

THE EFFECT OF MANGGIST SKIN JUICE ON THE STABILITY OF BLOOD SUGAR LEVELS IN DIABETES MELLITUS (DM) PATIENTS

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ABSTRACT

Blood sugar level refers to the level of glucose in the blood. One that can maintain stable blood sugar levels is mangosteen peel juice, because mangosteen peel juice contains xantones and flavonoids that stabilize blood sugar levels. This study aims to determine the effect of mangosteen peel juice on the stability of blood sugar levels in diabetes mellitus patients at the Public Health Center Sibolangit. The design of this research is Quasi Experiment Design using One-group pretest posttest design. The sample in this study were 10 patients using purposive sampling. Data analysis used Paired Sample T-Test. The results showed that the P-value was 0.027 (P-value <0.05) so it could be concluded that there was an effect of giving mangosteen rind juice on the stability of blood sugar levels in diabetes mellitus patients at the Sibolangit Health Center. Mangosteen peel juice is one of the herbal medicines that can lower blood sugar levels in Diabetes Mellitus patients.

Keywords: Juice Mangosteen Skin, The Stability of Blood Sugar Levels

INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disease due to problems with insulin secretion, insulin action or both (Ignatavicius, Workman, & Winkelman, 2016). According to (ADA, 2019), the prevalence of DM sufferers in the world reaches 463 million and is expected to continue to increase by 578 million in 2030 to 700 million in 2045. The increasing prevalence of DM occurs in Low-Income Countries, one of which is Indonesia into the top 10 countries with the highest number of people with diabetes, with a prevalence of 10 million patients. WHO predicts the number of people with diabetes in Indonesia in 2030 will increase

from 8.4 million people to 21.3 million people. Data from Riskesdas 2018 states that the prevalence of DM based on doctor's diagnosis in residents aged 15 years when compared to 2013 increased to 2%. The highest prevalence is in DKI Jakarta at 3.4% and the lowest is in NTT at 0.9% (InfoDATIN, 2018).

Indonesia is the best herbal medicine country in the world as the main ingredient in the manufacture of herbs and herbal medicines. Medicinal plants are plants that have medicinal properties and are used for healing and preventing disease. This is a very big gift, because these various medicinal plants have effects

similar to the chemical structure of medical drugs, so they are very useful in the process of treating various diseases. And an advantage, medicinal plants when compared to medical drugs have very much smaller side effects. One of the traditional medicines that can reduce blood sugar levels in diabetic patients is by consuming decoction or mangosteen peel juice (Savitri, 2016).

Mangosteen (*Garcinia mangostana* L) is one of the tropical fruit plants favored by the community and has the nickname Queen of Tropical Fruit because of its various benefits and tastes that are liked by everyone. Mangosteen fruit has high economic value and has good prospects to be developed as an export commodity. The demand for export markets from abroad is increasing from year to year so that the demand cannot be fulfilled in accordance with the needs, both in quantity, quality and continuity. The export of mangosteen fruit ranks first in the export of fresh fruit to foreign countries, followed by pineapple, mango, banana and papaya (Firmansyah et al. 2016).

(Warisno, 2017) states that developing herbal medicine uses mangosteen rind to help the healing process of diabetes because there are xanthone compounds that can control diabetes in 2 ways, namely directly lowering blood glucose levels and inhibiting the formation of low density lipoproteins. (Darmawansyih 2015) study showed that the ethanol extract of mangosteen rind had an effect on the blood glucose levels of alloxan-induced diabetic mice (*Mus musculus* L.) by significantly lowering blood glucose levels with a statistical value of 0.005 with $p < 0.05$. The test of ethanol extract of mangosteen rind

on blood glucose levels of mice induced by sucrose has been shown to reduce blood glucose levels of mice with hyperglycemia (Pasaribu, 2016). (Dungir, Katja, and Kamu 2017), have also proven that this plant has high antioxidant activity, especially for dry extracts.

Mangosteen rind is very effective in lowering blood sugar levels because of the xanthenes and flavonoids in the mangosteen rind. Recent research has shown that xanthenes and flavonoids act as very strong antioxidants, exceeding several times that of vitamin C and vitamin E. These antioxidants protect and prevent pancreatic beta cells from being damaged. And this is proven by clinical trials conducted by Jay K. (UCLA) School of Medicine (Mardiana 2016), the study proved that mangosteen rind juice has the potential to prevent diabetes and cardiovascular disease in obese people. Several studies also conclude that there is a positive relationship between type 2 diabetes mellitus and antioxidants, and many testimonials say that type 2 diabetes blood sugar levels can drop after consuming for a few days or weeks. Diabetic patients will do well if they consume large amounts of antioxidants, although the mechanism is not clear.

Based on the above, it is important to give mangosteen peel juice to lower blood sugar levels in DM patients. The purpose of this study was to determine the effect of mangosteen peel juice on KGD stability in patients with diabetes mellitus at the health center of Sibolangit.

LITERATURE REVIEW

Diabetes mellitus is caused by the failure of beta cells to secrete insulin or insulin resistance.

Therefore, blood glucose levels after eating become high and this condition is known as impaired glucose balance. The failure of beta cells to secrete insulin will affect the liver in increasing glucose production, which causes fasting blood glucose levels to increase (Triana & Salim, 2017).

Complications can be prevented by changing the behavior of DM patients to undergo DM management by changing the lifestyle of DM patients to a healthy lifestyle. To prevent complications in diabetics, controlling and managing blood glucose must be done early before it's too late.

One of the plants that has an effect as an antidiabetic mellitus is the mangosteen plant which is located on the skin of the mangosteen fruit. Empirically, part of the mangosteen rind can be used as a hypoglycemic agent (Pedraza-Chaverri et al., 2008). Mangosteen rind contains xanthenes as much as 107.76 mg per 100 g of rind. Xanthenes are not found in other fruits, therefore the mangosteen is called the queen of fruits or the queen of fruits. Mangosteen fruit also contains catechins, potassium, calcium, phosphorus, iron, vitamin B1, vitamin B2, vitamin B6, and vitamin C (Chivapat, Chacalittumrong & Wongsin, 2018).

The results of the study (Anik Enikmawati et al., 2022) showed that there was an effect of mangosteen peel on a significant decrease in blood sugar levels (p) 0.002 because of the p value (<0.05).

The results of data analysis (Laili, Roi'sah, Rahmat 2020) showed the group treatment has a value of $p = 0.001$, this means that there is an effect of giving mangosteen peel to blood sugar levels, whereas in the control group it had a value of $p=0.166$.

METHOD

Study design

This research is a quantitative study with a Quasi Experiment Design approach using a One-group pretest posttest design. One-group pretest posttest is a research design that does not have a comparison group (control) but the first observation (pretest) is carried out which allows testing of changes after being given treatment (Notoatmodjo 2014).

The researcher conducted a pretest on the respondents regarding blood glucose levels before being given the intervention, the respondents' blood glucose levels were reassessed with a posttest to see the difference in blood glucose levels between before and after being given mangosteen peel juice only in the intervention group.

Sample

This research was conducted at the Public Health Center of Sibolangit from January 2023 to February 2023. The sampling technique used was non-probability sampling with the Purposive Sampling method. This method is a sample selection method that is carried out by determining a sample that fits the inclusion criteria (Polit, D.F. & Beck, 2014).

The number of samples is 10 people. The inclusion criteria are: (a) type 2 diabetes patients aged 40-60 years, (b) patients who have blood glucose levels > 125 mg/dl before eating, (c) patients who have blood glucose levels > 200 mg/dl 2 hours after eating.

Instrument

The instruments used in this study were the Guidelines for Giving Mangosteen Peel and Observation Sheets made based on the research of (Ayuliawati, Prabowo and Hafiduddin, 2019) and using a blood glucose level check tool.

Data collection was carried out by direct observation at the Sibolangit City Health Center for 1 month by administering mangosteen peel juice to 10 intervention groups in accordance with the provision of mangosteen peel juice to see if blood sugar levels were stable or not. Then the researchers recorded the results of observations in the observation attachment. After completing the research, the researcher conducted data processing using the SPSS for Window program.

Intervention

The procedure for making mangosteen peel is: Provides ingredients 100 grams of ripe mangosteen rind, 1/3 cup warm water and honey to taste. Remove the stem and bottom, take the skin from the two ripe mangosteens, remove the hard skin then squeeze the inner skin with 1/3 warm water, try not to get the black part of the mangosteen peel (outer skin) and don't let the sap come in taken, because it can cause the taste of mangosteen juice to be bitter later. Then filtered with a filter or cloth so that the dregs are completely separated. Then drink the filtered water with added honey to taste or palm sugar. The recommended dose for diabetic patients is cup twice a day. Observation activities were carried out on respondents by doing a blood sugar test before giving mangosteen peel juice on Monday, then intervening by giving mangosteen peel juice on Tuesday,

Thursday, and on Saturday, then doing a blood sugar test again on Sunday. In the observation sheet, the results before and after examination of blood sugar levels were recorded before and after administration of mangosteen peel juice.

Ethical considerations

This study passed the ethics review of the Research Ethics Committee, Universitas Audi Indonesia. Informed consent was signed by all respondents who were willing to participate in this study.

Data analysis

Data analysis used univariate and bivariate analysis. Univariate analysis determines the characteristics of respondents which are presented in the form of a frequency distribution and a percentage consisting of age, gender, religion and occupation. Bivariate analysis was conducted to determine the effectiveness of mangosteen peel juice on blood glucose levels in diabetic patients. Data analysis using Paired T-test.

RESULT

From table 1, the frequency distribution of respondents' demographic data based on gender is 5 people (50%), and 5 people (50%); as many as 7 people (70%) are Muslims and 3 Christians (30%); 6 people (60%), ages 55-60 (40%) with an average of 53.8 with a total of 10 people (10%).

Table 1. Frequency Distribution of Respondents Demographic Data (n=10)

Gender	f	Percentage (%)
Man	5	50
Woman	5	50
Total	10	100
Religion	f	Percentage (%)

Islam	7	70
Christian	3	30
Total	10	100
Age	f	Percentage (%)
50-54	6	60
55-60	4	40
Total	10	100
Average 53.8 years		

From table 2, the results obtained before the treatment of minimum blood glucose levels = 123, maximum = 135, mean = 128.20, standard deviation = 3.824 and results after treatment of minimum

blood glucose levels = 120, maximum = 135, mean = 126.20, standard deviation = 5.371 and the average decrease in blood glucose levels = 2.00 mg/dl.

Table 2. Frequency distribution of blood glucose levels before and after administration of mangosteen peel juice (n=10)

Measurement	n	Min	Max	Mean	SD deviation
Before	10	123	135	128.20	3.824
After		120	134	126.20	5.371
Average loss of kgd				2.00	

From table 3, the results obtained for the effect of mangosteen peel juice on the stability of blood sugar levels in

diabetic patients before and after treatment, the SE = 0.760, Mean = 2.00 and P-value = 0.027.

Tabel 3

Measurement	Pvalue	SE	Mean
Sesudah perlakuan	0.027	0.760	2.00

DISCUSSION

Supporting data on the results of the study were obtained from the assessment of blood glucose before giving the respondent's mangosteen rind juice, there was a decrease in blood glucose levels by an average of 2.00mg/dl. This study is in line with the results of research conducted by (Wulandari, 2014) at the Wonokromo Health Center Surabaya, it was found that the average blood sugar level before consuming mangosteen

rind juice was 210.9 mg/dL and the average blood sugar level after consuming mangosteen rind juice was 169, 9 mg/dL. The decrease in blood sugar levels before and after consuming mangosteen rind juice was 41 mg/dL on average. Likewise with (Herminto, 2016) study on 12 diabetic patients who had blood sugar levels of 300-400 mg/dl as many as 7 people and after consuming mangosteen rind the

number dropped to 5 people.

(Anik Enikmawati et al., 2022)

The results showed that there was an effect of mangosteen rind on a significant decrease in blood sugar levels (p) 0.002 because of the p value (<0.05).

(Yusni, Akbar, Rezanita, & Fahlevi, 2017) stated that giving mangosteen and tomato peel extracts at a dose of 50 mg/kg BW/day each lowered blood glucose levels for diabetes. (Kurniawati, 2014) states that xanthenes in mangosteen rind juice can inhibit the activity of glucosid enzymes by 64.71% in diabetics.

Mangosteen rind contains xanthenes as much as 107.76 mg per 100 g of rind. Xanthenes are not found in other fruits, therefore the mangosteen is called the queen of fruits or the queen of fruits. Mangosteen fruit also contains catechins, potassium, calcium, phosphorus, iron, vitamin B1, vitamin B2, vitamin B6, and vitamin C (Chivapat, Chacalittumrong & Wongsin, 2018). Research by (Dyahnugra and Widjanarko 2015) showed that the extract of the mangosteen peel simplicia powder contains antioxidant compounds with an activity of 84.42% with a known total phenol of 41.12 mg GAE/g sample. The dose of mangosteen peel extract given during the treatment had a very significant effect ($\alpha = 0.01$) on decreasing blood glucose levels, increasing body weight and increasing feed intake in experimental rats. Administration of the extract at a dose of 250 mg/kg BW and 500 mg/kg BW for 4 weeks of the experiment could reduce blood glucose levels by 105.92 mg/dl and 134.25 mg/dl. Research conducted on 40 obese people aged 30-75 years consuming 252 grams of mangosteen peel juice with a frequency of twice

a day can reduce inflammation. This inflammation is a precursor to metabolic disorders that trigger heart disease, such as diabetes (Subagja, 2017).

In this study, blood sugar tests were carried out before giving mangosteen peel juice on Monday, then intervened by giving mangosteen peel juice on Tuesday, Thursday, and Saturday, then did a blood sugar test again on Sunday. The results of this study are similar to (Yatman, 2017) study of seven diabetic patients for 10 days consuming mangosteen rind extract proven to be able to reduce blood sugar from 205.0 to 119.86 mg/dl. (Ayuliawati, Prabowo and Hafiduddin, 2019) in a study conducted on 2 patients with diabetes mellitus <1 year with blood glucose levels >200 mg/dl got the results of lowering blood sugar levels from 258 mg/dl to 194 mg/dl in patients In the first and the second patient, initially 245 mg/dl to 190 mg/dl, mangosteen peel boiled water was given once a day every morning.

This study obtained the results of differences before treatment with minimum blood sugar levels = 123, maximum = 135, standard deviation = 3.284, mean = 128.20 and results after treatment with minimum blood sugar levels = 120, maximum = 135, standard deviation = 5.371, mean = 126.20 . This means that the patient experienced changes in blood glucose levels before and after the intervention. This means that the administration of mangosteen rind juice has a significant effect on reducing blood glucose levels in diabetic patients so that patients can improve their health status. Harmoko (2018) argues that families and health workers have a duty to provide care for sick families and use health facilities in the management

of diabetes mellitus more effectively, one of which is using mangosteen peel. Effective methods used in the form of interviews, observations, measurements, knowledge of mangosteen peel and for 6 days given mangosteen peel decoction to 2 patients were able to increase knowledge about DM management and decreased to <200 mg/dl (Ayuliawati, Prabowo and Hafiduddin, 2019).

This study has limitations including the researchers did not assess blood glucose levels for patients with the control group and did not compare blood sugar levels at 2 hours after eating; when the research was conducted only 10 respondents for 1 month. At the time of the study, respondents were not compared with a history of being diagnosed with diabetes mellitus.

CONCLUSION AND RECOMMENDATION

Blood glucose levels in the intervention group of patients with diabetes mellitus who were given mangosteen peel juice decreased. Researchers hope that nursing practitioners can use the results of this study as a reference and give consideration when providing nursing care to diabetic patients through the administration of mangosteen rind juice as a non-pharmacological treatment. Further research is expected to increase the number of samples, sample criteria and add other variables to be studied.

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