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The Administration Effectiveness Of The Extract Of Sunti Aceh (Dried Averrhoa Bilimbi L.) Towards Reduction In Blood Sugar Levels In Diabetic Rats

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ABSTRACT

Introduction: West Aceh has diabetes prevalence above the national prevalence rate, namely >30,8%. One of the causative factors of the high number in diabetes cases is dietary, such as the habit of not consuming healthy food, so it is important to have healthy foods in the form of herbal medicines that are able to control blood sugar levels in diabetics. This study aims to measure the effectiveness of administrating the extract of dried Averrhoa bilimbi L. (sunti aceh) to reduce blood sugar levels in diabetic rats. **Material and Method** This is an experimental study with the research plan of pre and post test of randomized controlled group design, the experimental animals were 15 rats which were divided into 3 groups, namely group 1 distilled water (negative control), group 2 metformin at a dose of 500mg/BWgr (positive control), group 3 the extract of sunti aceh (ESA) at a dose of 750mg/BWgr. All groups were first induced with alloxan until their blood sugar levels reached 200mg/dl. After four weeks of treatment, blood sugar levels were measured, then a decrease in blood sugar levels was observed. **Results** The study showed that group 1 did not experience a significant decrease in blood sugar levels between pre and post test at $p>0.05$, while groups 2 and 3 experienced a significant decrease in blood sugar levels between pre and posttest at $p <0.05$. Groups 2 and 3 both have a better level of effectiveness than distilled water. **Conclusion** Groups 2 and 3 have the same level of effectiveness in reducing blood sugar levels.

Keywords : Sunti Aceh, Extract, Diabetes

INTRODUCTION

The prevalence of Diabetes Mellitus (DM) continues to increase in Aceh province as well as the prevalence of prediabetes which is seen based on the prevalence of cases of Disrupted Glucose Tolerance (DGT) that is still above the national prevalence rate of above 30.8%. The prevalence of Aceh Barat Regency is not much different from that of Aceh province (1,2). Based on data from health center in West Aceh, DM still occupies the top ten of non-communicable diseases. The data is also obtained from the annual data of Cut Nyak Dhien Hospital in West Aceh (3–5).

The increase in diabetes cases, based on previous research, was caused by several factors. Previous research showed that a good diet can control blood sugar levels, and vice versa (6,7) and this statement is also supported by other studies that are in line with diabetes studies (8-10).

The patient's unhealthy diet before illness was the dominant factor that caused disturbed blood sugar levels. A person's diet is very closely related to one's body functions such as the production and control of insulin by the pancreas, if insulin is disturbed, sugar will accumulate in the area which then results in cholesterol, disturbed blood pressure, and even complication condition such as kidney failure that will require the patient to have a dialysis, and also make the patient very vulnerable to

covid19 (11–15).

Diabetes and its complication conditions can be avoided by giving more attention to our diet, starts from the selection, process, and the presentation of the food ingredients. Regarding the selection of food ingredients in Aceh, there are actually a lot of food ingredients from basic ingredients to food seasonings that contain substances, based on previous studies, which have the effect of preventing and controlling blood sugar levels. Aceh has a distinctive cooking spice, namely sunti aceh (dried Averrhoa bilimbi L.), which is often used in Acehnese specialties such as curry of asam keueng (16-18). Based on previous studies, Averrhoa bilimbi L. contains substances that can control blood sugar levels (19–22).

Based on previous studies, it is very possible for Sunti Aceh to be classified as cooking spice and even food that can prevent diabetes. Sunti aceh can even be developed as a herbal medicine or food additive for prediabetes and diabetes groups so that it can lower and control their blood sugar levels. Regarding sunti aceh, dried Averrhoa bilimbi L., it is necessary to conduct research to ensure its effectiveness in reducing blood sugar levels. This research needs to be carried out considering that there is no specific research related to Sunti Aceh, where most of the previous studies were focused on the effectiveness of the juice of Averrhoa bilimbi L. in reducing blood sugar levels.

We were interested in conducting this research because sunti aceh is a typical aceh spice that is easy to find in Aceh, thus making it easier for us to study it, and since Sunti aceh is a food product of agro-industry, this research is also in line with the vision and mission of the University of Teuku Umar (UTU) to become a source of inspiration and reference in the marine and agro-industrial fields. Furthermore, this is also in line with the vision and mission of the Department of Nutrition which is a derivative of UTU's visions and missions, namely we are engaged in the downstream sector, such as conducting research that can produce agro-food products which have nutritional value so that we can improve our public health. One of the efforts is with this early stage study which is later expected to be able to produce herbal products of Aceh's and UTU's specialty.

So based on the background that has been written, we are interested in conducting research with the title of: **(The Administration Effectiveness of the Extract of Sunti Aceh (Dried Averrhoa bilimbi L.) towards Reduction in Blood Sugar Levels in Diabetic Rats)**

MATERIAL AND METHOD

The research method is experimentation in the laboratory with a research plan of pre and post test of randomized controlled group design (23–25). The research object was 15 rats that had been injected with alloxan so that their blood sugar levels (bsl) reached 200mg/dl (pretest). The 15 rats were grouped into 3 groups with each treatment (posttest) as follows: the negative control group was group 1 of distilled water. The positive control group was group 2 with metformin at a dose of 500 mg/BWgr. Group 3 was intervention group with the extract of sunti aceh (ESA) at a dose of 750mg/BWgr. All groups, after being given treatment for four weeks, were measured for random blood sugar levels and a decrease in their blood sugar levels was observed.

The data is primary data resulted from the measurement of blood sugar levels of rats that have been induced with alloxan before and after the administration of negative and positive control as well as ESA. The data were then processed using SPSS for Windows Release 20. The data were analyzed using a comparative hypothesis test for two numerical variables, namely the dependent t-test and the comparative hypothesis test for more than two numerical variables, namely Repeated Annova test.

RESULTS

The results of this study based on the results of the dependent t-test and the Repeated Annova test can be read in Table 1 and Table 2.

Table 1. Result of data analysis with dependent t-test

Variable	Mean	SD	P Value	N
Group 1 (Distilled water)				
Pre Test	390.40	97.575	0.226	5
Post Test	199.60	13.795		
Group 2 (Metformin 500mg/BWgr)				
	352.00	26.505	0.000	5
Pre Test	146.00	20.489		
Post Test				
Group 3 (ESA 750 mg/BWgr)	386.80	36.725	0.000	5
Pre Test	139.40	4.722		
Post Test				

Based on the results of the dependent t-test in Table 1, it can be seen that the average comparison of pre and post test of blood sugar levels in group 1 is not significant because it has a p value> 0.05, it can be concluded that the decrease in blood sugar levels in group 1 is not significant. This is inversely proportional to groups 2 and 3 that get significant comparisons of pre and post test of blood sugar level with a p value <0.05, meaning that there is a significant decrease in blood sugar levels after treatment with metformin and ESA.

Table 2. Result of data analysis with repeated annova test

Variable	Variable	Mean	P Value
Group 1	Group 2	141.200	0.017
	Group 3	148.400	0.007
Group 2	Group 1	-141.200	0.017
	Group 3	7.200	0.550
Group 3	Group 1	-148.400	0.007
	Group 2	- 7.200	0.550

Based on the results of the Repeated Annova test in Table 2, it can be seen that group 3 experienced a more significant decrease in blood sugar levels (p value = 0.007) than group 2 (p value = 0.017) when compared to group 1. Group 3 when compared to group 2 did not experience a significant decrease in blood sugar levels (p value = 0.550), meaning that the

average values of decrease in blood sugar levels in rats in treatment groups 2 and 3 are almost the same, so it can be concluded that the effectiveness of ESA 750mg/BWgr is almost the same as metformin 500mg/BWgr after 4-week treatment, but ESA 750mg/BWgr was more effective than the negative control (distilled water) treatment.

DISCUSSION

Based on the results of this study, it was found that the average blood glucose level of rats after alloxan induction was 200 mg/dl. In group 1 the average value of blood glucose levels at the time of the pre-test was 390.40 mg/dl and 199.60 mg/dl at post-test. Group 2 has the average value of blood glucose levels at the time of pre-test of 352.00 mg/dl and at the time of post-test of146.00 mg/dl. Group 3 has the average value of blood glucose levels at the time of pre-test of 386.80 mg/dl and at the time of post-test of 139.40 mg/dl. There was a decrease in blood glucose levels in each group based on the results of the bivariate paired group or dependent t-test, where the significant decrease in blood glucose levels were in groups 2 and 3 with $p < 0.05$.

The results of the paired multivariate test or the Repeated Annova test showed that the effectiveness of reducing blood glucose levels in group 3 was more effective than group 2 when compared to group 1 with a p value of <0.05. The effectiveness level of group 3 when compared to group 2 is almost the same, as can be deduced from the $p>0.05$. This means that the administration of extract of sunti aceh at a dose of 750mg/BWgr is effective in reducing blood sugar levels, comparable to metformin 500mg/BWgr and better than distilled water.

Studies on other parts of Averrhoa bilimbi L. such as on the leaves and stems showed that this plant has flavonoids, saponins, and tannins that play a role in reducing blood glucose levels. Putra's study stated that leave extract of Averrhoa bilimbi L. was effective in reducing glucose levels with a p value of $p<0.05$. Agriani's study on stem extract of Averrhoa bilimbi L. also found that stem extract of Averrhoa bilimbi L. was effective in reducing blood glucose levels with a value of $p<0.05$. Moreover, Widodo also examined the same plant's part as in this study, namely the fruit extract of Averrhoa bilimbi L. and obtained the same result, i.e. the fruit extract was effective in reducing blood sugar levels with a p value of <0.05, but is not more effective than metformin (20,26,27).

There are also several overseas studies that have investigated the effects of substances contained in Averrhoa bilimbi L. in decreasing blood sugar levels, such as the Pushparaj study in Singapore which stated that the extract was effective up to 50% in reducing blood glucose levels at a dose of 125 mg/bwkg and 130% in reducing triglyceride levels when compared with the negative control group. A study in Amazon, Brazil conducted by Seixas and colleagues, where they tried administrating several types of fruit endemic there including Averrhoa bilimbi L. in their 10 treatment groups and they obtained a result that Averrhoa bilimbi L. or in their language biri-biri, is effective in reducing the blood glucose level $p<0.05$ (21,28).

CONCLUSION

Based on the results of this study, it can be concluded that all treatment groups were able to reduce blood glucose levels, but group 3 (ESA at a dose of 750mg/BWgr) obtained a more significant value, as can be seen from the results of the numerical test of two paired groups with P value = 0.000, and from the results of the numerical test of more than two paired groups. Group 3 was more effective in reducing blood sugar levels than group 2 when compared to group 1 with P value = 0.007. Therefore, the extract of Averrhoa bilimbi L. / dried sunti aceh is effective at a dose of 750mg/BWgr in reducing blood sugar levels compared to distilled water and comparable to metformin at a dose of s500mg/BWgr.

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CONFLICT OF INTEREST

The author states that there is no conflict of interest.

ETHICAL CLEARANCE

Health Research Ethics Committee, Faculty of Nursing, University of North Sumatera.

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