

THE EFFECT OF TRADITIONAL DRINK OF SIRSAK LEAVES ON BLOOD SUGAR LEVELS OF DIABETES MELLITUS PATIENTS IN ELDERLY

Widia Astuti*, Ade Suryani, Retno Dwi Santi, Ayu Sri Rejeki

Wijaya Husada Health Institute

Jl. Letjend Ibrahim Adjie, No. 180, Sindang Barang, Bogor, West Java, Indonesia

***corresponding author:** wijayahusada@gmail.com

ABSTRACT

The results of a preliminary study in Puskesmas North Bogor on July 29, 2019 from interviewing 10 people suffering from DM data obtained that 4 people said they had heard the benefits of sour sop leaf decoction but had never used it, 3 respondents said that knowing sour sop leaf as a medicine but did not know the benefits of sour sop leaf as a blood sugar-lowering, 2 respondents did not know the benefits of sour sop leaf decoction as an anti-diabetic, and 1 respondent knows and uses a traditional sour sop leaf drink to reduce sugar levels. The purpose of this study is the effect of sour sop leaf traditional drinks on blood sugar levels in patients with diabetes mellitus in the elderly at the Health Center in North Bogor. The method used is an experimental study Pre-Test-Post-Test Design, using quantitative data analysis. The study was conducted at the North Bogor Health Center. The research sample was taken using a purposive sampling technique, with a total sample of 40 elderly people divided into 20 intervention groups and 20 control groups.

The results showed that the influences of the traditional drink sour sop leaves on blood sugar levels of patients with diabetes mellitus in the elderly in North Bogor health center, where the results of the calculation of Independent Sample T-Test unknown value_t of 3.163 with 0.000 significance. The value of t_{table} from $dk = 80 - 2 = 78$ is 2,000. So it can be concluded that $t_{count} > t_{table}$ ($3.163 > 2,000$)

So that it can be stated that there is an influence of sour sop leaf traditional drinks on blood sugar levels in patients with diabetes mellitus in the elderly at the North Bogor Health Center. For people with diabetes mellitus, especially the elderly, it is expected that the results of this study can be used as a means to reduce blood sugar levels by drinking a traditional sour sop leaf drink. The results of this study can be used as a support for further research and used as a source of reading material and references in the STIKes Wijaya Husada Bogor library.

Keywords : Traditional, Blood Sugar Levels, Elderly

INTRODUCTION

The number of DM sufferers will increase to 552 million people in 2030. DM sufferers are scattered from urban to rural areas. The total number of DM sufferers in Indonesia based on WHO data in 2017 is around 8 million and it is estimated that the number will exceed 21 million in 2030. This number makes Indonesia the fourth largest country with diabetes after China, India and America. Indonesia is facing a diabetes threat situation similar to that of the International Diabetes Federation (IDF) Atlas 2017 reports that the Diabetes epidemic in Indonesia is

still showing an increasing trend. Indonesia is the sixth country in the world after China, India, the United States, Brazil and Mexico with about 10.3 million people with diabetes aged 20-79 years.¹

Currently, there are approximately 425 million people in the world who have diabetes. By 2030, it is estimated that the number will increase to 600 million people. In Indonesia, there are already more than 10 million people who have diabetes. Meanwhile, the incidence of diabetes in West Java in 2017 was 4.2% with the number of people with diabetes at 7.8%.²

The high prevalence of DM sufferers in Indonesia has led to various treatment efforts, both pharmacological and non-pharmacological. Pharmacological treatment is expensive and causes side effects. Meanwhile, traditional or alternative medicine is not expensive and has no side effects.³

In non-pharmacological therapy, there are many medicinal plants that are reported to be useful and used as antidiabetic agents empirically. The content of chemical compounds in plants is reported to be safe for people with diabetes mellitus. Research on the discovery of new anti-diabetic agents from plants is still ongoing, although it is known that more than 400 plants have hypoglycemic activity.⁴

One of the anti-diabetic medicinal plants that has not been widely researched scientifically is the sour sop plant. The part of the sour sop plant that has anti-diabetic properties is the leaves. Sour sop leaves are believed to be used as a diabetes mellitus drug. The content of sour sop leaves among other acetogenin things, annocatacin, annocatalin, annohexocin, annonacin, anomuricin, anomurine, anonol, caclourine, gentisic acid, gigantetronin, linoleic acid, muricapentocin, flavonoids, alkaloids, fatty acids, phytosterols, mirisil alcohol and anonol.⁵

Research conducted by Arizona on the effectiveness of sour sop leaf boiled water in reducing blood sugar levels in mice concluded that consumption of sour sop leaf boiled water can help reduce blood glucose levels in mice.⁶

Sour sop (*Annona muricata* L.) is a plant that grows in Indonesia which has many benefits and uses. Each part of this plant has many benefits, one of which is the leaves. Sour sop leaves have been used by some Indonesians as traditional medicine, including as a back pain medication, relieving pain, itching, rheumatism, ulcers and fever.⁷

Sour sop leaves contain flavonoids, alkaloids, fatty acids, phytosterols, myristil alcohol and anonols. The compounds in sour sop leaves that have antidiabetic properties are alkaloids and flavonoids.⁸ Flavonoids can stimulate the effect of insulin by influencing the phosphokinase protein. In addition, flavonoids also have hypoglycemic activity or decrease blood glucose levels by inhibiting important enzymes that play a role in breaking down carbohydrates into

monosaccharides that can be absorbed by the intestine, namely alpha amylase and alpha glucosidase enzymes.⁹

Sour sop leaf extract can improve the function of pancreatic beta cells which produce insulin function. Sour sop leaves with a given dose have a hypoglycemic effect thought to be caused by flavonoids that stimulate insulin secretion, increase β -cell repair or proliferation and increase the effect of insulin.¹⁰

Non - pharmacological management was carried out for the first time for diabetes mellitus patients, in the form of meal planning and exercise /exercise. Then if these steps are not on target, the next step is drug / pharmacological management. In addition, blood sugar levels must be monitored regularly. Blood sugar checked before and after meals is useful in monitoring the results of diet, exercise, and other medications.¹¹

Disorders of lipid metabolism in diabetes mellitus cause abnormalities in the hepatic cells. The pathogenesis of abnormalities in hepatic cells arises because of the insulin resistance produced by lipolysis. This lipolysis will increase the circulation of free fatty acids which are then taken up by the liver. These fatty acids in the liver will cause the formation of free radicals that cause lipid peroxidation.¹² Fatty liver in diabetes mellitus is also related to ketosis which occurs due to the absence of insulin which causes the transport of glucose into cells, so that carbohydrates that should be metabolized and stored in the form of glycogen in the liver will be metabolized into fat. Liver damage due to exposure to reactive radicals in DM sufferers can be prevented by antioxidant compounds.¹³

The results of Ari Rahmat Aziz's research (2013) in his research entitled Effectiveness of Sour sop (*Annona Muricata*) Leaf Boiled Water on Blood Sugar Levels in Patients with Type II Diabetes Mellitus. The results showed that the test showed that the average blood glucose patient with diabetes after being given sour sop with boiled water. The blood glucose level before being given boiled sour sop leaf water was 236.60 mg / dl in the experimental group and 279.67 mg / dl in the control group. with p value = 0.006. The dependent sample t test in the experimental group showed that the average patient with blood glucose was 277.07 mg / dl, and after being given boiled sour sop leaf water was 236.60 mg / dl, that means a decrease in blood glucose levels was around 40.467 mg. / dl with p value = 0.000.¹⁴

The results of Afriani Rini's research (2015) found that there was an effect of giving sour sop leaf boiled water on blood sugar levels in people with diabetes mellitus (p value = 0.000). It was concluded that there was an effect of giving sour sop leaf boiled water on blood sugar levels in people with Diabetes Mellitus.¹⁵

The results of a preliminary study at the North Bogor Public Health Center on July 29, 2019, from interviews with 10 people suffering from diabetes, it was found that 4 people said they had heard of the benefits of sour sop leaf decoction

but had never used it, 3 respondents said that they knew sour sop leaves as medicine but did not know the benefits of sour sop leaves as a blood sugar lowering, 2 respondents did not know the benefits of sour sop leaf decoction as an anti-diabetes, and 1 respondent knew and used traditional sour sop leaf drinks to reduce sugar levels.

Based on the description above, further research was carried out with the title "The Effect of Traditional Sour sop Leaf Drinks on Blood Sugar Levels for Elderly Diabetes Mellitus Patients at North Bogor Community Health Center in 2019".

From the background previously described, the problem formulation in this study is "Is there an effect of traditional sour sop leaf drinks on blood sugar levels on elderly diabetes mellitus patients at the North Bogor Puskesmas in 2019?"

The purpose of this study was to determine the effect of traditional sour sop leaf drinks on blood sugar levels in elderly patients with diabetes mellitus at the North Bogor Community Health Center.

RESEARCH METHOD

This research is an experimental study Pre-Test-Post-Test Design, using quantitative data analysis. The test was carried out twice, namely before and after the experiment. The test conducted before the experiment (O_1) is called the pretest and the observation after the experiment (O_2) is called the posttest. The difference between O_1 and O_2 is that $O_1 - O_2$ is assumed to be the effect of the treatment or experiment. Pre-Test-Post-Test Design.

The hypothesis is a temporary answer to the problem to be studied which is still presumptive because it still has to be proven.¹⁸ The hypothesis proposed in this study is to find out the effect and difference of traditional sour sop leaf drinks on reducing blood sugar levels in elderly patients with diabetes mellitus, if the p-value is ≤ 0.05 .

The population in this study were the elderly who suffered from diabetes mellitus at the North Bogor Public Health Center, as many as 207 people consisting of 101 men and 106 women.

The research sample was taken using purposive sampling technique, namely one of the non-random sampling techniques where the researcher determines the sampling by determining specific characteristics in accordance with the research objectives so that it is expected to be able to answer the research problem.²¹ The specific characteristics referred to are the elderly at Puskesmas Bogor Utara who suffer from diabetes.

To determine the sample, Federer's formula is used as follows:

$$(n-1) \times (t-1) \geq 15$$

Thus, each group has a minimum of 16 samples, the authors chose to use 20 samples per group with 2 groups so that the total number of subjects (sample) research as many as 40 people.

Hypothesis testing is basically a decision-making method based on data analysis. In this research, t test hypothesis will be tested. unpaired groups, meaning that the data sources come from different subjects.

In addition to using the Independent T Test , the Mann Whitney U Test is also used, which is a non-parametric test used to determine the difference in the median of 2 independent groups if the dependent variable data scale is ordinal or interval / ratio but not

RESEARCH RESULTS

A. Assessment of Sugar Levels

Table 1 Distribution of Sample Frequency Based on Group of Blood Sugar Levels of Diabetes Mellitus Patients in the Elderly

Blood Sugar Levels in	the Intervention				Group Control Group			
	Pre-Test		Post-Test		Pre-Test		Post-Test	
	F	%	F	%	F	%	F	%
Normal	0	0	0	0	0	0	7	35
Pre-Diabetes	0	0	8	40	3	15	5	25
Diabetes	20	100	12	60	17	85	8	40
Total	20	100	20	100	20	100	20	100

Source: Processed Primary Data

Based on table 1 shows that out of 20 respondents in the intervention group obtained data on the elderly who had diabetes blood sugar levels in the pre-test as many as 20 respondents (100%) greater than the post-test with diabetes blood sugar levels, namely 12 respondents (60%). The control group during the pre-test diabetes blood sugar levels were 17 respondents (85%) greater than the post-test, namely 8 respondents (40%). This shows that the blood sugar levels of diabetic patients in the elderly have decreased after drinking the traditional sour sop leaf drink.

B. Control Group Normality Test

Based on the control group data, it can be seen the results of the normality test in the following.

Table 2. Results of Normality Test for Control Group Giving Traditional Drinks of Sour sop Leaves

Group	Shapiro-Wilk			sig	
	Sta	df	Sig.		
Pre-Test	0.924	20	0.120	0.05	Normal
Post-Test	0.960	20	0.544	0.05	Normal

Source: Primary Data Processed

Based on the table above, it is known that the significant value of the control group data in the Shapiro-Wilk Test is 0.120 in the Pre-Test and 0.544 in Post-Test. From these data we can conclude that the data of blood sugar levels in the control group giving traditional drink sour sop leaf is distribution, **Normal**, this was due to the significant value that is greater than 0.05.

C. Normality Test Intervention Group C. Giving Traditional Drink Sour sop Leaf

Data sugar intervention group given traditional drink sour sop leaves can be seen at the normality test results below.

Table 3. Results of the Intervention Group Normality Test for Giving Traditional Drinks of Sour sop Leaves

Intervention of	Shapiro-Wilk			Sig.	
	Sta	df	Sig.		
Pre-Test	0.817	20	0.200	0.05	Normal
Post-Test	0.805	20	0.100	0.05	Normal

Source: Primary Data Processed

Based on the table above it is known that the significant value of the sugar content in the intervention group giving traditional sour sop leaves in the Shapiro-

Wilk test is 0.200. on the Pre-Test and 0.100 on the Post-Test. From these data it can be concluded that the sugar content data intervention group giving traditional drink sour sop leaf is distribution, **Normal**, this was due to the significant value that is greater than 0.05.

D. Homogeneity

Test of the control group, giving traditional sour sop leaves drink.

Table 4. Homogeneity Test Results of Control Group Giving Traditional Drinks of Sour sop Leaves

Sta.	df1	df2	Sig.	Sig.	
0.024	1	38	.878	0.05	Homogeneous

Source: Processed primary data

From the table above it can be seen that the sig. The levene statistic on the data about the control group is $0.878 > 0.05$, thus it can be concluded that the data variants of the control group both Pre-Test and The Post-Test is **homogeneous**.

E. Homogeneity Test of the Intervention Group for Giving Sour sop Leaf Traditional Drinks

Based on the results of the homogeneity test on the intervention group giving traditional sour sop leaf drinks, it can be seen in the following table.

Table 5. Results of Homogeneity Test for the Intervention Group of Traditional Drinking Sour sop Leaves

Sta.	df1	df2	Sig.	Sig.	
0.001	1	38	0.975	0.05	Homogeneous

Source: Processed primary data

From the table above it can be seen that the sig. Levene Statistic on the data about the group giving traditional sour sop leaves drink is $0.975 > 0.05$, so it can be concluded that the data variants of giving traditional sour sop leaf drink both Pre-Test and Post-Test are **homogeneous**.

F. T -test for the Intervention Group Pre-Test and Pre-Test the Control Group

Analysis of the Paired t-test on the Pre-Test for the group giving the traditional sour sop leaf drink and the pre-test for the control group aims to determine whether there is a significant difference in the scores Pre-Test in the group. giving the traditional sour sop leaf drink and the control group. The research conclusion stated that there was a difference if the p-value <0.05. The summary of the Paired t-test between the Pre-Test group giving the traditional sour sop leaf drink and the control group is shown in the following table:

Table 6. Data Table Paired Samples Statistics Pre-Test Intervention Group with Pre-Test Control Group(n = 20)

	Mean	N	Std. Dev	Std. Error Mean	P Value
Control	263,75	20	62,972	14,081	0,000
Intervention	326,25	20	60,413	13,509	

Source: Primary Data Processed

From table 6, data on paired samples statistics shows that the mean (average) blood sugar levels of the control group when the Pre-Test was 263.75 and the mean (average) blood sugar level of the intervention group at the Pre-Test was 326.25. So it is known that the blood sugar levels in the intervention group were higher than those in the control group with an average difference of 62.5 mg / dl. The number of respondents in the study was 20 people. The results of statistical tests used the Paired t-test Pre-Test and Post-Test. The value of significance (2-tailed) shows the value of p-value = 0.006, which means that p-value <0.05. So in this case Ha is accepted, namely "There is a difference in blood sugar levels between the control group and the intervention group for diabetes mellitus patients at the Bogor Utara Health Center in 2019"

G. Pre-Test and Post-Test for the Intervention Group to Give Sour sop Leaf Traditional Drinks

The Paired t-test between the pre-test and post-test of the traditional sour sop leaf giving group aims to determine whether there is a difference. The research conclusion stated that there was a difference if the p-value <0.05. The summary of

the Paired t-test between the pre-test and post-test of the experimental class is shown in the following table:

Table 7. Paired Samples Statistics for the Intervention Group on Traditional Drinking Sour sop Leaves (n = 20)

	Mean	N	Std. Dev	Std. Error Mean	P value
Pre-Test	326,25	20	60,413	13,509	0,00
Post-Test	223,75	20	63,967	14,303	

Source: Primary Data Processed

From table 7, data on paired samples statistics shows that the mean (average) value of the Pre-Test blood sugar levels is 326.25 and the mean (average) the values Post-Test drops by 223.75. So that there is a mean change of 102.5, which means there is a decrease in blood sugar levels of 102.5 mg / dl after being given the traditional sour sop leaf drink. The number of respondents in the study was 20 people. The results of statistical tests used the Paired t-test Pre-Test and Post-Test. The value of significance (2-tailed) shows the value of p -value = 0,000, which means p -value < 0.05. So in this case H_a is accepted, namely "There is a difference in blood sugar levels between the Pre-Test and Post-Test groups who were given traditional sour sop leaf drinks in diabetes mellitus patients at the North Bogor Public Health Center in 2019"

H. Pre-test and post-test control group was not given traditional sour sop leaves.

The Paired t-test between the pre-test and post-test of the control group aims to determine whether there is a difference. The research conclusion stated that there was a difference if the p -value < 0.05. The summary of the Paired t-test between the pre-test and post-test of the control group is shown in the following table:

Table 8. Data table for Paired Samples Statistics for the Control Group not given traditional sour sop leaves (n = 20)

	P value
Pre-Test	0.000
Post-Test	

Source: Primary Data Processed

From table 8, data on paired samples statistics shows that the mean (average) value of the Pre-Test blood sugar levels is 263.75 and the mean (average) of the values has Post-Test decreased by 176.50. So that there is a mean change of 87.25, which means that there is a decrease in blood sugar levels of 87.25 mg / dl. The number of respondents in the study was 20 people. The results of statistical tests used the Paired t-test Pre-Test and Post-Test. The value of significance (2-tailed) shows the value of p -value = 0,000, which means p -value <0.05. So in this case H_a is accepted, namely "There is a difference in blood sugar levels between the pretest and posttest groups in the control group of diabetes mellitus patients at the North Bogor Puskesmas in 2019 "

I. Test t Post--test for the intervention group with traditional drinking sour sop leaves and post-test for the control

Table 9. Post-Test Paired Samples Statistics for the Intervention Group and Post-Test for the Control Group (n = 20)

	Mean	N	Std. Dev	Std. Error Mean	P Value
Control	176.50	20	58.873	13.164	0.021
Intervention	223.75	20	63.967	14,303	

Source: Primary Data Processed

From table 9, data on paired samples statistics shows that the mean (average) blood sugar levels of the control group at the Post-Test it was 176.50 and the mean (average) blood sugar level of the intervention group at the Post-Test was 223.75. So it is known that the blood sugar levels in the intervention group were higher than those in the control group with an average difference of 47.25 mg / dl. The number of respondents in the study was 20 people. The results of statistical tests used the Paired t-test Pre-Test and Post-Test. The value of significance (2-tailed) shows the value of p -value = 0.021, which means that p -value <0.05. So in

this case H_a is accepted, namely "There is a difference in blood sugar levels between the Post-Test group in the control group and the intervention group for diabetes mellitus patients at the North Bogor Community Health Center in 2019"

J. Test Independent Sample T-Test Blood Sugar Among Intervention Group Sour sop Leaf Giving Traditional Drinks with Control Group Giving Traditional Drink Sour sop Leaf

Table 10. Test Results Independent Sample T-Test Blood Sugar Control Group Group Intervention with

Group	t	t _{table}	Conclusion
Control	3.163	2.000	There is a significant difference
Intervention			

Source: Primary Data Processed

Based on calculations Independent Sample T-Test unknown value t of 3.163 with 0.000 significance. The t_{table} value of $dk = 80 - 2 = 78$ is 2,000.

Table 11. Mann-Whitney U

Test	Results of
Mann-Whitney U	504,000
test, Wilcoxon W	1324,000
Z	-2851.
Asymp Sig. (2-tailed)	.004

Source: Primary Data Processed

It is known the asymp value. Sig 0.004 < 0.05 means that there is a difference.

DISCUSSION

A. Blood Sugar Levels Before Drinking Traditional Sour sop Leaves Drinks in the Intervention and Control Group

Based on the results of the study, it is known that the blood sugar levels before drinking traditional sour sop leaf drinks in the intervention group and the control group are known to be the average of the control group is 263.75 and an average the group giving the traditional sour sop leaf drink was 326.25, so it can be concluded that the average blood sugar level in the intervention group was higher

than the sugar level in the control group with an average difference of 62.5 mg / dl.

The results of Afriani's research (2015) in his research entitled The Effect of Sour sop Leaf Boiled Water on Blood Sugar Levels in Patients with Diabetes Mellitus in the Internal Medicine Polyclinic of Dr. M Zein Painan Hospital in 2014. The results showed that the results showed that there was an effect of giving boiled leaf water. sour sop on blood sugar levels in people with diabetes mellitus with ($p = 0.000$). It is concluded that there is an effect of giving sour sop leaf boiled water on blood sugar levels in people with diabetes mellitus. ²²

From the results above, it can be said that the blood sugar levels of diabetes mellitus sufferers can be influenced by the provision of traditional sour sop leaves. Thus it can be assumed that drinking sour sop leaf traditional drinks can reduce blood sugar levels in people with diabetes mellitus.

B. Frequency of Decrease in Blood Sugar Levels in the Control Group.

Based on the results of the study, it is known that the frequency of the Pre-Test group giving the group of traditional sour sop leaves was 326.25 and the mean (average) of the values Post-Test decreased by 223.75. So that there is a mean change of 102.5, which means there is a decrease in blood sugar levels of 102.5 mg / dl after being given the traditional sour sop leaf drink. Whereas in the control group it was 263.75 and the mean (average) Post-Test score decreased by 176.50. So that there is a mean change of 87.25, which means that there is a decrease in blood sugar levels of 87.25 mg / dl.

Research conducted by Arizona on the effectiveness of sour sop leaf boiled water in reducing blood sugar levels in mice concluded that consumption of sour sop leaf boiled water can help reduce blood glucose levels in mice.²³

Thus, it can be said that the frequency of blood sugar levels is influenced by the traditional drink of sour sop leaves, where there is a decrease in blood sugar levels in people with diabetes mellitus. Thus it can be assumed that the blood sugar levels of diabetics do not decrease before consuming the traditional sour sop leaf drink.

C. Effect of Blood Sugar Levels After Drinking Traditional Sour sop Leaf Drinks in the Intervention and Control Group.

Based on the results of the study, it is known that the value of p -value = 0.021, which means p -value < 0.05. So in this case H_a is accepted, namely "There is a difference in blood sugar levels between the Post-Test group in the control group and the intervention group for diabetes mellitus patients at the North Bogor Community Health Center in 2019"

Levi, Marlina and Syalfinaf, Manaf and Rochmah, Supriati. 2018. (2018) proved that the dose of sour sop leaf extract 150 mg / kg BW can affect and reduce blood glucose levels.

Based on the research results, it can be seen that the decrease in blood sugar levels in diabetes mellitus sufferers has decreased after drinking the traditional sour sop leaf drink, thus it can be assumed that diabetes mellitus sufferers have decreased their blood sugar levels after routinely for 3 days drinking the traditional sour sop leaf drink.

D. Effect of Traditional Drinks of Sour sop Leaves on Blood Sugar Levels on Elderly Diabetes Mellitus Patients at North Bogor Community Health Center in 2019

Based on the results of the research, the calculation of the Independent Sample T-Test the t_{count} shows that 3.163 with a significance of 0.000. The t_{table} value of $dk = 80 - 2 = 78$ is 2,000. So it can be concluded that $t_{\text{count}} > t_{\text{table}}$ (3.163 > 2,000) and the asymp value is known. Sig 0.004 < 0.05 means that there is a difference, so it can be stated that there is an effect of traditional sour sop leaf drinks on blood sugar levels in elderly diabetes mellitus patients at the North Bogor Community Health Center in 2019.

Research that supports the results of this study is the result of Diana's research. (2017) which showed that the ethanol extract of sour sop leaves caused a decrease in blood sugar levels ($p < 0.05$) and an improvement in liver histology ($p < 0.05$) at a dose of 150 mg / kg bw per day. It is concluded that there is an effect of giving sour sop leaf boiled water on blood sugar levels in diabetes mellitus sufferers, so it is advisable for DM sufferers to make boiled water of sour sop leaves as an alternative natural treatment in lowering blood sugar levels and should be able to comply with the procedures established during the process. use of boiled water for sour sop leaves in order to obtain far more maximum results.

It can be assumed that there are differences and effects of blood sugar levels of diabetes mellitus sufferers before and after consuming the traditional sour sop leaf drink, where after drinking the traditional sour sop leaf drink, the blood sugar levels have decreased.

The researcher realizes that this study has various limitations that can affect the research results. These limitations include:

1. This study was conducted on the elderly population with diabetes mellitus at the North Bogor Public Health Center in 2019. The conclusion of the research results is limited to generalization to diabetes mellitus sufferers who are in North Bogor Community Health Center, cannot be generalized to other populations that are not have the same character as the study population.
2. The limitation of the research variables used, the researchers only analyzed the traditional sour sop leaf drink variables that could affect the decrease in blood

sugar levels, while it was known that there were other variables that could affect blood sugar levels but were not examined in this study, namely age, family history, race. or background, and a history of diabetes.

For people with diabetes mellitus, especially the elderly, it is hoped that the results of this study can be used as a means to lower blood sugar levels by drinking the traditional sour sop leaf drink. The results of this study can be used as a support for further research and used as a source of reading material and reference in the library of STIKes Wijaya Husada Bogor.

CONCLUSION

1. The average blood sugar level of the intervention group was higher than the control group with an average difference of 62.5 mg / dl.
2. There is a decrease in blood sugar levels as much as 87.25 mg / dl.
3. There is a difference in blood sugar levels between the Post-Test group in the control group and the intervention group for diabetes mellitus patients at the North Bogor Public Health Center in 2019
4. There is an effect of traditional sour sop leaf drinks on blood sugar levels on elderly diabetes mellitus patients at the North Bogor Puskesmas, where the results of the calculation of Independent Sample T-Test unknown value_t of 3.163 with 0.000 significance. The t_{table} value of $dk = 80 - 2 = 78$ is 2,000, so it can be concluded that $t_{arithmetic} > t_{table}$ ($3.163 > 2,000$) and the asymp value is known. Sig 0.004 < 0.05

SUGGESTIONS

1. For Puskesmas
It is hoped that in providing services to patients who have diabetes mellitus, treatment can be given that can reduce blood sugar levels.
2. Nurses.
Nurses are expected to play an active role in providing health education for both patients and families in reducing blood sugar levels for diabetes mellitus sufferers.
3. Educational Institutions
This research is expected to be an input for nursing disciplines regarding the effect of traditional sour sop leaf drinks. in lowering blood sugar levels for people with diabetes mellitus.
4. For Diabetes Patients
The results of this study are expected to be used as information that drinking sour sop leaves can reduce blood sugar levels.

5. For further researchers. The results of this study can be used as a basis for future research on other aspects that can reduce blood sugar levels in patients with diabetes mellitus.

REFERENCES

1. Guyton, A. C & Hall, JE 2012. Textbook of FisiologiMedicine. (Edition 11). Jakarta: EGC.
2. <https://regional.kompas.com/read/2017/11/17/10100121/penderita-diabetes-di-bandung-men-Increase-60-persen>. Retrieved 6 August 2019.
3. Purwatesna, E. 2012. Antidiabetic Activity of Water Extract and Ethanol Sour sop Leaves In Vitro Through Inhibition of α -Glucosidase Enzymes. Retrieved from [http:// repository. ipb.ac.id/handle/123 456789/58641](http://repository.ipb.ac.id/handle/123456789/58641). Retrieved 12 August 2019
4. Malviya, N., Jain, S., Malviya, S. 2010. Antidiabetic Potential Of Medicinal Plants. *Acta poloniae pharmaceutica-drug research* 67: 113-118
5. Joe, W. 2012. The tremendous efficacy of sour sop for many deadly diseases. Yogyakarta: Andi.
6. Arizona, D. 2010. The Effectiveness of Sour sop Leaf Boiled Water on Decreasing Blood Sugar Levels in Mice. Airlangga University. Surabaya.
7. Mardiana, L. 2012. The magic leaves kill the disease. Jakarta: Self-help spreader.
8. Purwatesna, E. 2012. Antidiabetic Activity of Water Extract and Ethanol Sour sop Leaves In Vitro Through Inhibition of α -Glucosidase Enzymes. Retrieved from [http:// repository. ipb.ac.id/handle/123 456789/58641](http:// repository. ipb.ac.id/handle/123456789/58641). Retrieved 12 August 2019
9. Putri, RNA, 2012. Antioxidant Activity Test of Sour sop (*Annona muricata* L.) Leaf Extract Using the DPPH (1,1-Diphenyl-2-picrylhydrazyl) Method. [Essay]. Jakarta: Faculty of Medicine and Health Sciences, Syarif Hidayatullah State Islamic University, Undergraduate Program. (Thesis)
10. Gumelar, Bakti, RA Retno Ekowati, Annisa Rahmah Furqaani Potential of Ethanol Extract of Sour sop Leaves (*Annona muricata*) as Therapeutic Agent of Hyperglycemia in Alloxan-Induced Mice. Bandung Meeting on Global Medicine & Health (BaMGMH), Vol. 1 No. 1 of 2017 Faculty of Medicine, Bandung Islamic University.
11. Kariadi, Sri Hastuti. 2010. Diabetes: A Complete Guide To Diabetes. Jakarta: Mizan Media Utama.
12. Wijayanti, R. Abdur Rosyid and Iffa Kholishotul Izza, 2017. Bulk Effect of GarlicSkin Extract (*Allium sativum* L.) on Total Blood Cholesterol Levels of

- Wistar Male Rats with Diabetes Mellitus. Pharmacia. Semarang: Faculty of Medicine, Sultan Agung Islamic University Semarang. 7 (1): 13.
13. Aziz, Ari Rahmat. 2013. Effectiveness of Sour sop (Leaf *Annona muricata* Boiled Water) Against Blood Sugar Levels in Type II Diabetes Mellitus Patients. Jurnal program studi ilmu keperawatan universitas riau kampus binawidya pekanbaru, 28293, Indonesia.
 14. Riri, Afriani. 2015. Pengaruh Air Rebusan Daun Sirsak Terhadap Kadar Gula Darah Pada Penderita Diabetes Melitus Di Ruang Poliklinik Penyakit Dalam RSUD Dr.M Zein Painan Tahun 2014. Diploma thesis, Universitas Andalas. (Skripsi)
 15. Supranto, J. 2013. Statistika Teori dan Aplikasi. Jakarta: Penerbit Erlangga.
 16. Sugiyono. 2015. Metode Penelitian Administrasi, Bandung: Alfabeta
 17. Subekti, I. 2009. Neuropati Diabetik. In AW Sudoyo, B. Setiyohadi, I. Alwi, MS K & S. Setiati. Buku ajar ilmu penyakit dalam. Jakarta: Penerbit FK UI.
 18. American Diabetes Association (ADA), 2015. Standards of Medical Care in Diabetes-2015. Diakses dari: http://care.diabetesjournals.org/content/36/Supplement_1/S11.full.pdf+html. Diakses tanggal 19 Agustus 2019.
 19. Wijayanti, R. Abdur Rosyid dan Iffa Kholishotul Izza, 2017. Pengaruh Ekstrak Kulit Umbi Bawang Putih (*Allium sativum* L.) Terhadap Kadar Kolesterol Darah Total Tikus Jantan Galur Wistar Diabetes Mellitus. Pharmacia. Semarang: Fakultas Kedokteran, Universitas Islam Sultan Agung Semarang. 7 (1): 13.
 20. Aziz, Ari Rahmat. 2013. Efektivitas Air Rebusan Daun Sirsak (*Annona muricata*) Terhadap Kadar Gula Darah Pada Penderita Diabetes Melitus Tipe II. Jurnal program studi ilmu keperawatan universitas riau kampus binawidya pekanbaru, 28293, Indonesia.
 21. Astuti, Putri Dhea. 2017. Pengaruh Ekstrak Daun Sirsak (*Annona muricata* L.) terhadap Penurunan Kadar Glukosa Darah. Fakultas Kedokteran, Universitas Lampung. Jurnal Majority Volume 6 Nomor 2 Maret 2017.
 22. Joe, W. 2012. Dahsyatnya Khasiat Sirsak Untuk Banyak Penyakit Mematikan. Yogyakarta: Andi.
 23. Arizona, D. 2010. Efektivitas Air Rebusan Daun Sirsak Terhadap Penurunan Kadar Gula Darah Pada Mencit. Universitas Airlangga. Surabaya.