The Effect of Mangosteen (*Garcinia Mangostana*) Rind in The Blood Glucose Levels of Adult Patients with Type 2 Diabetes Mellitus

Muhtarul Anam¹*

¹. Budi Luhur Institute of Health Sciences, Cimahi, 40522, Indonesia

*E-mail: anammuhtarul7@gmail.com

**Abstract**

**Objective:** This study aimed to determine the effect of mangosteen rind in blood glucose levels of adult patients with diabetes mellitus (DM) type 2.

**Methods:** The quasi experimental method was carried out to examine the effect of mangosteen rind decoction in the blood glucose levels of adult patients with DM type 2.

**Results:** The blood glucose level of control group during pre and post intervention was increased, however blood glucose levels of experimental group during pre and post intervention was decreased. The blood glucose level of control and experimental group during 1st week intervention was above normal levels which is 171.27 mg/dl for control group and 178.60 mg/dl for experimental group.

**Conclusion:** There was a significant effect in lowering blood glucose level of adult patients with type 2 diabetes mellitus before and after the consumption of mangosteen rind decoction.

**Keywords:** Decoction; Diabetes Mellitus Type 2; Glucose Level; Mangosteen Rind; Quasy Experimental

**Introduction**

Diabetes Mellitus (DM) is a chronic disease, which occurs when the pancreas is not able to produce insulin sufficiently, or when the cell cannot effectively use the produced insulin. This leads to an increased concentration of glucose in the blood which is called hyperglycemia.¹

It has been estimated that the prevalence of DM in Indonesia is about 21.3 million people in 2030. DM type 2 is roughly more prevalent than type 1 which contributes 80% of all DM cases. From among the provinces in Indonesia, West Java ranks first for DM cases which is estimated around 643,246 people.²

DM increases the risk of many serious health problems such as heart and kidney diseases.³ In 2010, it is reported that—Askes insurance has covered DM treatment by spending more than USD$ 22.4 million. Compared to DM without chronic kidney disease and other complications, it cost more than USD $ 40 and USD$ 800 respectively. ⁴

These complications need to be prevented by requiring appropriate management therapy of medications, diet, and activity. The treatment of DM can be done with several ways. Herbal medicine is one way which is somehow can provide a more practical and affordable treatment for DM.

Mangosteen, is known as one of the traditional therapies for treatment of various health problems including diabetes.⁵

Nowadays, herbal medicine is an alternative effort to treat diseases. Herbal is art or practice of using herbs and herbal preparations to maintain health and to prevent, alleviate, or cure disease. Herbal remedies or medicines consist of portions of plants or unpurified plant extracts containing several constituents, which often work together synergistically. Herbal medicine or herbalism is the use of herbs or herbal products for their therapeutic or medicinal value. They may come from any part of the plant yet are most commonly made from leaves, roots, bark seeds, and flowers. They are eaten, swallowed, drunk, inhaled, or applied topically to the skin Herbal products often contain a variety of naturally-occurring biochemical from plants, many of which contribute to the plant’s medicinal benefits. ⁶

Mangosteen contains nutrients named xanthone that is contained in the skin.⁷ Xanthone is able to lower blood glucose level of patients with DM. It is supported by a study that consumption of mangosteen rind has an effect on lowering blood glucose level in patients with type 2 diabetes mellitus.⁸
Mangosteen contains xanthone as excellent compounds, which is a natural chemical substance that is classified as polyphenols. It is generated by secondary metabolites. The highest content of xanthone is contained in the rind of the mangosteen, which is 107.76 mg per 100 g of the rind. Xanthone can lower blood sugar level in patients with diabetes mellitus 7.

By considering the benefit of xanthone of mangosteen rind and its abundance in Indonesia, it is deemed that this fruit could be an alternative intervention to delay DM complication.

This study aimed to determine the effectiveness of mangosteen rind decoction in lowering blood glucose levels of patient with type 2 diabetes mellitus in Cimahi Indonesia.

Methods

The study used the quasi experimental design. This design is to examine causal relationship or determine the effect of one variable on another 9. Time series test design has been used by the researcher to found the difference blood glucose levels during pre-post and 1st week intervention.

The study used purposive and random sampling to participants. The participants have been selected based on the inclusion and exclusion criteria. The inclusion criteria included: (1) adults aged 45-60 years old; (2) diagnosed with type 2 DM for longer than 6 months and diagnosed of type 2 diabetes mellitus by a medical intern in Pasirkaliki Health Center; (3) blood glucose level was greater than 200 mg/dl in RBS testing; (4) dosage metformin given was 1500mg as medication therapy; (5) able to perform active daily living; and (6) Should not be enrolled in any Diabetes Self-Management Education (DSME) program. The exclusion criteria included patients with DM type 2 with heart and kidney complications and the patients who did not signed the informed consent.

The following instrument that have been used in this study were mangosteen rind decoction, ACCU Chek glucose level, OMRON weighing scale, blood glucose monitoring sheets, and mangosteen rind decoction monitoring sheets.

To analyze the gathered data, the researchers used mean, standard deviation and t-test for statistical treatment. T-test utilized to analyze the difference blood glucose levels of patients with type 2 diabetes mellitus during pre-post intervention and during 1st week of intervention.

Results and Discussion

The data collected was analyzed to prove the effectiveness of mangosteen (garcinia mangostana) rind decoction in lowering the blood glucose levels that were implemented in 30 adult patients with type 2 diabetes mellitus.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-intervention Mean (mg/dl)</th>
<th>SD (mg/dl)</th>
<th>Post-intervention Mean (mg/dl)</th>
<th>SD (mg/dl)</th>
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<tbody>
<tr>
<td>Control Group</td>
<td>167,40</td>
<td>67,034</td>
<td>176,20</td>
<td>65,818</td>
</tr>
<tr>
<td>Experimental Group</td>
<td>192,47</td>
<td>40,371</td>
<td>176,20</td>
<td>65,818</td>
</tr>
</tbody>
</table>

Table 1. Pre and Post Test of Blood Glucose Levels in Term of FBS

Table 1 shows the results of the examination during the pre and post intervention phase. The above table shows mean and standard deviation of blood glucose level during pre and post intervention phase in control group and experimental group. Blood glucose level of control group in pre-intervention phase is 167,40 mg/dl with standard deviation 67,034 mg/dl, and in post-intervention phase is 176,20 mg/dl with standard deviation 65,818 mg/dl. This result shows blood glucose level in control group during pre and post intervention was increased from 167,40 mg/dl to 176,20 mg/dl.

However, in experimental group, pre-intervention phase has 192,47 mg/dl with standard deviation 40,371 mg/dl, and in post intervention phase is 163,13 mg/dl with standard deviation 32,454 mg/dl. This result shows blood glucose level in experimental group during pre and post intervention was decreased from 192,47 mg/dl to 163,13 mg/dl.

Table 2. 1st Week Test of Blood Glucose Levels in Term of FBS

Table 2 shows the results of the examination during the 1st week intervention phase. The above table shows mean and standard deviation of blood glucose level during 1st week intervention phase in control group and experimental group. Blood glucose level of control group during 1st week intervention phase is 171,27 mg/dl with standard deviation 67,870 mg/dl and blood glucose level of experimental group during pre-intervention phase is 178,60 mg/dl with standard deviation 93,388 mg/dl.

Table 3. The Difference in the Blood Glucose in Term of FBS

Table 3 shows the difference results of the examination during the pre and post intervention phase used paired t-test analysis. The above table shows mean difference, standard deviation difference, and p-value of blood glucose level during pre and post intervention phase in control group and experimental group.

The difference mean of control group is -8,800 mg/dl with standard deviation 16,367 mg/dl and the p-value is 0,056.
This p-value \( (0.056) > \alpha (0.05) \) have meaning there is no significant effect in the blood glucose levels of control group.

The researcher did not perform any intervention to this group, this group was monitored by using FBS test by the researcher during intervention phase. The rising of blood glucose levels in control group in both pre and post-test intervention might be influenced by some factors such as exercise and diet. If the patients have no any activities, the blood glucose level is potential to increase. This is because exercise is beneficial for patients with DM particularly in controlling the blood glucose level. Taking too much food, such as a meal or snack with more carbohydrates than usual also leads to blood glucose increase. It is recommended that dietary changes includes maintaining a low carbohydrate diet, while exercise should consist of both weight-bearing and aerobic fitness

The difference mean of experimental group is 29,333 mg/dl with standard deviation 32,022 mg/dl and the p-value is 0.003. This p-value \((0.003) < \alpha (0.05)\) means that there is a significant effect in the blood glucose levels of experimental.

Thus it can be deemed that there is a significant effect in the blood glucose level of adult patients with DM type 2 after consumed mangosteen rind decoction. This notion is made by the findings used paired t-test analysis of the experimental group obtained p-value \((0.003) < \alpha (0.05)\). It is also supported by the results obtained in control group. The result showed p-value \((0.056) > \alpha (0.05)\) which is no significant effects in blood glucose level of adult patients with DM type 2. Therefore, the researcher found that mangosteen rind decoction has a significant effect to lower blood glucose level of adult patients with DM type 2.

The consumption of mangosteen rind decoction has a significant effect to lowering blood glucose level in patients with DM type 2. The health condition of patients with DM type 2 can be better if the patients consume antioxidants continuously. Mangosteen rind contains antioxidants that have strong activity as antioxidant which is named xanthone. It is possible if mangosteen rind can make health condition of patients with DM being better. Mangosteen rind can lower blood glucose level because it has xanthone and antosianin that has benefit as antioxidants and antidiabetic.

Mangosteen can help maintain normal blood sugar levels. It has been shown to act as an alpha-amylase inhibitor, which means that it inhibits enzymes that cause starches to break down into glucose. Mangosteen also contains compounds that were found to be comparable to that of acarbose, a prescription drug used for type 2 diabetes symptoms.

Conclusions

The blood glucose level of control group during pre and post intervention was increased, however blood glucose levels of experimental group during pre and post intervention was decreased. The blood glucose level of control and experimental group during 1st week intervention was above normal levels which is 171.27 mg/dl and 178.60 mg/dl. There is a significant effect in lowering blood glucose level of adult patients with DM type 2 before and after the consumption of mangosteen rind decoction.

Though this study shown that mangosteen rind decoction was effective in lowering blood glucose level with lower cost, this study has some limitations due to short time of intervention, expenses, and controlling the respondent’s activity daily living and diet in 24 hours a day.

Based on the result of the finding, the researcher suggests that patients with DM type 2 should start to utilize herbal medicine especially mangosteen rind decoction as alternative medicine to maintain blood glucose level at lower cost. Further study is recommended especially to examine the use of mangosteen rind decoction to increase the body immune and prevent from other diseases.

Acknowledgement

The researcher would like to thank to Budi Luhur Institute of Health Sciences Cimahi for financial support.

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