Available online: http://journal.ipb.ac.id/index.php/jgizipangan ***J. Gizi Pangan, December 2023, 18(Supp.1):125-127***
Accredited based on DGHE, Republic of Indonesia No. 28/E/KPT/2019
ISSN 1978-1059 EISSN 2407-0920

Effect of Seaweed Rice Intervention on Fasting Blood Glucose Levels and Antioxidant Activity in Prediabetics and Diabetics Adults

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ABSTRACT

This study aimed to analyze the effect of seaweed rice on Fasting Blood Glucose (FBG) and Superoxide Dismutase (SOD) levels in humans measured using finger prick method. This research was a quasi-experimental study with pre-posttest design. A total of 34 adult subjects were divided into control and intervention groups. The intervention group received 250 g/day of seaweed rice made by extrusion method at 8 AM for 42 days, while the control group received none. The results showed that the intervention had no significant effect on either FBG or SOD levels.

Keywords: antioxidant activity, blood glucose, diabetes, prediabetes, seaweed rice

INTRODUCTION

There are several food ingredients currently being developed as supportive therapies for diabetes, one of which is seaweed. Seaweed contains bioactive compounds such as carotenoids, phenols, polyphenols, vitamins, minerals and dietary fiber, and it also has high antioxidant activity (Purwaningsih *et al.* 2020). Seaweed rice has been developed with the formulation of rice, corn and cassava flour with the addition of seaweed flour (Hidayanti 2021). Seaweed rice lowers blood glucose levels by slowing gastric emptying, reducing glucose absorption, and increasing insulin sensitivity (Sunarti 2017). A previous study by Purwaningsih *et al.* (2020) showed that seaweed rice could reduce blood glucose levels in diabetic rats, but there is lack of information on its effect in humans. This study aimed to analyze the effect of seaweed rice intervention on Fasting Blood Glucose (FBG) and Superoxide Dismutase (SOD)levels in prediabetics and diabetics subjects.

METHODS

The study is a quasi-experimental study with pre-posttest control group design and conducted from December 2021 to August 2022 in Jakarta and Bogor. The inclusion criteria of subjects were male or female adults with Body Mass Index (BMI) ≥18.5, age between 20–70 years, fasting blood glucose ≥100 mg/dL, and not under medical treatment. Seaweed rice was made by extrusion method. There were 34 subjects divided into control and intervention groups. The intervention group, which consisted of subjects with prediabetes and diabetes condition, received 250 g/day of seaweed rice that was provided at 8 AM every day for 42 days, while the control group only consumed food according to their habits. Overnight fasting blood samples were taken by paramedics via finger prick on day 0 and day 43. Subjects were purposively determined. Data were collected by direct measurement and interviews using questionnaires and then processed using Microsoft Excel 2010 and SPSS. This study received ethical approval from the Ethics Committee for Research Involving Human Subjects, IPB University, with reference number 509/IT3. KEPMSM-IPB/SK/2021.

RESULTS AND DISCUSSION

The mean age of the subjects was 48.4±9.7 years, and the subjects included people at high risk for diabetes mellitus. The educational attainment of most subjects was high school diploma (51.4%). The majority of subjects (60%) worked in the private sector, were married

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(Received 09-06-2023; Revised 09-08-2023; Accepted 13-08-2023; Published 30-12-2023)

(85.7%), had a small family (80%), and had no history of diabetes (82.4%). Nevertheless, the subject's acceptance of seaweed rice was good.

Based on Table 1, it is known that blood glucose levels after the intervention decreased compared with before the intervention. There was no significant difference in the reduction of blood glucose levels between the two groups (p=0.931). Analogue seaweed rice from *Gracilaria sp*. is claimed to have a high dietary fiber content that can help lower blood glucose levels. High-fiber foods can help lower blood sugar levels by prolonging satiety (Rimbawan & Siagian 2004). Fiber can help lower blood glucose levels because dietary fiber, especially water-soluble dietary fiber can improve food viscosity by forming gel, leading to the food not being able to be digested by the digestive enzymes properly. More viscous foods will slow the gastric emptying process and cause digestion to slow down. This slow digestion leads to a decrease in nutrient absorption, including glucose. Slower gastric emptying and slower digestion create a longer sense of fullness, which reduces food intake. There is a decrease in glucose absorption, and decreased dietary intake will make blood glucose levels lower or remain within the normal range. Moreover, dietary fiber enters the large intestine intact. Fibers that are still intact in the large colon are then differentiated by colonic bacteria to form SCFA (Short-Chain Fatty Acids). This formation of SCFA induces the secretion of the hormones GLP-1 (Glucagon-Like Peptide-1), GIP (Gastric Inhibitory Polypeptide), and PYY (Peptide YY) which will increase insulin sensitivity and eventually lead to a decrease in blood glucose levels (Sunarti 2017).

Table 1. Effect of seaweed rice

Variable	Intervention	Control	*p*-value
Fasting blood glucose levels			
Before (mg/dL)	134±45	146±57	0.292[a]
After (mg/dL)	114±25	125±45	0.512[a]
Δ (mg/dL)	20±25	21±45	0.931[a]
Superoxide dismutase activity			
Before (U/mL)	0.461±0.13	0.727±0.22	0.000[a]
After (U/mL)	0.511±0.15	0.826±0.31	0.000[a]
Δ (U/mL)	0.050±0.13	0.099±0.24	0.524[b]

[a]: Mann Whitney test; [b]:Wilcoxon test

According to Panchali (2014), blood glucose level is influenced not only by food intake but also by several factors, such as age, family history, nutritional status, physical activity, and stress. On the other hand, the SOD level of the subjects was 0.461 U/mL before the intervention and 0.511 U/mL after the intervention. It can be seen that the antioxidant activity increased. However, the SOD level of the control subjects also increased. The test for the difference in SOD levels between the two groups showed no significant difference with a value of p=0.524. These results showed that the increase in SOD levels was not only due to the seaweed rice intervention but it may also be due to other factors. Panchali (2014) explained several factors that can affect oxidant and antioxidant levels in the body, including stress and exposure to free radicals such as cigarette smoke, alcohol, unsaturated fats, and other compounds.

CONCLUSION

Provision of seaweed rice at 250 g/day was not yet effective in either lowering fasting blood glucose or increasing SOD levels. Further studies on homogeneous subjects are needed because the standard deviation is considerable.

ACKNOWLEDGEMENT

This research was funded by the Directorate General of Higher Education, Ministry of Education, Culture, Research, and Technology.

DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflicts of interest to declare.

REFERENCES

Hidayanti S. 2021. Characteristics of artificial rice with the addition of *Gracilaria* sp. seaweed [Undergraduate thesis]. Bogor: IPB University.

Panchali DR 2014. Superoxide dismutase 1 acts as a nuclear transcription factor to regulate oxidative stress resistance: a study on antioxidant properties of different bioactive compounds. AJDDT 4(4):38–46. https://doi.org/10.1038/ncomms4446

Purwaningsih S, Santoso J, Handharyani E, Setiawati NP, Deskawati E. 2020. Characteristics and antioxidant activity of *Gracilaria sp*. seaweed from Banten. Indonesian Journal of Fisheries Product Processing 23(3):503–512. https://doi.org/10.17844/jphpi.v23i3.32808

Rimbawan, Siagian. 2004. Indeks glikemik pangan, cara mudah memilih pangan yang menyehatkan. Jakarta (ID): Penebar Swadaya.

Sunarti. 2017. Dietary Fiber in the Treatment of Metabolic Syndrome. Yogyakarta (ID): Gadjah Mada University Press.