

Efficacy of Water Intake on Body Weight and Body Mass Index of Overweight Students

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Abstract— The objective of this research was to analyze effect of water intake on body mass index and body weight of overweight students. For this purpose a pre-post experimental study design for 29 students of Nutrition Science of Bogor Agricultural University aged 17-23 years with BMI ≥ 23 kg/m² were selected. Each subject was given 3 bottles of plain water (600 ml) every day. The water was consumed before meals (breakfast, lunch, and dinner) for 2 months. Data on body weight, body high, food and beverages intake were collected before and after intervention. The result showed that water intake has not significant effect on change of body weight ($p=0.490$) as well as water intake has not significant effect on change of body mass index ($p=0.398$). Based on result, it will be conclude that water intake has not significant effect both change body weight and body mass index, because of that another exposure which is may affected, it must be identified.

Keywords— water intake; body weight; body mass index; overweight students

I. INTRODUCTION

Based on references [1] showed that 2-3 billion people was identified as overweight and obese. Prevalence of that case has been emerged in Indonesia especially in urban which are detail on reference [2] from Ministry of Health well informed that 19.1% adolescents in Indonesia have an obesity problem. Classification of obesity that used is Body Mass Index (BMI) more than equal 23 as overweight according to reference [3].

Many studies that concern on change body weight through diet and change life style has been done to change food and beverages pattern [4]. Because of that reference [5] gives suggest a potential treatment on diet side which is develop to change body weight with increasing plain water intake and replacing sweet beverages to plain water. Reference [6] showed that clinic study on overweight adults which is asked to drink 2 glasses of plain water before have meals (breakfast, lunch, dinner) should be declining body weight. Replacement of caloric beverages with non caloric beverage (plain water) as a weight loss strategy resulted in average weight losses of 2% to 2.5%. Other study that concern regarding change body weight, it was proved by reference [7] showed that drinks a plain water before meals, it can be decline body weight and caloric intake.

Replacing specific foods or beverages that provide a substantial portion of daily calories may provide a useful strategy for modest weight reduction or weight-gain

prevention [8]. According to reference [9-10], beverages may be ideal targets however substitution of non caloric beverages (plain water) for caloric beverages will be beneficial only if compensation or consuming the calories from other foods, does not occur. On the other hand, reference [5,11-13] showed that observational evidence suggest that drinking water is associated with weight loss and a reduction in caloric intake. The hypothesis of this study was that participant has declined body weight and body mass index after intervention of plain water.

II. MATERIAL AND METHODS

A. Human Subjects

We recruited, enrolled, and followed participants between October 2014-January 2015 in Bogor Agriculture University. Eligible participants ($n=10$) were overweight and obese [BMI (kg/m²): 23-34] adolescent aged 18-22 years. Participants were included for student of nutrition science, not on other diet program, healthy, not smoker and willing to follow this research. Food and beverages consumption was administered by questionnaire. This study approved by and was in accordance with the ethical standards of the University of Indonesia. Written informed consent was obtained from all participants.

B. Experimental study

This study was a pre-post experimental design. Participants were got an intervention water intake (WI).

Eligible participant were randomly assigned. The study was conducted 2 months intervention. WI group consist of 10 participants, 1 of 10 was exclude because not attending intervention regularly, so completely participants are 9. On the baseline and end line, participants were measurement including body weight and body mass index.

C. Intervention

The treatment plan was not individually change foods and beverages pattern. In baseline and end line, we measured body weight, body high, body mass index. Compliance was monitored by form which was given to participant and it was checked by facilitator every day.

Intervention WI (water intake), the WI group received a rule orientation for each participants was given 3 bottles water (600 ml) every day. The plain water was consumed before three times of meal (breakfast, lunch, dinner) for 2 months. That rule cites by reference [13] showed that consuming the plain water (0.5L) before three times of meal (1-2 hours before meal) was given effect for declining of body weight (p=0.030). After consuming 1 bottle of water before meal, participants haven't been suggested to consume light food. Participants must be took the 3 bottles of waters by its self every day before going to campus.

D. Measurement Body Weight and BMI

Body weight and BMI were measured with a fixed BIA (Body Index Analyzer). BIA was worked with participants who has hold the instrument without speaking load and not using the shoes or shock shoes also not using metal stuff. After BIA worked and printed the result, it can be presented details of anthropometric parameters included BMI. The nutritional status was classified by BMI [3].

E. Statistics analysis

Statistical analyses were conducted using SPSS for windows version 17.0. All variables were examined for their normality in distribution by the Kolmogorov-Smirnov test. Descriptive statistics were used to identify participant characteristics and to provide summary indicates of selected measures. Effects of intervention (pre-post) of group were analyzed by paired t-test to show the difference between groups. The analyses were on a per protocol basis. The result were expressed as means (SD) and considered statistically significant if the P value was < 0.05.

III. RESULT AND DISCUSSION

Drinking a lot of water is publically believed to support weight loss efforts or maintenance and has become a commonly used practice for weight control [14]. Increasing water consumption for overweight prevention also seems promising because an interventional study in children showed that promoting the drinking of waters at school reduced the risk of overweight [15]. Such evidence is missing in adults who concern to focusing on water consumption and body weight outcomes. In order that on this research choose a young adult (student) to investigating.

In this study, totally, 10 students overweight performed all baseline assessment. After the initial assessment, 1 participant dropped out before completing the study. Individual who dropped out did not differ significantly in

their baseline values when compared with those who completed the intervention. After exclusion of drop outs, the group still did not show statistically differences in baseline values (p > 0.05 for all).

Baseline value consist of breakfasts habit (p=0.794), menu of breakfast (p=0.661), drinking of plain water before sleep (p=0.384), glasses of plain water before and after sleep (p=0.991), drinking of plain water before meals (p=0.533), length of drinking plain water to meals (p=0.524), drinking of plain water while meals (p=0.277), glasses of drinking plain water while meals (p=0.330), drinking of plain water before exercise (p=0.503), and glasses of drinking plain water before exercise (p=0.112).

Based on the Table 1 shows that the treatment WI has a tendency lower body weight and body mass index in students overweight but, statistically, it is not significant on changes in body weight (p=0.490) and body mass index (p=0.398). Table 1 shows the effect of intervention WI on body weight and body mass index.

TABLE I
BODY WEIGHT AND BODY MASS INDEX CHANGES WITH INTERVENTION WI

Outcomes	Means	SD	P value
Body weight	-0,188	0,78	0,490
Body mass index	0,089	0,29	0,398

The intervention of WI (plain water) has no changes in body weight and body mass index may be caused by many possibilities. According to reference [16] showed that intervention effect of increased pre-meal water consumption on maintaining body weight after weight loss compared with self-monitoring of weight, result has no significant (p=0.08) on body weight and body mass index. Based on it, the excuses would be conclude are the study has no randomization and there are 2 of group have same baseline data include body weight, body fat, metabolism rate and water intake.

In this study, water intake out of intervention WI (pre-post) has no significant difference in water intake of energy (p=0.296), water intake of protein (p=0.783), water intake of fat (p=0.468), and water intake of carbohydrate (p=0.291) shows in Table 2. Briefly, it might be the excuse that the intervention of WI has no significant on body weight and body mass index.

Others possibility from result on this study regarding that intervention WI (plain water) has not effect on change body weight and body mass index because of criteria inclusion listed that subjects can't be able to change their food and beverages pattern during intervention. As well as, reference [9-10] was proved that the intervention non caloric beverages (plain water) will be beneficial only if compensation or consuming the calories from other foods, does not occur. That reference were support this study result which is food and beverages pattern should be manage only if intervention able to give an impact.

Based on Table 2 presented that average intake of energy water intake on pre-post intervention has increasing as well as average intake of protein water intake. Whereas, inversely, an average intake of fat water intake also carbohydrate water intake on pre-post intervention has been decreased. Briefly, water intake from out of intervention WI (plain water)

should be manage to give the possibility of effect for intervention.

TABLE II
WATER INTAKE ON PRE AND POST INTERVENTION

Nutrient	WI		
	Intake Pre-Intervention	Intake Post-Intervention	Paired t-test p < 0.05
Energy (Cal)	16±16.21	28±21.00	0.296
Protein (gram)	0.42±0.54	0.53 ±1.06	0.783
Fat (gram)	5.34±10.99	2.30±3.49	0.468
Carbohydrate (gram)	47.31±92.53	11.93±17.32	0.291

IV. CONCLUSIONS

According to the result, it will be suggest that the possibility of intervention WI (plain water) has a chance to become one of program to changes body mass index and body weight on student overweight will be beneficial only if water intake out of intervention does not occur.

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