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PENGARUH PEMBERIAN EKSTRAK DAUN SALAM (*EUGENIA POLYANTHA*)TERHADAP KADAR GLUKOSA DARAH PUASA PADA PESERTA PROLANIS DIABETES MELLITUS TIPE 2 DI KLINIK IMAN

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ABSTRAK
Diabetes melitus merupakan gangguan metabolik kronis yang ditandai dengan peningkatan kadar gula darah atau hiperglikemiaakivagangguan sekresi insulin dan resistensi dari insulin atau kadar gula darah 2 jam setelah makan ≥200 mg/dl, kadar gula darah setelah puasa ≥ 126 mg/dl. Penatalaksanaan enyakit ini bersifat kompleks dan tidak jarang banyak pasien yang kurang patuh terhadap pengobatan. Daun salam merupakan tanaman yang dapat dimanfaatkan sebagai obat, khasiatnya menurunkan kadar gula darah. Penelitian ini bertujuan untuk melihat pengaruh pemberian ekstrak daun salam (*Eugenia polyantha*) terhadap kadar glukosa darah puasa pada peserta prolanis diabetes mellitus tipe 2 di klinik iman. Penelitian ini menggunakan studi eksperimental dengan rancangan penelitian yang digunakan adalah non-equivalent control grup pretest-postest design dimana sampel yang digunakan sebanyak 34 sampel yang dibagi atas kelompok eksperimen dan kelompok kontrol. Sampel merupakan seluruh peserta Prolanis Diabetes Mellitus tipe 2 di Klinik Iman Kecamatan Medan Labuhan Kota Medan. Hasil penelitian menunjukkan nilai rata-rata penurunan kadar glukosa darah puasa pretest 209,1765± 43,86946 dan nilai postest 112,6471±37,38640 (p value <0,003). Penelitian ini menunjukkan terdapat pengaruh ekstrak daun salam (Eugenia polyantha) terhadap penurunan kadar glukosa darah puasa pada peserta prolanis diabetes mellitus tipe 2 di klinik iman.

Kata kunci **:** daun salam, diabetes mellitus tipe 2, glukosa darah puasa

ABSTRACT
Diabetes mellitus is a chronic metabolic disorder characterized by increased blood sugar levels or hyperglycemia due to impaired insulin secretion and insulin resistance or blood sugar levels 2 hours after eating ≥200 mg/dl, blood sugar levels after fasting ≥ 126 mg/dl. The management of this disease is complex and it is not uncommon for many patients to be less compliant with medication. Bay leaf is a plant that can be used as a medicine, its properties lower blood sugar levels. This study aims to find out the effect of giving bay leaf extract (Eugenia polyantha) on fasting blood glucose levels in type 2 diabetes patient in PROLANIS program at Iman clinic. This study used an experimental study with a non-equivalent control group pretest-posttest design. The sample was 34 diabetes patient in PROLANIS program at Iman clinic Medan Labuhan District, Medan City which were divided into the experimental group and the control group. The results showed that the average decrease in fasting blood glucose levels was 209.1765 ± 43.86946 pretest and posttest 112.6471 ± 37.38640 (p value <0.003). This study showed that there was an effect of bay leaf extract (Eugenia polyantha) on decreasing fasting blood glucose levels in type 2 diabetes mellitus in PROLANIS program at Iman clinic.

Keywords ***:*** *bay leaf, diabetes mellitus type 2, fasting blood glucose*

INTRODUCTION

The body obtains glucose, a monosaccharide sugar, from meals and uses it as its primary energy source. The fundamental glucose chemical structure is C6H12O6. Several isomers and monosaccharides of glucose, such as galactose and fructose, are breakdown products of glucose. For absorption and metabolism, complex sugars must be broken down by the body into glucose, fructose, and galactose. The liver and kidneys can produce glucose through a

process known as gluconeogenesis in addition to getting it from diet. Glycogenolysis, in particular, allows the liver and muscles to release glucose from glycogen stores. Normal blood glucose levels range between 4-6 mmol, or between 72 and 108 mg/dl, and are measured in mmol/L or mg/dl. Pre-diabetes fasting blood glucose levels are stated to be between 5.6 and 6.9 mmol/L, or between 100 and 125 mg/dl, while blood sugar levels two hours after eating are said to be between 7.8 and 11.0 mmol/L, or between 140 and 199 mg/dl. While the patient's fasting blood glucose level was 126 mg/dl and blood glucose levels two hours after eating were 200 mg/dl, the patient is diagnosed with diabetes.

A chronic metabolic illness called diabetes mellitus (DM) is defined by elevated blood glucose levels, or hyperglycemia, which impair insulin secretion and lead to insulin resistance. Clinical signs of DM include excessive drinking (polydipsia), excessive urination (polyuria), excessive eating (polyphagia), rapid weight loss, and ocular issues such blurred vision.

The prevalence of type 2 DM is rising, which is a significant problem for global health care. The International Diabetes Federation (2019) forecasts that the number of people with type 2 diabetes in Indonesian territory would rise from 10.7 million in 2019 to 13.7 million in 2030. According to the 2018 Basic Health Research report (RISKESDAS), 2% of people with type 2 diabetes who were diagnosed by a clinician before the age of 15 have the disease. The age ranges 55–64 or 65–74 have the highest prevalence of type 2 DM, respectively. North Sumatra had a 1.8% prevalence of type 2 DM, according to RISKESDAS research from 2013.

Studies on traditional herbal plants, like those on bay leaves, have been used to control blood glucose levels in patients with Diabetes Mellitus 2. The *Myrtaceae* family of plants includes bay leaves, which have been utilized for essential oils, food flavoring, and traditional medicine for the past 1000 years. Bay leaves (*Eugenia polyantha*) include a variety of secondary metabolites, like tannins, flavones, flavonoids, alkaloids, eugenol, linalool, methyl chavicol, and anthocyanins. They also contain lactones, carbohydrates and lactosides. Bay leaves (*Eugenia polyantha*) are used to boost immunity and have biological properties such as wound healing, antioxidant, antibacterial, antiviral, immunostimulant, anticholinergic, antifungal, insect repellent, anticonvulsant, antimutagenic, and analgesic and anti-inflammatory. The components in bay leaf extract (*Eugenia polyantha*) have the effect of preventing free radicals, and because pancreatic beta cells can be damaged by the extract (*Eugenia polyantha*), the extract can prevent diabetogenic.

Flavanoids, in accordance with Brahmachari (2022), directly operate on pancreatic beta cells to cause cascade activity, cAMP signals, and the release of glucose-sensitive insulin. Similar to sulfonylurea anti-diabetics, saponins function by blocking K-ATPase channels and preventing potassium ions from leaving the cell. While TNF alpha (Tumor Necrosis Factor) is blocked by triterpenoids in pancreatic tissue to lower insulin levels. Alkaloids reduce blood glucose levels by acting as insulin secretions. In the meanwhile, tannins will help DM patients control their blood glucose levels by reducing free radicals and reducing enhanced oxidative stress.

This is consistent with research done by Ishack (2020), who divided a sample of about 40 persons with diabetes into two groups and gave the first group andrographis leaf extract and the second group 600 mg of bay leaf extract daily for a week. As a result of receiving the herbal medication, between 70 and 80 percent of each group's 20 respondents observed lower fasting blood glucose levels (140 mg/dL) than they had previously. It is evident that bay leaf may be beneficial for those with type 2 diabetes.

Giving bay leaf extract at a dose of 600 mg is considered to show more accurate results than boiled bay leaves which have many confounding factors (different processing methods and ingredients due to the addition of ethanol), so based on this research background researchers are interested in examining the efficacy of giving bay leaf extract (*Eugenia polyantha*) with a dose of 3x200 mg in PROLANIS participants at the 2022 Iman Clinic. This

study aims to determine whether or not there is an effect of giving bay leaf extract on fasting blood glucose levels of type 2 diabetes mellitus patient in PROLANIS program at the Iman Clinic.

METHODS

This research is an experimental study with a non-equivalent control group pretest- osttest design which was conducted at the Iman Clinic Kecamatan Medan Labuhan, Kota Medan from August to December 2022. The population of this study is 34 Diabetes Mellitus type 2 in PROLANIS program at the Iman Clinic, Medan Labuhan District, Medan City. The sample in this study was that the population that met the inclusion criteria were both willing to be respondents and patient who use oral anti-diabetic drugs. Exclusion criteria for this study were patients who were allergic to bay leaf, patients who did not routinely drink bay leaf extract and patients who used insulin therapy. This study used fasting blood glucose samples that taken directly through a glucometer (Alutocheck) at and a data sheets which contained respondents' name, age, gender, and results of measurement of blood fasting glucose concentration before and after therapy with bay leaf extract. The research procedure was initiated by measuring fasting blood glucose levels twice using a blood glucose level check (Alutocheck). To avoid doubts, fasting blood glucose levels were checked by the researcher. The determination of the experimental and control groups will be determined by randomization using a computer, then each sample will be coded. The treatment sample will be given bay leaf extract at a dose of 3x200 mg/day and the control group will be given placebo for 1 month. After 1 month, the sample will be re-examined for fasting glucose levels. Researchers use bay leaf extract in the form of capsules that have been made from the company PT. Unimax Power which has been standardized by BPOM. This capsules contains Eugenia polyantha extract 200 mg and is taken 3 x 1 capsule a day. Data analysis included demographic data and fasting blood glucose levels before and after administration of bay leaf extract. Analysis of the relationship between data was carried out by paired t test or Wilcoxon test on data that was not normally distributed.

RESULTS

Table 1. Characteristics by Gender of Respondents

Variable	Group	Categories	N	%
Gender	Control	Female	11	64,7
		Male	6	35,3
	Experiment	Female	10	58,8
		Male	7	41,2

Based on table 1. Most of the research respondents in the control group were female or as many as 11 people (64.7%) in the experimental group as many as 10 people (58.8%) were female.

Table 2. Characteristics by Age of Respondents

Age (years old)	Experiment group		Control Group	
	N	%	N	%
49 - 57	4	23,5	2	11,8
58 - 65	3	17,6	5	29,4
66 – 72	6	35,3	4	23,5
73 - 78	4	23,5	6	35,3
Total	17	100,0	17	100,0

Table 2 shows that in the elderly at the Iman Clinic in Medan there were an experimental group at the age of 49-57 years as many as 4 people (23.3%), aged 58-65 years as many as 3 people (17.6%), aged 66-72 years as many as 6 people (35.3) and at the age of 73-78 years as many as 4 people (23.5%). The control group consisted of 2 people (11.8%) for the elderly at the Medan Faith Clinic, aged 49-57 years, 6 people for 58-65 years (17.6%), 5 people for 66-72 years (29, 4%) and at the age of 73-78 years as many as 6 people (35.3%).

Table 3. The Average Value of Blood Glucose Levels of Respondents Before and After Treatment in The Control and Treatment Groups

Group	*Pre-Test*	*Post-Test*
	Mean* ± *SD	***Mean* ± SD**
Control	232,9412± 69,23553	232,7059± 57,21534
Experiment	209,1765± 43,86946	112,6471± 37,38640

Table 3 shows the average results of fasting blood sugar levels in elderly patients at the Medan Iman Clinic, in patients with the pre-test control group, the average blood sugar level is 232.9 mg/dL and the post-test control group is 232, 7 mg/dL. The average fasting blood sugar level in patients with the pre-test experimental group obtained an average blood sugar level of 209.1 mg/dL and the post-test experimental group was 112.6 mg/dL.

Table 4. The Effect of Bay Leaf Extract on Blood Fasting Glucose Based on Gender

Gender	Blood Fasting Glucose				P
	Control		Experiment		
	Mean ± SD		Mean ± SD		
	Pre	Post	Pre	Post	
Male	230,83 ± 71,44	220,33 ± 52,03	204,85 ± 52,7	92 ± 5,03	0,011
Female	234,09 ± 71,51	203,09 ± 40,12	252,2000 ± 54,23	128,1 ± 131	0,008

Table 4 shows fasting blood glucose levels in the Iman Medan clinic sample based on the sample's gender. With an average fasting blood glucose value in the male sex in the experimental group of 204.8 mg/dl to 92 mg/dl. Whereas in the female sex, fasting blood glucose levels before 252 mg/dl became 128.1 mg/dl.

Table 5. The Effect of Bay Leaf Extract on Blood Fasting Glucose Based on Age

Age (years old)	Blood Fasting Glucose				P
	Control		Experiment		
	Mean		Mean		
	Pre	Post	Pre	Post	
49 - 57	152,0	149,5	233,3	94	0,012
58 - 65	242,4	221,4	191	91	0,752
66 – 72	296	241	262,2	117,5	0,581
73 - 78	210	297	274,8	145,2	0,433

In table 5, the Wilcoxon test was carried out with age 49-57 years p=0.012 (p<0.05), age 58-65 years p=0.752(p>0.05), age 66-72 years p=0.581 (p >0.05) at the age of 73-78 years p=0.433 (p>0.05). The age of 49-57 years has the greatest influence on giving bay leaves in lowering fasting blood glucose in patients at the Iman Clinic.

Table 6. The Effect of Bay Leaf Extract in Lowering Fasting Blood Glucose Levels

Group	*Pre-Test*	*Post-Test*	P
	***Mean* ± SD**	***Mean* ± SD**	
Plaebo	232,9412± 69,23553	232,7059± 57,21534	0,003
Experiment	209,1765± 43,86946	112,6471± 37,38640	

The results of Table 6 show the results of statistical tests with a value of P = 0.003 (P <0.05) so that there is an effect of the administration of bay leaf extract on the decrease in glucose concentration in patients with type 2 diabetes mellitus at the Iman Clinic in Medan.

DISCUSSION

The results of this study were based on the gender of the control group which was the most likely, namely the gender of 11 women (64.7%) in the experimental group which had the most gender of 10 women (58.8%). With the average value of fasting blood glucose in the male of the experimental group 204.8 mg/dl before being given bay leaf extract, after being given bay leaf extract it became 92 mg/dl. While in female the fasting blood glucose value before being given bay leaf extract is 252 mg/dl and after being given the leaf extract the fasting blood glucose value is 128.1 mg/dl.

Numerous factors, including the respondent's gender, might cause hyperglycemia. Compared to men, women have more masculine pattern inclinations. In comparison to male, female tend to experience more stress, more frequent mild malnutrition, less fertility, and lactation. According to studies, males do not enjoy eating side dishes, whereas the majority of women (52.9%) frequently eat light snacks. This behavior is consistent with that finding. In additionparents have a propensity to have various traits, which can also raise the responders' blood glucose levels. Previous research on respondents before consuming bay leaf powder showed a hyperglycemic condition when examining glucose during fasting.

Age factors affected the glucose in the hyperglycemic responses. In contrast to individuals who were older and tended to have a loss in the ability of their organs to be active, respondents between the ages of 18 and 59 were still productive. It is a trait of human nature that the aging process is a natural condition that is inherently impoverished. Blood glucose levels tend to rise as people get older.

The activities that are done can also have an impact on glucose levels in T2DM patients. Low activity naturally has an effect that results in a small amount of energy being required by the body throughout the metabolism process. In people who are of working age, moderate exertion will alter how well their blood sugar is used. It has ran out for activities, so modest exertion won't result in excessive blood glucose levels. Work-related activities like thinking and movement require energy in addition to other forms. The results of this research are in accordance with the research of Makuta Azizah (2021) a theory which proves that actives are one of the factors for glucose levels in the blood.

The results of this study showed that the normal glucose balance in the initial blood glucose at the Iman Clinic, with the pre-test control group, the control group post-test was 152.3 mg/dL. mg/dL. The average value of fasting blood glucose levels in patients with the pre-test experimental group was found to be 143.1 mg/dL in the post-test experimental group to 142.5 mg/dL. This research is in accordance with research conducted by Novitasari (2017) with the method of giving bay leaf infusions for 2 times and 6 days consumed in the morning and evening at approximately 300 ml/day showing the average blood glucose level when respondents with diabetes reached 16%, which is about 87.8 mg/dl for 6 days.

One of herbal treatment called bay leaf helps lower the blood's glucose level. This is consistent with the study's findings, which showed that eating cooked bay leaves reduced the respondents' overall glucose content. Secondary metabolites found in bay leaf extract include phenolics, salponins (triterpenoids), terpenoids, alkaloids, glycosides, sesquiterpenes, citral, lalkton, and altsiri oil (salamol and eugenol). Flavonoids (quercetin, quercitrin, and myricetin) are also present. Bay leaf extract contains flalvonoid glycosidal substances that function as scavengers of hydroxyl free radicals, which may damage pancreatic beta-cells.

By acting as α-glucosidalse inhibitors, flavonoids are substances that can lower blood

sugar levels. By blocking both the peroxidation reaction and the transfer of electrons, flavanoids are known to inhibit raldikall free of both reactive oxygen species (ROS) and reactive nitrogen species (RNS). By boosting the activator of the signaling cascade cAlMP (cyclic Aldenosine Monophosphate), flavonoids can increase the release of glucose-sensitized insulin from the pancreatic -cells.

In addition, because it can promote glucose absorption through GLUT4 regulation, α-glucosidase is also able to block the enzymes maltase and β-amylase. Through hydroxyl and -ring substitution, flavonoids exert inhibitory effects on the α-gucosidease enzyme that are reduced by half. Acarbose, which is usually used as a medication for the prevention of diabetes mellitus, works on the basis of inhibition, delaying the hydrolysis of carbohydrates and also blocking the metabolism of sucrosal, and disaccharides in the absorption of glucose. Tannins are also known to increase the metabolism of fat and glucose, preventing the accumulation of these two sources of energy from becoming acidic. Tannins have antioxidant activities and hypoglycemic activities, namely by increasing glycogenesis. Besides that, talc also functions as an astringent or inhibitory substance which is able to shrink the intestinal epithelial membrane so that it reduces the absorption of food extracts and in turn inhibits glucose absorption and the rate of glucose increase is not too high.

Salponin is crucial for the establishment of Ca2+ homeostasis and intracellular Ca2+ concentration. Similar to oral sulfonylureal anti-diabetic medications, the process involves blocking K-ATPase channels to stop potassium from leaving cells. The Ca2+-ATPase channel opens, the pancreatic beta cell membrane depolarizes, and calcium ions enter the cytoplasm as a result. Finally, by activating calcium enzymes in the cells, these calcium ions lead to the exocytosis of insulin from vesicles and its secretion outside of the cells.

Terpenoids are a class of substances that imitate the action of insulin as an insulin sensitizer to improve glucose absorption, which may lead to a combined drop in blood glucose levels. Triterpenoids that attach to the insulin receptor and function similarly to insulin. Triterpenoids are unable to stop the pancreatic tissue from producing TNF-α (Tumor Necrosis Factor).[14] The imidazole ring alkaloids stimulate insulin secretion, which lowers blood glucose levels and improves glucose tolerance. Tannins have the ability to lower glucose concentration in diabetics, allowing them to control their glucose balance.

Another substance found in bay leaf extract that is effective as an anti-diabetic is quercetin. Quercetin works by decreasing lipid peroxidation, promoting the translocation of GLUT4 and its excretion in skeletal muscles, reversing oxidative stress and inflammation markers in adipose tissue like Nrf2, heme oxygenase-1, and NFkB, and upregulating antioxidant enzymes like SOD, GPX, and CAl In addition to flavonoids, bay leaves contain several derivatives that make them efficient as an antidiabetic and have been shown to be superior than glibenclamide in this regard.

The findings of the study by Rudi et al. (2017) demonstrated the association between age, heredity, gender, and food and blood glucose and glucose levels. Generally speaking, the age factor is strongly tied to physiological conditions where, as you age, your body's capabilities will decline, including the functioning of the insulin hormone, which will influence its ability to perform properly. However, there are other risk factors as well, such as gender, which suggests that a higher proportion of women than men develop diabetes mellitus because women have a higher proportion of body fat than males and are more likely to become obese.

CONCLUSION

After conducting research on the effect of bay leaf extract (*Eugenia Polyantha*) on blood fasting glucose level in PROLANIS patients at the Iman Clinic can be concluded that the results of the study were based on gender at the Imma Clinic, the gender of which was female

before being given bay leaf extract, the average value of fasting blood glucose levels was 252 mg/dl after being given the extract, the average value of glucose levels was 128 mg/dl. While the male gender before being given bay leaf extract, the average fasting blood glucose level was 204 mg/dl, after being given bay leaf extract, the average value of glucose in the blood glucose level was 92 mg/dl. The research results are based on age at the Faith Clinic which is more influential in reducing glucose concentration in pulses after being given bay leaf extract, namely age 49-57 years with a p value of 0.012 (p <0.05).

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