EFFECTIVENESS OF THE COMBINATION OF SEAWEED JELLY AND LIME IN THE REDUCTION OF CENTRAL OBESITY IN HOUSEWIVES IN GROBOGAN, CENTRAL JAVA

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ABSTRACT

Background: Obesity is a grave public health threat, more serious even than the opioid epidemic. It is linked to chronic diseases including type 2 diabetes, hyperlipidemia, high blood pressure, cardiovascular disease, and cancer. This number does not include deaths from the many other medical conditions associated with obesity. Edible seaweed is a vegetable of the sea, a food source for ocean life and humans who consume it in it is many forms. Low-calorie and nutrient-dense, edible seaweed has long been harvested and consumed in Asian cuisines. Agar or jelly is a gelatinous substance that is extracted from seaweed and processed into flakes, powders and sheets. Agar tends to make people feel full, so they might stop eating earlier than they otherwise would. Some people think this reaction will lead to weight loss. But so far, there is no reliable scientific evidence that supports this weight loss theory. This study aimed to determine the effect of consuming the combination of agar-agar and lime on central obesity in housewives.
Subjects and Method: This study was a randomized control trial (RCT). A total of 32 housewives were selected for this study, and divided at random into two groups: (1) Experimental group consisting of 16 housewives who consumed combination of agar-agar and lime; (2) Control group consisting of 16 housewives who did not consume combination of agar-agar and lime. The dependent variable was abdominal circumference. The abdominal circumference was measured by placing a measuring tape in a horizontal plane around the abdomen at the level of iliac crest. The independent variable was the consumption of 200 g agar-agar in combination with 7 ml lime daily for 30 days. The mean difference of abdominal circumference after the intervention between the experimental group and control group was compared with by paired t-test.
Results: The mean abdominal circumference after the intervention in the experimental group (Mean= 87.50; SD= 9.10) was lower than that in the control group (Mean= 91.81; SD= 7.14), but it was not statistically significant (p= 0.358).
Conclusion: The combination of agar-agar and lime is not effective in reducing central obesity in housewives.

Keywords: agar-agar, lime, central obesity, housewife.

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BACKGROUND

Central obesity has become one of the nutritional problems of people around the world. Central obesity is the accumulation of excess fat in the abdomen caused by non-functioning subcutaneous fat resulting in an energy imbalance associated with excessive nutrient intake and low physical activity. A woman will be diagnosed with central obesity if the waist circumference is more than 80 cm (Savitri, 2017).

https://doi.org/10.26911/ICPHpromotion.FP.08.2021.14

The prevalence of obesity in adult women in Indonesia tends to increase every year. The prevalence of obesity reached 13.39% In 2007, 15.5% in 2010 and then increased to 32.9% in 2013. In Grobogan, Central Java, 1.89% of women over 15 years of age suffer from obesity (Provincial Health Profile of Central Java, 2017). Based on previous research on 200 women, the highest factor that affects the incidence of obesity in housewives is low physical activity. Increasing physical activity to 15-60 minutes a day can help prevent a housewife from obesity (Suryadinata and Sukarno, 2019).

Obesity has a negative impact on physical health and mental health among housewives. Women with obesity are advised to consume high-fiber foods such as jelly. agar contains high fiber, nutrients, and minerals which can significantly reduce belly fat (Aini et al., 2019). In addition to gelatin, lime with a high vitamin C content is very important for breaking down fat during exercise. Consuming lime every day can meet 22% of vitamin C needs per day and prevent obesity. Based on previous research, consuming lime juice before doing physical activity can help break down fat effectively (Ningtyas et al., 2017).

The research of Bainuan and Juaria (2018) shows that there is a significant effect between giving stomach tapel and orange juice aurantifolia on weight loss in postpartum women. The results in the intervention group before and after being given a stomach bandage and orange juice aurantifolia showed a significant difference (p = 0.006).

A preliminary study conducted by researchers in September 2020 in Dukuh Tapen, Grobogan showed that out of 10 subjects, 7 subjects had an abdominal circumference of 80-90 cm, 1 subject had an abdominal circumference of 90-100cm, and two subjects had an abdominal circumference of 100-110 cm. The results showed that all subjects had an abdominal circumference of more than 80 cm, which was beyond the normal minimum abdominal circumference size for women (Huldani et al., 2019). The subject said that he never tried to shrink his stomach even though he really wanted to.

Based on the high prevalence of obese women and the benefits of agar-agar and lime to reduce fat, this study aims to determine the effect of the combination of agar-agar and lime on central obesity among housewives in Grobogan, Central Java.

SUBJECTS AND METHOD

1. Study Design

This study is a randomized control trial (RCT) conducted in Tapen Hamlet, Grobogan, Central Java.

2. Population and Sample

The population of this study were all housewives with a waist circumference of more than 80 cm in Tapen hamlet, Grobogan. The sample was selected by purposive sampling. 32 subjects were selected and divided into two groups, namely 16 control group subjects and 16 intervention group subjects who received a combination of 200 g of agar and 7 ml of lime dissolved in 200 ml of water for 30 days.

3. Variable

The dependent variable is central obesity. The independent variable is the combination of agar and lime.

https://doi.org/10.26911/ICPHpromotion.FP.08.2021.14

4. Variable Operational Definition

Central obesity is the accumulation of excess fat in the abdomen caused by non-functioning subcutaneous fat resulting in an energy imbalance associated with excessive nutrient intake and low physical activity.

The combination of agar and lime is a combination of 200 g of agar-agar and 7 ml of lime dissolved in 200 ml of water.

5. Instrument

The instruments used in this study were a questionnaire to record the characteristics of the subject, metline, and an observation sheet to record the measurement of abdominal circumference.

6. Data Analysis

Univariate analysis was used to describe the characteristics of the subjects such as age, and education. Bivariate analysis was performed using paired t-test to determine the difference in abdominal circumference between the control and intervention groups before and after the intervention.

RESULTS

Table 1 shows that the majority of subjects in the intervention group were aged 30-40 years (62.5%) with education completing elementary school (87.5%), while in the control group the majority were aged 30-40 years (56.3%) and graduated from elementary school (93.8%). .

Table 2 shows that before being given the intervention, the abdominal circumference of the intervention group had a higher mean (Mean = 95.62; SD= 11.84) than the control group (Mean= 92.06; SD= 11.15; p= 0.890). After being given the intervention, the intervention group had a lower mean (Mean= 87.50; SD= 9.10) than the control group (Mean= 91.81; SD= 7.14; p= 0.315).

Table 1. Subject Characteristics

Variable	Group			
	Intervention		Control	
	Frequency	(%)	Frequency	(%)
Age				
30-40	10	62.5	9	56.3
40-50	6	37.5	7	43.8
Education				
Primary school	14	87.5	15	93.8
Junior high school	2	12.3	1	6.3

Table 2. Distribution and Frequency of Abdominal Circumference Before and After Intervention was Given in Both Groups

Group	Mean	SD	SE	P
Before intervention				
Intervention Group	95.62	11.84	2.96	0.890
Control Group	92.06	11.15	1.78	
After intervention				
Intervention Group	87.50	9.10	2.27	0.358
Control Group	91.81	7.14	1.78	

https://doi.org/10.26911/ICPHpromotion.FP.08.2021.14

DISCUSSION

Based on the results of the study showed that after being given the intervention there was a higher reduction in abdominal circumference in the intervention group given a combination of agar and lime (Mean= 87.50; SD= 9.10) than the control group (Mean= 91.51; SD= 7.14) but the difference not statistically significant (p= 0.358). It can be concluded that the combination of agar-agar and lime can help reduce abdominal circumference but is not too significant for central obesity. The results of this study are in line with research by Rahma (2014) that seaweed in agar has higher fiber and lower calories. Seaweed can accelerate the body's metabolic processes and reduce triglyceride and blood sugar levels, so it is recommended to reduce obesity.

Energy intake that exceeds energy expenditure is the main driver of weight gain. Dietary quality may have an effect on energy balance through complex hormonal and neurological pathways that affect satiety and possibly through other mechanisms. The food environment, marketing of unhealthy foods and urbanization, and reduction of sedentary behavior and physical activity play important roles in overcoming weight loss (Romie et al., 2017).

The research of Bainuan and Juaria (2018) which states that the juice of lime or orange aurantifolia which contains high vitamin C has a significant effect on weight loss in postpartum women. Vitamin C has a significant role in breaking down fat effectively.

Local lime (Citrus aurantifolia Swingle) contains higher citric acid than other limes. There is 55.6 g/kg of citric acid in local limes. 48.9 g/kg citric acid in lemon, and 38.6 g/kg citric acid in Bangkok lime. Citric acid is an organic acid that is soluble in water. Citric acid can dissolve fat in the body because citric acid has the ability to bind fat. Citric acid is used as an antioxidant synergism in fats, oils and foods containing fat (Bikash, 2020).

Seaweed as the main component of agar generally refers to plants and algae that grow in waterways such as oceans, lakes, and rivers. Seaweed contains bioactive compounds such as polyphenols, lipids, and carotenoids, which exhibit antioxidant activity and other beneficial properties, with wide applications in the food, feed and pharmaceutical industries. Previous results have shown that seaweed is considered a protective agent that can decrease oxidative inflammatory status associated with weight gain, and is being applied in the treatment of various obesity-induced diseases (Ojulari et al., 2020).

Fucoxanthin (FXN), a seaweed carotenoid that is effective in increasing the expression of lipid metabolism enzymes, promotes fatty acid oxidation, and suppresses the activity of cholesterol-regulating enzymes. Several studies in the literature have linked the anti-obesity mechanism of fucoxanthin to the modulation of key transcription factors associated with obesity. Among these, FXNs play an important role in the differentiation and function of mature adipocytes. Activation of this nuclear receptor in adipocytes has been

https://doi.org/10.26911/ICPHpromotion.FP.08.2021.14

reported to increase insulin resistance associated with obesity (Lee et al., 2019).

The combination of jelly and lime has a high fiber and antioxidant content that can help lower cholesterol, blood sugar and improve digestion. The combination of agar and lime can prevent metabolic syndrome and help overcome central obesity (Tamimi et al., 2019).

This study concluded that there were differences in the abdominal circumference of housewives in the intervention group given a combination of agar and lime with the control group. The mean value of abdominal circumference was lower in the intervention group than in the control group. It is hoped that the combination of agar and lime can be a non-pharmacological alternative to overcome central obesity in housewives.

AUTHOR CONTRIBUTION

The first author as the lead researcher coordinated the implementation of the research, internal and external licensing, and provided intervention to the subject. The second author analyzed the data, compiled the manuscript and gave intervention to the subject.

FUNDING AND SPONSORSHIP

This research received support from LPPM Muhammadiyah Kudus University as an effort to develop lecturers in carrying out research.

ACKNOWLEDGMENT

The researcher would like to thank LPPM Muhammadiyah Kudus University for the support it has given and the Grobogan district health office for providing land for research.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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