Organization (WHO)* in 2011, that one billion people in the world suffering from hypertension are found in developing countries with low to moderate income.<sup>(2)</sup> Health Research Results (RISKESDAS) in 2013, noted the prevalence of hypertension in Indonesia at 26.5%. The highest prevalence of hypertension in Indonesia is in the Bangka Belitung region with 30.9% and the lowest is in the Papua region with 16.8%.<sup>(3)</sup> Whereas the incidence of hypertension in Aceh from Health Research (RISKESDAS) report in 2007, noted the prevalence of hypertension in Aceh at 30.2%.<sup>(4)</sup> Basic Health Research (RISKESDAS) in 2013, noted the prevalence of hypertension in Aceh reaching 21.5%. According to the 2015 health profile of Aceh, Banda Aceh residents who suffer from hypertension reach 13,968 people.<sup>(5)</sup>

One of the behavior of the community in dealing with high blood pressure is to consume cucumber juice. Apart from the fruits that are easily obtained, cucumber fruit is also an option because of its low price. People believe there are several cucumber contents that can reduce blood pressure.

Some studies have proven the effect of cucumber juice on blood pressure. One of them was research conducted at the Medical Faculty of Maranatha Christian University in Bandung in 2013, which gathered 30 adult men aged 19-23 years with normal blood pressure, who received blood pressure reduction results after drinking cucumber juice.<sup>(6)</sup>

However, from research that has been done using cucumber juice preparations without sugar solution, people usually consume cucumber juice mixed with sugar in the making. So the authors are interested in examining further by comparing the effect of cucumber juice without a mixture of sugar and cucumber juice with sugar mixture to find out whether the effect is the same or different. So that the existence of this study can determine a good preparation for consumption by the public in reducing blood pressure.

## METHODS

This study used an experimental research design. The design in this study was a pre-experimental one group pre and post test. The study began on November 5-28, 2018. The population in this study were all Medical students at Syiah Kuala University. Research samples were taken from populations that met the inclusion and exclusion criteria.

The inclusion criteria for this study were students of Medical Education at Syiah Kuala University who were willing to become respondents, and students with a normal Body Mass Index (BMI). Exclusion criteria in this study were students with history of smoking and alcohol consumption, hypertension, diabetes mellitus, kidney disease and obese. The research sample was determined by using

*nonprobability sampling technique* that is by *purposive sampling method*. The sample size in this study was 88 people. A total of 44 people were given the treatment of drinking cucumber juice with sugar mixture and 44 people were given the treatment of drinking cucumber juice without sugar mixture. The dose of cucumber fruit is 100 grams, 51.3 grams of sugar dose, and 200 ml of water.

Blood pressure measurement is done before being given treatment and after being given treatment. Blood pressure measurements after treatment were measured at 15, 30, and 60 minutes. Blood pressure measurements were carried out by the enumerator and using mercurysphygmomanometer. This study was conducted on

respondents with normal blood pressure. The data obtained were analyzed statistically using the *Independent T Test* and *Paired T Test*.

## RESULTS AND DISCUSSION

During the study period, there were 88 subjects included in the study. The characteristics of the respondents were presented in table 1, the highest was female 63 (71.6%). The majority of subjects were aged  $\geq 20$  - < 22 years ,47 (53.4%). The selection of treatment, it is applied by drawing a lottery, 44 were given the treatment to drink cucumber juice with sugar mixture and 44 took cucumber juice without sugar mixture.

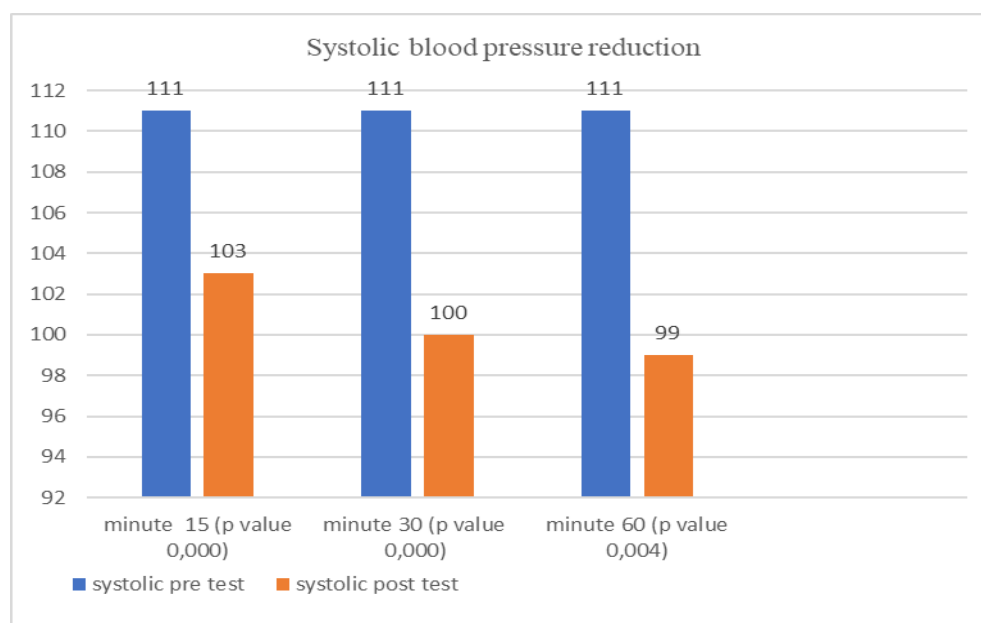
**Table 1. Characteristics of subjects**

Characteristics	Frequency (n)	Percentage (%)
<b>Sex</b>		
Male	25	28.4
Female	63	71.6
<b>Age (years)</b>		
$\geq 18$ - < 20	29	33.0
$\geq 20$ - < 22	47	53 , 4
$\geq 22$ - < 23	12	13.6
<b>Treatment</b>		
With Sugar Mixture	44	50.0
Without Sugar Mixture	44	50.0
<b>Total</b>	<b>88</b>	<b>100.0</b>

### Characteristics of Blood Pressure Given Cucumber Juice with Sugar Mixture

#### a. Systolic blood pressure

Data for systolic blood pressure before administration of cucumber juice with a mixture of sugar and blood pressure at 15 minutes,30 minutes and 60 minutes after being given cucumber juice with sugar mixture can be seen in figure 1 below:



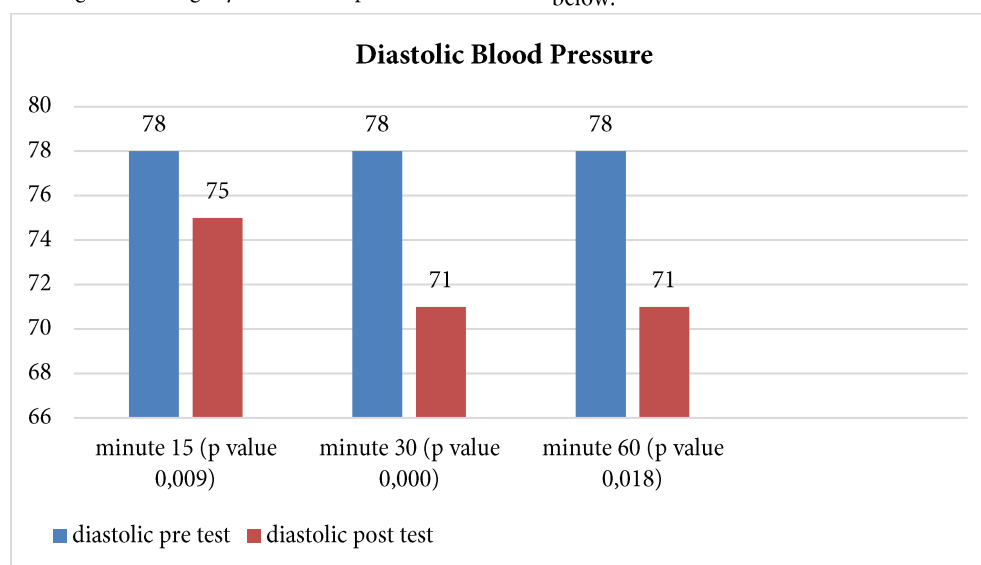
**Figure 1. Systolic Blood Pressure in subjects who get Cucumber Juice with Sugar Mixture**

Data analysis of Figure 1 using Paired T test, shows that the average initial systolic blood pressure before drinking cucumber juice with a sugar mixture is 111 mmHg. After drinking cucumber juice with sugar mixture, at 15 minutes the average systolic blood pressure becomes 103 mmHg (*p value* 0,000), at 30 minutes the average systolic blood pressure becomes 100 mmHg with (*p value* 0,000), at 60 minutes on average the average systolic blood pressure is

99 mmHg (*p value* 0.004), which means a significant decrease in systolic blood pressure.

#### b. Diastolic blood pressure

Data for systolic blood pressure before administration of cucumber juice with a mixture of sugar and blood pressure at 15.30 minutes, and 60 after being given cucumber juice with sugar mixture can be seen in Figure 2 below:



**Figure 2. Diastolic Blood Pressure in subjects who get Cucumber Juice with Sugar mixture.**

Data analysis of Figure 2 using Paired T Test, shows that the average initial diastolic blood pressure before drinking cucumber juice with sugar mixture was 78 mmHg. After drinking cucumber juice with a sugar mixture, at 15 minutes the average diastolic blood pressure becomes 75 mmHg (*p value* 0.009), at 30 minutes the average diastolic blood pressure becomes 71 mmHg (*p value* 0.000), at 60 minutes on average diastolic blood pressure becomes 71 mmHg (*p value* 0.018), which means a significant decrease in diastolic blood pressure.

### Characteristics of Blood Pressure Giving Cucumber Juice Without Sugar Mixture

#### a. Systolic blood pressure

Data for systolic blood pressure before administration of cucumber juice without a mixture of sugar and blood pressure at 15 minutes, 30 minutes and 60 minutes after being given cucumber juice without sugar mixture can be seen in figure 3 below:

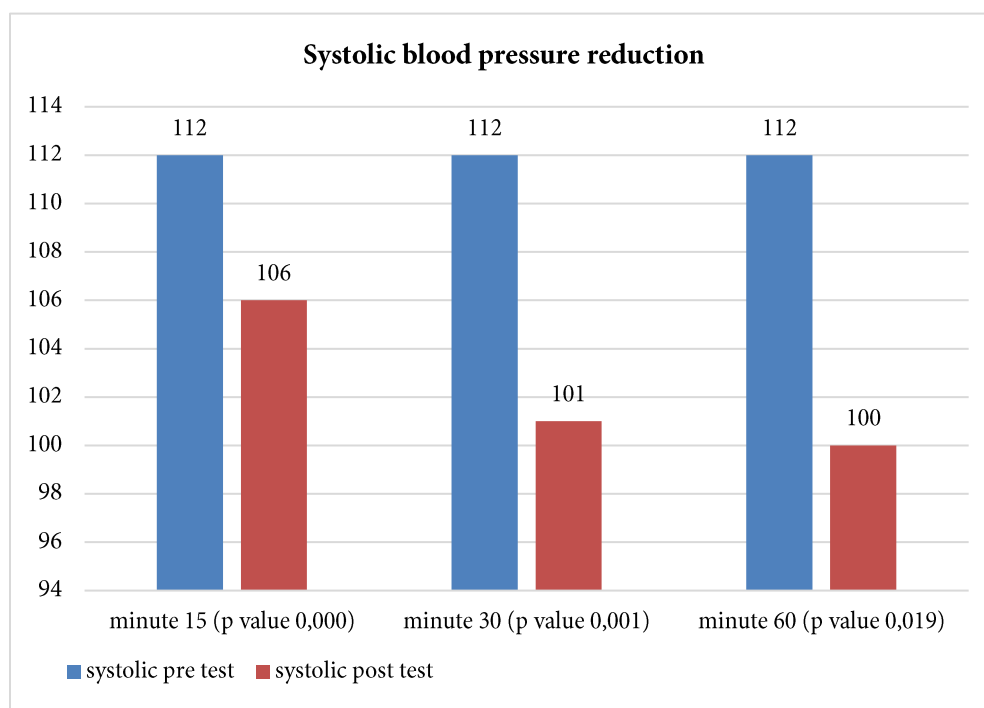


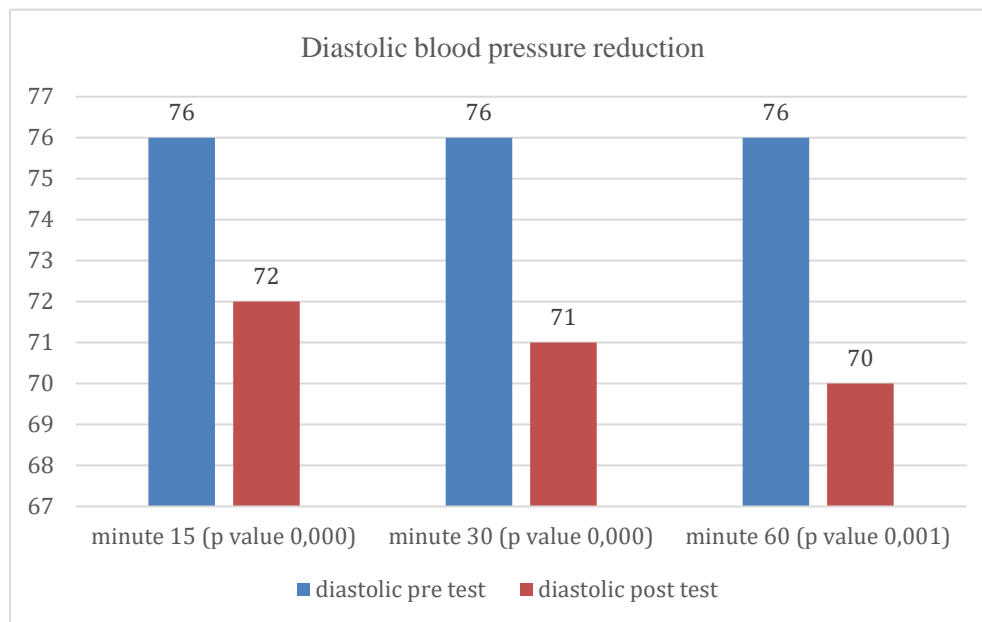
Figure 3. Systolic Blood Pressure in subjects who get Cucumber Juice Without Sugar Mixture

Data analysis of Figure 3 using Paired T test, shows that the average initial systolic blood pressure before drinking cucumber juice without sugar mixture is 112 mmHg. After drinking cucumber juice without sugar mixture, at 15 minutes the average systolic blood pressure becomes 106 mmHg (*p value* 0.000), at 30 minutes the average systolic blood pressure becomes 101 mmHg (*p value* 0.001), at 60 minutes on average systolic blood pressure becomes 100

mmHg (*p value* 0.019), which means a significant decrease in systolic blood pressure.

#### b. Diastolic blood pressure

Data for diastolic blood pressure before administration of cucumber juice without a mixture of sugar and blood pressure at 15 minutes, 30 minutes, and 60 minutes after being given cucumber juice without sugar mixture can be seen in Figure 4 below:



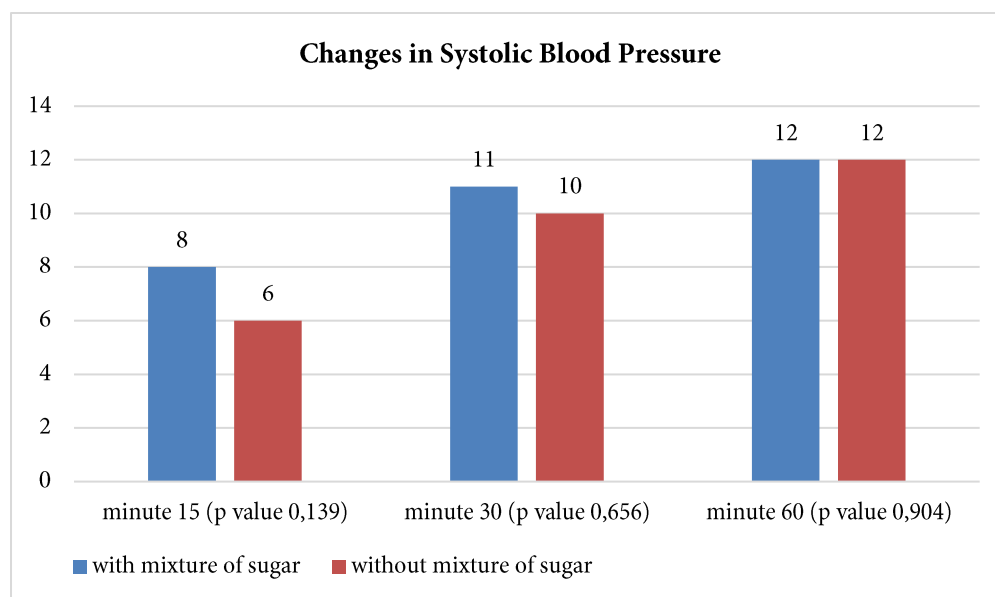
**Figure 4. Diastolic Blood Pressure in subjects who get Cucumber Juice Without Sugar mixture**

Data analysis of Figure 4 using Paired T test, shows that the average initial diastolic blood pressure before drinking cucumber juice without sugar mixture is 76 mmHg. After drinking cucumber juice without sugar mixture, at 15 minutes the average diastolic blood pressure becomes 72 mmHg (*p value* 0,000), at 30 minutes the average diastolic

blood pressure becomes 71 mmHg (*p value* 0,000), on 60 minutes on average diastolic blood pressure becomes 70 mmHg (*p value* 0.001), which means a significant decrease in diastolic blood pressure.

#### Differences in the Effect of Cucumber Juice with a Mixture of Sugar and without a Mixture of Sugar Towards Blood Pressure

##### a. Systolic blood pressure

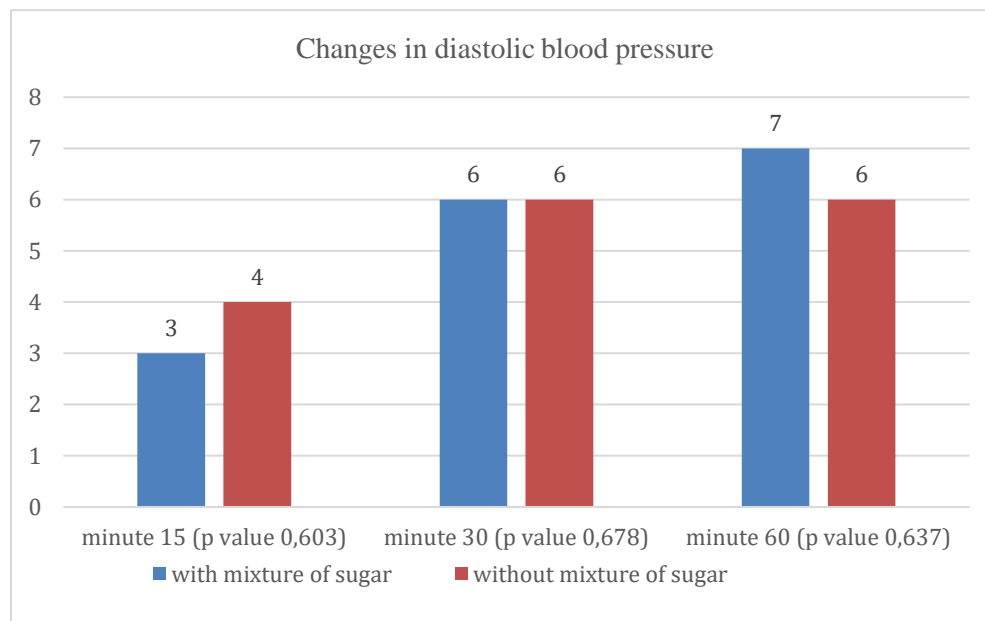


**Figure 5. Changes in Systolic Blood Pressure.**

Data Analysis of Figure 5 using *Independent T Test*, shows a decrease in the average systolic blood pressure at 15 minutes, with the treatment of cucumber juice with a sugar mixture of 8 mmHg and cucumber juice without sugar mixture of 6 mmHg, with a *p value* of 0.139. Then at 30 minutes, the average decrease in systolic blood pressure with the treatment of cucumber juice with a sugar mixture of 11 mmHg and cucumber juice without sugar mixture of 10 mmHg, with a *p value* of 0.656. Then at 60 minutes, the

average decrease in systolic blood pressure by cucumber juice treatment with a sugar mixture of 12 mmHg and cucumber juice without sugar mixture of 12 mmHg, with a *p value* of 0.904. The result suggests that there were no significant differences between the two treatments.

#### b. Diastolic blood pressure



**Figure 6. Changes in Diastolic Blood Pressure.**

Data Analysis of Figure 6 data using *Independent T Test*, showed a decrease in the average diastolic blood pressure at 15 minutes, with the treatment of cucumber juice with a sugar mixture of 3 mmHg and cucumber juice without sugar mixture of 4 mmHg, with a *p value* of 0.603. Then at 30 minutes, the average decrease in diastolic blood pressure with the treatment of cucumber juice with a sugar mixture of 6 mmHg and cucumber juice without sugar mixture of 6 mmHg, with a *p value* of 0.678. Then at 60 minutes, the average decrease in diastolic blood pressure with the treatment of cucumber juice with a sugar mixture of 7 mmHg and cucumber juice without sugar mixture of 6 mmHg, with a *p value* of 0.637. The result suggest that there were no significant differences between the two treatments.

## DISCUSSION

### The Relationship of Cucumber Juice with a Mixture of Sugar and Without Sugar Mixture towards Blood Pressure

In this study, 88 respondents participated in this study. 44 respondents were given the treatment of drinking cucumber juice with sugar mixture and 44 respondents were given cucumber juice treatment without sugar mixture. This study was conducted on respondents with normal blood pressure. Of the two treatments given, it showed a significant decrease in systolic and diastolic blood pressure at 15 minutes, 30 minutes, and 60 minutes after being treated. The results of this study are also the same as the results of research conducted by Cinta Rulita Tiominar Panggabean and Iwan Budiman in 2013, carried out on 30 adult men aged 19-23 years with normal blood pressure, getting a blood pressure reduction at 10 minutes after being given cucumber

juice without sugar mixture.<sup>(6)</sup> The results of this study were also supported by a study conducted in 2016, in 50 students aged 18-29 years with normal blood pressure at the Rivers State University of Science and Technology, Port Harcourt, Nigeria who received a blood pressure reduction.<sup>(7)</sup>

From the results of this study, it proves that cucumber juice with a mixture of sugar and cucumber juice without sugar mixture can reduce systolic and diastolic blood pressure. In 100 grams of cucumber fruit, it has several ingredients that are very beneficial for the human body. The highest content in 100 grams of cucumber is 96.2 grams of water and 154 mg of potassium.<sup>(8)</sup>

Potassium is an electrolyte which plays an important role in the human body in controlling intracellular fluid. Potassium can reduce blood pressure in several ways. First, consumption of potassium can increase the concentration in intracellular fluid and increase fluid in the extracellular, so it can lower blood pressure. Secondly, a decrease in blood pressure of potassium by vasodilatation results in a decrease in total peripheral retention and also increases heart output. Third, potassium can also interfere with the renin angiotensin system by reducing renin production, resulting in reduced formation of angiotensinogen II, reduced vasoconstriction in blood vessels, resulting in reduced aldosterone, and reduced reabsorption of water and sodium, causing a decrease in blood pressure. Fourth, Potassium also plays a role in the peripheral and central nerves so that it can affect blood pressure.<sup>(9)</sup>

Aside from the potassium contained in cucumber juice to lower blood pressure, there is also sugar dissolved in cucumber juice to lower blood pressure. The sugar used is sucrose. Sucrose can be obtained from sugar cane and is often referred to as cane sugar or granulated sugar. Sucrose has a high osmotic diuretic, so it can help lower blood pressure. Osmotic diuretics increase urinary excretion due to differences in osmotic pressure. At first diuretics work by reducing the volume of blood and heart, so that the sodium stores in the body decrease and cause a decrease in blood pressure.<sup>(10)</sup>

### Differences in the Effect of Cucumber Juice with Mixture and No Sugar Mixture on Blood Pressure

Of the 88 respondents who were divided into 2 different treatment groups, 44 respondents were given cucumber juice with a sugar mixture and 44 respondents were given cucumber juice without sugar mixture, getting the result cucumber juice with mixture of sugar is more influential in lowering blood pressure. But with a statistical test using the *Independent T Test*, it was found that there was no significant difference between cucumber juice and a mixture of sugar and cucumber juice without sugar mixture.

Diuretic is a substance that can increase the rate of urinary output and is also able to increase excretion of sodium and chloride in the urine. There are three factors that can affect diuretics, namely the workplace diuretics in the

kidneys, organ physiology status and interactions between drugs and receptors. Sucrose sugar has high osmotic diuretic properties in increasing excretion of water. This osmotic effect causes urine volume to increase so that it can lower blood pressure.<sup>(11)</sup>

The process of urine formation passes through several stages in the kidney. The first process, glomerular filtration. The process of filtration will cause substances with large molecules to be retained to not pass through the filtration membrane, such as platelets and plasma proteins. However, smaller components that are soluble in plasma will pass through the filtration membrane, such as glucose, amino acids, potassium, sodium, chloride, urea and water. The results of glomerular filtration are called primary urine or glomerular filtrate. The second process, tubular reabsorption. Substances that are still useful and will be reabsorbed are water, sodium, glucose, urea, and phenol. Sodium reabsorption is complex, from 99.5% filtration results it is normally reabsorbed. Approximately 67% is reabsorbed in the proximal tubule, 25% in the henle, and 8% in the distal tubule and colon. After reabsorption of substances that are still useful, secondary urine or tubular filtrate will be formed. The third process, tubular secretion. The ingredients secreted by tubules are hydrogen ions, potassium, organic anions and cations. Hydrogen ion secretion functions to regulate acid base balance in the body. While the secretion of potassium is controlled by aldosterone. The fourth process, urine excretion. Urinary excretion is the result of the previous three processes. Of the 125 ml of plasma filtrated per minute, and the final amount of urine formed is 1 ml / minute. Therefore, 180 liters of filtration per day, 1.5 liters into urine to be excreted.<sup>(11)</sup>

The formation of urine can be influenced by two factors, namely internal factors and external factors. Internal factors that can affect the formation of urine are anti-diuretic (ADH) and insulin hormones. While external factors are influenced by several factors. First, the amount of water consumed. Second, the temperature of the environment. Third, emotions and stress.<sup>(12)</sup>

### CONCLUSION

Our study, can be concluded that; consumption of cucumber juice with a mixture of sugar can reduce blood pressure significantly, and there is no significant difference between the effect of cucumber juice with mixture of sugar and cucumber juice without sugar mixture.

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