Correlation of Total Fruit Vegetable Consumption with WHR & WTHR of Indonesian Nutrition Science Female Students

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Abstract

Purpose: This project is aimed to determine the relationship between total consumption of fruit vegetable with waist to hip ratio (WHR) and waist to height ratio (WTHR) on female students of Muhammadiyah University of Surakarta (UMS) majoring nutrition program.

Methodology: The research was observational with a cross-sectional design. A total of 45 samples used in this study. Data collections were taken by using identity questionnaire, anthropometry measurements of WHR and WTHR and fruit vegetable consumption obtained using a semi-quantitative food frequency questionnaire (SQFFQ). Analysis of data applied Spearman Rank correlation test.

Results: All respondents consume fruits vegetables less than recommendations (<400gr/day). This study found that 13.3% and 28.9% respondents had abdominal obesity of WHR and WTHR, respectively. Respondent with WHR normal status were 86.7% and 71.1% of WTHR. Data analysis found that p-value = 0.825 for the relationship between the total of fruit vegetable consumption with WHR and p-value= 0.809 for the relationship between the total of fruit vegetable consumption with WTHR. There was no relationship between the total of fruit vegetable consumption with WHR and WTHR.

Applications/Originality/Value: Basic data on the WHR and WTHR which can indicate the risk of abdominal obesity, especially in women and vegetable fruit processing methods must be considered as one of the factors that can affect the nutritional status.

Keywords: fruit vegetable consumption, WHR, WTHR, nutrition students

Introduction

Students are individuals or young adults ranging in age from 19-29 years (Istiany & Rusilanti, 2013). Most of student have eating patterns tend to be wrong (Surjadi, 2013). There are so many examples of student eating patterns: breakfast skipping, consume high calori food or drink, often skipping meals, high consumption of junk food and fast food, eating patterns that are not follow the rules of balanced nutrition and low consumption of fiber including fruits and vegetables (Pam et al., 2015). Based on Baseline Health Research 2013, the prevalence less consumption of fruits vegetables on people aged >10 years is 93.5% (Badan Penelitian dan Pengembangan Kesehatan, 2013). Low consumption of fruits vegetables is one of other causes of obesity (Beck, 2011). The research on female students in Saudi Arabia showed that low consumption of fruits vegetables have twice risk that can cause obesity (Epuru et al., 2014). The research in adults aged 18-24 years in Portugal shows the prevalence of central or abdominal obesity in women is 9.9 %, higher than men that is 4.3 % (Sardinha et al., 2012).

The research was carried out in the Nutrition Science Department, Faculty of Health Sciences, Muhammadiyah University of Surakarta (UMS) on 2017 class year students, based on the results of a pre-survey of 19 UMS nutrition science female students, was found that the prevalence of fruit vegetable consumption <400gr/ day was 94.73 %. It was means that almost all nutrition science female students of a pre-survey consume fruits vegetables less than recommendations. The prevalence of female students who had nutritional status risk of abdominal obesity based on waist-to-hip ratio (WHR) was 5.26%, while the prevalence of risk of abdominal obesity based on waist-to-height ratio (WTHR) was 21.05%. The purpose of this study was to determine a relationship between the total of fruit vegetable consumption with WHR and WTHR of nutrition science female students in UMS.

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Materials and Methods

Samples

The research was observational with a cross-sectional design. Total of 47 samples obtained using simple random sampling method, but two samples were excluded, so that only 45 samples were involved in the study. The inclusion criteria in the study as follows: female students are not on a weight loss diet, not vegetarian, not consume supplements or weight-loss vitamins and have not physical abnormalities (such as scoliosis, kyphosis, lordosis, genu valgum/ knock knee, and genu varum/ bow legs), did not have chronic pain and was not an athlete. The exclusion criteria were female students who resigned during data collection.

WHR, WTHR and Fruit Vegetable Frequency Assessment

Categorizing data consumption of fruit vegetable is insufficient if the consumption of fruit vegetable is < 400 grams/ day, and sufficient if gram 400 grams/ day (Kementerian Kesehatan Republik Indonesia, 2014). According to WHO category, the cut off point for WHR is normal if value < 0.85 and obesity abdominal if ≥ 0.85 (WHO, 2008). Cut off point WTHR is normal if < 0.5 and including central or abdominal obesity if ≥ 0.5 (Ashwell & Gibson, 2016)

Identity data of respondents is obtained using an identity questionnaire including name, age, residence, pocket money, income of parents, and transportation. Data for fruit vegetable consumption during one month, obtained using a semi-quantitative food frequency questionnaire (SQFFQ). Anthropometry data were obtained by measuring height by stature meter and waist circumference and hip circumference by measuring tape.

Data processed using Microsoft Excel 2013 and data analysis using SPSS version 23. Univariate analysis is to describe all research data and it also presented in the frequencies and percentages. Bivariate analysis to determine the relationship between the total fruit vegetable consumption with WHR and WTHR and it was analyzed using by Spearman Rank test. This study has been licensed by the Medical Research Ethics Commission of Medical Faculty UMS with no. 2115/ B.1/ KEPK-FKUMS/ V/ 2019.

Results

Distribution of Respondent Characteristics

Table 1 shows that the respondents with the most number were respondents aged 20 years as many as 22 people (48.9 %). Most of the respondents residing in boarding houses were 33 people (73.3 %). Characteristics of respondents according to pocket money and parents' income contained in table 1 are grouped into two groups based on the median value of the monthly pocket money per respondent. Respondents who had pocket money ≥ IDR 1,200,000 (USD 87.75), was 24 respondents (53.3 %). Twenty five (55. 6 %) respondents' parents have mounthly income ≥ IDR 5,000,000 (USD 365.59) and 39 respondents (86.7 %) used motorcycle as transportation to campus, more than those on foot.

Table 1. Distribution of Characteristics of Respondents

Characteristics	Number of Sample	
	n	%
Age group		
19	19	42.2
20	22	48.9
21	4	8.9
Total	45	100
Residence		
Boarding house	33	73.3
With parents	7	15.6

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Pesma (Pesantren Mahasiswa/ Islamic boarding school)	4	8.9
Others	1	2.2
Total	45	100
Pocket Money / Month		
< 1.200.000	21	46.7
≥ 1.200.000	24	53.3
Total	45	100
Parent Income / Month		
< 5.000.000	20	44.4
≥ 5.000.000	25	55.6
Total	45	
Transportation		
On foot	6	13.3
Motorcycle	39	86.7
Total	45	100

Distribution of Total Consumption of Fruit Vegetable, WHR, and WTHR

Based on table 2 which shows the number of respondents who consumed less vegetables per serving (<400 grams/ day), were 45 (100 %) respondents, six (13.3 %) respondents were included WHR abdominal obesity. Table 2 also shows that 13 (28.9 %) of respondents have WTHR abdominal obesity.

Table 2. Distribution of Respondent Characteristics

Variable	Number of Samples	
	n	%
Total Consumption of Fruits Vegetables/ Day		
< 400 grams/day	45	100
≥ 400 grams/day	0	0
Total	45	100
WHR		
Normal	39	86.7
Abdominal obesity	6	13.3
Total	45	
WTHR		
Normal	32	71.1
Abdominal obesity	13	28.9
Total	45	

Data on the frequency distribution of fruit and vegetable consumption in this study were obtained from the SQ-FFQ with a total number of registered vegetable fruits, there was 46 types of fruits and 42 types of vegetables.

Table 3 shows that ambon bananas and carrots are the most commonly consumed fruits and vegetables by respondents. Respondents consumed fruits and vegetables with a variety of preparations that shows in table 4. The most form of preparation of fruit such as fresh, sweetened drink, juice, also chips and fried, and for vegetable such as sauteed, stewed, fresh, fried/ fried with flour, and mixed with other food.

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Table 3. List of 5 Types of Fruits and Vegetables that are consumed the most

Fruit	Vegetable
Ambon banana	Carrot
Melon	Spinach
Watermelon	Kale
Orange	Mustard green
Papaya	Bean sprouts

Table 4. Average Frequency of Consumption of Fruits and Vegetables in 1 Month Based on Types of Processed

Average frequency of consumption per month (times per month)	
Fruit	
Fresh	12.133
Sweetened drinks	9.4
Juice	3.288
Chips and Fries	1.622
Lotis	1.044
Salad	0.511
Soup	0.488
Candied fruit	0.2
Stew	0.022
Vegetable	
Saute	19. 133
Stew	14.377
Fresh	9.511
Fried or with flour	3.67
Mixed ingredients	2.555
With coconut milk	1.777
Juice	0.311
Lotis	0.266
Salad	0.022

Relationship of Consumption of Fruit Vegetable with WHR

The distribution of the amount of fruit vegetable consumption with WHR can be seen in table 5. In table 5, can be seen that there were six (13.3 %) respondents who had abdominal obesity with the amount of consumption of vegetables that was insufficient. The analysis result of amount consumption of vegetable fruits with WHR shows at table 6 which is no correlation between consumption of vegetable fruits with WHR.

Relationship of Consumption of Fruit Vegetable with WTHR

Table 5 shows distribution of the amount of consumption of fruit vegetable with WTHR. In table 5, can be seen that from total of 45 respondents there were 13 (28.9 %) respondents who had abdominal obesity with the amount of consumption of vegetable fruits which were also insufficient. There was no relation between consumption of vegetable fruits with WTHR that can be seen in table 7.

Table 5. Distribution of total consumption of fruit vegetable with WHR and WTHR

Nutritional Status	Total consumption of Fruit Vegetable			
	Insufficient		Sufficient	
	n	%	n	%
WHR				
Normal	39	86.7	0	0
Abdominal obesity	6	13.3	0	0
Total	45	100	0	0
WTHR				
Normal	32	71.1	0	0
Abdominal obesity	13	28.9	0	0
Total	45	100	0	0

Table 6. Relationship of Total Consumption of Fruit Vegetables with WHR

Variable	Mean	Minimal	Maximal	Standard Deviation	p value
Total Consumption of Fruit Vegetable	161.47	43.26	346.83	84.731	0.825
WHR	0.76	0.67	0.95	0.064	

Table 7. Relationship of Total Consumption of Fruit Vegetables with WTHR

Variable	Mean	Minimal	Maximal	Standard Deviation	p value
Total Consumption of Fruit Vegetable	161.47	43.26	346.83	84.731	0.809
WTHR	0.46	0.39	0.64	0.055	

Discussion

Respondents in this study were students of nutrition science department class of 2017 who were in semester 4. Respondents involved in this study were active students with busy routines with diverse lecture schedules and practices. Lecture activities are held on the 3rd floor and practicum on the 4th floor, thereby increasing the physical activity of the respondents because there are no elevators or escalators in the lecture building. Respondents whose activities were so dense affect the amount and type of food consumed, including the amount of consumption of fruit vegetable every day. Table 1 shows that the age range of respondents is 19-21 years.

Respondents were 4th semester nutrition students who already knew the recommended consumption of fruits and vegetables per day. However, in table 2 shows that all respondent consumption of fruit and vegetables were below the prescribed recommendations. The results of this study are same as the results of research on students in West Virginia, that the consumption of fruit and vegetables among students requires less. This happens due to various constraints such as the amount of allowance, the number of access to unhealthy food vendors, the influence of taste, fruit season, time and lack of nutrition knowledge (Samples, 2017). This shows that it turns out that the education and nutritional knowledge that respondents have obtained did not significantly influence healthy eating habits and frequency, especially consumption of fruits and vegetables. Some research results that nutrition education and knowledge on nutrition students did not affect the consumption of fruits and vegetables every day (Jeżewska-zychowicz & Zięba, 2016; Majors, 2015).

Table 4 shows that the processed fruit most frequently consumed by respondents in one month is in the form of fresh or directly consumed 12.133 times per month. In addition, preparations that are included in a lot of respondents consumed were juices and sweetened drinks added with other additional ingredients such as sugar and milk creamer with an average consumption frequency 9.4 times per month and 3.288 times per month, respectively. Orange ice and young coconut ice are processed fruit made into sweet drinks.

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The fourth most commonly processed preparations were chips and fried foods, with an average consumption frequency 1.622 times per month. Such as fried bananas, banana chips, apple chips, and *molen* (bananas that are coated in flour dough and then fried). Some respondents also consumed fruit with other ingredients added such as *lotis* (sliced fruits with spicy brown sugar sauce), as well as additional ingredients mayonnaise, creamer, cheese and yogurt to the fruit salad.

How to consume fruit with the addition of other ingredients such as sugar, milk cream, cheese, mayonnaise and others can increase the calorie content in the fruit. Processed fruits such as chips and fried in the presence of cooking oil in the processing process can also affect the fiber content in the fruit. Addition of other additives can provide a different satiety effect compared to consumption of fruit in the form of fresh or eaten directly. Fresh fruit with low energy density can provide a longer full effect compared to fruit puree. Fruit puree provides a longer satiety effect compared to fruit juice. Fruit consumption can provide a full effect so that it can control energy intake and weight gain, if consumed in fresh form (Tohill, 2005)

Table 4 shows that most respondents consume the most vegetables by sauteed like sauteed kale, bean sprouts, mustard greens, *capcay* (various vegetable stewed or sauteed) etc with an average consumption frequency of 19.133 times per month. Stewed processing method ranks second most frequently consumed with an average consumption frequency of 14,377 times per month. Some respondents also consumed vegetables by frying with flour, for example crispy mushrooms and crispy eggplants. There were also those who consume vegetables as a mixture of processed food, such as a mixture of *bakwan* (fried flour with vegetable), fried rice, spring rolls, fried noodles and others. How to process vegetables can affect the energy density content. Energy density in fresh vegetables can increase when undergoing processing such as fried, dried, or with the addition of sugar, fat or high-calorie sauces such as in vegetable salads (Tohill, 2005).

Another factor influencing the consumption of fruit and vegetables in respondents is seller access and pocket money (Surjadi, 2013). Limited access to healthy food sellers, especially fresh fruit and processed vegetables without any other additional ingredients, was one of the obstacles for respondents to consume vegetable fruits. The area of the campus environment and the respondent's residence sell more processed fruits such as juice, sweetened drinks, fruit salads, chips and fried foods than fresh fruit. As with vegetables, on average many sell by frying or frying flour. Research results in Canada show that accessibility, the availability of sellers, can affect the consumption of vegetable fruit in adult women (Maclellan et al., 2004).

Pocket money also affects the consumption of fruit and vegetables. More than half of the total respondents were boarding with minimal pocket money so they tend to be thrifty. A study at one of the universities in Jakarta stated that students tend to prefer low-priced food, large portions, fast in serving, and of course have a good taste, so that the stomach is filled and full (Surjadi, 2013).

In Table 6 it is known that the Spearman Rank statistical test results obtained p value is 0.825 (> 0.05) means the hypothesis is rejected meaning that there is no relationship between the amounts of consumption of fruit vegetable with WHR. Siegel et al (2010) also stated that fruit and vegetable consumption, physical activity and WHR did not have a significant relationship. However, the results of this study contradict the results of research by Mostad et al (2014) which states that a person with central obesity has a habit of fruit consumption and vegetables less than recommended. The results of this study, the majority of respondents consume more fruit by juiced and made sweetened drinks. Likewise with vegetables, more respondents consume them by sauteed, compared to stewed or consumed directly (fresh). How to process fruit and vegetables can affect the fiber content and energy density. Fruit juice has less fiber content compared to fresh fruit (Tohill, 2005).

Lack of fruit and vegetable consumption can increase the risk of abdominal obesity (Schwingshackl et al., 2015). Some other factors that affect abdominal obesity are gender, energy intake, intake of simple carbohydrates, fat intake, and fiber intake. Women are more at risk of abdominal obesity than men (Rahmawati, 2015). In addition, high and low physical activity has been shown to affect WHR (Gornale et al., 2015).

In table 5, most of the respondents' nutritional status was in the normal category but their consumption of fruit vegetable is insufficient. In this study, most respondents used motorcycle as the main transportation. Frequent use of motorcycle is associated with decreased physical activity. Physical activity is not only seen from transportation, but there are many other physical activities that affect nutritional status. Such as physical activity

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on campus which can also affect the normal nutritional status of respondents. The tight lecture schedule starts from morning to evening with the location of lectures on the 3rd floor and if there is a practicum schedule that is located on the 4th floor, thus making respondents more often physically up and down stairs every day. So that it can affect most respondent normal nutritional status even though the consumption of fruits and vegetables is lacking.

In Table 7 it can be seen that the Spearman Rank test results show that the p value of 0.809 (> 0.05) means that the hypothesis is rejected meaning that there is no relationship between the amounts of consumption of fruit vegetable with WTHR. The results of this study are the same as those of Abreu et al (2013) who stated that consumption of fruit and vegetables in women does not have a significant relationship with WTHR (Abreu et al., 2013). Based on WTHR has a significant relationship with fruit and vegetable consumption in women (Al-hazzaa et al., 2012).

In this research, most respondents consume fruits and vegetables in the presence of other additives. How to process or kinds of processed fruits and vegetables can affect satiety. Consumption of fresh fruit gives a longer full effect compared to fruit puree or fruit sauce. Consumption of fruit sauce provides a longer fullness than fruit juice. Consumption of fresh fruit before meals can also reduce energy intake (Flood-Obbagy & Rolls, 2009). Some research results suggest that consumption of fresh fruits and vegetables provides a full effect for 2-3 hours and will feel hungry after 3 hours (Hakim et al., 2018).

Conclusion

All respondents consumed fruit and vegetable less than 400 grams/day. As many as 13.3% of female students had an abdominal obesity nutritional status based on WHR and 28.9% of female students had an abdominal obesity nutritional status based on WTHR. There is no relationship between the total of fruit vegetable consumption with WHR and there is no relationship between the total of fruit vegetable consumption with WTHR on nutrition female students.

Students are expected to increase consumption of fruits and vegetables as recommended and to improve education about the correct processing methods so as to prevent and reduce the risk of abdominal obesity. For further researchers to add other variables such as physical activity, energy intake, protein intake, fat intake, carbohydrate intake, total fiber intake, consumption of sweetened drinks and et al.

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