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The Effect Of Giving Purple Sweet Potato And Kepok Banana Talam Cake On Fasting Blood Glucose Levels Of Type 2 Diabetes Mellitus Patients

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ABSTRACT

Background: *The number of people with type 2 diabetes mellitus in Indonesia is increasing every year. One of the efforts to manage type 2 diabetes mellitus is providing medical nutrition therapy by consuming foods high in fiber and low glycemic load to control blood glucose levels. Food ingredients with relatively high fiber content and low glycemic index are purple sweet potatoes and kepok bananas as alternative healthy snacks for DM sufferers, namely purple sweet potato talam cake and kepok bananas as high-fiber snacks and low glycemic index.*

Research Methods: *This type of research is a quasi-experimental non-equivalent control group design with a pre-post test and a control group research design. The study's sample size was 38 people selected by systematic random sampling. The samples were divided into two groups, namely the control and treatment groups, by being given purple sweet potato talam cake and kapok banana once a day for seven consecutive days.*

Research Result: *Fasting blood glucose levels before and after the purple sweet potato talam cake and kepok banana study decreased by 35.94 mg/dl in the intervention group and 5.37 mg/dl in the control group.*

Conclusion: Purple sweet potato talam cake and kapok banana have an effect on fasting blood glucose levels in diabetes mellitus patients, with $p = 0.00$ ($p > 0.05$).

BACKGROUND

Diabetes mellitus is a non-communicable disease that is currently a global health threat (Perkeni, 2021). If effective action is not taken to address this problem, an estimated 643 million people (11.3% of the population) will experience Diabetes. This number is expected to increase to 783 million (12.2%) by 2045 (IDF, 2021). Based on the results of the Basic Health Research report (2018), in Indonesia, as many as 12 million people suffer from Type 2 DM.

The increasing number of DM sufferers is related to several factors. Changes can include eating habits, rest patterns, physical activity, and stress management. Factors that cannot be changed include age, gender, and family history of DM (Isnaini & Ratnasari, 2018).

One of the pillars of DM control is controlling blood sugar levels through food, in the form of consuming foods that are high in fiber and have a low glycemic index load. Foods rich in fiber are very beneficial for DM sufferers. The fiber contained in food can suppress the increase in postprandial hyperglycemia by delaying or slowing down the digestion and absorption of carbohydrates, which then increases the feeling of fullness as it appears from the results of weight loss (Ayu, Basuki, & Susilowati,

2020). This is reinforced by the research results (Maenasari & Soviana, 2019), which state that there is a relationship between fiber intake consumption and blood glucose levels in type II Diabetes Mellitus patients.

Examples of foods with high fiber content and low glycemic index are purple sweet potatoes and kepok bananas. One hundred grams of purple sweet potatoes contain a low glycemic index of 54 and a fiber content of 4.2 grams. Purple sweet potato extract has prebiotics and antioxidants that can lower blood glucose and protect body cells from the dangers of free radicals to minimize complications of DM. Kepok bananas are also fruits that contain high fiber with resistant starch; every 100 grams of bananas contain 5.7 grams of fiber and have a glycemic index of 43 or a low IG category (Suloi et al., 2020).

Based on research conducted by Gipyapuri, Susyani, & Terati (2020) on the provision of purple sweet potato pudding, which was carried out for 3 days on 30 people in the treatment group with a dose of 2 times a day, namely 4 cups (100 grams of purple sweet potato and 100 ml of soy milk), it showed an effect on reducing blood glucose levels with an average decrease of 53.3 mg/dl.

This is supported by research (Legi, Pascoal, Walalangi, and Umar, 2022) on the provision of purple sweet potato spring rolls. This study showed decreased blood glucose levels after giving two purple sweet potato spring rolls/day, each 50 g, for 7 days. The treatment group obtained an average decrease of 47 mg/dl, while the control group obtained an average decrease of 18 mg/dl.

Based on the description above, the researcher aims to make purple sweet potato talam cake and kepok banana to reduce fasting blood glucose levels in people with type 2 diabetes mellitus.

RESEARCH METHODS

The research method used is a Quasi-experimental study with a non-equivalent group design. This study was conducted in February 2024 in the Suela Health Center work area, East Lombok Regency, West Nusa Tenggara Province, to analyze the effect of giving talam cakes on fasting blood glucose levels in patients with type 2 diabetes.

This study has obtained research ethics approval from the Poltekkes Mataram Health Research Ethics Commission with number LB.01.03/6/402/2023, as well as a research permit application letter from Poltekkes Kemenkes Mataram and a research recommendation letter from Bappeda Lombok Timur. The intervention was 100 grams or two pieces of purple sweet potato talam cakes and kapok bananas, which were given for seven consecutive days, with the intervention time being in the afternoon, at 15.00-17.00 WITA.

The population that was the subject of the study were outpatients with diabetes mellitus at the Suela Health Center who met the research criteria. The sample size was 38 people, consisting of 19 treatment and 19 control groups.

The instruments and tools used were informed consent forms, questionnaires, 24-hour food recall forms, and anthropometric tools such as digital scales and microtones.

Data processing in this study used univariate analysis, which described each variable studied, such as age, gender, family history of disease, and nutritional status. Bivariate analysis was used to evaluate the effect of administering intervention products on fasting blood glucose levels in type 2 DM patients.

RESULTS

Characteristics of Research Subjects

Subject characteristic data in age, gender, family history of disease, nutritional status, and consumption of anti-diabetic drugs. Subject characteristics are presented in Table 1.

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Table 1. Distribution of Research Subject Characteristics

Characteristics	Intervension		Control		*P-value*
	n=10	%	n=10	%	
Age (Year)					
36-45	4	2,05	6	31,57	0.762
46-55	7	36,84	6	31,57	
56-65	8	42,1	7	36,84	
Gender					
Man	2	10,52	3	15,78	1.000
Woman	17	89,47	16	84,21	
Family history of illness					
Yes	4	21,05	3	15,78	0,676
No	15	78,94	16	84,21	
Drug Consumption					
Yes	19	100	19	100	1.000
No	0	0	0	0	
Nutritional Status					
Thin	3	15,78	1	5,26	0.816
Normal	7	36,84	9	47,36	
Overweight	3	15,78	2	10,52	
Obesitas I	4	21,05	5	26,31	
Obesitas II	2	10,52	2	10,52	

Table 1 shows that the results of statistical tests were (p>0.05), which means there were no significant differences in the characteristics of age groups, gender, family history of illness, drug consumption, and nutritional status.

Analysis Of Intake Data Before And During The Intervention

Table 2 presents an analysis of nutrient intake data (carbohydrates, fat, and fiber) before and during the intervention.

Table 2. Nutrient Intake Data (Carbohydrates, fat, and fiber)

Nutrient Intake Levels	Group			
	Intervension (n= 10)		Control (n=10)	
	Mean± SD	*p*	Mean±SD	*p*
Carbohydrate Intake				
Before	129,21±29,285	0.300[a]	136,74±29,684	0,333[b]
During	176,74±29,093		128,05±22,155	
Fat Intake				
Before	25,84±9,394	0.177[a]	31,74±15,999	0,615[a]
During	29,84±10,319		34,16±14,822	
Fiber Intake				
Before	7,95±12,903	0.007[a]	4,89±2,447	0,886[a]
During	9,26±2,941		5,21±3,765	

Note : *a = wilcoxon test, b = paired t-test*

Table 2 shows that there was no difference in carbohydrate intake in the control group before and during the intervention, with a value of p>0,05.

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The results of the difference in average fat intake in the two groups before and during the intervention, using the Wilcoxon test, show that there is no difference in fat intake between the two groups before and during the intervention, with a value of p>0.05.

The results of the difference in average fiber intake in the two groups before and during the intervention using the Wilcoxon test show a difference in fiber intake in the treatment group with a value of p<0,05. In contrast, in the control group, there was no difference in fiber intake, with a value of p>0,05.

Average Fasting Blood Glucose in Treatment Group and Control Group Before and After Intervention
A fasting blood glucose examination was performed twice, before and after the intervention. Fasting blood glucose values were obtained by direct measurement by medical laboratory personnel using a syringe. The blood sample was inserted into an EDTA tube and examined in the laboratory.

Table 3. Average Fasting Blood Glucose Levels in the Treatment Group and Control Group Before and After Intervention

Fasting Blood Glucose Levels (mg/dl)	Intervension (n=19) X±SD	Control (n=19) X±SD
Before	219,26±73,268	195,26±4,179
After	183,32±59,400	189,89±43,098
p-value	0,00[b]	0,117[a]

a: Paired t-test, b: Wilcoxon test

Table 3 shows a difference in blood sugar results before and after the intervention in the treatment group with a p-value <0.05. While in the control group, the test results obtained a p-value> 0.05, so there was no difference in blood sugar levels before and after the intervention in the control group.

Analysis of the Effect of Giving Purple Sweet Potato and Kepok Banana Talam Cake on Fasting Blood Glucose of Patients
Table 4 presents the results of the analysis of the effect of giving purple sweet potato talam cake and kapok banana on the fasting blood glucose of patients in the treatment group.

Table 4. The Effect of Giving Purple Sweet Potato and Kepok Banana Talam Cake on Fasting Blood Glucose

Fasting Blood Sugar Levels	mean ± SD	Δ Change	p
Δ Pre-Post Intervensi	35,95 ± 28,124		
Δ Pre-Post Control	5,37 ± 14,198	29,98 ± 13,926	0,000

Table 4 shows a difference in the fasting blood glucose results between the treatment group and the control group, with a p-value of 0.000. This means that purple sweet potato talam cake and kapok banana affect the fasting blood glucose of Diabetes mellitus patients.

DISCUSSION
Characteristics of Research Subjects
The research subjects were dominated by those in the 56-65 age range (42.1%). Age factors are closely related to physiological changes that occur with age. As a person gets older, body functions tend to decline. For example, the work of the insulin hormone becomes less effective, which can cause a significant increase in blood sugar levels. Degenerative diseases will also begin to be diagnosed. Physical activity and quality of life also deteriorate because physical or psychological weakness is disturbed (Arania et al., 2021).

The majority of this study were female, as much as 89.47%. According to (Komariah and Rahayu, 2020), women have a higher risk of developing Diabetes. According to researchers, women have a greater risk of developing type 2 diabetes mellitus compared to men. Monthly cycle syndrome (premenstrual

syndrome), post-distribution of body fat becomes easily accumulated due to the hormonal process, so women are at risk of developing type 2 diabetes mellitus (Komariah & Rahayu, 2020).

The standard category of 36.8% dominated the nutritional status of the subjects, and 21.05% of subjects had nutritional status. Obesity I. Obesity occurs when resistance production increases, interfering with insulin function and causing insulin resistance. This condition causes a decrease in the production of the hormone adiponectin, which is important for increasing insulin sensitivity and insulin effects. In addition, fat tissue can release fatty acids, which, if they accumulate abnormally in the muscles, can interfere with the work of insulin in the muscles. Weight gain and obesity play a significant role in increasing blood sugar levels, ultimately increasing the risk of DM (Sumarni, Nadia, Suryo, & Sudirman, 2023).

Family history of Diabetes is 21.4%. Line with research conducted by (Monica, Asrinawaty, and Hadi, 2020) shows that hereditary factors from families who have experienced DM have an influence and increase the risk of DM occurrence up to 5,000 times.

All subjects were taking anti-diabetic drugs. Commonly used therapy is metformin with glimepiride. This combination can reduce HbA1c by 0.8 - 1.5%. In addition, this combination can achieve a more significant reduction in HbA1c with a higher risk of hypoglycemia (Nur, Liza, & Ika, 2023).

Intake Data Before And During The Intervention

Carbohydrates are the body's primary energy source, including the brain and body tissues that need them as fuel. People with DM are advised to avoid foods that quickly convert into blood sugar, known as simple carbohydrates. These carbohydrates will be converted into glucose in the blood, causing rapid fluctuations in blood glucose levels, which can be dangerous for people with DM (Mahasanti, 2023).

Research (Purba & Monolimay, 2015) shows a relationship between fat intake and blood sugar levels, where increased fat intake can cause increased blood fat levels, which triggers the risk of DM. Fat intake is recommended to be <20% of total needs because fat also influences the absorption of fat-soluble vitamins.

High fiber consumption can reduce carbohydrate absorption, which can reduce insulin response. A high-fiber diet effectively manages DM because fiber slows down the digestion and absorption of carbohydrates, thereby reducing spikes in blood sugar levels. In addition, fiber can create a feeling of fullness, which can help with weight loss (Ayu et al., 2020).

Effect of Giving Purple Sweet Potato and Kepok Banana Talam Cake on Fasting Blood Glucose of Patients

The study's results showed that the average fasting blood glucose before the intervention in the treatment group was 219.26 mg/dl, while in the control group, it was 195.26 mg/dl. The average fasting blood glucose after the intervention in the treatment group was 183.32 mg/dl; in the control group, it was 189.89 mg/dl. The statistical test using the Wilcoxon test showed a difference in blood sugar results before and after the intervention in the treatment group with a value of $p < 0.05$. In the control group, a test was carried out using the Paired t-test. The test results obtained a $p > 0.05$, so there was no difference in blood sugar results before and after the intervention in the control group.

Furthermore, a difference test was carried out using the Mann-Whitney test to determine the effect of giving purple sweet potato talam cake and kepok banana on fasting blood glucose because the data was not normally distributed ($p < 0.05$). The results showed that the difference between fasting blood glucose in the treatment group and the control group was significantly different, with a p-value of 0.000, which means that the administration of purple sweet potato talam cake and kepok banana affected fasting blood glucose in diabetes mellitus patients.

These results are in line with research (Legi et al., 2022) that there is an effect of giving purple sweet potato spring rolls on significantly reducing fasting blood glucose levels by giving two purple sweet potato spring rolls (100 grams) for 7 days. Likewise with the results of research (Suhaema et al., 2019) by giving functional drinks made from kepok bananas and soybeans, there was a significant decrease in glucose levels by giving 330 ml for 14 days.

CONCLUSIONS

The treatment group's fasting blood glucose levels were affected by the addition of purple sweet potato talam cake and kapok banana.

RECOMMENDATION

Laboratory tests are needed to determine the nutritional content of carbohydrates, fat, and fiber in this talam cake product, and research on its shelf life is recommended.

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