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The Influence Of Brown Rice And Corn Rice On Blood Glucose Levels In People With Type 2 Diabetes Mellitus At Antang Health Center Makassar

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Abstract

In low- and middle-income countries, diabetes mellitus (DM) is becoming more common. Lifestyle modifications can prevent Type 2 diabetes mellitus. Consumption of vegetables and fruit, fiber, or low glycemic index foods is very important and effective. This study aims to determine the influence of brown rice and corn rice on blood glucose levels in people with type 2 diabetes mellitus.Quantitative research used the Experimental Quasi method with pre-test and post-test group designs. There were 44 samples, 22 samples in the intervention group and comparison group. The sampling technique was purposive sampling. The provision of brown rice and corn rice is carried out for seven days, as much as 150 gr. Wilcoxon and Mann-Whitney tests were used to analyze the data. The results showed an average blood glucose level value before being given brown rice of 203.59 mg/dl, after 152.72 mg/dl, before being given corn rice of 220.40 mg/dl, and after 166.50 mg/dl, each obtained a value of p = 0.000. In seeing the difference in influence, the Mann-Whitney test obtained an average brown rice group of 21.43 mg/dl and the corn rice group of 23.57 mg/dl with a value of p = 0.581. There was no significant difference between brown rice and corn rice. It is expected for people with diabetes to consume brown rice and corn rice as an alternative to carbohydrates.

Keywords: Brown Rice, Corn Rice, Type 2 DM, Blood Glucose Levels

Introduction

Hypergilchemia is a symptom of diabetes mellitus, a set of metabolic disorders (WHO, 2019). Diabetes mellitus occurs when the body cannot create enough insulin or uses the insulin produced effectively, resulting in high blood glucose levels. Insulin deficiency, if left untreated for a long period, can damage multiple organs, resulting in life-threatening impairment and health issues, such as cardiovascular disease (CVD), nerve damage (neuropathy), kidney damage (nephropathy), and eye disease (retinopathy). Serious problems may be postponed or avoided if diabetes is managed properly(International Diabetes Federation, 2019).

In 2019, the International Diabetes Federation (IDF) predicted that 463 million people worldwide have diabetes, expected to rise to 578 million by 2030 and 700 million by 2045. DM influences an estimated 136 million adults over the age of 65. According to the World Health Organization (WHO), the number of DM responders in Indonesia increased by 8.4 million people in 2000 and would grow by approximately 21.3 million people by 2030. Indonesia is ranked fourth due to its high number (Kemenkes RI, 2018). Diabetes mellitus prevalence in Indonesia was at 6.9% in 2013 and has risen to 8.5% in 2018(Riskesdas, 2018).Based on secondary data obtained from the Makassar City Health Office, the number of cases of diabetes mellitus in 2020 amounted to 22,476 people from 47 health centers in Makassar. DM cases in Antang Health Center are first, with diabetes cases of 1,333 people. In second place was Kassi-Kassi Health Center with 1,248 people, and in third place was the new end-of-view health center with 1,204 people in 2020 (Dinkes Kota Makassar, 2021).

Brown rice's anthocyanins and oil content helps to lower bad cholesterol and manage blood pressure, making it ideal for preventing cancer and hypertension (Arianto, 2018). After rice, corn is the second most common food. Corn has about the same nutritional value as rice, which contains carbohydrates, proteins, fiber, vitamins, and minerals. Corn rice may be created by crushing or grinding shelled corn into little rice grains. Therefore it has the potential to be a rice alternative. (Tarwotjo, 2008). The fiber in corn controls blood sugar levels, so it is good for people with diabetes. Corn is also an antioxidant, preventing and killing cancer cells, especially in liver cancer and breast cancer (Arianto, 2018).

Methods

This was quantitative research with the Experimental Quasi method, with a pre-test design and a post-test group. This research was conducted in the working area of the Antang Health Center in Makassar City. The study began from June to July 2021.The population in this study was all people with Type 2 diabetes mellitus in the Antang Health Center Work Area. The sample met the inclusion criteria in this study: type 2 sufferers of mild to moderate diabetes mellitus, respondents, aged ≥20 years, and those willing to be given brown rice and corn rice for seven days. The exclusion criteria were the respondents that did not participate fully in the study.The instruments used in this study were: Informed Consent, Observation Sheet, SOP (Standard Operating Procedure) blood sugar levels, SOP (Standard Operating Procedure) giving brown rice and corn rice, and Questionnaire Sheet. The tool used was a GCU that has been calibrated, and the materials used were scales, measuring cups, pans, spatulas, brown rice, and corn rice that has been cooked as much as 150 grams, and water.

Resultsand Discussion

Table 1 shows that characteristics based on the age of the brown rice group are mostly between the ages of 45-54 years old (40.9%). The most common corn rice group was between 55–64 years of age (45.5%). The gender of most respondents was women in the brown rice group (68.2%) and the corn rice group (86.4%). The respondents' education mostly finished high school in the brown rice group (63.3%) and the corn rice group (40.9%). Most of the respondents' occupations were housewives in the brown rice group (63.6%) and the corn rice group (77.3%). Respondents were the most Bugis in the brown rice group (72.7%) and the corn rice group (77.3%).

Table 1. Characteristics of Respondents

Characteristics of Respondents	Brown Rice Group (n=22)		Corn Rice Group (n=22)	
	n	%	n	%
Age (Year)				
35 – 44	1	4.5	0	0
45 – 54	9	40.9	6	27.3
55 – 64	6	27.3	10	45.5
≥65	6	27.3	6	27.3
Gender				
Man	7	31.8	3	13.6
Woman	15	68.2	19	86.4
Education				
Primary	2	9.1	3	13.6
Junior High School	2	9.1	3	13.6
Senior High School	14	63.6	9	40.9
D3/S1/S2	4	18.2	7	31.8
Occupation				
Housewife	14	63.6	17	77.3
Civil Servant/Army/Police/BUMN/BUMD	2	9.1	0	0
Farmer/Fisherman/Labor	2	9.1	3	13.6
Others (retirees)	4	18.2	2	9.1
Tribe				
Bugis	16	72.7	17	77.3
Makassar	5	22.7	5	22.7
Jawa	1	4.5	0	0

Source: Data Primer, 2021.

Table 2 showed respondents with no history of diabetes mellitus in the brown rice group (72.7%) and the corn rice group (81.8%). The history of diabetes mellitus in the brown rice group was the mother's (13.6%), while the corn rice group was the most from the brother's (9.1%). The history of diabetes has at most <5 in the brown rice group (50%) and the corn rice group (63.6%).

The characteristics of respondents were based on the type of drug consumed the most, with taking the Metformin drug in the brown rice group (86.4%) and the corn rice group (100%). The most common history of the disease was hypertension in the brown rice group (22.7%) and the corn rice group (36.4%). Compliance with taking the respondents' medicine was mostly a moderate category in the brown rice group (59.1%) and the corn rice group (50%).

Table 2. Distribution of Respondents Based on DM History, Drugs consumed

Characteristics of Respondents	Brown Rice Group (n=22)		Corn Rice Group (n=22)	
	n	%	n	%
DM history				
No History	16	72.7	18	81.8
Father	2	9.1	0	0
Mother	3	13.6	1	4.5
Aunt	0	0	1	4.5
Others (Brothers)	1	4.5	2	9.1

Long Suffering from DM				
< 5 years	11	50.0	14	63.6
≥ 5 Years	11	50.0	8	36.4
History of Other Diseases				
None	9	40.9	4	18.2
Hypertension	5	22.7	8	36.4
Heart	1	4.5	0	0
Dyslipidemia	3	13.6	4	18.2
Others (Gout)	1	4.5	2	9.1
Hypertension and heart	1	4.5	1	4.5
Hypertension and Dyslipedemia	2	9.1	2	9.1
Hypertension and Gout	0	0	1	4.5
DM drugs taken				
Metformin	19	86.4	22	100.0
Glucodex	1	4.5	0	0
Metformin and Glucodex	1	4.5	0	0
Metformin and Levemir	1	4.5	0	0
Drug Compliance				
High	5	22.7	4	18.2
Moderate	13	59.1	11	50.0
Low	4	18.2	7	31.8

Source: Data Primer, 2021.

Table 3 shows that the blood glucose level of the brown rice group has a maximum pre-test value of 437, the minimum pre-test value was 138, the mean value was 203.59, and the standard deviation value was 70.32. The maximum post-test value was 320, the minimum post-test value was 102, the mean value was 152.72, and the standard deviation value was 58.05, with a value of p-value = 0.000 ($p<0.05$), which means Ha was accepted and H0 was rejected, so it can be concluded that there is an effect of giving brown rice to the blood glucose levels of type 2 diabetes mellitus in Antang Health Center.

The blood glucose level of the corn rice group had a minimum pre-test maximum value of 350-135, the mean value was 220.40, and the standard deviation value was 71.34. The maximum post-test value was 266-105, the mean value was 166.50, and the standard deviation value was 41.93, with a value of p-value = 0.000 ($p<0.05$), which means Ha is accepted and H0 is rejected, so it can be concluded that there is an effect of giving corn rice to the blood glucose levels of type 2 diabetes mellitus sufferers in Antang Health Center.

Table 3. bivariate analysis (Wilcoxon Test)

Variable	**Fasting Blood Sugar Levels (mg/dl)**		
	Pre-test	**Post-test**	**p value**
Brown Rice Group			
N	22	22	0.000
Maximum	437	320	
Minimum	138	102	
Mean	203.59	152.72	
SD	70.32	58.05	
Corn Rice Group			
N	22	22	0.000
Maximum	350	266	
Minimum	135	105	

Mean	220.40	166.50	
SD	71.34	41.93	

Source: Data Primer, 2021

Table 4 shows that in the brown rice group, the maximum pre-test value was 119, the minimum pre-test value was -19, the mean value was 21.43, and the standard pre-test deviation value was 37.66. The maximum post-test value of corn rice was 112, the minimum post-test value was -30, the mean value was 23.57, and the standard deviation value was 39.27, with a value of p-value = 0.0581 (p>0.05), which means Ha is rejected and H0 is accepted, so it can be concluded that there is no significant difference between the brown rice group and the corn rice group in type 2 diabetes mellitus sufferers at Antang Health Center.

Tabel 4. analysis bivariate(Uji Mann Whitney)

Variable	**Fasting Blood Sugar Levels (mg/dl)**	
	Pre-Posttest Difference	**p-value**
Brown Rice Group		0.0581
N	22	
Maximum	119	
Minimum	-19	
Mean	21.43	
SD	37.66	
Corn Rice Group		
N	22	
Maximum	112	
Minimum	-30	
Mean	23.57	
SD	39.27	

Source: Data Primer, 2021

Influence of Giving Brown Rice on Fasting Blood Sugar Levels

The study results of 22 respondents showed an average reduction in blood sugar levels before and after giving brown rice in the main intervention group, with the provision of 150 grams of brown rice that has been processed every day for seven days.The giving was done three times a day, namely in the morning, noon, and night, obtaining pre-test results of 203.59 mg/dl and post-test results of 152.72 mg/dl. It was with statistical test results obtained at p-value = 0.000 (p< 0.05), which means there is an influence of giving brown rice on the GDP levels of type 2 DM sufferers in Antang Health Center.

The results of the study are in line with the research of Ardiansyah et al. (2021) and Kuszairi (2017) before and after the giving of brown rice intervention for one week, obtaining a value of p = 0.000, which means brown rice is effective against decreased blood glucose levels in people with diabetes mellitus. Mohan et al.'s (2014) research also state that brown rice consumption instead of white rice may help reduce fasting glucose and fasting insulin response in overweight Asian Indians.

Brown rice has a low carbohydrate content and a low glycemic index. Carbohydrates in foods with a high glycemic index are broken down slowly, so glucose release is slower, and blood glucose levels are stable. Foods with low IG have been shown to increase glucose and fat levels in patients with hyperglycemia and increase insulin resistance (Herlina, 2017). In addition to carbohydrates, another nutrient that needs to be considered is fiber. The process of blood glucose was changed with the giving of brown rice due to the high fiber content in brown rice. The benefits of fiber in brown rice can increase the viscosity of the intestinal lumen, thereby decreasing the efficiency of carbohydrate absorption and insulin response. Brown rice can also lower lipid levels in serum, thereby inhibiting glucose levels in the blood (Kuszairi, 2017).

In addition, brown rice contains the mineral selenium and anthocyanin pigments as antioxidants. Antioxidants are compounds that can inhibit oxidation reactions or neutralize or trap free radicals that can cause cell damage and increase the risk of cancer and heart disease. Anthocyanins are antioxidant compounds that have blood sugar lowering, antimutagenic, liver-protecting, and antihypertensive effects(Daeli, 2018).

Influence of Corn Rice on Fasting Blood Sugar Levels

The study results of 22 respondents showed an average reduction in blood sugar levels before and after giving corn rice in the main intervention group, with the provision of 150 grams of corn rice that has been processed every day for seven days. The giving is done three times a day, namely in the morning, noon, and night, obtaining pre-test results of 220.40 mg/dl and post-test results of 166.50 mg/dl with statistical test results obtained at p-value = 0.000 ($p< 0.05$). It means there is an influence of corn rice on the GDP levels of type 2 DM sufferers in Antang Health Center.

The results align with Juanico and Hurtada's research (2019) that found the rice-corn mixture showed significant results with a value of $p = 0.006$ on the decrease in fasting blood sugar. Tan et al.'s (2020) study also state that incorporating soluble corn fiber into the diet menu is beneficial in controlling the postprandial glycemic profile. Replacing total carbohydrates with soluble corn fiber decreased glycemic response, insulin response and delayed the subject's transition from prediabetes to diabetes.

Corn rice contains water-soluble fiber in the form of gum and pectin that will affect the emptying time and metabolism of the stomach. Therefore, corn rice is a source of fiber that can control blood glucose levels (Suarni and Yasmin, 2011). According to research by Abutair et al. (2016), the mechanism of water-soluble fiber to control blood glucose is unclear. Water-soluble fiber can delay transit time in the intestines, resulting in satiety and slowing glucose absorption into blood vessels. Water-soluble fibers can absorb fluids and form gels in the stomach. The gel will slow down emptying the stomach and the absorption of nutrients. The gel can slow down the movement of nutrients (blood glucose) from the small intestine walls to the absorption zone, lowering blood glucose levels.

Differences in the influence of giving brown rice and corn rice on the blood sugar levels of diabeticMellitus

The difference in blood glucose levels using the Mann Whitney test showed an average blood glucose level of the brown rice group of 21.43 mg/dl and the corn rice group was 23.57 mg/dl. With a p-value of = 0.581, ($p >0.05$) means ha was rejected and H0 was accepted, so it can be concluded that there is no significant difference between the brown rice group and the corn rice group in people with Type 2 diabetes mellitus in Antang Health Center. In line with Widiawati's (2019) research, which showed that there was no significant difference in the brown rice and corn rice groups with a P-value of 0.978.

This study showed that brown rice and corn rice are good for diabetic Mellitus as an alternative to white rice to control blood sugar. If brown rice is difficult to get or the price of brown rice is too high. The affordable and easy-to-obtain alternative is to choose corn rice. It is a good choice.

Limitations of Research

The limitation in this study is the distance where respondents live far enough away that researchers cannot be sure how respondents spend the rice given. It was done in the pandemic period not to make long contact with people with DM. Confection factors that can affect blood sugar, such as physical activity and consumption of other foods, cannot be controlled by researchers.

Abbreviation

IDF: International Diabetes Federation, WHO: World Health Organization), DM: diabetes mellitus, SOP: Standard Operating Procedures, GCU: Glucose, Cholesterol, Uric Acid, SLTA: Upper High School, IRT: Housewife, KNEPK: National Commission onHealthResearchEthics

StatementofEthics

HealthResearchEthicsCommission, Faculty of Public Health, Hasanuddin University on July 29, 2021, 9878/UN4.14.1/TP.01.02/2021.

Conclusion

This study showedthat there is an influence of giving brown rice and corn rice on changes in fasting blood sugar levels. Brown rice and corn rice effectively reduced fasting blood sugar levels of type 2 DM sufferers**.**

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