Conference Paper

The Effectivity of Tomato and Guava Combination Juice and Guava Juice Administration on Blood Glucose Level in Patients with Type II Diabetes Mellitus

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Abstract

This study aims to determine the effectivity of tomato and guava juice combination with guava juice on blood glucose levels of patients with type II diabetes mellitus in the work area of Kuranji Padang Health Center in 2019. This quasi-experimental study used a pretest-posttest design with a control group. The population of this study was all patients with type II diabetes mellitus in the working area of Kuranji Health Center, Padang City. Sampling is done by purposive sampling. The number of samples was 24 people, divided into treatment groups and a control group. The data obtained were analyzed by two different dependent tests and an independent t-test. The results of statistical tests showed that there were significant differences between the average decrease in fasting blood glucose levels of respondents who were given tomato and guava combination juice with respondents who were given guava juice (p = 0,026). People with diabetes mellitus are expected to consume tomato and guava combination juice as a form of complementary therapy.

Keywords: Diabetes mellitus, blood glucose level, tomato, guava

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1. Introduction

Non-communicable diseases are one of the health problems that are of concern today both nationally and globally. Salah satu. One of the non-communicable diseases that are of concern at this time are diabetes mellitus. Diabetes mellitus is a group of metabolic diseases with characteristics of hyperglycemia that occur due to abnormalities of insulin secretion, insulin action or both (Soelistijo S, Adi, et al. 2015).

Based on WHO data, currently there are 171 million people with diabetes mellitus in the world and will double to 366 million by 2030. The increase in the prevalence of diabetes mellitus will be faster in developing countries compared to developed countries, one of them in Indonesia (Bustan N, 2015).

2013 Basic Health Research (Riskesdas) results showed that the prevalence of diabetes mellitus in Indonesia increased from 1.1% in 2007 to 2.1% in 2013.

Based on the results of the 2007 Basic Health Research (Riskesdas), the prevalence of diabetes mellitus in West Sumatra province was 1.2% while the results of the 2013 Basic Health Research (Riskesdas) stated the prevalence of diabetes mellitus in West Sumatra province was 1.8%. This shows an increase in the prevalence of diabetes mellitus in the province of West Sumatra.

The prevalence of diabetes mellitus in the working area of the Padang City health center in 2016 with the highest number are; Andalas 10,64%, Lubuk Buaya 9,93%, Lubuk Begalung 8,40%, Kuranji 6,98%, Air Dingin 6,95% and Ambacang 6,22%. These data indicate that the prevalence of diabetes mellitus in the city of Padang is higher than the data of the Riskesdas of West Sumatra in 2013.

According to the American Diabetes Association (ADA) in 2010, diabetes mellitus is a metabolic disease characterized by high blood sugar levels (hyperglycemia) due to abnormal insulin production (secretion), insulin action, or both (Jauhariah D, Prasetyaningrum Y, 2016).

One of the micro minerals that is known to help glucose metabolism and increase insulin work is chromium. Chromium is a micromineral which has a role as a cofactor in increasing glucose metabolism. Consumption of chromium can help improve blood sugar levels and vice versa the lack of chromium in food intake will result in insulin resistance (Ngaisyah RDD, 2010).

One food that has high chromium content is in fruits such as tomatoes. Buah Tomat (*Lycopersicum Esculentum*) dalam 100 gram mengandung 20 µg kromium (Nurohmi S, 2017).

In addition, lycopene content in tomatoes can reduce blood glucose by reducing insulin resistance, resulting in increased cell tolerance to glucose so that excess blood sugar levels can be overcome (Astuti YD, 2013).

One of the factors that can increase the absorption of chromium is vitamin C. (Astuti YD, 2013). Chromium is more easily absorbed with vitamin C supplements or foods rich in vitamin C (Toruan PL, 2000). One food that is rich in vitamin C is guava fruit, where in 100 grams of guava there is 87 mg of vitamin C (TKPI, 2017)

Based on the description above, researchers have conducted research on the effectivity of tomato and guava combination juice and guava juice on blood glucose levels in patients with type II diabetes mellitus within the work area of Kuranji Padang Health Center in 2019.

This study aims to determine the effectivity of tomato and guava combination juice and guava juice on blood glucose levels in patients with type II diabetes mellitus within the work area of Kuranji Padang Health Center in 2019.

2. Method

This quasi-experimental study used a pretest posttest design with a control group. This research was conducted in January 2018 until February 2019 in the work area of the Kuranji Health Center.

The population of this study was all patients with type II diabetes mellitus in the working area of Kuranji Health Center, Padang City. Sampling is done by purposive sampling. The number of samples was 24 people, with the criteria: patients without complications, not taking drugs that inhibit the work of chromium namely antacid drugs, corticosteroid NSAIDS, and levothyroxine, aged >= 25-59 years.

The measurements of respondents' fasting blood glucose levels were measured one day before the intervention and one day after the intervention was conducted. The administration of the tomato and guava combination juice and guava juice is 240 ml, once daily for 7 consecutive days, the researcher also monitored the intake of respondents.

3. Result

The general description of respondents can be seen in the following table:

TABLE 1: Sex based respondents frequency distribution.

Sex	Treatment		Control		Total	
	n	%	n	%	N	%
Male	0	0	1	8,3	1	4,2
Female	12	100	11	91,7	23	95,8
Total	**12**	**100**	**12**	**100**	**24**	**100**

In this study almost all respondents were female as many as 23 people (95.8%).

More than half of the study respondents were in the age range of 50-64 years as many as 15 people (62.5%).

More than half of the respondents had overweight nutritional status as many as 14 people (58.3%). The start and end fasting blood glucose levels in the treatment group and the control group can be seen in the following table:

Table 2: Age based respondents frequency distribution.

Age	Treatment		Control		Total	
	n	%	n	%	N	%
19-29 y.o.	1	8,3	0	0	1	4,2
30-49 y.o.	6	50	0	0	6	25
50-64 y.o.	5	41,7	10	83,3	15	62,5
65-80 y.o.	0	0	2	16,7	2	8,3
Total	**12**	**100**	**12**	**100**	**24**	**100**

Table 3: Nutrition status based respondents frequency distribution.

Nutrition status	Treatment		Control		Total	
	N	%	n	%	n	%
Underweight	2	16,7	1	8,3	3	12,5
Normal	5	41,7	2	16,7	7	29,2
Overweight	5	41,7	9	75	14	58,3
Total	**12**	**100**	**12**	**100**	**24**	**100**

Table 4: Start and end fasting blood glucose level disribution.

Fasring BGL	Mean	Minimum	Maximum	SD
Start of treatment	231,25	142	444	84,80
Start of control	200,92	138	328	53,19
End of treatment	182,83	98	315	64,73
End of control	197,08	113	315	58,96

Based on table 4 it is known that the average fasting blood glucose level of the treatment group was 231.25 mg / dl ± 84.80 and the control group was 200.92 mg / dl ± 53.19. The average final fasting blood glucose level in the treatment group was 182.83 mg / dl ± 64.73 and the control group was 197.08 mg / dl ± 58.96. The results of the analysis of different fasting blood glucose levels in the treatment and control groups can be seen in the following table :

Table 5: Treatment fasting BGL difference analysis result.

Statistic analysis	Test	n	Mean	SD	P
Start fasting BGL	T-test	12	231,25	84,80	0,002
End fasting BGL		12	182,83	64,73	

Based on table 5, it can be seen that there is a difference in the initial and final fasting blood glucose levels in the respondent treated with p = 0.002 which means p <0.05.

Based on table 6, it can be seen that there were no differences in the initial and final fasting blood glucose levels in the control group with p = 0.659, which means p> 0.05. Although statistically there was no significant difference after being given treatment,

Table 6: Treatment fasting BGL difference analysis result.

Statistic analysis	Test	n	Mean	SD	P
Start fasting BGL	T-test	12	200,92	53,19	0,659
End fasting BGL		12	197,08	58,96	

but there was a tendency to decrease fasting blood glucose levels in the control group. The results of the analysis show the effect of the combination of tomato and guava juice and guava juice on fasting blood glucose levels of type II diabetes mellitus patients can be seen in the following table :

Table 7: Tomato and guava combination juice and guava juice effect on fasting BGL in patients with type II diabetes mellitus.

Statistic analysis	Test	n	Mean	SD	p
Treatment fasting BGL mean decrease	T-test	12	52,25	36,05	0,026
Control fasting BGL mean decrease		12	26,17	11,12	

Table 7 shows that there is an effect of juice combination of tomatoes and guava with guava juice on fasting blood glucose levels, as evidenced by the value of $p < 0.05$, which is equal to 0.026.

4. Discussion

Based on the results of the study, the average decrease in fasting blood glucose levels of respondents given a combination of tomato and guava juice was greater (52.25 mg / dl ± 36.05) compared to the average decrease in blood glucose levels of respondents given guava juice only (26.17 mg / dl ± 11.12). The results of the statistical tests showed that there were significant differences in the initial and final fasting blood glucose levels in respondents who were given tomato and guava combination juice with $p < 0.05$. This can occur because the combination of tomato and guava juice contains chromium, lycopene, vitamin C, and antioxidants while guava juice only contains lycopene, vitamin C and antioxidants.

Theoretically, chromium is able to improve the work of insulin so that it can maintain blood glucose levels under normal conditions and in the presence of working vitamin C chromium will be more effective in its absorption process (Ngaisyah RDD, 2010). Besides tomatoes and guava both contain lycopene. Lycopene can reduce blood glucose levels

by reducing insulin resistance, so that excess blood glucose levels can be overcome (Astuti YD, 2013).

The results also showed that there was an effect of the combination of tomato and guava juice and guava juice on fasting blood glucose levels of type II diabetes mellitus patients, $p < 0.05$. This shows that tomato and guava combination juice is more effective in reducing fasting blood glucose levels of type II diabetes mellitus patients.

This is supported by Martha Sri's research (2015) by giving 200 ml of cucumber juice and tomato juice from 100 grams of cucumber and 100 grams of tomatoes for 7 consecutive days with an average decrease in blood sugar of 3.32 mg / dl.

This research is also supported by the theory that chromium and lycopene in tomatoes and the influence of vitamin C which is high in guava can reduce blood sugar levels. Where chromium plays an important role in metabolism and carbohydrate use, controlling the work of insulin in the body and controlling factors for blood sugar levels (Wardhani S, 2018).

Chromium also shows the effect of stimulating activity in cells which leads to increased absorption of blood sugar in muscle cells as an insulin cofactor and the work of chromium consistent with increasing insulin sensitivity (Ngaisyah RDD, 2010).

Chromium is more easily absorbed with foods rich in vitamin C, one of which is guava. This is supported by Anugrah Linda (2015) study that giving chromium, vitamin C, and a mixture of chromium, vitamin C, vitamin E has an effect on blood sugar.

Apart from containing chromium, tomatoes also contain the strongest antioxidant, lycopene. Lycopene in tomatoes can increase insulin concentration so that it can function as an antidiabetic. Lycopene will be more easily absorbed if consumed from food that has been processed or cooked (for example in the form of juice). Before being processed, tomatoes are blanched first to activate lycopene found in tomatoes so that it is more easily absorbed by the body (Putri A, 2017).

Combining two or more types of antioxidants will have a synergistic effect or cooperate in tackling free radicals (Fennema, 1996). Free radical exposure is an important factor that can affect sugar metabolism, causing symptoms of diabetes mellitus (Lingga L, 2012). Lycopene in tomatoes will work synergistically in improving the performance of vitamin C in helping the process of absorption of chromium.

5. Conclussion

Based on the results of the study, the average initial fasting blood glucose level in the treatment group was 231.25 mg / dl ± 84.80 while the average fasting blood glucose level was 182.83 mg / dl ± 64.73. The average initial fasting blood glucose level in the control group was 200.92 mg / dl ± 53.19 whereas the average fasting blood glucose level was 197.08 mg / dl ± 58.96. There were significant differences in the initial and final fasting blood glucose levels in the treatment group ($p < 0.05$). There were no significant differences in the initial and final fasting blood glucose levels in the control group ($p > 0.05$).

There is an effect of the administration of the combinations juice on blood sugar levels in patients with type II diabetes mellitus ($p < 0.05$).People with diabetes mellitus are expected to consume tomato and guava combination juice as a form of complementary therapy.

Subsequent research is expected to continue this research by testing chromium and lycopene and vitamin C contained in the product and adding other factors that influence blood glucose levels in patients with diabetes mellitus such as hormonal factors, genetic factors, living habits, checking lipid profiles and serum chromium.

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