

EFFECT OF OAT FERMENTED BLACK GLUTINOUSRICE COOKIES INTERVENTION ON OBESE WOMEN BODY WEIGHT

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Abstract Background: The prevalence of obesity among adult in Indonesia is high. With the development of several anti-obesity foods, different attempts have been made to verify the antioxidant, insulin-sensitivity, and anti-inflammatory effects of anthocyanins. Increased consumption of dietary fiber has the potential to induce structural, physicochemical and gastrointestinal site-specific benefits that are relevant for the treatment of obesity and metabolic syndrome. The content of oat fermented black glutinous rice (OFBGR) cookies that contain anthocyanin, low calories, and high fiber is expected to be able to reduce obesity.

Objective: This study aimed to know effect of oat fermented black glutinous rice (OFBGR) cookies on obese women body weight.

Method: The study design was true experiment with a control group. There were 20 obese women subjects (>20 years old) each group by purpose sampling method. Subjects were divided into two groups: the experimental group (OFBGR cookies administrated for 30 days) and the control group no OFBGR cookies administration. Body weight were collected pre and post intervention. Data analysis by double difference approach to compare body weight of the two groups.

Results: Administering OFBGR cookies significantly reduced body weight in obese women with a p-value of <0.001 and 0.039 ($p \leq 0.05$).

Conclusion: This study concluded that OFBGR cookies reduced body weight in obese women.

Keywords: OFBGR cookies, Obese women, Body weight

BACKGROUND

Obesity is a complex chronic progressive disease characterized by excess body weight and dysregulation in entero-endocrine and neurohormonal signalling pathways favouring increased appetite and energy storage (1). The latest statistics from the World Obesity Alliance's "2024 World Obesity Map" indicate that the global count of overweight and obese adults has exceeded 2.2 billion, with a continually rising obesity rate projected to reach 3.3 billion by 2035, accounting for over 54% of the global adult population (2). Obesity escalates the risk of numerous chronic diseases, including type 2 diabetes, hypertension cardiovascular diseases, kidney and liver diseases, and certain cancers (2). Dietary adjustment is a crucial approach to obesity management. Therefore many nutrition research on food have been explored for their effectiveness on weight loss. Dietary fiber is a potent tool for the management of obesity (3). More recently, natural phytochemicals present in foods, including anthocyanins, due to their chemical structure, seem to be able to exert several pharmacologic activities, mainly antioxidant and anti-inflammatory actions (3). It has been reported that the anthocyanins might play a role in attenuating obesity by producing a decrease in weight and adipose tissue (4). The content of OFBGR cookies that contain anthocyanin, low calories, and high fibre is expected to be able to reduce obesity.

METHODS

Study setting and design

This study was an experimental design with a control group. In the intervention group, samples were given OFBGR cookies for 30 days, while in the control group were not given OFBGR snack bar. The research was conducted in Pasirkaliki, Cimahi Utara West Java on October 2024.

Study population and sampling procedure

Study population was the obese women in Pasirkaliki, Cimahi Utara, West Java. Samples were women that met the criteria and agree to participate the research by signed informed consent. Minimum samples were calculating by hypothesis test to compare two means. There were 40 samples totally or 20 subjects for each group. The sample criteria were female, BMI > 27 kg/m², aged 25 to 60 years old, and willing to participate this research. Exclusion criteria were stroke or CAD or renal diseases sufferers, professional athlete, and not willing to participate the research. Sample was determined using purposive sampling technique.

Data Collection and Variable measurement

The data collection was performed using primary data by interviewing samples, daily food intake with 24-h food recall. Samples body weight was measured using digital scales, which collected before OFBGR cookies were given, and after 30 days intervention. Normality test for data was done to check normality distribution data. Bivariate analysis to test efficacy the OFBGR cookies by independent and the dependent t-test when data normally distributed, Mann Whitney and Wilcoxon Sign Rank test when data not normally distributed. Our study limitation is no control on physical activities.

Ethic Consideration

The studies involving human participants were reviewed and approved by the Research Ethic Committee from Poltekkes Kemenkes Bandung (No. 26/KEPK/EC/VI/2024). The participants provided their written informed consent to participate in this study.

RESULTS AND DISCUSSION

Oat Fermented Black Glutinous Rice (OFBGR) Cookies Nutrient Content

The cookies contain low calories, high in fiber, and as a resource of anthocyanin (table 1.). Wich is good for people who want to loose weight or maintan their weight. OFBGR cookies has brown to violet color with round shape and crispy texture (figure 1).

Table 1. Nutrient content of OFBGR Cookies

Nutrient content per 100 gram (14 pieces)		Nutrient content per portion 21 gram (3 pieces)	
Energy	: 439,24 kcal	Energy	: 92, 24 kcal
Protein	: 8,67 g	Protein	: 1,82 g
Fat	: 16,21 g	Fat	: 3.40 g
Carbohydrate	: 63,52 g	Carbohydrate	: 13,34 g
Dietary fiber	: 7,3 g	Dietary fiber	: 1,53 g
Anthocyanin	: 23,49 mg	Anthocyanin	: 4,93 mg

SIG Laboratory test results



Figure 1. Oat Fermented Black Glutinous Rice Cookies

Characteristic of Respondents

Table 2 displays the characteristics of the study's respondents. The findings revealed that the average of age and body weight of intervention and control group were almost similar.

	Intervention group		Control group	
	Min-max	Mean	Min-max	Mean
Age (yo)	28 - 59	39	25-60	42

Comparison of Energy, Protein, Fat, Carbohydrate, and Fiber Intake Before and After the Intervention of Black Glutinous Rice Oat Tape Cookies and the Control Group

Table 3. Comparison of Energy, Protein, Fat, Carbohydrate, and Fiber Intake Before and After the Intervention of OFBG Cookies and the Control Group

Variable	Intervention		p value ¹⁾	control		p value ¹⁾
	pre	post		pre	post	
Energi (kkal)	1561,1 (511,7)	1311,1,3 (492,3)	0,090	1456,2 (519,9)	1409,3 (516,7)	0,722
Protein (g)	55,2 (22,4)	49,1 (22,6)	0,336	43,6 (13,9)	47,9 (14,4)	0,365
Fat (g)	61,3 (23,4)	45,9 (21,1)	0,023	48,7 (24,1)	43,4 (19,8)	0,467
Carbohydrtae (g)	193,0 (21,1)	184,3 (72,9)	0,711	227,1 (109,4)	211,7 (78,1)	0,486
Dietary fiber (g)	7,5 (4,8)	10,1 (7,4)	0,227	6,1 (4,1)	6,5 (5,1)	0,822

¹⁾Dependent T Test

The results of the statistical test using the Dependent Test at a 95% confidence interval showed no significant difference between energy intake before and after in the group given black glutinous rice oat tape cookies (p-value = 0.090 (p>0.05)), and no significant difference between energy intake before and after in the control group (p-value = 0.722 (p>0.05)). Table 3 shows no significant difference between protein intake before and after in the group given black glutinous rice oat tape cookies (p-value = 0.336 (p>0.05)). There was no significant difference between protein intake before and after in the control group (p-value = 0.365 (p>0.05)). It shows a significant difference between fat intake before and after in the group given black glutinous rice oat tape cookies (p-value = 0.023 (p≤0.05)), but no significant difference between fat intake before and after in the control group (p-value = 0.467 (p>0.05)). Table 3 shows no significant difference between carbohydrate intake before and after in the group receiving black glutinous rice oat tape cookies (p-value = 0.711 (p>0.05)). There was no significant difference between carbohydrate intake before and after in the control group (p-value = 0.486 (p>0.05)). Table 3 shows no significant difference between fiber intake before and after in the group receiving black glutinous rice oat tape cookies (p-value = 0.227 (p>0.05)). There was no significant difference between fiber intake before and after in the control group (p-value = 0.822 (p>0.05)).

Comparison of Body Weight before and after the intervention in intervention and the control groups

Table 4. Comparison of Body Weight before and after the intervention of OFBGR cookies in intervention and the control groups

Variable	Intervention		p value ¹⁾	control		p value ¹⁾
	pre	post		pre	post	
BW (kg)	69,3 (11,9)	67,8 (11,8)	<0,001	69,4 (7,3)	69,5 (7,3)	0,547

¹⁾Dependent T Test

Body weight in intervention group declined after 30 days cookies administration in intervention group. The results of the statistical test using the Dependent Test at a 95% confidence interval showed significant difference between pre post in intervention group (p<0.05).

Effectiveness of OFBG Cookies on Energy, Protein, Fat, Carbohydrate, and Fiber Intake in Obese Women.

Table 5. Effectiveness of OFBGR Cookies on Energy, Protein, Fat, Carbohydrate, and Fiber Intake in Obese Women

Variable	Treatment		control		p value ^{*)}
	Mean (SD)	Md (Min-Max)	Mean (SD)	Md (Min-Max)	
Energy (kcal)	-249,9 (607,0)	-230,4 (-1338-814,8)	-46,8 (565,5)	-151,1 (-1017,1-827,2)	0,300
Protein (g)	-6,10 (26,89)	-5,2 (-47,5-47,1)	23,8 (86,8)	-0,8 (-22,8-372,8)	0,157
Fat (g)	-15,4 (26,9)	-9,6 (-61,0-33,6)	-5,3 (31,2)	-3,6 (-57,4-57,8)	0,300
Carbohydrate (g)	-8,67 (100,2)	-1,60 (-161,3-262,0)	-15,4 (94,3)	-28,8 (-173,1-153,5)	0,988
Dietary Fiber (g)	2,56 (8,9)	2,1 (-7,0-30,47)	6,84 (20,2)	0,56 (-10,99-61,3)	0,942

^{*)} Mann Whitney test

Table 5 shows that the statistical test results using the Mann-Whitney test at a 95% confidence interval indicate that administering OFBGR cookies effectively reduced energy intake in obese women, but not significantly with a p-value of 0.300 ($p > 0.05$). Table 5 shows that administering OFBG cookies effectively reduced protein intake in obese adults, but not significantly with a p-value of 0.157 ($p > 0.05$); effectively reduced fat intake in obese adults, but not statistically significantly with a p-value of 0.300 ($p > 0.05$); effectively reduced carbohydrate intake in obese adults, but not statistically significantly with a p-value of 0.988 ($p > 0.05$); and effectively increased fiber intake in obese adults, but not statistically significantly with a p-value of 0.942 ($p > 0.05$).

Effectiveness of OFBG Cookies on Body Weight in Obese Women

Table 5. Effectiveness of OFBG Cookies on Body Weight in Obese Women

Reduction	treat		control		p value ^{*)}
	Mean (SD)	Md (Min-Max)	Mean (SD)	Md (Min-Max)	
BW (kg)	-1,5 (0,7)	-1,2 (-3,3-(-0,6)	0,1 (0,9)	-0,2 (-1,3-1,8)	<0,001

^{*)} Mann Whitney test

Table 5 shows that the results of statistical tests using the Mann-Whitney test at a 95% confidence level indicate that administering OFBG cookies is effective in significantly reducing body weight in obese adults with a p-value of < 0.001 ($p \leq 0.05$). It has been found to be involved in many complex metabolic interactions in human metabolism. Anthocyanins are generally effective in inhibiting α -glucosidase, lipase, α -amylase enzymes, lowering glucose levels, regulating insulin secretion, and preventing insulin resistance. They possess anticancer, anti-tumoral, anti-atherosclerotic, anti-inflammatory, anti-microbial and anti-obesity effects on human health and are the chemical compound that prevent neuronal and cardiovascular diseases (5). Deehan, Mocanu and Madsen found that samples who were intervened with Queen Garnet Plum Juice which has chemical compound significantly reduces body weight ($p < 0.05$) with the average decrease of 0.6 kg in body weight over the period of 4 weeks (6). Overwhelming evidence exists supporting the use of dietary fiber as a public health tool with which to prevent obesity and its metabolic consequences. There is also a large body of evidence supporting the use of fiber intake as adjunctive therapy for patients with hypertension, dyslipidaemia and T2DM and patients with these conditions should be encouraged to consume increased amounts of a variety of high fiber foods, including fruits, vegetables, grains, nuts and

seeds, and legumes as well as specific fiber supplements (7). Heterogeneity exists between fibres in terms of their chemical and physical structures, which determines the effects of fibre on the gastrointestinal tract, the gut microbiota and energy homeostasis. Increased consumption of dietary fibre has the potential to induce structural, physicochemical and gastrointestinal site-specific benefits that are relevant for the treatment of obesity and metabolic syndrome (8)

CONCLUSION

Administering black glutinous rice oat tape cookies significantly reduced body weight in obese women with a p-value of <0.001 ($p \leq 0.05$). Further research is need to conduct.

COMPETING INTERESTS

All authors had none to declare

AUTHOR'S CONTRIBUTION

Yenny Moviana conceived of the presented idea, data analysis, and writing manuscript; Rr. Nur Fauziah was in charge of data collection and analysis; and drafting the manuscript. All authors contributed to the final manuscript.

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