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## **DRINKING PLAIN WATER BEFORE HAVING BREAKFAST SIGNIFICANTLY LOWERS BODY WEIGHT IN OBESE MALE ADOLESCENTS**

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### **ABSTRACT**

Drinking plain water can increase daily energy expenditure and decrease total energy intake. This study aimed to analyze the effects of drinking plain water before eating steamed rice with high glycemic index (GI) at breakfast, on body weight (BW) and blood glucose level (BGL) in obese male adolescents. Twenty male adolescents aged 15-18 years old and had BMI for age > 85 percentile participated in this randomized control trial study. Ten male students in G1 group drank 250 ml plain water before eating 180 g steamed rice with high GI and 10 male in the other group (G2) drank the same amount of water after eating the same rice for breakfast for 7 days. Paired and independent t tests were used to analyze BW and BGL in both groups with p value < 0.05. Mean BW change in G1 was significantly different from mean BW changes in G2 (p=0.006), whereas mean fasting and 1h after meal BGLs changes of both groups were similar. Drinking water before having breakfast reduces BW in obese male adolescents.

Keywords : blood glucose level, body weight, high glycemic index obesity, plain water

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### **ABSTRAK**

Minum air putih dapat meningkatkan pengeluaran energi harian dan mengurangi total asupan energi. Penelitian ini bertujuan untuk menganalisis pengaruh minum air putih sebelum sarapan nasi kukus dengan indeks glikemik (IG) tinggi terhadap berat badan (BB) dan kadar glukosa darah (KGD) pada remaja putra dengan obesitas. Dua puluh remaja putra berusia 15-18 tahun dan IMT/U > 85 persentil berpartisipasi dalam penelitian randomized control trial study ini. Sepuluh remaja putra kelompok K1 minum 250 ml air putih sebelum sarapan 180 g nasi kukus dengan IG tinggi dan 10 remaja putra kelompok K2 minum air putih dalam jumlah yang sama setelah sarapan nasi yang sama selama 7 hari. Uji t berpasangan dan independen digunakan untuk menganalisis BB dan KGD pada kedua kelompok dengan nilai p < 0,05. Rata-rata selisih perubahan BB pada kelompok K1 berbeda secara signifikan daripada rata-rata selisih perubahan BB pada kelompok K2 (p = 0,006) sedangkan rata-rata KGD puasa dan 1 jam posprandial sama pada kedua kelompok. Kesimpulan: Minum air putih sebelum sarapan nasi menurunkan BB pada remaja putra dengan obesitas.

Kata kunci : kadar glukosa darah, berat badan, indeks glikemik tinggi, obesitas, air putih

## BACKGROUND

Obesity in children and adults is one of health problems around the world. The prevalence of overweight in the Southeast Asia region is approximately 14%, while the prevalence for obesity is 3% (WHO, 2016). Basic Health Research (Riskesdas) showed the prevalence of obesity in late adolescents in Indonesia increases from 11.7% in 2010 to 15.4% in 2013 (Badan Penelitian dan Pengembangan Kesehatan, 2013). Lifestyle changes such as unhealthy diet and low physical activity increase the risk of obesity in adolescents. In recent years, adolescents prefer to eat fast foods, which contain high calories with high fat, sugar, and salt and low fibers, than to eat nutritious foods. This habit can trigger obesity during adolescents and in adulthood periods (Datar & Nicosia, 2013).

Consumption of high GI food contributes in increases of BW and BGL (Cocate et al., 2011). High-GI foods such as steamed white rice which are quickly digested and absorbed in small intestine, resulting in a high glycemic response to stimulate higher insulin secretion. It subsequently affects appetite and energy metabolism, which increase BW and fat accumulation (Ding & Malik, 2008).

BW management for obesity is intended to reduce energy intake and to raise energy expenditure. Reduction of food intake includes changes in food portion, macronutrient composition, meal frequency, and eating pattern, and also replacement of meal products and high GI foods. Whereas doing more exercise is intended to increase energy expenditure (Ard, Miller, & Kahan, 2016). However, some obese adults fail to achieve their ideal BW although they do such treatments for long time (Gibson & Sainsbury, 2017).

Drinking plain water has beneficial effect for BW management in people with obesity. Obese adults who drank plain water at least 710 ml/day for 1 year lose their BW from  $93.15 \pm 12.94$  to  $90.70 \pm 13.70$  kg (Peters et al., 2016). However, this study did not clearly state when water is consumed whether before or after meals. Water consumption

stimulates the sympathetic nervous system, which leads to increase thermogenesis and daily energy expenditure. In addition, drinking enough plain water can facilitate weight loss through reduction of total energy intake and increase of cellular fat oxidation (Stookey et al., 2015). Another study reported that drinking 500 ml plain water for 12 week before eating low caloric meals decreases approximately 2 kg of BW, which is 44% greater than eating low caloric meals only (Dennis, Flack, & Davy, 2009). However, an Indonesian study reported that young females who drank the same amount of plain water 30 minutes before meals time for 5 weeks did not lose their BW (Mulyasari, Muis, & Kartini., 2015). Type of diet in that study was unknown. Overall it suggests that drinking plain water before meals has various effects. Therefore, the purpose of this study was to analyze the effects of drinking plain water before eating steamed rice with high GI on BW and BGL in male adolescents with obesity.

## METHOD

Randomized control trial study was conducted in male adolescents who studied in the public senior high school 8, Jebres district, Surakarta. They were selected as respondents with inclusion criteria: 15-18 years old, healthy, > 85 percentile of BMI for age (CDC, 2016), and low physical activity. Selected male students were excluded from this study if they had a history of diabetes mellitus, were active smokers and consumed alcohol, energy drinks or some drugs that influenced BGL. Sample size was calculated using a formula for experimental research (Dahlan, 2010) and the combined standard deviation was determined using standar deviation inprevious study (Rouhani, Kelishadi, Hashemipour, Esmailzadeh, & Azadbakht, 2013). This research protocol has been approved by the Commission for Ethics of Medical Research, Faculty of Medicine, Universitas Sebelas Maret No. 541/ IV/ HREC/ 2018 and the research subjects have also signed the informed consent.

A total of twenty male students

were randomly divided into 2 groups (G): 10 students in the G1 drank 250 ml plain water before eating 180 g steamed rice with high-GI (Pandan Wangi, IPB Bogor) and 10 students in the G2 drank the same amount of plain water after eating the same rice for breakfast time for 7 days. For lunch, all respondents received 180 g carbohydrates, 75 g protein, and 15 g fat. For dinner, the meal was adjusted to their daily menu like in the lunch. Their BW was monitored before, and after treatments.

Anthropometric data (BW and height) of respondents were measured using BW scale (Camry, American Samoa) and a microtoise (GEA, Indonesia) respectively. Fasting and 1 hour after meal BGL were measured before and after treatments. All collected data were analyzed using independent and paired t-tests with p value <0.05.

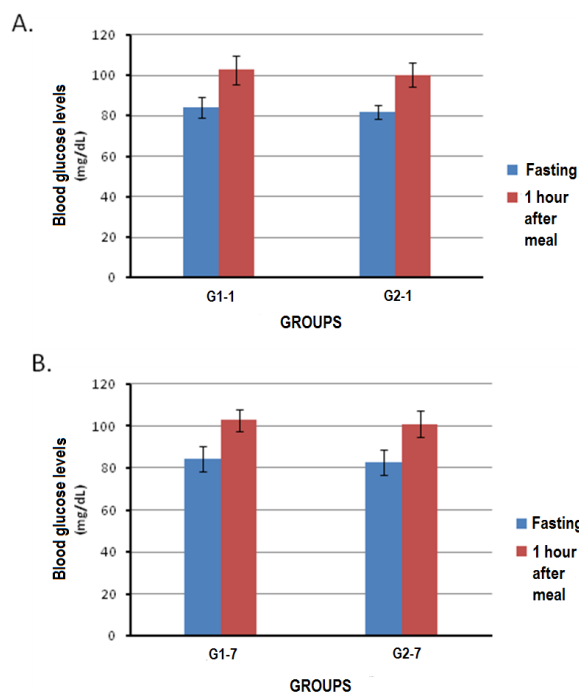
**RESULT**

This study analyzed the effect of drinking plain water before eating high-GI steamed rice in male students with obesity. Table 1. showed that similar characteristics of research subjects were observed in G1 and G2, except for BMI for age.

Fasting and 1h after meal BGL were evaluated before and after treatments to find out the effects of drinking plain water before eating high-GI steamed rice (Figure.1). There were no significant changes in fasting and 1h after meal BGL in both groups in day 1 and day 7 of treatments.

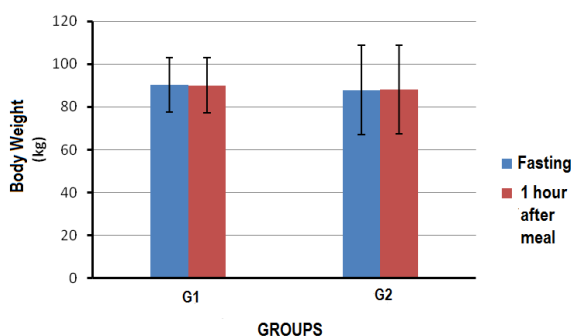
**Tabel 1. Characteristics of respondents**

Characteristics	Group		p
	G1	G2	
Age (year)	16.50±0.53	16.30±0.67	0.24
BW (kg)	90.25±12.77	87.84±20.88	0.38
Heigh (m)	1.69±0.03	1.69±0.06	0.46
BMI for Age (percentile)	97.34±3.40	95.09±3.17	0.06
Fasting BGL (mg/dL)	84.30±5.03	81.70±5.93	0.30



**Figure 1. Fasting and 1h after meal BGL before treatment (A) and after treatment (B)**

Figure 2 shows comparison of BW at day 1 and day 7 for both groups. In group 1 (G1), mean BW at day 1 was 90.25 ± 12.77 kg and it decreased to 90.04 ± 12.83 kg at day 7 (p=0.144). While in group 2 (G2), mean BW at day 1 was 87.84 ± 20.88 kg and it increased to 88.13 ± 20.59 kg at day 7 (p=0.058).



**Figure 2. The mean BW of G1 and G2 before and after treatment**

**Table 2. The mean differences of BW, fasting and 1h after meal BGL in G1 and G2**

	G1	G2	p
BW (kg)	-0.21±0.41	0.29±0.20	0.006*
Fasting BGL (mg/dl)	0.2±5.14	1±5.03	0.30

	G1	G2	p
1 hour after meal BGL (mg/dl)	0±4.9	0.7±7.21	0.40

Table 2 shows comparison in BW, fasting and 1 h after meal BGL changes between groups. There was a significant difference in BW changes between groups ( $p=0.006$ ). After 7 days treatment, BW in G1 decreased, while in G2 increased. However, no significant differences were found for fasting and 1 hour after meal BGL changes between groups ( $p=0.30$  dan  $0.40$  respectively).

### DISCUSSION

The present study showed that drinking plain water before eating high-GI steamed rice could significantly decrease BW compared to those drinking the water after meal. Reduction of BW is more likely caused by decrease in energy intake, which leads to increase leptin hormone secretion. So it will reduce hunger sensation and increase satiety (Van Walleghe, Orr, Gentile, & Davy, 2007; Davy et al., 2009, and (Rexford, 2009).

Dennis et al. (2010) in their study found that drinking 500 ml plain water before each meal times could reduce around 2 kg BW for 12 weeks. The amount of reduction is almost equal to this study which was 0.21 kg for 1 week. All respondents in this study had 3,030 kcal/day total energy intake.

There were some limitations identified in this study. First, the intervention was only applied during breakfast. At lunch and dinner, the intervention was not applied. Other factors are possibly involved in the inhibition process of the hunger center in the brain. Second, daily intake of respondents was not be monitored. The last limitation was this study did not evaluate physical activities of respondents during 7 day of intervention. Those limitations could possibly influence the effect of the intervention.

### CONCLUSION

Drinking plain water before having breakfast could reduce BW among

male adolescents with obesity. It is suggested male adolescents with obesity to regularly drink plain water 30 min before having breakfast to reduce their BW. However, further studies are needed to confirm this effect.

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