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EFFECT OF GUAJAVA *(PSIDIUM)* LEAVES DECOCTION ON CHANGES IN BLOOD GLUCOSE LEVELS OF PEOPLE WITH DIABETES MELLITUS

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Abstract

Diabetes mellitus is a type of metabolic disease characterized by hyperglycemia. If this condition is not treated correctly, it can cause various complications that can lead to death. Diabetic mellitus patients are given pharmacological treatment and can be given non-pharmacological treatment with the use of plants as an alternative to lower blood sugar levels, including the use of guava leaves (psidium guajava leaf). The chemical content found in guava leaves, skin, and fruits is tannins, calcium, and flavonoids, which have the benefit of lowering blood glucose levels. This research aims to determine the effect of giving guava leaf decoction water on changes in blood glucose levels in people with diabetes mellitus. This quantitative research used a quasi-experimental design method and a non-equivalent pretest-posttest control group design. The number of respondents was 70 people divided into 2 groups, namely the intervention group of 35 people and the control group of 35. The sampling technique used was nonprobability sampling, done by consecutive sampling. The intervention group was given guava leaf boiled water for 14 days, once a day in the afternoon, with a dose of 250 ml, while the control group was only educated about diabetes mellitus. The study's results using the unpaired T-test obtained a p-value = 0.000. It is concluded that there is a change in blood glucose levels after the intervention of giving guava leaves decoction. People with diabetes mellitus suggest consuming guava leaves decoction to help control their blood glucose levels.

Keywords: *Psidium Guajava Leaf, Blood glucose levels, DM*

1. INTRODUCTION

Diabetes is a metabolic disorder characterized by hyperglycemia related to impaired insulin secretion or action that interferes with the metabolism of carbohydrates, proteins, and lipids [1]. Chronic metabolic disease is characterized by increased blood glucose levels, which over time can cause severe damage to the heart, blood vessels, eyes, kidneys, and nerves [2]. According to the global survey of diabetes mellitus in the last three years, its prevalence has increased dramatically at all income levels in the country. About 422 million people worldwide suffer from diabetes mellitus, the majority of them living in low- to middle-income countries, resulting in 1.5 million deaths each year due to diabetes mellitus [3]. The number of

cases and prevalence of diabetes mellitus is expected to reach 643 million people by 2030, and this number will reach 783 million by 2045 [4].

Indonesia is the seventh-ranked country with a total of 10.7 million cases, which shows that Indonesia has made an immense contribution to diabetes mellitus in the Southeast Asian Region [5]. It is estimated that by 2030, the prevalence of diabetes mellitus in Indonesia will reach 21 million people and will contribute to the seventh leading cause of death worldwide [6]. Data from the National Riskesdas stated that the prevalence of diabetes mellitus according to the doctor's diagnosis in residents of all ages, DKI Jakarta is in first place with the highest prevalence (2.6%), and East Nusa Tenggara has the lowest prevalence (0.6%), while the prevalence of South Sulawesi is at 1.3%. It is estimated that there are around 1,017,290 cases of diabetes in Indonesia. Based on statistical data from the Bulukumba Regency Health Office, in 2022, 7,820 people were suffering from diabetes mellitus, while in 2023, there was a significant increase with a prevalence of 14,759 people.

In general, the cause of diabetes mellitus is caused by being overweight (obesity) and not being physically active, which can result in impaired carbohydrate metabolism, which leads to hyperglycemia [7]. Diabetes mellitus, if not treated early, can lead to complications. People with diabetes mellitus are 20 times more at risk of developing kidney disease. In addition, 50% of individuals with diabetes mellitus tend to develop neuropathy, which is characterized by pain in the hands, legs, or thighs, loss of sensation, muscle weakness, impotence, and susceptibility to infections because the immune system is weakened, and can even result in death [8].

Therefore, to reduce the occurrence of complications, prevalence, and incidence of diabetes mellitus, it is essential to improve knowledge, attitudes, and practices about diabetes mellitus [9]. In addition, two treatments can be given to patients, namely pharmacological and non-pharmacological treatment [10]. Non-pharmacological treatment can be given by utilizing plants that help lower blood glucose levels, such as guava leaves *(Psidium).* Guava leaves are a plant that grows well in various places; besides that, it can be found in almost all regions and is known to almost everyone [11]. Guava leaves have many pharmacological effects, such as hypoglycemia, anti-diarrhea, anti-oxidation, anti-tumor, anti-bacterial, and hypotensive activities [12]. The chemical content in guava leaves, skin, and fruits is tannins, calcium, and flavonoids. Tannins, calcium, and flavonoids have the benefit of lowering blood glucose levels [13]. Apart from that, research by Shukla finds that guava leaves decoction water compounds, particularly qu ercetin, improve glucose absorption in hepatocytes and reduce hyperglycemia in diabetes mellitus [14].

The results of interviews with 10 people with diabetes mellitus do not reveal any plants other than cherry leaves that can be used as herbal medicines to lower blood sugar. Therefore, it is concluded that their knowledge of herbal plants that could be used as medicine is still lacking, especially guava *(Psidium)* leaf decoction. Based on these problems, this study aims to determine the effect of giving guava leaf decoction *(Psidium)* on the blood glucose levels of people with diabetes mellitus.

2. METHODOLOGY

This research used a quasi-experimental design method with a non-equivalent pretest-posttest control group design. The number of respondents was 70 people divided into 2 groups, namely the intervention group of 35 people and the control group of 35. The sampling technique used nonprobability sampling with a consecutive sampling approach. In the intervention group, guava *(psidium)* leaf decoction was given for 14 days and once a day in the afternoon with a dose of 250 ml. The control group was given education about diabetes

mellitus. Education was given once after a blood glucose test. The inclusion criteria in the intervention group were those willing to be respondents, GDS 200-400 mg/dL, did not consume blood glucose lowering drugs, and did not consume herbal medicines other than guava leaf decoction water. The inclusion criteria in the control group were willingness to be a respondent, GDS 200-400 mg/dL, not taking drugs to lower blood glucose levels, and not taking herbal drugs. The exclusion criteria were respondents with a history of heart, respondents with diabetes mellitus complications, respondents who did not complete the intervention to completion, and respondents who participated in PROLANIS (*Program Pengelolaan Penyakit Kronis*/ Chronic Disease Management Program, Eng.).

The instruments used were glucometers, strips, alcohol cotton, handscoen, and observation sheets. This research was carried out in the work area of the Ponre Health Center and has received approval from research ethics with the number 000234/KEP Stikes Panrita Husada Bulukumba/2024. The analysis used the SPSS 22 application to determine the effect of guava leaf decoction on changes in blood glucose levels in patients with diabetes mellitus using an unpaired T-test.

3. RESULTS

This study was conducted in April-May 2024 in the Ponre Health Center area with a sample of 70 people divided into two groups: the intervention and the control groups. The results are as follows:

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The results include the characteristics of each respondent, consisting of age, gender, and occupation. The results are as follows:

Table 1: *Respondent Characteristics Based on Age, Gender, and Occupation In Patients With Diabetes Mellitus*

Respondent Criteria	Intervention Groups		Control Group	
	n	%	n	%
Age:				
Pre-Elderly	25	71,4	25	71,4
Elderly	10	28,6	10	28,6
Gender:				
Man	6	17,1	5	14,3
Woman	29	82,9	30	85,7
Work:				
Farmer	4	11,4	4	11,4
Self-employed	2	5,7	1	2,9
Housewife	29	82,9	30	85,7
Total	35	100	35	100

Based on Table 1, pre-elderly (25, 71.4%) were the age characteristics most prevalent in the intervention group. Gender characteristics: 6 were male (17.1%) and 29 were female (82.9%). The occupational characteristics were as follows: housewives were 29 (82.9%), farmers were 4 (11.4%), and self-employed were 2 (5.7%). The characteristics of the respondents in the control group were 25 people in pre-elderly (71.4%) and 10 people in the elderly (28.6%). The sex characteristics were 5 males (14.3%) and 30 females (85.7%). Most working respondents were housewives (30 respondents, 85.7%). The rest were farmers (4 respondents, 11.4%) and self-employed people (1 respondent, 2.9%).

3.1 Univariate Analysis

Univariate analysis was carried out by tabulating two variables to determine the difference in results before and after the intervention. The univariate results in this study are as follows:

3.1.1 Blood Glucose Before and After Administration of Guava Leaf (psidium guajava leaf) Decoction Water in the Intervention Group

***Table 2**: Distribution of Blood Glucose Before and After Administration of Guava Leaf Boiled Water In the Intervention Group*

Blood Sugar	Minimum	Maximum	Mean
Pretest Intervenes	217	326	257.06
Posttest Interventions	135	252	176,26

Table 2 shows that blood glucose before the administration of guava leaf decoction (psidium guajava leaf) had a minimum value of 217 mg/dL and a maximum value of 326 mg/dL, with a mean of 257.06 mg/dL. In comparison, the blood glucose level after the intervention had a minimum value of 135 mg/dL and a maximum value of 252 mg/dL, with a mean of 176.26 mg/dL.

3.1.2 Blood Glucose Before and After in the Control Group

***Table 3:** Distribution of Blood Glucose Before and After in the Control Group*

Blood Sugar	Minimum	Maximum	Mean
Pretest Control	200	235	212,31
Posttest Control	130	257	215,57

Table 3 shows that the blood glucose results in the control group had a minimum value of 200 mg/dL and a maximum value of 235 mg/dL, with a mean value of 212.31 mg/dL in pre-intervention. Meanwhile, the minimum value was 130 mg/dL, and the maximum was 257 mg/dl, with a mean value of 215.57 mg/dL after the intervention.

3.2 Bivariate Analysis

The bivariate analysis aims to identify the relationship between the free variable and the bound variable through cross-tabulation between the two variables. The results of the bivariate analysis in this study are as follows:

3.2.1 Differences in Blood Glucose in the Intervention Group and Control Group

***Table 4**: Analysis of Blood Glucose Differences in the Intervention Group and Control Group*

Blood Glucose	N	Group	Mean	Difference in Value ρ
Intervened	35	Post Test	176,26	6,976 0,000
Control	35	Post Test	207,57	

Table 4 illustrates the effect of guava leaf decoction on patients with diabetes mellitus. The average glucose in the intervention group after being

given guava leaf decoction water was 176.26 mg/dL, and in the control group was 207.57 mg/dL, with a difference of 6.976. The results of the unpaired T-test had a *ρ*-value = 0.00 (*ρ<0.05)*. It can be concluded that giving guava leaf decoction influenced the changes in the blood glucose levels of people with diabetes mellitus.

Based on the result, there was a decrease in blood glucose levels before and after the intervention. Guava leaves are plants that have benefits in increasing the activity of the pancreatic glands, which have other properties that can facilitate blood circulation and help increase pancreatic activity in the treatment of diabetes mellitus [15]. Guava leaves have catechins, epitakein, naringenin, and kaemferol. In addition, other contents in guava leaves are calcium, tannins, guavinosides A and B [16]. Guava leaves have been widely used as ethnomedical for diabetes management. The flavonoid and polysaccharide content in guava leaves has been widely used for antidiabetic treatment. Flavonoids from guava leaf extract may lead to significant improvements in pancreatic β cell function and hepatocyte morphology [17].

According to Buheli and Ratna [13], the cause of decreased blood glucose levels is the content of guava leaves, which are tannins and calcium. Tannins function as filtering agents that can reduce the consumption of food juices and slow down the absorption of blood sugar, which prevents excessive increases in blood sugar [18]. In addition, tannins act as alpha-glucosidase inhibitors that work to inhibit the absorption of blood glucose after meals, thereby reducing the risk of hyperglycemia after meals [19].

The calcium content in guava leaves can stimulate insulin production by pancreatic β cells. In addition, calcium can improve blood circulation and restore the physiological function of the pancreas, which can be used to treat diabetes mellitus [11]. In addition to the chemical content in the form of tannins and calcium, guava leaves have content in the form of phytochemicals with hypoglycemic properties, such as flavonoids, phenolic acids, and triterpenes that can increase glucose absorption through hepatocytes, which in turn can contribute to the reduction of hyperglycemia in diabetic patients [20].

In this study, there was a decrease in blood glucose levels because guava leaves have great properties, such as anti-diabetics, which have a lot of content in the form of tannins and calcium, which function to prevent hyperglycemia and help restore pancreatic function. The decoction of young guava leaves is consumed for 14 days at a dose of 250 ml consumed in the afternoon. In addition, the decrease in blood sugar levels was caused by a good stress management pattern in the intervention group, which could increase insulin sensitivity. Respondents also conveyed that dietary arrangements can be improved by reducing excessive carbohydrate consumption; the type of carbohydrate consumed is tubers and corn. Respondents also have enough activity, which can affect the decrease in blood glucose levels because the glucose stored in the body's muscles will react by disintegrating and producing energy, resulting in reduced stored glucose.

The same research results are conducted by Fitriana and Putradana [19], with the intervention of guava leaf decoction and the results of the respondents' blood glucose levels in the poor category (before the intervention). After the intervention, most respondents were in the category of medium blood glucose

levels. So, there is an effect of giving guava leaf boiled water on changes in blood glucose levels of people with type II diabetes and obesity in the working area of the Jatibaru Health Center, Bima City. Likewise, in a study consisting of 37 respondents with the intervention of guava leaf decoction water with a dose of 250 ml given 2 times a day for 7 days, the average value of blood glucose levels before the administration of guava leaf decoction water intervention was 270.19 mg/dL and after the administration of the intervention was 173.14 mg/dL., it was concluded that there was a decrease in blood glucose levels in patients with diabetes mellitus before and after the administration of guava leaf decoction water in work area of Gorontalo South City Health Center [13].

In the control group, after being given education about diabetes mellitus, it was found that the median blood glucose level increased by 3 mg/dL because only education was given about diabetes mellitus in general, and respondents said that stress management was still not good. Stress conditions cause the body to produce toxic hormones. If stress is prolonged, it will cause the content of toxins in the body to increase, resulting in disturbed insulin sensitivity, which can cause hyperglycemia. Meanwhile, the female sex also affects the increase in glucose levels because the level of the hormone estrogen in women increases, which leads to insulin resuscitation. In addition, age in the pre-elderly category in the age range of 45-65 and above also affects the increase in blood glucose because insulin sensitivity has decreased, and the type of work can increase blood glucose levels.

Genetic factors have an essential role in the etiology of diabetes. The increasing prevalence of diabetes in recent decades is attributed to internal factors such as stress and external factors such as poor diet and low physical activity. In recent years, the psychological aspect has become a very significant factor in causing diabetes mellitus to cause an increase in blood glucose levels [21]. Based on the data of respondents in the control group, most respondents' jobs were IRT (housewives). IRT will focus on household chores that increase insulin and blood sugar because IRT work can be categorized as light activity. In addition, the female sex also affects glucose levels because the level of the hormone estrogen in women increases, which causes insulin resistance. Blood glucose levels increase when the insulin produced by the pancreas is insufficient, so it cannot maintain the body's blood sugar stability. The purpose of the hormone insulin is to regulate the concentration of carbohydrates in the blood, which is known as glucose. This concentration of carbohydrates will be distributed through regular pancreatic activity or adequate insulin secretion in the body [22].

4. CONCLUSIONS

The average blood glucose level before being given guava leaf decoction water in people with diabetes mellitus was obtained with an average blood glucose level of 257.06 mg/dl. In comparison, the local glucose level after being given guava leaf decoction water in patients with diabetes mellitus was obtained with an average blood glucose level of 176.26 mg/dL, so it can be concluded that there is an effect of giving guava leaf decoction *water (Psidium Guajava Leaf)* on changes in blood glucose levels in people with diabetes mellitus.

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6. REFERENSI

[1] S. A. Antar *et al.*, “Diabetes mellitus: Classification, mediators, and complications; A gate to identify potential targets for the development of new effective treatments,” *Biomed. Pharmacother.*, vol. 168, p. 115734, 2023, doi: 10.1016/j.biopha.2023.115734.

[2] E. W. Gregg *et al.*, “Improving health outcomes of people with diabetes: target setting for the WHO Global Diabetes Compact,” *Lancet*, vol. 401, no. 10384, pp. 1302–1312, 2023.

[3] WHO (World Health Organisation), “Advisory Group on Diabetes,” no. December, pp. 1–21, 2023.

[4] IDF, “Diabetes around the world,” *Curr. status Prev. Treat. Diabet. Complicat. Proc. Third Int. Symp. Treat. Diabetes Mellitus. ICS821*, pp. 116–122, 2021.

[5] Kemenkes, “Riskendas 2018,” *Lap. Nas. Riskesndas 2018*, vol. 44, no. 8, pp. 181–222, 2018.

[6] N. Sitorus, O. Suriyani, and I. yunita S. Putri, *Laporan Akhir Penelitian Risbinkes Determinan Kualitas Hidup Penderita Diabetes Melitus Tipe 2 di Kota Bogor Tahun 2018No Title*. Jakarta: Puslitbang Upaya Kesehatan Masyarakat, 2018.

[7] F. Sijabat, R. Siregar, and T. Sitanggang, “Pemberian Jus Buah Naga Merah Pada LansiaYang Menderita DM Tipe 2 Di Puskesmas Darussalam,” *J. Abdimas Mutiara*, vol. 3, no. 1, p. 297, 2022.

[8] M. S. Hutabarat and H. Sinaga, “PENINGKATAN PEMAHAMAN MASYARATAKAT TENTANG PENYAKIT DIABETES MELLITUS (KENCING MANIS) DAN PENGOBATANNYA PADA MASYARAKAT RT 01 RW 01 DAN RT 07 RW 02 KELURAHAN SUKAJAYA PALEMBANG Mustika,” *J. Pengabdi. Ilmu Kesehat.*, vol. 2, no. 2, pp. 22–27, 2022.

[9] A. B. Tombong and A. N. Amin, “Long-Standing Type-2 Diabetes Mellitus Is Related to Neuropathy Incidence: A Cross Sectional Study,” *Compr. Heal. Care*, vol. 5, no. 1, pp. 32–43, 2021.

[10] S. A. Mukaromah and C. Chanif, “Penurunan kadar glukosa darah pasien diabetes melitus tipe 2 menggunakan terapi dzikir,” *Ners Muda*, vol. 2, no. 3, p. 141, 2021, doi: 10.26714/nm.v2i3.8245.

[11] R. Hidayati and A. Cumayunaro, “The Effect Of Giving Jambu Seed Leaves Boiled Water On Blood Glucose Levels In Diabetes Mellitus Type 2 n Kubu Village in,” *J. Sci. Res. Dev.*, vol. 2, no. 1, pp. 1–6, 2020.

[12] L.-R. Jiang, Y. Qin, J.-L. Nong, and A. Hui, “Network pharmacology analysis of pharmacological mechanisms underlying the anti-type 2 diabetes mellitus effect of guava leaf,” *Arab. J. Chem.*, pp. 1–16, 2021.

[13] K. Buheli and R. Ratna, “Pemberian Air Rebusan Daun Jambu Biji Terhadap Kadar Glukosa Darah Penderita Diabetes Melitus,” *Jambura Heal. Sport J.*, vol. 3, no. 1, pp. 1–10, 2021, doi: 10.37311/jhsj.v3i1.9873.

[14] M. Shukla, “Anti-Diabetic Property of Catharanthus roseusleaves and Psidium

guajava Leaves," *J. Adv. Res. Ayurveda, Yoga, Unani, Sidhha Homeopath.*, vol. 07, no. 1&2, pp. 1–5, 2020, doi: 10.24321/2394.6547.202001.

[15] P. Marantika, Sudirto, and F. D. Puspasari, "PEMBERIAN AIR REBUSAN DAUN JAMBU BIJI (TANIN) TERHADAP KADAR GLUKOSA DARAH SEWAKTU PENDERITA DIABETES MELITUS TIPE II," *Sentani Nurs. J.*, vol. 6, pp. 11–20, 2023.

[16] A. F. Gunata, "Potensi daun jambu biji sebagai agent antidiabetik tradisional," *J. Penelit. Perawat Prof. Vol. 3 Nomor 1 e-ISSN 2715-6885; p-ISSN 2714-9757*, vol. 1, no. November, pp. 89–94, 2021.

[17] M. Kumar *et al.*, "Guava (Psidium guajava L .) Leaves : Nutritional Composition," *Foods*, vol. 10, no. 752, pp. 1–20, 2021.

[18] W. Susanti Abdulkadir, E. Nurrhohwinta Djuwarno, and S. A. Damiti, "Uji Efektivitas Ekstrak Daun Jambu Biji (Psidium guajava) dalam Menurunkan Kadar Gula Darah Mencit (Mus musculus)," *J. Syifa Sci. Clin. Res.*, vol. 6, no. 1, pp. 1–8, 2024, doi: 10.37311/jsscr.v6i1.21376.

[19] D. Fithriana, A. Putradana, and M. Mukhlishah, "Pengaruh Pemberian Air Rebusan Daun Jambu Biji (Psidium Guajava Leaf) Terhadap Perubahan Kadar Glukosa Darah Penderita Dm Tipe Ii Dengan Obesitas Di Wilayah Kerja Puskesmas Jatibaru Kota Bima," *JISIP (Jurnal Ilmu Sos. dan Pendidikan)*, vol. 5, no. 1, 2021, doi: 10.36312/jisip.v5i1.1769.

[20] Q. Yang *et al.*, "Guava leaf extract attenuates insulin resistance via the PI3K/AKT signaling pathway in a type 2 diabetic," *Diabetes, Metab. Syndr. Obes.*, vol. 13, pp. 713–718, 2020, doi: 10.2147/DMSO.S231979.

[21] M. Z. Zeinabeh, A. Atefeh, G. H. P. Masumeh, D. Tania, S. Mojgan, and A. Katayoun, "The Effect of Mindfulness-Based Stress Reduction Counseling on Blood Glucose and Perceived Stress in Women with Gestational Diabetes," *Rev. Bras. Ginecol. e Obstet.*, vol. 45, no. 9, pp. E517–E523, 2022, doi: 10.1055/s-0043-1775810.

[22] L. Afiyati and T. S. Widyaningsih, "Penerapan Pemberian Air Rebusan Daun Jambu Biji Untuk Mengatasi Ketidakstabilan Kadar Glukosa Darah Pada Pasien Diabetes Melitus Tipe 2 Application Of Water Decoction Of Guava Leaves To Overcome The Instability Of Blood Glucose Levels In Patients With Typ," *Pros. Semin. Nas. Hasil-Hasil Penelit. dan Pengabdi. Masy.*, vol. 5, no. 1, pp. 104–107, 2023.