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Association of Anthropometric Profiles with Triglyceide/High-Density Lipoprotein Ratios in Adult Islamic Boarding School Students

Astriana Marta Batubara[1], A. Fahmy Arif Tsani[1*], Astika Widy Utomo[2], Ahmad Syauqy[1]
[1]Department of Nutrition Science, Faculty of Medicine, Diponegoro University, Semarang 50275, Indonesia
[2]Department of Pharmacology and Therapeutics, Faculty of Medicine, Diponegoro University, Semarang 50275, Indonesia

ABSTRACT

The aim of this study was to analyze the relationship between anthropometric profiles and Triglyceide/ High-Density Lipoprotein (TG/HDL-C) ratio in adult Islamic boarding school students. A cross-sectional study was conducted on 83 Islamic boarding school students, aged 19 to 23 years, selected using a consecutive sampling design. Anthropometric measurements consisted of Waist Circumference (WC), Waist-to-Hip Ratio (WHR), and Skinfold Thickness (SFT). There were 45.8% students who had high TG/HDL-C ratio, WC ($p<0.001$; $r=0.379$) and WHR ($p<0,001$; $r=0.455$). The respondents' waist circumference and waist-to-hip ratio were positively associated with TG/HDL-C ratio.

Keywords: islamic students, skinfold thickness, TG/HDL-C ratio, waist circumference, waist-to-hip ratio

INTRODUCTION

The prevalence of dyslipidemia has increased in certain populations. One of the groups at risk for dyslipidemia is Islamic boarding school students. In addition to following regular curriculum, the students are required to complete tasks to deepen their religious knowledge, such as reciting and memorizing the Quran, and praying (Shadrina *et al*. 2017). The food provided in Islamic boarding schools is limited and less varied to meet daily nutritional needs (Khusniyati *et al.* 2016). The Triglyceide/High Density Lipoprotein-C (TG/HDL-C) ratio is an influential biomarker in determining metabolic syndrome such as impaired glucose tolerance in children (Manco *et al.* 2015). Simple predictors such as body mass index, waist circumference, waist to hip ratio, and subcutaneous fat thickness can be used to screen for the risk of dyslipidemia (Mamabolo *et al.* 2014). This study aims to analyze the correlation of anthropometric indicators with the TG/HDL-C ratio among students enrolled in Islamic boarding school.

METHODS

The study was observational-analytical study with a cross-sectional design. Data collection was conducted from September to October 2020 at the Kyai Galang Sewu Islamic Boarding School, Semarang. This study was approved by the Bioethics Committee of the Faculty of Medicine, Sultan Agung Islamic University with reference number 310/IX/2020/ Commission on Bioethics.

The sample was selected by consecutive sampling that was calculated using the correlation hypothesis test in 83 subjects. The independent variables were Body Mass Index (BMI) from weight and height, Waist Circumference (WC), Waist-to-Hip Ratio (WHR) and Skinfold Thickness (SFT), while the dependent variable was the ratio of Triglyceide/High Density Lipoprotein-C (TG/HDL-C).

Confounding variables were macronutrient intake, physical activity and gender. Anthropometric measurements were performed with a maximum difference of 0.5 cm. Blood was obtained by venipuncture by laboratory personnel after the subject had previously fasted for at least 8 hours. Triglyceide (TG) and High-Density Lipoprotein Cholesterol (HDL-C) levels were analyzed by enzymatic colorimetry. Macronutrient intake was assessed by interviews using Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Food intake data were analyzed in grams using Nutrisurvey software

[*]**Corresponding Author:** tel: +622476402881 email: fahmi.tsani@gmail.com
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and compared with the recommended dietary allowance.

Univariate analysis was used to describe each variable. Statistical analysis used Spearman's correlation with a significance value of $p<0.05$ to see the relationship between anthropometric profiles, macronutrient intake, and physical activity with TG/HDL-C ratio.

RESULTS AND DISCUSSION

The subjects were predominantly female (69.9%). The proportion of subjects with nutritional status linked to obesity were 8.4% (BMI), 2% (WC), 2.4% (WHR), and 2.4% (percent body fat). A total of 1.2% of the subjects had a high TG level, 13.5% had a low HDL-C level, and 45.8% had a high TG/HDL-C ratio. Based on the results of statistical analysis using Spearman's rank correlation test as shown in Table 1, it was found that there was a significantly positive correlation between WC ($r=0.379$; $p<0.001$) and TG/HDL-C radio. The WHR also had a positive relationship with sufficient strength ($r=0.455$; $p<0.001$) on the TG/HDL-C ratio, while there was no relationship between BMI and the TG/HDL-C ratio ($r=0.153$; $p=0.167$). Similarly, there was no significant relationship between body fat percentage and TG/HDL-C ratio ($r=-0.173$; $p=0.118$).

Fat intake was associated with TG/HDL-C ratio. Protein and carbohydrate intake were not associated with TG/HDL-C ratio. Most of the students had low protein and carbohydrate intakes. The relationship between physical activity and the TG/HDL-C ratio was not found in this study.

Table 1. Relationship between anthropometric profiles and other factors with TG/HDL ratio

Variable	TG/HDL Ratio	
	r	*p*
BMI	0.153	0.167
Waist circumference	0.379	<0.001*
WHC	0.455	<0.001*
Percent body fat	-0.173	0.118
Protein intake	0.097	0.385
Fat intake	0.266	0.015*
Carbohydrate intake	0.093	0.405
Physical activity	0.042	0.705

BMI: Body Mass Index; HDL: High-Density Lipoprotein Cholesterol; TG: Triglyceide; WHC: Water Holding Capacity
*significant ($p<0.05$; Spearman's r test)

This study found that waist circumference and waist-to-hip ratio were significantly associated with TG/HDL-C ratio in students. Waist circumference and waist-to-hip ratio indicate the presence of fat deposits in the abdominal area. Excess adipose tissue stimulates the liver to increase the production of free fatty acids in the bloodstream and lipoprotein synthesis. This result in an increase in triglyceide levels and a decrease in HDL-C levels (Sultani *et al*. 2020).

Body mass index was found not to have relationship with the TG/HDL-C ratio of the students. The results showed that there was no significant relationship between the percentage of body fat that was obtained from subcutaneous fat thickness with the TG/HDL-C ratio.

CONCLUSION

Anthropometric profiles of WC and WHR are significantly correlated with TG/HDL-C ratio in adult Islamic boarding school students, while BMI and SFT did not have association with the TG/HDL-C ratio. Further research is needed to examine the correlation between the lifestyle of Islamic boarding school students, anthropometric profiles, and lipid levels in relation to the incidence of dyslipidemia using a cohort study design.

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DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflicts of interest.

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