DIFFERENCES IN BLOOD GLUCOSE LEVELS BETWEEN INDIVIDUALS WHO ARE USUALLY CONSUMING WARM RICE AND COLD RICE IN DEMBE JAYA VILLAGE, NORTH KOTA DISTRICT, GORONTALO CITY

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ABSTRACT

Freshly cooked, warm rice has a higher carbohydrate content than cold rice, as the glycemic index of cold rice tends to be lower. Therefore, consuming cold rice does not immediately increase blood sugar levels. Glucose in food is a simple carbohydrate from the monosaccharide group obtained from the hydrolysis of starch. Several factors influence the carbohydrate and glucose content of rice, including the type of rice, processing method, and storage method. This research approach was quantitative, with a cross-sectional design and comparative quantitative approach. A sample size of 30 was selected using a purposive sampling technique. Blood glucose testing used a POCT (Point of Care Testing) device. Based on the results of the Shapiro-Wilk normality test, the blood glucose levels in the group consuming warm rice had a significance value of <0.001 (<0.05), indicating a non-normal distribution. Meanwhile, in the group consuming cold rice, the significance value was 0.223 (>0.05), indicating a normal distribution. The Mann-Whitney U test, conducted to determine the difference in blood glucose levels between individuals consuming warm and cold rice, yielded a significance value of 0.001 (<0.05), indicating a significant difference between blood glucose levels in individuals consuming warm and cold rice. This means that hypothesis Ha is accepted and hypothesis H0 is rejected.

Keywords: Warm Rice, Cold Rice, Blood Glucose

INTRODUCTION

Rice is a staple food for approximately half the world's population, providing 20% of total calories consumed globally. Rice consumption increases with population growth. In the 21st century, the world's population is predicted to continue to grow significantly in the coming years, particularly in Asia and Africa, where populations rely heavily on rice.

For Indonesians, rice is a staple food, made by boiling it until it's fully cooked. Most Indonesians consume rice as part of their daily main meal, whether for breakfast, lunch, or dinner. In South Sulawesi, rice consumption is quite high.

According to [4], modern society's habits indicate a preference for eating rice warm. Freshly cooked, hot rice actually has a higher carbohydrate content than rice that has been left to cool. This phenomenon is due to the lower glycemic index of cold rice. As a result, consuming cold rice does not necessarily cause a spike in blood sugar levels.

The term blood sugar, or more formally blood glucose, refers to the amount of sugar present in the bloodstream. This circulating glucose serves as the primary fuel for cells throughout the body. The body maintains blood glucose concentrations closely through a dual

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mechanism: if levels are too low, the liver breaks down glycogen (stored glucose) to supply it to the bloodstream; conversely, if levels are too high, glucose is transported to the liver or muscles to be converted and stored as glycogen.

In the context of metabolism, glucose plays a role as a carbohydrate circulating in the body and serves as an essential cellular fuel. The body's main carbohydrate reserves, known as glycogen, accumulate primarily in the liver and muscle tissue. Glycogen stored in the liver supplies glucose to the needs of extrahepatic tissues, while muscle glycogen functions as a source of metabolic fuel that can be readily utilized by the muscles themselves. Blood glucose comes from the diet; carbohydrates in food are broken down into glucose, fructose, and galactose, which are then transported to the liver via the hepatic portal vein.

Glucose found in food is a simple carbohydrate from the monosaccharide group, obtained through the hydrolysis of starch. Although crucial for energy production, glucose intake exceeding requirements will cause it to accumulate as fat and potentially increase the risk of obesity. The carbohydrate and glucose content of rice depends heavily on several variables, including the rice variety, processing (cooking) method, and storage techniques. One study noted that the glucose content in white rice is 25.4%, while the reducing sugar content (including glucose) experiences a sharp reduction from 95.48% in raw rice to 31.76% after cooking.

This significant decrease is explained by the fact that during the cooking process, some carbohydrates are lost and reducing sugars are damaged. On the other hand, a study of several rice processing methods revealed that the glucose content of regular rice that has undergone the baking and roasting processes is actually higher than that of regular rice. This is attributed to the repeated heating processes experienced by baked and roasted rice, which triggers the evaporation of a greater volume of water content in the rice.

A study conducted by [4] found that starch concentrations in freshly cooked white rice were higher than in white rice that had been stored in a rice cooker for varying periods of time. This significant disparity highlights an important implication for people with diabetes: they should avoid eating freshly cooked rice immediately. The primary reason is that high starch levels can directly contribute to spikes in blood glucose levels.

According to observations made, most people in North Kota District regularly consume warm rice and only a small portion consumes cold rice. This is because consuming warm rice has become a hereditary habit because consuming warm rice can provide a warm feeling for the body especially in the morning, while those who consume cold rice are those who are used to consuming rice that has been cooled because they think it is better to just use the leftover rice so it is not wasted. Based on the explanation in the background and previous research, the researcher is interested in conducting research with the title of the difference in blood glucose levels between individuals who habitually consume warm rice and cold rice.

RESEARCH METHODS

This study used a quantitative method with an observational analytical approach and a cross-sectional design to examine the disparity in blood glucose levels among individuals, which are differentiated based on their habitual preferences in eating rice (warm or cold).[2] The study was conducted from September 25 to 30, 2025 with a sample of 30 people, namely people who consume warm rice and cold rice in North City District and Gorontalo City, selected using purposive sampling according to inclusion and exclusion criteria. Data were obtained through questionnaires, informed consent, measurements using the Easy Touch tool. Analysis used the Mann-Whitney U Test to evaluate the presence of meaningful differences between the two data groups.

RESEARCH RESULT

The research, conducted in Dembe Jaya Village, North Kota District, successfully collected a total of 30 samples, using purposive sampling. Following the established data analysis process, after the research findings were obtained, the next step was to analyze the data using univariate and bivariate analysis. A comprehensive overview of the data is summarized and presented in Table 4.1.

Table 4.1 Research Results on Differences in Blood Glucose Levels in Individuals Consuming Warm Rice and Cold Rice in Dembe Jaya Village, North Kota District.

No	Respondent ID	Age (Years)	Gender	Rice Category	G2JPP Glucose Level (mg/dL)
1	D.S	34	Woman	Warm	156
2	F.R	39	Woman	Warm	131
3	A.L	43	Woman	Warm	179
4	J.L	54	Woman	Warm	107
5	R.H	60	Woman	Warm	125
6	L.A	35	Woman	Warm	116
7	N.I	21	Woman	Warm	124
8	A	26	Man	Warm	118
9	S.H	32	Man	Warm	107
10	F	25	Man	Warm	101
11	D	22	Man	Warm	156
12	K.I	45	Woman	Warm	484
13	G.P	35	Man	Warm	122
14	U.I	51	Man	Warm	126
15	S	36	Woman	Warm	137
16	A.R	22	Woman	Cold	83
17	S.M	23	Man	Cold	56
18	A.I	63	Man	Cold	74
19	M.M	60	Woman	Cold	116
20	M.U	21	Woman	Cold	111
21	F.D	38	Woman	Cold	82
22	N	27	Woman	Cold	102
23	M.A.U	25	Man	Cold	103
24	F.A	22	Woman	Cold	109
25	Z.P	21	Woman	Cold	97
26	N.K	20	Woman	Cold	107
27	M.P	20	Woman	Cold	116
28	F.M	44	Woman	Cold	118
29	S.S	31	Woman	Cold	83
30	A.T	22	Woman	Cold	94
Total					**4.258**
Rata-rata					**142**

(Source: Primary Data, 2025)

Table 4.1 shows the results of the study of g2jpp blood glucose levels in individuals who consumed warm rice and cold rice in

Dembe Jaya Village, North Kota District, the highest glucose level was 484 mg/dL and the lowest glucose level was 56 mg/dL, with an average of 142 mg/dL.

In accordance with the data analysis flow, the findings obtained (as summarized in Table 4.1) will then proceed to the next stage. This stage involves processing the research data through two types of statistical analysis: univariate and bivariate analysis. The following is a presentation of the results of the data analysis.

1. Univariate Analysis

The type of univariate analysis used is descriptive analysis to describe each research variable, in this case the researcher describes or presents the respondent's identity in the form of gender and age, as well as the results of the 2-hour post-prandial blood glucose level examination (G2JPP).

a. Minimum, Maximum, Mean and Standard Deviation Values

Based on the results of the minimum, maximum, mean and standard deviation values in table 4.2.

Table 4.2 Minimum, Maximum, Mean and Standard Deviation Values

Rice Category	n	Minimun (mg/dL)	Maximun (mg/dL)	Mean (mg/dL)	Standard Deviation (mg/dL)
Warm Rice	15	101	484	161.3	94.5
Cold Rice	15	56	118	95.7	17.6
Amount	**30**	**56**	**484**	**128.5**	**73.2**

Based on the descriptive analysis results in the table above, it is known that the group of respondents who consumed warm rice had an average blood glucose level of 161.3 mg/dL with a range of values between 101–484 mg/dL, and a standard deviation (SD) of 94.5 mg/dL, indicating a fairly high variation in glucose levels between individuals. Meanwhile, in the group of respondents who consumed cold rice, the blood glucose level had an average of 95.7 mg/dL, with a range of 56–118 mg/dL and a standard deviation of 17.6 mg/dL, indicating smaller and relatively stable data variations.

b. Respondent Characteristics Based on Gender

Based on the distribution of respondents by gender, it is shown in table 4.3.

Table 4.3 Distribution of Respondents by Gender.

Gender	Frequency (*f*)	Percentage (%)
Man	9	30,0
Woman	21	70,0
Amount	**30**	**100,0**

(Source: Primary Data, 2025).

Based on the data presented in Table 4.3, it can be seen that of the 30 respondents involved in the study, the majority were female. This composition consisted of 21 female participants (70.0%), while the remaining 9 participants (30.0%) were male.

b. Respondent Characteristics Based on Age

Based on the distribution of respondents by age, it is shown in table 4.4.

Table 4.4 Distribution of Respondents by Age.

Umur (Tahun)	Frekuensi (*f*)	Persentase (%)
20-29	14	46,7
30-39	8	26,7
40-49	3	10,0
50-59	2	6,7
>60	3	10,0

Total	**30**	**100,0**

(Source: Primary Data, 2025).

Table 4.4 shows the age of respondents based on the age groups studied, that of the 30 respondents, the majority were aged between 20-29 years, namely (46.7%), followed in succession by the 30-39 age group, namely (26.7%), respondents aged 40-49 years and >60 years, each 3 people (10.0%), and only 1 respondent aged 50-59 years (6.7).

c. Blood Glucose Level Examination Results

Below, we describe the data obtained from blood glucose measurements. These results have been summarized and presented in Table 4.5.

Table 4.5 Results of Blood Glucose Level Examination in Individuals Consuming Warm Rice and Cold Rice.

	Glucose Level Examination Results			
	Warm Rice		**Cold Rice**	
	n	**%**	**n**	**%**
Normal	11	86,7	15	100,0
Abnormal (High)	4	13,3	0	0
Total	**15**	**100,0**	**15**	**100,0**

(Source: Primary Data, 2025)

Table 4.5 shows the glucose levels of 30 samples tested using capillary blood samples. Based on the table, the blood glucose levels of 11 individuals (86.7) who consumed warm rice were normal and 4 individuals (13.3) who consumed abnormal (high). Meanwhile, the blood glucose levels of 15 individuals (100.0) who consumed cold rice were normal.

2. Bivariate Analysis

Bivariate analysis was used to evaluate differences in blood glucose levels between individuals consuming warm and cold rice. The analysis was conducted using Statistical Product and Service Solutions (SPSS) version 27.0, beginning with a normality test of the research data. This normality test aims to assess whether the data distribution follows a normal pattern. The results of this test then serve as the basis for determining the type of bivariate test (difference test) to be applied, whether using parametric or nonparametric methods.

a. Normality Test

The normality test is intended to determine whether the data obtained in this study has a normal distribution or data spread or not, which is then used as a reference in determining parametric or non-parametric tests.

The results of the normality test for blood glucose levels in individuals who consumed warm rice and cold rice are shown in table 4.6

Table 4.6 Blood Glucose Level Normality Test in Individuals Consuming Warm Rice and Cold Rice

	Test of Normality			
		Shapiro Wilk		
Blood Glucose Levels	**Intervention**	***Statistic***	***n***	***Sig***
	Warm Rice	.482	15	<.001
	Cold Rice	.924	15	.223

(Source: Primary Data, 2025)

Based on the data normality test conducted using the Shapiro-Wilk method, different results were obtained for the two groups. The blood glucose level data in the warm rice consuming group showed a significance value of 0.001, which is less than 0.05 ($\lt$0.05), so it can be concluded that the data is not normally distributed. On the other hand, the cold rice consuming group showed a significance value of 0.223, which is greater than 0.05 ($\gt$0.05), indicating that the data in this group is normally distributed. Considering that one of the groups failed to meet the assumption of normality, the use of parametric tests, such as the Independent Sample t-test, cannot be justified. Therefore, to test the difference in blood glucose levels between individuals consuming warm rice and cold rice, an alternative nonparametric test was chosen, namely the Mann-Whitney U Test.

b. Nonparametric Test (Mann-Whitney U Test)

The use of nonparametric test methods is indicated when the results of the normality test show that the data are not normally distributed. In the context of this study, the Mann-Whitney U Test was specifically chosen to evaluate the existence of significant differences between two data sets. The reason for choosing this test is because the data does not meet the assumptions of a normal distribution but is measured using an ordinal scale.

Thus, to identify differences in blood glucose levels between individuals who consumed warm rice and cold rice, statistical analysis was carried out using the Mann-Whitney U Test, and the test results are presented in Table 4.6.

Table 4.6. Mann-Whitney U Test Analysis of Blood Glucose Level Examination Results in Individuals Consuming Warm Rice and Cold Rice.

	Nasi Hangat-Nasi Dingin	**Taraf Signifikansi**	**Keterangan**
Z	-3.779	0.05	
Asymp. Sig. (*2-tailed*)	.001		Terdapat perbedaan yang signifikan

(Source: Processed Primary Data, 2025).

Table 4.6 based on the results of the Mann-Whitney U Test conducted to determine the difference in blood glucose levels in individuals who consume warm rice and cold rice, obtained a Z value = -3.779 with a significance value of $p < 0.001$. The significance level used in this study is 0.05. Because $p < 0.05$, it can be concluded that there is a meaningful or significant difference between blood glucose levels in individuals who consume warm rice and cold rice, meaning that the Ha hypothesis is accepted and the H0 hypothesis is rejected.

DISCUSSION OF RESEARCH RESULTS

Based on table 4.1, information was obtained that the average 2-hour PP glucose level was an average of 142 mg/dL, with the highest glucose level being 484 mg/dL and the lowest glucose level being 56 mg/dL.

1. Blood Glucose Levels in Respondents Who Consumed Warm Rice

Based on the research results shown in Table 4.1, the group of respondents who consumed warm rice showed G2JPP glucose levels that tended to be higher than the majority of respondents who consumed cold rice. This is also consistent with the display in Table 4.4, namely the results of the blood glucose levels of those who consumed warm rice, namely normal for 11 people (86.7) and abnormal (high) for 4 people (13.3).

Glucose levels in the warm rice group varied between 101 and 156 mg/dL, with one respondent showing a very high level of 484 mg/dL. In general, the average glucose levels in the warm rice group were seen to be in a higher range than the cold rice group, indicating that consuming warm rice can trigger a more significant increase in postprandial blood glucose levels. This finding is in line with the theory that the temperature and physical condition of rice directly affect the structure of the starch in it, which then impacts the speed of digestion and absorption of glucose in the body.

These results align with the theory put forward by [5] about the gelatinization and retrogradation processes of starch. When rice is freshly cooked and still warm, the starch structure in the rice undergoes gelatinization, a process in which amylose and amylopectin molecules absorb water and form a gel that is easily digested by the amylase enzyme in the digestive tract. Starch in this state is classified as rapidly digestible starch, a type of starch that is quickly broken down into glucose and absorbed into the blood, thus causing a faster and higher increase in blood glucose levels. Conversely, if rice is allowed to cool, retrogradation occurs, namely the recrystallization of starch molecules into a more stable and difficult to digest form, known as resistant starch. This resistant starch is like fiber, not easily digested in the small intestine, so the release of glucose into the blood is slower. This condition explains why warm rice, which has not undergone starch retrogradation, produces higher blood glucose levels than rice that has been cooled or reheated.

The results of this study are consistent with the findings of [5], who reported that rice stored in a refrigerator for 24 hours and then reheated had a significantly lower incremental area under the glucose curve (IAUC) than freshly cooked rice. This is also supported by research by Strozyk et al. (2022), conducted in patients with type 1 diabetes. They found that consuming rice that had been cooled for 24 hours at 4°C resulted in a lower maximum blood glucose increase and area under the glucose curve (AUC) than freshly cooked warm rice. Thus, consuming warm rice has been shown to trigger a greater spike in blood glucose due to the availability of more easily digested carbohydrates.

In the context of the glycemic index (GI), warm rice is classified as a food with a higher glycemic index. The glycemic index describes how quickly carbohydrates in food raise blood glucose levels compared to a standard (usually pure glucose). Foods with a high GI, such as freshly cooked white rice, cause a more rapid spike in blood glucose because glucose is released and absorbed quickly. Meanwhile, rice that has been cooled or stored tends to have a lower GI because some of the starch has converted to a resistant form. A recent study by [7] also confirmed that modifying starch structure through heat-moisture treatment can increase resistant starch levels and lower long-term blood glucose levels in experimental animals.

Furthermore, another international study by [2] also showed that rice cooled after cooking had a lower glycemic response than rice consumed immediately warm. They explained that the cooling process causes the rebinding of amylose and amylopectin molecules, thereby reducing the availability of starch for breakdown into glucose. This study confirms the findings of this study that warm rice has a higher glycemic effect than cold rice.

Another research result that supports this finding is a study conducted by [1], which stated that hot rice contains sugar and simple carbohydrates that are more easily broken down than cold rice, which supports the theory that the temperature and physical structure of rice affect blood glucose levels.

2. Blood Glucose Levels in Respondents Who Consumed Cold Rice

Based on the research results shown in Table 4.1, the group of respondents who consumed cold rice showed generally lower G2JPP glucose levels than the group who consumed warm rice. Glucose levels in the cold rice group ranged from 56 to 137 mg/dL, with a relatively lower average than the warm rice group which reached more than 140 mg/dL. These results indicate that consuming cold rice has the potential to lower postprandial blood glucose levels compared to warm rice.[7]This phenomenon is closely related to changes in the chemical structure of starch due to the cooling process, where some of the starch that was originally easily digested (digestible starch) changes into a form that is difficult to digest or known as resistant starch (RS) [5].

This is in line with the theory stated by [5], that physiologically, when freshly cooked rice is allowed to cool, the amylose and amylopectin molecules in it will undergo a retrogradation process, namely the re-formation of hydrogen bonds that cause the starch molecules to become more crystalline and difficult to break down by the amylase enzyme in the small intestine. As a result, some starch is not immediately digested into glucose, but persists until it reaches the large intestine, where it acts like dietary fiber fermented by intestinal bacteria. This process causes glucose absorption to be slower and blood glucose levels after eating to increase in a more controlled manner.

The findings of this study are consistent with those of [5], who reported that rice stored at 4°C for 24 hours experienced a 2–3-fold increase in resistant starch levels compared to freshly cooked rice, and a 35% decrease in glycemic response. Similarly, research by [6] found that consuming cooled rice for one day resulted in significantly lower postprandial blood glucose levels than warm rice, both in healthy individuals and those with type 1 diabetes. This decrease in blood glucose levels is due to the cold rice containing more resistant starch type 3 (RS3) formed through the cooling process after gelatinization.

From a glycemic index (GI) perspective, cold rice falls into the category of foods with a lower GI. According to [2], the process of cooling and storing rice at low temperatures lowers the glycemic index of white rice by 20–30% compared to warm rice. This is because retrograded starch molecules are not easily broken down into glucose by digestive enzymes, thus slowing the rise in blood sugar levels. This research supports the findings that respondents who consumed cold rice in this study showed relatively stable blood glucose levels, without the sharp spikes seen in the warm rice group.

Recent research from abroad also provides scientific support for these results. [7] reported that processing starch through heat-moisture treatment or repeated cooling can significantly increase resistant starch levels and contribute to long-term reductions in blood glucose levels in rats with induced hyperglycemia. Cooled starch was shown to reduce blood glucose response by up to 40% compared to uncooled starch.

3. Blood Glucose Levels in Respondents Who Consumed Cold Rice

In this research, statistical data processing was carried out using the Statistical Package for the Social Sciences (SPSS) version 26.0 software. This step was crucial to meet the study's objectives, namely to identify disparities in glucose levels among residents of Dembe Jaya Village, North Kota District, based on their preference for rice consumption (hot or cold). The data analysis procedure began by calculating the frequency of each variable (univariate analysis), followed by bivariate analysis focused on comparing the results between the two groups of variables.

As a prerequisite before proceeding to bivariate testing, the raw data must first undergo a normality test. This test is essential for evaluating the data distribution, whether it follows a normal curve or not. The assumption is: if the data distribution is proven to be normal, then the bivariate analysis will apply a parametric test, specifically the independent sample t-test. However, if the data distribution does not show a normal distribution, then the bivariate test must switch to a non-parametric method, namely the Mann-Whitney U Test.

Referring to Table 4.5, the results of the normality test (NPar Tests) using the Shapiro-Wilk method show different findings. The variable "consumption of warm rice" produces a significance value (asymp sig.) below 0.001 ($p < 0.05$), which indicates that the data for this group is not normally distributed. In contrast, the variable "consumption of cold rice" obtained a significance value of 0.223 ($p > 0.05$), which indicates that the data is normally distributed. Because one of the data groups failed to meet the assumption of normality, the use of the parametric Independent sample t-test could not be continued. Consequently, the analysis of differences in blood glucose levels between the two groups was switched to the Mann-Whitney U Test, a non-parametric method designed to determine statistical significance between two independent (unpaired) groups when the assumption of normality is not met.

Turning to the non parametric Mann-Whitney U Test, the findings presented in Table 4.6 show a significance value (Sig. 2-Tailed) of 0.001. The significance limit (alpha) set in this research is 0.05. Since the p-value (0.001) is much smaller than alpha (0.05), it can be concluded that H0 (null hypothesis) is rejected and Ha (alternative hypothesis) is accepted. Statistically, this proves a significant difference in blood glucose levels between the group of individuals who are accustomed to consuming warm rice and the group who consume cold rice.

Based on the results of data processing from the Mann-Whitney U Test and referring to the results of blood glucose levels between consumption of warm rice and cold rice, it is known that the average G2JPP glucose level (two-hour postprandial glucose) is lower compared to the group that consumed warm rice. The average glucose value in the cold rice group was below 142 mg/dL, with some respondents showing fairly stable glucose levels below 120 mg/dL. This finding suggests the possible influence of rice temperature on the body's glycemic response, where cooled rice tends to produce a lower blood glucose response than warm rice.

This phenomenon can be explained through the concept of resistant starch, which is starch that is not fully digested in the small intestine and functions similarly to dietary fiber. When rice is cooked and then cooled, some of the previously easily digested starch (amylose and amylopectin) will undergo a retrogradation process, forming type 3 resistant starch. This type of starch is not easily converted to glucose during digestion, so blood glucose levels rise more slowly after consuming cold rice compared to warm rice. According to research by [6], the process of cooling rice at 4°C for several hours or overnight can increase resistant starch levels by 2–3 times compared to rice consumed immediately after cooking. This increase in resistant starch levels has been shown to reduce the glycemic response by around 20–30% compared to fresh or warm rice.

According to [1] findings, significant differences in rice glucose levels were identified. These differences were attributed to temperature variations during the cooking process, which resulted in leaching. Furthermore, differences in temperature during the rice testing also triggered starch retrogradation. Therefore, the interaction between the various processing methods and temperatures applied to rice ultimately results in varying glucose levels.

Similar findings were also demonstrated by research by [3]. Their study revealed that longer heating durations correlated with reduced carbohydrate content in white rice. This prolonged heating process also resulted in a reduction in water content, resulting in a drier and harder texture for the rice.

Overall, the results of this study align with previous theory and scientific evidence showing that changes in rice temperature can modify starch structure and affect postprandial blood glucose levels. Consuming cold rice has been shown to reduce the glycemic response by increasing resistant starch levels, making it a better dietary alternative for blood glucose control, especially in individuals at risk for type 2 diabetes mellitus.

Thus, it can be concluded that the results of this study support the theory that cold rice has the potential to provide a natural hypoglycemic effect due to its higher resistant starch content. These findings also open up opportunities for public nutrition education, encouraging greater attention to temperature and storage methods for rice, as important factors in daily blood glucose control.

Based on study [4] This research focuses on the development technology herbal formulation that is capable of produce stock drug traditional in stable , effective and fulfilling sambiloto tablet form standard pharmacopoeia , as innovation in field pharmacy and medicine preventive . The relationship with This research is based on the objective where the research is the goal ensure quality and safety consumed products society , good through development safe herbal preparations for health and supervision free food from contamination pathogenic microbes

CONCLUSION

Referring to the research findings and data analysis that have been completed, several conclusions can be drawn, namely as follows:

1. The group consuming warm rice had a minimum blood glucose level of 101 mg/dL, a maximum of 484 mg/dL, a mean of 161.3 mg/dL, and a standard deviation of 94.5 mg/dL.
2. The group consuming cold rice had a minimum blood glucose level of 56 mg/dL, a maximum of 118 mg/dL, a mean of 95.7 mg/dL, and a standard deviation of 17.6 mg/dL.
3. There is a statistically significant difference between blood glucose levels in individuals who consume warm rice and those who consume cold rice, with a significance value (sig.) (2-Tailed) of 0.001 which is smaller than the α value ($\alpha = 0.05$), or $0.001 < 0.05$, so it can be concluded that the alternative hypothesis (Ha) is accepted, while the null hypothesis (H_0) is rejected.

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