

# Index Glycemic and Haemoglobin In Patients With Diabetes Mellitus Type 2 Through A Combination Of Rice Red And Red Spinach

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## Abstract

**Background and aim:** Indonesia is one of the countries with the highest incidence of type 2 diabetes in the world. Management of diabetes in management of food that does not cause depression in patients and is rich in nutrients as a consequence of consumption drug routine is things to do searching for Street exit. Study this aim for With Thus, we explore the effect of rice red and spinach red in the form of cookies to index glycemic and haemoglobin levels.

**Methods:** as many as 50 respondents diagnosed with type 2 DM with a history of more than two years registered in a quasi-experimental test pre-pest design with the control group in Sorong, West Papua. Cookies consisting of 200 grams of flour rice red mixed with 20 grams of flour spinach red were given for 30 days. Inspection Check blood sugar and haemoglobin levels Before and after the intervention. Data analysis used an independent sample t-test.

**Results:** we found that occur drop index glycemic as big as 81.8 Mg/dl and increased haemoglobin by 1.161 g/dl in the group intervention

**Conclusions:** Rice red and spinach red in the form of cookies show benefit potential at index glycemic and haemoglobin levels among participants with diabetes mellitus type 2.

**Keywords:** Red rice, Red Spinach, glycemic index, hemoglobin, diabetes mellitus.

## INTRODUCTION

Diabetes mellitus is one disease degenerative and occurs because of an insufficient amount of insulin balanced in the body 1,2. Diabetes can develop Becomes disease complications microvascular and macrovascular as well as could cause death. Diabetes mellitus prevalence type 2 global is by 8.3% of the population in this world have diabetes 3. Indonesia occupies a rating of four with 21.3 million soul patients 4

Diabetes management consists of the four pillars therapy, nutrition, exercise, physical, education, and pharmacology 5. It is hoped that this management can prevent the consumption of common antihyperglycemic drugs as we know that antihyperglycemic drugs can cause resistance 6,7.

In 2013, about 1.93 billion people suffered from anaemia worldwide. More diabetic patients many caught anaemia compared with non-diabetic patients. The socio-demographic and glycemic index correlates with anaemia in type II diabetic patients. Enhancement proof shows that anaemia in the diabetic population is a strong predictor independent of enhancement risk complications macro-vascular and micro-vascular diabetes 8–11.

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Principle therapy nutrition in patients with diabetes mellitus type 2 who also experienced anaemia is patient could consume food, but no cause enhancement index glycemic and maintain rate haemoglobin in the blood. Because of that, various types of food have been researched to be consumed by people with diabetes mellitus type 2 safely. Besides that, one must notice quality physique food like colour, aroma, texture and taste 12,13.

One ingredient moderate food developed is rice red (*oriza nivara*) and spinach red (*Amaranthus tricolour L*). The second ingredient of food this often found in Indonesia. However, processing only in the shape of rice, vegetables, and juice 14,15.

Some research, Rice red is one type of rice colour that has a content of tall fibre 14.15. Besides that, the essential fatty acids and more Gamma Amino Butyric Acid (GABA) tall compared with rice white, also able lower rate cholesterol blood with method stimulation cells of the pancreas for produce excess insulin, so HSL activation plays a role in lipolysis also decreased. State the will lower free fatty acids in Genre blood 18–21.

Spinach red contains protein, vitamins A, C, B, and K and contains mineral salts such as calcium, phosphorus, substance iron, amaranth, potassium nitrate, iron, pyridoxine and phosphate. Leaf nor root spinach red is used as breast milk, as laxative urine and as enhancer blood. Destination study is for know influence rice red and spinach processed red in form flour and cookies to index glycemic and haemoglobin diabetes mellitus patient.

## Materials and methods

### Participants and Procedure

Study this is a quasi-experimental, pre-pest design with a control group of 20. Participants were recruited from 8 community health centres. Participants this is routine patient carry out control at the community health centre with a history of type 2 diabetes mellitus at least two years however without complications disease another. Patients who had blood sugar low at the start inspection and medium in state pregnant were not included in the study. The sampling technique used is consecutive sampling 23. Respondent shared Becomes two groups using 22. Generator software group random. After getting the sample, the researcher explains the benefits and goals study this and asks for agreement participation in the research. Every respondent was given cookies made from base flour rice red and spinach red, as many as 30 pieces with heavy every cookie is 55 gr 23 composition comparison flour rice 200 gr red and 20 gr (10%) flour spinach red 24.25. Every respondent requested to consume this one piece per day for 30 days, then examined blood sugar and haemoglobin levels.

### Cookies Making

The manufacturing process of cookies started with making flour rice red and flour spinach red. Flour rice red is made through washing, soaking for 24 hours, screening, milling, and sifting so that it Becomes flour rice textured red smooth. While manufacturing, flour spinach with freeze dryer technique ( temperature -20 o C with a drying time of 2-3 days ). Spinach red mashed using a grinder and sifted using a sieve size 60 mesh. Processed Cookies through mixing batter from flour rice red 200 gr 28, flour spinach red 20 gr, egg, a sweetener from the stevia plant, oil olives and milk for people with diabetes then roasted \_about 15 -30 minutes. Making cookies in the control group did not use flour rice red; they used flour rice white and dye food resembling flour spinach red. Manufacturing process cookies equated with cookies for group intervention 29–31.

### Measurements and Data Collection

Data collection is carried out for six months in 2021 using a questionnaire and examining blood sugar and haemoglobin levels. Questionnaires were used to examine demographic data such as age, sex, gender, occupation, marital history, and history of diabetes. Inspect blood sugar levels when haemoglobin is done twice within the 30-day range. Inspect blood sugar levels using a glucometer and haemoglobin examination using a portable Hb meter. Data collection includes recommendations for preventing covid-19 transmission from the World Health Organization and the Ministry of Health of the Republic of Indonesia 32.

### Ethics

The protocol study has been approved by the Commission Ethics Health Research Health Polytechnic Ministry of Health Sorong, Number: DM.03.01/4.2/017/2021, and follows clinical trial flow registered at ClinicalTrials.gov (NCT01814735) 28.

### Data analysis

analysis on research this using paired t-test and independent t-test that has been preceded by tests of normality and homogeneity of the data. The normality test results for blood sugar were 0.481, and haemoglobin was 0.840. the results of the homogeneity test of blood sugar 0.210 and haemoglobin 0.218. Data analysis using jamovi 33.

## Results and discussion

Fifty respondents contributed to the study and shared in group intervention and control groups. The average age of respondents is 34.2 – 35.8, with a history of type 2 DM of 3.96-4.2 years. Manifold sex women, married and also married. Overview from characteristics respondents presented in table 1.

Table 1. Characteristics respondent

Variable	Group			
	Intervention (26)		Control (24)	
	n	%	n	%
<b>Age, Year (mean, SD)</b>	34.2 (9.25)		35.8 (11.2)	
<b>Sex</b>				
Male	11	42.3	14	58.3
female	15	57.7	10	41.7
<b>Occupation</b>				
Work	14	53.8	12	50
Not Work	12	46.2	12	50
<b>Marriage Status</b>				
Widower / widow	2	7.7	1	4.2
Married	19	73.1	18	75
Single	5	19.2	5	20.8
<b>DM History (Year) ( mean, SD )</b>	3.96 (3.42)		4.2(3.19)	

A T-test was used to analyze the difference Between index glycemic and haemoglobin levels in both groups. This result shows that there is a difference in index glycemic index and haemoglobin in both groups. After the intervention, the

difference in the mean index glycemic experience drop of - 81.811 Mg/dl while rating haemoglobin experience enhancement of 1.161 g/dl in the group intervention. The data are presented in table 2 and pictures 1 and 2.

Table 2. Index level post glycemic and haemoglobin intervention

	Statistics	df	p	Mean difference	SE difference	Effect Size
Blood Glucose -post	-13.75	48.0	< .001	-81,811	5.948	-3,893
Hemoglobin - Post	4.86	48.0	< .001	1.161	0.239	1.375

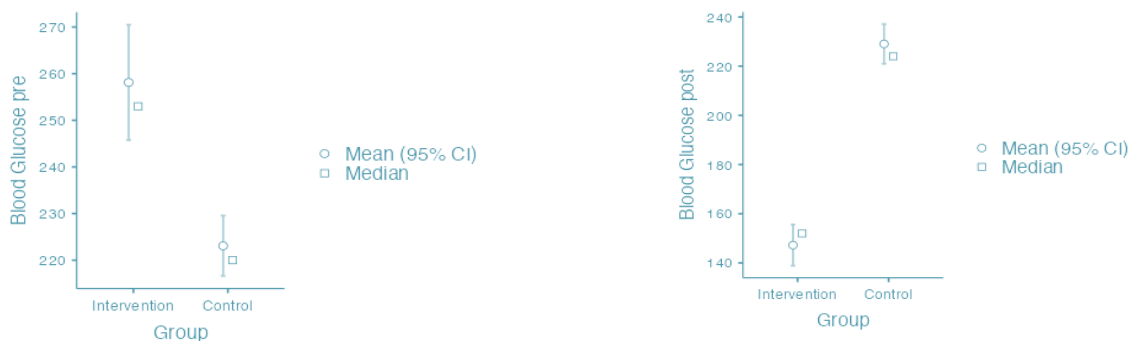


Figure 2 difference in glycemic index

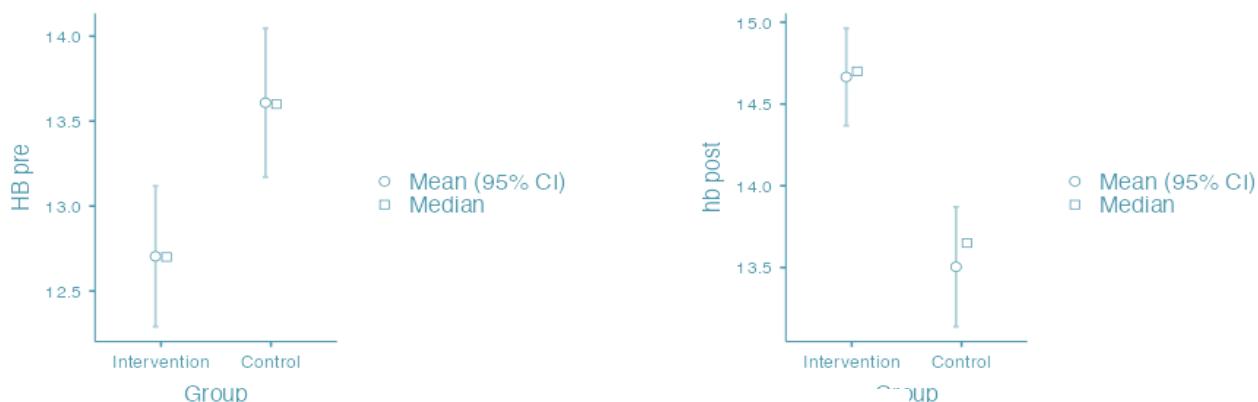


Figure 2 difference in haemoglobin index

Discussion

Studies have taken note of the importance of rice red and spinach red in normalizing blood sugar and increasing haemoglobin by separating 13 34. However, little is found in literature about using the second ingredient together and in different forms in patients with diabetes mellitus type 2. Research this designed to determine the effect of gift rice red and spinach red together in food-shaped cookies.

This study aims to evaluate the importance of the recovery rate of blood glucose and haemoglobin in patients with diabetes mellitus, considering that in some previous research literature, it was stated that people with type 2 diabetes mellitus had problems with blood glucose and haemoglobin instability. Research results show that consuming rice red is capable of lower index glycemic. At the same time, spinach red can increase haemoglobin in people with diabetes with type 2.

What a surprise is that people with diabetes mellitus by volunteer use up whole given cookies. Besides that, no, there is an effect nauseous or vomit post consume cookies. Study this support proof from observation previously that cookies rice red with weight 50% of the cake liked 35–37.

Type 2 diabetes patients have a problem with food control. In several studies, dietary management of type 2 DM Dietary

management requires a series of changes in behaviour such as planning to eat, choosing food, preparing food, eating out and controlling portions. In the end, Diabetic patients face many difficulties in adhering to the diet. They disclose feeling a lack of diet and rigid diet control, so they feel depressed. Feeling stressed causes Type 2 DM patients to behave backwards, like overeating by secretly 36.37 pulses. Food preparation in Nutrient-rich Cookies, however, no cause enhancement index glycemic even help increase haemoglobin with ingredient experience could help Type 2 DM patients become no stressed in guard index glycemic.

We found that the mixture of flour, spinach red on cookies rice red can increase haemoglobin in people with diabetes type 2. However, the result was not yet explained previously, even in the preparation of cookies. The previous study proved spinach red's effectiveness in rating haemoglobin, but not in people with diabetes mellitus 34,40,41.

This result is possibly related to Magnesium content as a cofactor of more than 300 enzymes, including glucagon and insulin in the body man contained in rice red. In addition, brown rice contains functional anthocyanins as antioxidants, antihyperglycemic, antimutagenic, and hepatoprotective prevention of oxidative stress, the cause of pancreatic cell apoptosis. Besides that, the content of vitamin B in rice red protects against Metabolic incident disorders in type 2 DM

patients.

The high fibre content in brown rice allows for the slowing of gastric emptying and glucose diffusion, decreases amylase activity and consequently increases the viscosity of intestinal contents and decreases transit time, changes in intestinal peristalsis, and decreases transit time, resulting in shortened glucose absorption. This effect enhances insulin secretion and uses glucose by cells heart.

Spinach red Contains 3 grams of substance iron in 100 grams of preparation to increase the rate of haemoglobin. The content of flavonoids can protect pancreatic cells from damage. The ability of flavonoids, especially quercetin, inhibits liver glucose transporter type 2 intestinal mucosa so that it could reduce glucose absorption.

The implication of drop rate glucose and increased haemoglobin from consumption of spinach red and fibre is the possibility that content from the second type of food contains anthocyanins, flavonoids and fibre that can inhibit GLUT in the intestine and slows down emptying stomach as well as prevent damage pancreatic cells. The moment deceleration emptying stomach and intestines diabetic patients will feel full so that activity amylase will decrease such a glucose absorption will Become short so that insulin secretion and use glucose by cells heart will increase and rate glucose blood will be decreased.

## Conclusion

The high B vitamins and iron content in brown rice and red spinach will significantly increase haemoglobin in people with diabetes mellitus. Brown rice and red spinach can prevent functional deficiency of vitamin B12 and haemoglobin due to long-term use of metformin 40–42. With thereby could be recommended that people with diabetes mellitus type 2 who have a history of metformin use could consume cookies for permanent guard index glycemic and increase haemoglobin.

### Strengths and limitations

To study this, we use a small sample. So with a small sample, be careful to apply because the findings could not represent the result. Because of that, the study focuses more on using cookies to need nutrition needed by type 2 DM patients with more extensive samples and time. Long observations are recommended.

### Financial/non-financial disclosures

The authors have reported to Clinical Nutrition that no potential conflicts of interest exist with companies/organizations whose products or services may be discussed in this article.

### Author contributions

LS; contributed to the conception and design of the study; acquisition, analysis. MS contributed to interpretation of the

data; and ACM contributed to statistical analysis and drafting of the manuscript. YR contributed to the conception and design of the study; analysis and interpretation of the data; and statistical analysis and drafting of the manuscript. RR contributed to the acquisition and interpretation of the data and critical revision of the manuscript; contributed to the statistical analysis, and interpretation of the data; and critical revision of the manuscript.

### Conflicts of Interest:

Each author declares that he or she has no commercial associations that might pose a conflict of interest in connection with the submitted article

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