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The Influence Of Tomato Juice And Red Dragon Juice On Changes In Blood Sugar Levels Of People With Type 2 Diabetes Mellitus In Antang Health Center In Makassar

Hartika[1] , Andi zulkifli Abdullah[2] , Ida Leida Maria[2] , Nur Nasry Noor[2] , Masni[3], Fridawati[4]

[1]Master Program ofEpidemiology Department, Faculty of PublicHealth, Hasanuddin University,INDONESIA

[2]Department ofEpidemiology, FacultyofPublicHealth,Hasanuddin University, INDONESIA

[3]Department ofBiostatisticsFacultyofPublicHealth,Hasanuddin University, INDONESIA

[4]Departement of Hospital Management, Hasanuddin University, INDONESIA

Abstract

Diabetes mellitus is a chronic condition where the body cannot make enough insulin or use it efficiently, increasing blood sugar levels. Antang Health Center, which ranks first among 47 health centers in Makassar, has a relatively high proportion of DM patients. This research focuses on whether providing tomato juice with red dragon fruit juice has a different influence on changes in blood sugar levels in people with type 2 diabetes mellitus at Antang Health Center.The type of research used was a quasi-experiment with a non-randomized pre-test and post-test control group design. The determination of samples by a purposive sampling method included as many as 52 respondents with type 2 diabetes mellitus, namely each of the 26 respondents in the main intervention group and the comparison intervention group. The sample was given tomato juice with red dragon fruit juice, as much as 250 ml for 14 days. The data obtained were analyzed using the Wilcoxon test and the Mann-Whitney test.The results showed the average blood sugar levels of the pre (244.88) and post (170.19) tomato juice groups, respectively, were obtained on average at pre (228.50) and post (173.84), respectively, $p<0.05$ values. There were significant differences before and after the intervention. Statistical test results after the intervention using Mann-Whitney showed a value of $p = 0.044$ ($p<0.05$). It can be concluded that there is a difference in influence between the two, with tomato juice being more influential than red dragon fruit juice, with an average of 30.73 and 22.27 points, respectively. It is expected that researchers will further examine the use of fasting blood sugar measurements.

Keywords: Diabetes Mellitus, Blood Sugar Levels, Tomato Juice, Red Dragon Juice
Fruit

Introduction

Diabetes mellitus is a chronic disorder in which the body's ability to create or sufficiently produce the insulin hormone or utilize insulin efficiently results in a rise in blood glucose levels (International Diabetes Federation, 2019). Due to the body's ineffective use of insulin, type 2 diabetes mellitus is referred to as

non-insulin-dependent diabetes. Although the symptoms are similar to type 1 diabetes, they are frequently misdiagnosed or non-existent. As a result, the condition goes undetected for years until problems occur. Type 2 diabetes was previously only observed in adults. However, it is now being detected in children(WHO, 2016).

A report from the International Diabetes Federation (IDF) in 2019, predicting 463 million people with diabetes mellitus and an estimated 578 million people by 2030 and 700 million people by 2045, said the IDF said type 2 diabetes mellitus accounts for a portion of diabetes worldwide.

Based on secondary data obtained from the Makassar City Health Office (2021), it was found that the number of cases of diabetes mellitus in 2020 amounted to 22,476 cases. The diabetes mellitus cases at Antang Health Center were first with 1,333 cases among 47 health centers in Makassar City, while the 2nd highest case was at Kassi-Kassi health center with 1,248 cases.

Treatment efforts to control and lower blood sugar levels can be achieved with pharmacological and non-pharmacological treatments. Non-pharmacological treatment can be done by providing food ingredients to lower blood sugar levels. Among them are tomatoes and red dragon fruit.

Tomatoes contain lycopene as a powerful antioxidant and non-pro-vitamin A carotenoid and efficiently cure diabetes mellitus (Imran et al., 2020). Lycopene mechanisms prevent chronic disease, i.e., lycopene can increase lycopene status in the body and act as an antioxidant. Lycopene binds to reactive oxygen and increases antioxidant potential or reduces oxidative damage to lipids (including lipid membranes and lipoproteins), proteins, and DNA, thereby lowering oxidative stress (Revelation, 2021).

Red dragon fruit is also a useful food ingredient in lowering blood sugar levels. According to Ayuni (2020), red dragon fruit can reduce blood glucose levels because it includes sntioxidant compounds in flavonoids, which protect beta cells from harm as insulin makers and can increase insulin sensitivity.

Methods

This type of research was an experimental study in this quasi-experimental design with the non-randomized pre-test and post-test control groups. This research was conducted in the working area of the Antang Health Center Makassar. The study began from July to September 2021.

The population in this study had type 2 diabetes mellitus and was medically recorded in the Antang Health Center Work Area. In this study, the sample met the following inclusion criteria: people with type 2 diabetes mellitus, respondents aged ≥35 years, and those willing to be given tomato juice and red dragon fruit juice for two weeks. Exclusion criteria: a response that did not fully participate in the study.

The instruments used in this study were Informed Consent, Observation Sheet, SOP (Standard Operating Procedure) blood sugar levels, SOP (Standard Operating Procedure) in giving tomato juice and red dragon fruit juice, Questionnaire Sheet, tool using calibrated GCU and materials used, namely scales, measuring cups, spoons, filters, bottles, tomatoes (250 grams), red dragon fruit (250 grams) and water.

Results and Discussion

Table 1 shows the characteristics based on the age of the tomato juice group at the age of ≥ 60 years (42.3%) and the red dragon fruit juice group (42.2%). By gender, the tomato juice and red dragon juice groups had the most females (69.2% and 73.1%), respectively. Education respondents most recently finished high school in the tomato juice group (57.7%) and the red dragon juice group (50.0%). Respondents were most Bugis in the tomato juice group (73.1%) and the red dragon juice group (69.2%). Most

respondents were housewives in the tomato juice group (61.5%) and the red dragon juice group (69.2%). Herbal medicine consumption in both groups (80.0%) did not consume herbal remedies.

Table 1. CharacteristicsofRespondents

Characteristic	Group			
	Tomato Juice		Red dragon fruit juice	
	n	%	n	%
Age group(year)				
<40	0	0	3	11.5
40-49	4	15.4	3	11.5
50-59	11	42.3	8	30.8
≥60	11	42.3	12	42.2
Gender				
Man	8	30.8	7	26.9
Woman	18	69.2	19	73.1
Education				
Primary	3	11.5	2	7.7
Junior High School	3	11.5	2	7.7
High School	15	57.7	13	50.0
D3/S1/S2	5	19.2	9	34.6
Tribe				
Bugis	19	73.1	18	69.2
Makassar	6	23.1	7	26.9
Jawa	1	3.86	0	0
Selayar	0	0	1	3.8
Occupation				
Housewife	16	61.5	18	69,2
Civil servant/Army/Police/BUMN/BUMD	2	7.7	0	0
Farmer/Fisherman/Labor	3	11.5	2	7,7
Self employed	0	0	1	3,8
Private Employees	0	0	1	3,8
Others (retirees)	5	19.2	4	15,4
Traditional Medicine				
Yes	5	19.2	5	19.2
No	21	80.8	21	80.8

Source: Data Primer, 2021

Table 2 shows that the average GDS value in the first examination tomato juice group (pre-test) was 244.88 mg/dl. After treatment (post-test 4), it dropped to 170.19 mg/dl. The statistical tests in the tomato juice group obtained a value of P = 0.001 (P<0.05), which means there is a difference in GDS levels between the pre-test and post-test. In the first examination of the dragon fruit juice group (pre-test), the average value of GDS was 228.50 mg/dl, and after the treatment (post-test), it dropped to 173.84 mg/dl. Statistical test

results in the dragon fruit juice group obtained a value of P = 0.001 (P<0.05), which means a difference in GDS levels between the Pre-test and Post-test.

Table 2. bivariate analysis (Wilcoxon Signed Rank Test)

Statistical Value	Blood Sugar Levels		
	Pre- Test	Post- Test 4	P-Value
Tomato Juice Group			
n	26	26	0.001
Mean	244.88	170.19	
SD	78.90	52.75	
Red Dragon Juice Group			
n	26	26	0.001
Mean	228.50	173.84	
SD	63.53	43.22	

Source: Data Primer, 2021

Table 3 shows that the average difference in GDS values between the tomato juice group and dragon fruit juice is 30.73 mg/dl of tomato juice and 22.27 mg/dl of dragon fruit juice. The statistical test results of the difference between the tomato juice group and dragon fruit juice obtained a value of P = 0.044 (P< 0.05), which means a significant difference between the tomato juice group and the dragon fruit juice group.

Table 3. bivariate analysis (Mann Whitney U Test)

Group	Blood sugar levels		P-Value
	Mean Rank	Sum Of Ranks	
Tomato Juice	30.73	799.00	0.044
Red Dragon Juice	22.27	579.00	

Source: Data Primer, 2021

The Influence of Tomato Juice on Levels of Non-Fasting Blood Glucose

This study showed an average reduction in blood sugar levels before and after the tomato juice in the main intervention group by giving 250 ml of juice every day for 14 days. The giving is done in the morning, obtaining a pre of 244.88 mg/dl, and the last post result was 170.19 mg/dl, with statistical test results obtained at a value of p = 0.001 (p< 0.05), which means that there is a difference in non-fasting blood glucose levels between the pre and post-tests. Tomatoes contain high levels of lycopene. Lycopene is also a natural ingredient in tomatoes. Lycopene is a pigment that causes tomatoes to be red, and it acts as an antioxidant and can help lower blood sugar levels.(Febiola & Huzaifah, 2018), In addition, lycopene pigment lowers blood sugar levels by lowering insulin hormone resistance, so that cell tolerance to glucose increases and excess blood sugar levels can be overcome (Wang et al., 2006).

The fiber contained in tomatoes is an insoluble fiber that is hemicellulose, which can reduce the process of gluconeogenesis, which influences the increase in insulin secretion to reduce the increase in glucose levels (Rizki&Gz, 2013). Tomatoes are one of the fruits or vegetables that are easy to find, and their relatively low

price makes them affordable for the community. They taste good. In this case, tomatoes are also one way to help normalize blood glucose in the treatment of diabetes.

Research also conducted by Tarigan (2020) showed that giving tomato juice as much as 200 ml for 14 days influences reducing blood sugar levels with a p-value of 0.002 < 0.05. In line with the research conducted by Syafyu Sari &Afnuhazi (2021), giving tomato juice from 150 grams of tomatoes without additional water was given once a day. It obtained the results of decreased blood glucose in respondents as much as 34.3 gr/ml in the first week and 57.5 gr/ml in the second week.

The influence of Red Dragon Fruit Juice on Levels of Non-Fasting Blood Glucose

In this study, there was an average reduction in blood sugar levels before and after the giving of dragon fruit juice in the comparison intervention group. The red dragon fruit juice intervention group, with the provision of 250 ml of juice daily for 14 days, where the giving was done in the morning, obtained a pre result of 228.50 mg/dl and the last post result was 173.84 mg/dl, with statistical test results obtaining a value of p = 0.001 (p< 0.05), which means that there is a difference in non-fasting blood glucose levels when between pre and post-test.

The fiber content of dragon fruit, especially in the form of pectin, can slow down glucose absorption by increasing the viscosity of intestinal volume, which has the potential to decrease the speed of diffusion so that glucose levels decrease. Phytochemicals found in dragon fruit also serve as antioxidants in the form of flavonoids (Wiardani et al., 2014). Flavonoids are protective against damage to beta cells as insulin producers and can improve insulin sensitivity. Another mechanism is the ability of flavonoids to inhibit GLUT-2 intestinal mucosa from lowering glucose absorption.

The study in line with this study was conducted by Winarno (2018). After giving red dragon fruit juice as much as 100 grams (100ml) to 15 respondents for seven days, there was a decrease in fasting blood sugar levels from 230 mg/dl to 192 mg/dl. Research conducted by Poolsup et al. (2019) showed that the influence of dragon fruit with higher doses tends to decrease blood glucose more in people with type 2 diabetes mellitus. Then, supported by research conducted by Hadi et al. (2019), which also showed the effect of giving red dragon fruit juice on blood sugar levels. Giving 250 grams of dragon fruit for ten days obtained the results of a meaningful influence of giving red dragon fruit in reducing blood sugar levels of DM patients.In line with research conducted by Astuti (2019), it was said that dragon fruit juice affects blood sugar levels because, in dragon fruit juice, there are antioxidants and fiber so that it can lower blood sugar levels. Dragon fruit reduces blood glucose levels by weakening fibroblast-21 growth factor resistance and pancreatic cell regeneration (Paw, 2017).

Differences in the influences of giving tomato juice and red dragon fruit juice on blood sugar levels of diabetic Mellitus

The resultsof a statistical test with Mann-Whitney U test to test the difference in the influence of tomato juice and red dragon fruit juice on reducing blood sugar levels in diabetic Mellitus obtained a value of P = 0.044 because of the value of p < 0.05. It means that there is a significant difference between the tomato juice group and red dragon fruit juice with a mean rating of 30.73 mg/dl and 22.27 mg/dl, respectively. In this study, in the tomato juice group in the last post-test, one respondent experienced a rise in blood sugar levels. In contrast, in the dragon fruit juice group, three respondents experienced increasedblood sugar levels.

This study is not in line with research conducted by Nugroho (2019), which states that giving red dragon

fruit juice is more effective than giving tomato juice with an average of 63.47 and 48.14 points with a value of p = 0.034 > 0.05, respectively.

The difference in blood sugar levels is possible because the content of fruit juice has its respective roles in lowering blood sugar. The content in tomato juice that can lower blood sugar is chromium, a cofactor in increasing the work of insulin in the transfer of glucose into cells, and lycopene, which affects insulin hormone resistance so that the body's body's tolerance to glucose becomes increased. Lycopene is an antioxidant that is twice as strong as beta-carotene. At the same time, the content in red dragon fruit juice that can lower blood sugar levels is flavonoids that play a role in neutralizing free radicals and vitamin C as an antioxidant. As can be seen from the study results, researchers concluded that tomato juice has the greatest influence on the decrease in blood sugar levels of people with Type 2 diabetes mellitus.

Limitations of Research

The limitation of this study is that this study was conducted during the pandemic, so some people with DM refused to sample and could not have contact with people with DM. The study used non-fasting blood glucose measurements and did not limit the activity and control of the respondents' food intake to affect blood sugar.

Abbreviation

IDF: International Diabetes Federation, WHO (World Health Organization), DM: diabetes mellitus, SOP: Standard Operating Procedure, KNEPK: National Commission onHealthResearchEthics

StatementofEthics

HealthResearchEthicsCommission, Faculty of Public Health, Hasanuddin University on July 29, 2021, with number: 9879/UN4.14.1/ TP.01.02/2021

Conclusion

This study showsthat there is an influence of giving tomato juice and red dragon fruit juice on changes in blood sugar levels. Tomato juice is most influential on changes in blood sugar levels of type 2 diabetes mellitus sufferers in the health centerofAntang Makassar.

References

Astuti, E. (2019). Analysis of Dragon Fruit Juice (Hylocereus Polyrhizus) on Blood Sugar Levels in Type 2 Diabetes Mellitus Patients in Tambak Deres RW 01 Kenjeran Village Surabaya. NursingJournal, 8(1), 10–19.

Ayuni, N. M. I. (2020). Effect of Red Dragon Fruit (Hylocereus Polyrhizus) on Reducing Blood Glucose Levels in Type 2 Diabetes Effect of Red Dragon Fruit (Hylocereus Polyrhizus) on Reducing Blood Glucose Levels in Type 2 Diabetes Ni Made Indah Ayuni. Jurnal Ilmiah Kesehatan Sandi Husada, 11(1), 554–560. https://doi.org/10.35816/jiskh.v10i2.350

Febiola, D. P., & Huzaifah, Z. (2018). Effect of Tomato Juice on Blood Sugar Levels in Clients with Type 2 Diabetes Mellitus at Cempaka Health Center Banjarmasin. Health Dynamics: Journal of Midwife and Nursing, 9(2), 277–285.

Hadi, T., Sulendri, N. K. S., Luthfiyah, F., & Cahyaningrum, A. (2019). Giving Dragon Fruit (Hylocereus Polyrhizus) to Decrease Blood Glucose Levels in DM Patients in the Tanjung Karang Health Center Work Area.Prime Nutrition Journa, 3(2), 108–113.

Imran, M., Ghorat, F., Ul-haq, I., Ur-rehman, H., Aslam, F., Heydari, M., Shariati, M. A., & Okuskhanova, E. (2020). Lycopene as a Natural Antioxidant Used to Prevent Human Health Disorders. Antioxidants, 1–27.

Nugroho, S. H. P. D. Y. D. P. (2019). Differences in the Effectiveness of Giving Tomato Juice (Solanium Lycopersicum) and Dragon Fruit Juice (Hylocereus Polyrhizus) on Reducing Blood Sugar Levels in Patients with Diabetes Mellitus at Babat Health Center, Lamongan Regency.Health Communication Media Journal, 11(01).

Rizki, F., & Gz, S. (2013). The miracle of vegetables. Agromedia.

Syafyu Sari, F., & Afnuhazi, R. (2021). Tomato Juice Can Lower Blood Glucose Levels 2 Hours PP (Post Prendial). Perintis's Health Journal, 7(2), 59–64. https://doi.org/10.33653/jkp.v7i2.474

Wahyu, N. Y. (2021). Effect of Tomato Juice on Blood Sugar Reduction in Type 2 Diabetes Mellitus Patients in Gementar Hamlet, Selogiri District, Wonogiri Regency. Nursing Journal, 10.

Wang, L., Liu, S., Manson, J. E., Gaziano, J. M., Buring, J. E., & Lu Wang, Simin Liu, JoAnn E. Manson, J. Michael Gaziano, Julie E. Buring, dan H. D. S. (2006) The Consumption of Lycopene and Tomato-Based Food Products Is not associated with the Risk of Type 2 Diabetes in Women. Nutritional Epidemiology, September 2005, 620–625

WHO. (2016). Global Report on Diabetes. Isbn, 978, 6–86. http://www.who.int/about/licensing/copyright_form/index.html%0Ahttp://www.who.int/about/licensing/copyright_form/index.html%0Ahttps://apps.who.int/iris/handle/10665/204871%0Ahttp://www.who.int/about/licensing/

Wiardani, N. K., Moviana, Y., & Puryana, I. (2014). Red Dragon Fruit Juice Lowers Blood Glucose Levels in T2DM Patients. J. Skala Husada, 11, 59–66.

Winarno, E. (2018). The Effectiveness of Dragon Fruit Juice And Avocado Fruit Juice Against Blood Sugar Reduction In Diabetes Mellitus Patients At Krompol Health Center, Bringin District, Ngawi Regency. Stikes Bhakti Husada Mulia.