Correlation between dietary fat consumption with body mass index and body composition (a preliminary study in community based)

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Abstrak

Pendahuluan: *Sejumlah penelitian menunjukkan hubungan antara konsumsi lemak dengan indeks massa tubuh dan komposisi tubuh. Penelitian ini bertujuan untuk mengetahui hubungan antara konsumsi harian lemak total, asam lemak tak jenuh ganda (PUFA) dan kolesterol total dengan beberapa paramater gizi.*

Metode: *Penelitian ini merupakan studi cross-sectional, dengan 102 subjek. Pemeriksaan yang dilakukan adalah tinggi badan, berat badan, indeks massa tubuh dan pengukuran komposisi tubuh menggunakan timbangan komposisi tubuh Omron® HBF-212. Analisis konsumsi lemak total, asam lemak tak jenuh ganda dan kolesterol total menggunakan Software nutrisurvey 2007. Uji korelasi yang digunakan adalah Spearman Rho dengan menggunakan SpSS 21.*

Hasil: *Konsumsi lemak total tidak berhubungan dengan indeks massa tubuh, massa lemak total, dan massa lemak visceral. Konsumsi PUFA berhubungan secara negatif dengan indeks massa tubuh ($p < 0,014$, -0,24) dan massa lemak total ($p < 0,001$, -0,326), sedangkan konsumsi total kolesterol total berhubugan secara negatif dengan indeks massa tubuh ($p < 0,019$, -0,23), dan massa lemak total ($p < 0,001$, -0,337).*

Kesimpulan: *Ada hubungan antara konsumsi lemak dengan indeks massa tubuh dan komposisi tubuh. (Health Science Journal of Indonesia 2019;10(2):128-31)*

Kata kunci: *konsumsi lemak; indeks massa tubuh; komposisi tubuh*

Abstract

Introduction: Studies showed some relation between fat consumption with body mass index and body composition. We conducted a study to investigate relationships between daily consumption of total fat, *polyunsaturated fatty acid* (PUFA) and total cholesterol with some nutritional parameters.

Methods: This was cross-sectional study, with 102 subjects. The study was examined height, body weight, body mass index and body composition measurements using the Omron® HBF-212 body composition monitor. There was nutrisurvey 2007 to measure total fat, polyunsaturated fatty acid and total cholesterol consumption. We analyzed the correlation by using SpSS 21 (*Spearman Rho*)

Results: Total fat consumption was not related to body mass index, total fat mass, and visceral fat mass. PUFA consumption was negatively associated with body mass index ($p < 0.014$, -0.24) and total fat mass ($p < 0.001$, -0.326), while consumption of total cholesterol was negatively associated with body mass index ($p < 0.019$, -0.23), and total fat mass ($p < 0.001$, -0.337)

Conclusion: There was a relation between fat consumption with body mass index and body composition. *(Health Science Journal of Indonesia 2019;10(2):128-31)*

Keywords: fat consumption; body mass index; body composition

The quality of food intake can affect body composition. Consumption of macronutrients, especially fat, were associated with an increased of body fat mass which resulting in obesity. Obesity must be controlled because of their increased incidence both of developed or developing country, and they are related to the increased incidence of several comorbid diseases such as diabetes, cancer and cardiovascular disease.[1,2] Daily fat intake consists of several types, such as PUFA and cholesterol. Research showed that consumption of saturated fat was positively associated with total body fat (p <0.05) and trunk fat (p <0.001).[3,4] While research that shows the relationship between other types of fat intake has not been explored, especially in community based. This study aims to determine the relationship between consumption of total fat, PUFA and total cholesterol with nutritional status and body composition in community based.

METHODS

This was an observational study conducted in Universitas Sebelas Maret, using cross sectional design. It was held on March until September 2019. The subjects were 11 lectures, 20 administrative officers and 71 students of Medical Faculty Sebelas Maret University who met the criterias. All subjects had been given explanations and signed informed consent. We use a purposive sampling to selects 102 samples, the criteria were people aged above 17 years old and not use heart stent. Ethical clearance obtained from Ethics Committee of Universitas Sebelas Maret Number 363/UN27.06/KEPK/EC/2019.

The processed of collecting data was conduct by some trained enumerators. Height was measured by microtoise, while body weight, body mass index and body composition were measured using Omron® HBF-212 Body Composition Monitor. The classification of total fat and visceral fat mass level used its manual book. Total fat mass percentage was called 'low' if in the 5 to 9.9 range for man and 5 to 19.9 range for woman, it was called 'normal' if in the 10 to 19.9 range for man and 20 to 29.9 range for woman, it was called 'high' if in the 20 to 24.9 range for man and 30 to 34.9 range for woman, and it was called 'very high' if in the 25 to 50 range for man and 35 to 50 range for woman. Visceral fat mass percentage wasn't different between man and woman, it was called 'normal' if in the 1 to 9 range, and it was called 'high' if in the 10 to 14 range, and it was called 'very high' if in the 15 to 30 range.

Dietary fat intake was collected by interviewers using semiquantitative food frequency questionnaire. The results of the interviews were converted and analyzed with Nutrisurvey 2007 to determine the average intake of fats, PUFA and total cholesterol. Normality test was determined with Kolmogororv Smirnov that showed abnormal data distribution. The hypothesis was tested with Spearman Rho using SPSS v21 software and interpretate the correlation coefficients with Quinnipiac University's criteria.[5]

RESULTS

The subject characteristic of this study was showed in Table. 1. The statistical analysis of this study showed that total fat consumption was not related to body mass index, total fat mass, and visceral fat mass (Table. 2).

Table 1. Characteristic of subject

Characteristic	n (%)
Number of Subjects : 102	
Body Mass Index (BMI)	
- Underweight	13 (12,75)
- Normal	45 (44,12)
- Overweight	18 (17,65)
- Obese I	23 (22,55)
- Obese II	3 (2,94)
Sex	
- Male (♂)	26 (25,49)
- Female (♀)	76 (74,51)
Body Composition	
- Total Fat Mass (%)	
Low(♂:5-9.9; ♀:5-19.9)	5(4,90)
Normal (♂: 10-19.9;♀:20-29.9)	46(45,10)
High (♂: 20-24.9;♀:30-34.9)	27(26,47)
Very High (♂: 25-50;♀:35-50)	24(23,53)
- Visceral Fat	
Normal (♂ and♀: 1-9)	86(84,31)
High (♂ and♀: 10-14)	9(8,82)
Very High (♂ and♀: 15-30)	7(6,86)

PUFA consumption was negatively associated with body mass index (p <0.014, -0.24) and total fat mass (p <0.001, -0.326). The correlation coefficient of PUFA consumption and body mass index was -0.24, with a p-value of less than 0.014. This r of -0.24 is weak correlation, but has statistical significance.The correlation coefficient of PUFA consumption and total fat mass was -0.326, with a p-value of less than 0.001. This r of -0.326 is moderate correlation, and has statistical significance.

Consumption of total cholesterol was negatively associated with body mass index (p <0.019, -0.23), and total fat mass (p <0.001, -0.337). The correlation coefficient of total cholesterol consumption and body mass index was -0.23, with a p-value of less than 0.019. This r of -0.23 is weak correlation, but has statistical significance. The correlation coefficient of total cholesterol consumption and total fat mass was -0.337, with a p-value of less than 0.001. This r of -0.337 is moderate correlation, and has statistical significance. From food frequency questionnaire showed that the average total fat, PUFA and total cholesterol consumption in this study were 77 g, 4.5 g, and 283 g.

Table 2. Spearman Rho correlation coeffition between fat consumption, BMI and body composition

Variabel		Fat Consumption		
		Total Cholesterol	PUFA	Total Fat
BMI	Corr. Coeff.	-0.23	-0.24	-0,053
	Sig	0.019	0.014	0,596
Total Fat Mass	Corr. Coeff.	-0.337	-0.326	-0,01
	Sig.	0.001	0.001	0,921
Visceral Fat Mass	Corr. Coeff	-0,094	-0,118	0,097
	Sig.	0,345	0,237	0,33

DISCUSSION

This study analyzed the consumption of total fat, PUFA and total cholesterol. Total fat is one type of fat that cause some effect of their consumption on health. Maximum total fat consumption about 30% from total energy intake (TEI) could decrease the concentration of triacylglycerols (TAG), LDL-cholesterol, and increased concentration of HDL-cholesterol, and regulated insulin sensitivity.[6]

Classification of fatty acids according to their structure consist of saturated and unsaturated; saturated fatty acid (SFA), polyunsaturated and monounsaturated fatty acids. Both of them contain carbon chains varying between 2 and 36 carbon atoms. Polyunsaturated FA (PUFA) is characterized by pentadiene configuration of double bonds. This type is associated with protection from obesity-related phenotypes in adults. When someone had a higher intake of PUFAs and a higher ratio of PUFAs to SFAs are positively associated with lean mass and negatively associated with visceral adiposity and body fat in children.[7] The same result was also found in our study; the people who had a high BMI

score, total fat mass and visceral fat mass would have low consumption of PUFA (Table 2). Our study showed that total fat consumption was not related to body mass index, total fat mass, and visceral fat mass (Table 2). It needs much long study to firm this conclusion. The result in high income countries, may not be applicable in low and middle countries.[8] There were Muka *et al*'s study, showed that no correlation between dietary fat composition with total fat mass and body fat distribution in women. It might be because of different fat metabolism in each gender; man or woman.[9,10]

This study also investigated of total cholesterol intake related to body composition. There're not much study tell, but one study showed a combined effect of saturated fat and cholesterol intake on serum lipids among Tehranian adults. The study showed that the intake of cholesterol and saturated fat have no combined effect on serum low-density lipoprotein cholesterol levels.[11] The study hypothesized that cholesterol consumption was atherogenic, and could increase cardiovascular disease risk.[12]

However, there is an evidence that saturated fatty acids and trans-fats increase cardiovascular disease risk. The fact that dietary cholesterol is common in foods that are high in saturated fatty acids might have contributed to the hypothesis that dietary cholesterol is atherogenic.[12]

The limitation of this study did not calculate the physical activity, other food intakes like sugar consumption, and method in assessing fat consumption; semiquantitative food frequency questionnaire. Studies that measure relation between physical activity and body composition showed that, greater physical activity was associated with lower average body fat percentage (for a BMI of 22.5-24.99 kg/m^2: 2.0 (95% CI 1.8 to 2.2), percentage points lower body fat in men and 1.8 (95% CI 1.6 to 2.0) percentage points lower body fat in women.[13] The study showed that consumption of dietary sugar could increase obesity and metabolic disease like type 2 diabetes[14], a further study that also calculates sugar intake are needed.

This study used semiquantitative food frequency questionnaire to collect fat consumption data. Although this method can give overestimated and underestimated result, it is easily used in epidemiology study, and have been validated both children or adult subjects.[15,16]

Similar studies can be enhanced by using larger

sample sizes, standardized body composition device based on dual energy x-ray absorptiometry (DEXA), combined methods in collecting and assessing historical diet, combined method in analyze and count the fat intake, and also calculate other factors that influence body composition.

In conclusion, there was a correlation between fat consumption with body mass index and body composition. PUFA consumption was negatively associated with body mass index and total fat mass, while consumption of total cholesterol was negatively associated with body mass index and total fat mass.

Acknowledgment

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