

The Efforts to Reduce Blood Sugar Levels in Type II Diabetes Mellitus Patients Through Administration Aloe Vera Liquid

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Abstract—Diabetes mellitus is a degenerative disease that is dangerous to humans because it can cause death. For this reason, so that blood sugar levels do not increase further and prevent chronic complications from occurring, treatment is needed, both pharmacological and non-pharmacological, to control blood sugar levels, one of which is using the aloe vera plant. **Objective:** The aim of this research is to determine efforts to reduce blood sugar levels in type II diabetes mellitus patients by administering boiled aloe vera water. **Methods:** This research used a quasi experimental pretest and posttest with control group design. The population in this study were Type 2 DM patients aged 25-64 years and were selected using convenience sampling of 42 people. The experimental group was given intervention in the form of boiled aloe vera water for 7 consecutive days. Data measurement was carried out by measuring blood sugar levels while using the Autocheck Multi Monitoring System (pretest and posttest). Data were analyzed using the dependent t test with a significance level of $\alpha=0,05$. **Results:** The results of the study showed that the average blood sugar level before being given aloe vera decoction in the intervention group was 188 and in the control group 180,10. After administering the aloe vera decoction, blood sugar levels decreased by 3 in the intervention group and 1,67 in the control group. Statistical test results showed that there was an effect of boiled aloe vera water on reducing blood sugar levels in patients with type 2 diabetes mellitus ($p=0,000$). **Conclusion:** aloe vera boiled water can accelerate the reduction in blood sugar levels in type 2 diabetes mellitus patients. Therefore, it is recommended that in addition to standard therapy, type 2 diabetes mellitus patients can be given aloe vera decoction to speed up healing.

Keywords—Blood Sugar Levels; Diabetes mellitus; Aloe Vera Liquid.

I. INTRODUCTION

Type 2 diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia, occurring due to abnormalities in insulin secretion, insulin action or both. DM type 2 is the most common type found in the world. As many as 415 million people suffered in 2015 and it is estimated that this will increase to 642 million in 2040¹.

In the 10th edition of the IDF (International Diabetes Federation) Atlas, it is stated that in Indonesia the estimated population of adult diabetes aged between 20-79 years is 19.465.100 people². Meanwhile, the total adult population aged 20-79 years is 179.720.500, so if calculated from these two figures it is known that the prevalence of diabetes among those aged 20-79 years is 10,6%. In other words, if calculated in the 20-79 year age group, this means 1 in 9 people with diabetes².

Treatment for patients with DM can be said to be quite expensive and requires a relatively long treatment time compared to other diseases³. Apart from treating diabetes itself, treatment is also needed to treat complications of diabetes such as heart disease, kidney failure and so on⁴.

To address the increase in type 2 DM sufferers, drugs are needed that can help reduce blood glucose levels. Nowadays many people prefer treatment using medicinal plants compared to chemical drugs because apart from the relatively cheap price, the ingredients are easy to obtain and safe to consume⁴.

Various studies have been developed to treat DM. One way is to use treatment using herbal medicines. Research conducted

by Susilawati et.al shows that the types of plants that can be used to treat Diabetes Mellitus are: white turmeric, bitter, brotowali, meniran, moringa, gotu kola, neem/intaran, insulin, citronella, red ginger, red betel, binahong, secang wood, ciplukan, bitter melon, turi, wijaya kusuma leaves, cherry leaves, and aloe vera⁵.

Aloe vera contains vitamins and is a plant that is high in fiber. One of the things contained in aloe vera is chromium and aloe emodin which functions to lower blood sugar levels. The aloe emodin content of aloe vera (aloe vera) activates insulin signaling levels such as insulin receptor β and phosphatidyl inositol-3 kinase, substrate-1, and increases the rate of glycogen synthesis, inhibits glycogen synthesis kinase-3 β , so it is useful for reducing blood sugar ratios. Apart from aloe emodin, aloe vera also contains chromium which has the same function as insulin, namely helping make it easier for glucose to enter cells and this can be used to lower a person's blood sugar levels. So, aloe vera (Aloe vera) is a plant that has antihyperglycemic effects which can treat diabetes mellitus⁶.

Previous research was conducted by Qahar (2020) who conducted research by studying literature from various national and international journals, which showed that Aloe vera was proven to be able to reduce blood glucose levels in type 2 diabetes mellitus⁷.

Another study was conducted by Aryani et.al by giving boiled aloe vera for 7 days after dinner. The results of the study showed that giving boiled aloe vera had a significant effect on reducing blood sugar levels in patients with type II diabetes

mellitus at the Kebun Lada Village Community Health Center, North Binjai District with a p value = 0,001 ($p < 0,05$)⁸.

The aim of this research is to determine efforts to reduce blood sugar levels in type II diabetes mellitus patients by providing boiled aloe vera water in the work area of the Sindang Barang Community Health Center, Bogor City.

II. MATERIALS AND METHODS

The research design uses a quasi experimental pretest and posttest with control group design. The research was conducted in the work area of the Sindang Barang Community Health Center, Bogor City from January 9th to February 8th 2024. The population in this study were all Type 2 DM patients aged 25-64 years and were selected using convenience sampling with inclusion criteria, namely Type 2 DM sufferers who did not using insulin injections, male/female, not smoking, not consuming alcohol, and willing to be a respondent. Meanwhile, the exclusion criteria are patients who experience decreased consciousness. The sample was divided into 2 groups (intervention and control) with a sample size of 1:1 with each group totaling 21 respondents. The instrument in this study used an observation results sheet to record the value of blood sugar levels when measured by researchers, as well as boiled aloe vera water. The experimental group was given intervention in the form of aloe vera boiled water for 7 consecutive days. Data measurement was carried out by measuring blood sugar levels while using the Autocheck Multi Monitoring System before and after the intervention was given (7th day). Data were analyzed using the Dependent t test with a confidence level of 95%.

III. OBSERVATION AND RESULTS

TABLE 1. Distribution of Respondent Characteristics based on Age, Gender, Occupation, Education, and Length of Suffering from DM

S.No.	Respondent Characteristics	Intervention Group	Control Group
1	Age		
	< 50 years	5 (23,8%)	3 (14,3%)
	50-60 years	8 (38,1%)	4 (19%)
	61-70 years old	8 (38,1%)	14 (66,7%)
2	Gender		
	Man	12 (57,1%)	11 (52,4%)
	Woman	9 (42,9%)	10 (47,6%)
3	Work		
	Trader	14 (66,7%)	8 (38,1%)
	Private employees	4 (19%)	7 (33,3%)
	domestic worker	3 (14,3%)	6 (28,6%)
4	Education		
	Elementary School	5 (23,8%)	6 (28,6%)
	Junior High School	8 (38,1%)	6 (28,6%)
	High School	8 (38,1%)	9 (42,8%)
5	Suffering from DM for a long time		
	1-3 Years	9 (42,9%)	13 (61,9%)
	>3 Years	12 (57,1%)	8 (38,1%)

Table 1 shows that the majority of respondents aged > 50 years in the intervention group were 8 people aged 50-60 years (38,1%) and 8 people aged 61-70 years (38,1%). In the control group, most of them were 61-70 years old, 14 respondents (66,7%). Based on gender, most of the respondents in the intervention group were male (57,1%) and in the control group

most of the respondents were male (52,4%). In the intervention and control groups, most of the respondents were businessmen, respectively 66.7% and 38.1%. In the intervention group, the majority of respondents had junior high school education (38,1%) and high school education (38,1%), while in the control group the majority of respondents had high school education (42,8%). Based on the length of time they had suffered from DM, most respondents in the intervention group had suffered from DM for > 3 years (57,1%), while in the control group most of the respondents had suffered from DM for 1-3 years (61,9%).

TABLE 2. Intervention Group Blood Sugar Levels (Pretest and Posttest)

S.No.	Category	Intervention		N
		Pretest	Posttest	
1	Mean	188,00	185,14	21
2	Median	188,00	185,00	
3	Standard Deviation	15,928	15,752	
4	Minimal	156	153	
5	Maximum	210	208	

Based on table 2, blood sugar levels before the intervention showed an average and median of 188 with a standard deviation of 15,928, the lowest score was 156 and the highest was 210, while the average blood sugar level score after the intervention was 185,14 and the median was 185, with a standard deviation of 15,752. the lowest score was 153 and the highest was 208.

TABLE 3. Control Group Blood Sugar Levels (Pretest and Posttest)

S.No.	Category	Intervention		N
		Pretest	Posttest	
1	Mean	180,10	178,43	21
2	Median	186,00	184,00	
3	Standard Deviation	17,660	17,440	
4	Minimal	147	145	
5	Maximum	201	198	

Based on table 3, blood sugar levels in the control group, at the pretest, the average was 180,10 and the median was 186 with a standard deviation of 17,660, the lowest score was 147 and the highest was 201, while the average score for the control group's blood sugar levels at the posttest was 178,43 and a median of 184, with a standard deviation of 17,440, the lowest score was 145 and the highest was 198.

TABLE 4. Blood Sugar Level Normality Test Results in the Intervention Group and Control Group

S.No.	Category	Shapiro Wilk		
		Statistics	df	Sig.
1	Intervention Group Blood Sugar Levels (Pretest)	0,750	21	0,425
2	Intervention Group Blood Sugar Levels (Posttest)	0,496	21	0,152
3	Control Group Blood Sugar Levels (Pretest)	0,750	21	0,425
4	Control Group Blood Sugar Levels (Posttest)	0,496	21	0,152

Based on table 4, the results of the normality test using the Shapiro Wilk test above show that the 21 respondents in the intervention group and 21 respondents in the control group obtained a pretest value of 0,425 ($> 0,05$) and a posttest value of 0,152 ($> 0,05$). So it can be concluded that the results of the

normality test show that the data results are normally distributed, both in the intervention group and in the control group.

TABLE 5. Results of the Homogeneity Test for Blood Sugar Levels in the Intervention Group and Control Group

S.No.	Group	Levene Statistics	df1	df2	Sig.
1	Intervention	0,649	1	40	0,820
2	Control	0,617	1	40	0,625

Table 5 above shows the results of the homogeneity test in the intervention group with a value of 0,820 (>0,05) and the control group of 0,625 (>0,05) so it can be concluded that the data has a homogeneous variance.

TABLE 6. Differences in Blood Sugar Levels Before and After Intervention in the Intervention Group

S.No.	Category	Mean	Standard Deviation	95% CI		P value
				Lower	Upper	
1	Pretest	188	15,928	2,353	3,362	0,000
2	Posttest	185	15,725			

Table 6 shows the average value of pretest blood sugar levels of 188 and posttest of 185 with a difference in average value of 3. Dependent T test results obtained p value (0,000) < (0,05), so Ho is rejected which means there is a difference Blood sugar levels before and after the intervention of giving boiled aloe vera water.

TABLE 7. Differences in Blood Sugar Levels Before and After Intervention in the Control Group

S.No.	Category	Mean	Standard Deviation	95% CI		P value
				Lower	Upper	
1	Pretest	180,10	17,660	-0,319	3,653	0,095
2	Posttest	178,43	17,440			

Table 7 shows the average value of pretest blood sugar levels is 180,10 and posttest is 178,43 with a difference in average value of 1.67. The results of the Dependent T test obtained p value (0,095) > (0,05), so Ho was accepted, which means there was no difference in blood sugar levels before and after in the control group.

TABLE 8. Difference in Average Difference in Blood Sugar Levels Before and After in the Intervention Group and Control Group

S.No.	Category	Mean	Standard Deviation	S.E	P Value
1	Pretest	7,905	21,331	4,655	0,175
2	Posttest	6,714	21,875	4,774	0,001

Based on table 8, the average difference in blood sugar levels before the intervention was 7,905 with a standard deviation of 21,331, while after the intervention the average blood sugar level was 6,714 with a standard deviation of 21,875. The results of statistical tests during the pretest obtained a p value of 0,175, so it can be concluded that there was no significant difference in the average blood sugar levels during the pretest when giving boiled aloe vera water to the intervention group and the control group.

Meanwhile, during the posttest, the p value was 0,001, which means that there was a difference in the average blood

sugar levels during the posttest when giving aloe vera boiled water in the intervention group and the control group.

IV. DISCUSSION

The results of the study showed that boiled aloe vera water could reduce blood sugar levels in the intervention group compared to the control group with a p value = 0,000. This research is in line with research conducted by Aryani et.al showing that administering aloe vera decoction has a significant effect on reducing blood sugar levels in type 2 DM patients with a p value of 0,001⁸. Likewise hLarasati's research results support this research, which shows the benefits of aloe vera in lowering blood sugar levels for people with type 2 DM⁹.

Blood sugar levels are the amount of glucose circulating in the body. Its levels are influenced by various enzymes and hormones, the most important of which is the hormone insulin.¹⁰ In DM patients, the blood becomes thick and filled with glucose.¹¹ This glucose supply cannot be delivered to the cells by insulin due to the body's inability to produce insulin. Insulin can only transport about 25% of the glucose into cells of the total amount needed by cells in the body for metabolism. This causes the measurement of blood sugar levels in DM patients to be high.¹²

The condition of hyperglycemia in type 2 DM patients results in a decrease in chromium levels in the body by increasing free radicals and failure of several organ functions, thus affecting glucose control and the prognosis of DM patients.¹¹

With regular consumption of aloe vera boiled water, it has been proven to have a significant impact in lowering blood sugar levels. Several previous studies have shown the effectiveness of aloe vera in lowering blood sugar in type 2 DM patients, such as research conducted by Putri et.al which stated that aloe vera contains chemicals that have hypoglycemic properties including chromium, alprogen, anthraquinone, phytosterol, and methanol so that aloe vera has been proven to reduce blood glucose levels in type 2 DM patients¹³.

The aloe emodin content of aloe vera activates insulin β and phosphatidyl inositol-3 kinase, substrate-1, increases the rate of glycogen synthesis, and inhibits glycogen synthesis kinase-3 β , so it is useful for reducing blood sugar ratios.¹⁴

Apart from aloe emodin, aloe vera also contains chromium which has the same function as insulin, namely helping make it easier for glucose to enter cells and this can be used to stabilize blood sugar levels. Chromium is needed by the body for carbohydrate and fat metabolism¹⁵. Chromium together with insulin functions to facilitate the entry of glucose into the body. Chromium regulates the function of the insulin hormone, more efficiently distributing glucose into the bloodstream into cells, increasing the number of insulin receptors on cell membranes and making it easier for insulin to bind to cells.¹⁶

When someone consumes boiled aloe vera, the aloe emodin and chromium content will help insulin to enter blood sugar that has accumulated in the blood vessels so that it can enter the cells and the body's metabolic processes are fulfilled.¹⁷

V. LIMITATIONS OF STUDY

The intervention in providing aloe vera decoction was carried out door to door, it could not be given to respondents in the same place or at the same time.

VI. CONCLUSION

This research emphasizes the significant impact of administering boiled aloe vera water on reducing blood sugar levels in people with type 2 diabetes mellitus. Although the reduction in blood sugar levels observed was not too high, this confirms the effectiveness of the method of administering boiled aloe vera water as a non-pharmacological alternative. The practical implications include preparing an activity program to provide outreach and education that can help increase the knowledge of type 2 DM patients so that they are able to make aloe vera decoction to lower blood sugar levels in type 2 DM patients. With scientific support (evidence base practice) from this research, it encourages its use. Various herbal plants that can be used to help lower blood sugar levels. Overall, this research aims to inspire people to use various types of herbal plants, contributing to improving health programs, thereby increasing the level of health in society.

Conflict of Interest: None

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