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Subcutaneous Fat Thickness with HDL and LDL Levels in Overweight Female Students

Pengaruh Ketebalan Lemak Subkutan terhadap Kadar HDL Dan LDL Mahasiswi Overweight Di Universitas Berbasis Pesantren

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ABSTRACT

Background: Indonesia is now facing overweight problem as one of the major nutritional problems. It occurs due to excessive fat in the body. The distribution of body fat from subcutaneous fat can increase health risks such as dyslipidemia, one of which is characterized by abnormal High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) levels.

Objectives: The purpose of this study was to analyze the relationship between subcutaneous fat thickness and HDL LDL levels in overweight students at Universitas Darussalam Gontor.

Methods: This study used a cross-sectional design. The research subjects were 50 overweight adult women aged 18-25 years using the Lemeshow formula selected using consecutive sampling while the data analysis using the Chi-Square test. Data taken includes body fat percentage from measuring the thickness of subcutaneous fat folds using a skinfold caliper measuring instrument, and checking the lipid profile from HDL and LDL levels.

Results: The average thickness of subcutaneous fat in overweight female students was 32% body fat with high category (64%). The average HDL level was classified as normal (70%), while the LDL level was classified as high (58%). The results of the analysis test on the relation between subcutaneous fat thickness and HDL levels showed no significant difference with HDL levels (p-value = 0.199 [>0.05]). While there is a significant relationship between the subcutaneous fat thickness and LDL levels with a p-value of 0.042 (<0.05).

Conclusions: There is no significant relationship between subcutaneous fat thickness and HDL level contrarily, there is a relationship between subcutaneous fat thickness and LDL levels. Monitoring the thickness of subcutaneous fat needs to be done as a form of controlling LDL levels.

INTRODUCTION

Indonesia is a country that has a major nutritional problem, namely overweight or excess weight. Increased overweight can be caused by the result of excessive accumulation of body fat. Overweight is one of the main risk factors for degenerative diseases. The increasing overweight has become an epidemic problem in the world. Based on research by Ramadhani & Sulistyorini (2018) said that overweight occurs mostly in the age group of 18 years and over every year there are 2.8 million people who die as a result of overweight and obesity[1]. Results from Riskesdas data on 2018, stated that Indonesia has a high incidence rate overweight which mostly occurs at the age of >18 years. In the last decade, overweight increases from 11.5% in 2013 to 13.6% in 2018. Overweight begins with excessive weight gain due to unbalanced of energy intake and its expenditure. Based on Putri et al. study, excessive energy intake can

result in an increase in the size and amount of fat tissue (adipose), which will be stored as fat then causes weight gain[2]. Factors that can affect the occurrence of overweight are including less physical activity and poor food management.

The body fat thickness can be affected by excessive fat mass stored in the body; generally fat mass is widely spread more than 50% stored in tissues subcutaneous. Body fat thickness can cause several health problems. Based on research by Rahman et al. (2019) showed that the body fat distribution consists of subcutaneous fat and visceral fat in the abdominal area. Subcutaneous fat is a part of adipose tissue found under the skin[3]. Excessive body fat can increase health risks such as dyslipidemia, type 2 diabetes mellitus, hypertension and chronic heart disease[4]. Increased accumulation of excessive fat in the blood can cause dyslipidemia. According to research by Tinta, overweight

e-ISSN: 2580-1163 (Online)
p-ISSN: 2580-9776 (Print)
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individual has excessive fat levels, means the higher the fat storage in adipose tissue, the higher risk of abnormal lipid profile due to a decrease adiponectin[5]. Based on research by Basri (2020), patients with uncontrolled weight can cause obesity and degenerative disease risk such as cardiovascular. In addition, cardiovascular main disease is the number one cause of death in the world that increases from year to year in overweight and obese sufferers, and can be caused by disfunction metabolism resulting in dyslipidemia, including high Low Density Lipoprotein (LDL) cholesterol levels and low high density lipoprotein (HDL) cholesterol levels[6]. This was proven in Sitepu's research (2017) which obtained results that the average result of LDL cholesterol levels in overweight people were higher compared to the normal group, while the average HDL cholesterol levels in overweight were lower than normal group. The results of this study indicated that overweight is associated with lipid profile disorders. Based on Directorate for Prevention and Control of Non-Communicable Diseases, Ministry of Health 2018 stated that normal HDL cholesterol levels are 60 mg / dL and the normal limit for LDL cholesterol is <100 mg/dL[7].

Susilo (2017) stated that there are still many people aged 18 years and over who are overweight which is a factor in dyslipidemia with a high lipid profile, especially in LDL levels and low HDL cholesterol levels. Excessive levels of LDL cholesterol in the blood will increase the risk of cholesterol buildup or deposition on the walls of arteries followed by atherosclerosis[8]. With this, it is necessary to have an early check both anthropometric measurements and profile level tests thus, it can control risk factors for dyslipidemia. There is a need for prevention overweight as a warning that leads to obesity and dyslipidemia. Therefore, this study aims to determine the relationship between the composition of subcutaneous fat that can affect the lipid profile levels of each individual in a Universitas Darussalam Gontor students.

METHODS

The study design used analytical observational method with cross-sectional design. The population was overweight female students in Universitas Darussalam Gontor islamic boarding school. The research was carried out at Universitas Darussalam Gontor Female Campus in November-February 2022. The subjects of this study were female students aged 18-24 years with 50 people selected using consecutive sampling based on inclusion and exclusion criteria. Inclusion criteria of this study were: Universitas Darussalam Gontor female students aged 18-25 years; having a Body Mass Index (BMI) value with overweight category overweight > 25.0 – 27.0 kg; willing to be the subject of research as evidenced by informed consent; willing to fast 8-10 hours before taking

a blood sample; and willing to follow the measurement of subcutaneous fat thickness using a skinfold tool. Further, the exclusion criteria in this research were: running a diet program; taking dietary supplements; having a chronic illness; experiencing skin disease in the area of measurement of fat thickness Subcutaneous triceps, biceps, suprailiaka, and subscapular; unwilling to fast 8-10 hours before taking a blood sample; and unwilling to follow the measurement of subcutaneous fat thickness using a skinfold tool.

This research was submitted and carried out according to the established procedure in the form of an approval letter from the Ethical Clearance section at the Health Research Ethics Committee (KEPK) of Semarang State University (UNNES) with number 542/KEPK/EC/2022 on November 21, 2022. In the beginning of the research, the researchers reviewed the procedure for using anthropometric tools to determine overweight nutritional status in research subjects, including microtoise height measuring devices, digital weight scale, and skinfold caliper. Secondly, before measuring and collecting anthropometric data, the researchers checked anthropometric tools as well. The researchers shared, explained, and asked respondents to fill out the consent form of respondents who were willing to participate in the research. Researchers collected anthropometric data by measuring body mass index (BMI) from height, weight, and subcutaneous fat thickness measurements with the skinfold caliper, and taking biochemical data in the form of respondents' blood serum samples. Taking the Blood sampling of respondents was carried out by the professional medical personnel. Lipid profile blood sample of data collection in research respondents was carried out by health workers of Widodo Medika Ngawi Hospital through venous blood vessels. Checking the HDL and LDL levels of the respondents' lipid profile blood samples was also carried out in the Widodo Medika Ngawi Hospital laboratory.

The health workers used the Pictus 400 Diatron type Clinical Chemistry Analyzer, a multitasking system capable of performing 48 different tests automatically and selectively, so that it can read the results of HDL and LDL levels from the computer connected to the tematic. The Analysis used to test the relationship of tested variables was Chi-Square test.

RESULTS AND DISCUSSION

The respondents in this study were overweight students (female) of Universitas Darussalam Gontor, with 50 subjects. Subject of data collection was carried out in accordance with predetermined inclusion and exclusion criteria. The characteristics of respondents in this study were based on age. An overview of the subject characteristics can be seen based on the following table.

Table 1. The characteristics of respondents

Characteristics	n (50)	%
Age (years)		
18-19	16	32 %
20-24	34	68 %
Percentage of subcutaneous fat thickness		
Normal (25% - < 30%)	18	36 %

Characteristics	n (50)	%
High (≤ 30% - 35%)	32	64%
HDL level		
Normal (< 60 mg/dl)	35	70 %
Low (≥ 60 mg/dl)	15	30 %
LDL level		
Normal (≤ 100 mg/dl)	21	42 %
High (> 100 mg/dl)	29	58 %

The results of the study in Table 1 illustrated that the frequency of respondents in overweight female students with the highest percentage is in the age group of 20 - 24 years as many as 34 students (68%), while the lowest percentage of respondents in the group of overweight students aged 18 - 19 years (32%). The results of the study based on the percentage were found that more than half of the respondents experienced a high percentage of body fat, as many as 32 students (64%). 70% of respondents have normal HDL levels with an average value of 65.22 mg/dl. Meanwhile, based on the results of data analysis of LDL levels in respondents, it was found that, more than half of respondents (58%) have high LDL levels with an average value of 100.58 mg/dl.

Table 2. The relationship of subcutaneous fat thickness with HDL and LDL levels

Variable	Subcutaneous Fat Thickness		p-value
	Normal	Low	
HDL			
Normal	15 (83.3%)	3 (16.7%)	0.199
Low	20 (62.5%)	12 (37.5%)	
LDL			
Normal	4 (22.2%)	14 (77.8%)	0.042
Low	17 (53.1%)	15 (46.9%)	

The results of the analysis of the relationship between subcutaneous fat thickness and LDL levels using the Chi-Square test was p-value = 0.199 (p>0.05), which means Ho is accepted and it can be concluded that there is no significant relationship between subcutaneous fat thickness and HDL levels. Meanwhile, the results of the analysis of the relationship between subcutaneous fat thickness and LDL levels using the Chi-Square test was, p value = 0.042 (< 0.05), which means Ho is rejected, so it can be concluded that there is a significant relationship between subcutaneous fat thickness and LDL levels. Based on the research data in table 2, showed that there is no significant relationship between the thickness of subcutaneous fat and HDL levels in overweight female students of Universitas Darussalam Gontor aged 18-25 years indicated by the p-value in female respondents of 0.199. The results of this study are in line with the research of Song, et al. (2021) which explained that the percentage of body fat and subcutaneous fat is not related to HDL levels[9].

Yudin (2022) stated that there was no significant relationship between body fat percent and HDL lipid profile[10]. It is consistent with previous research that catecholamine-induced lipolysis higher in intraperitoneal fat than subcutaneous fat because of subcutaneous adipose cell hypertrophy in the ratio of HDL cholesterol is lower in strength than in predictors with hyper to visceral adipose cells[11]. According to Subandrate (2020), normal HDL levels in respondents of overweight subject can occur because HDL levels are not a component of lipids that make up body fat stores but function in transporting metabolism in the body[12]. Metabolism that was carried out quickly can cause the form of a compound produced not to settle in a certain form[13]. Previous studies also suggested that there is no significant or weak correlation seen in HDL with body fat percentage but in cardiovascular disease patients with overweight. Based on Pandiangan (2022) research, when body fat is calculated using a anthropometric measurement, it is not talking about free-flowing fat in the blood of CAD patients[14]. The results of this research are not in line with research by Susantini (2021)[15] stating that excessive weight is often associated with a decrease in HDL[15].

Based on results in table 2, showed that there is a significant relationship between subcutaneous fat thickness and LDL levels in overweight female students of Universitas Darussalam Gontor aged 18-25 years, indicated by a p-value in female respondents of 0.042. The results of this study are in line with the research that stated there was a significant relationship between the thickness of fat under the skin to LDL at the age of 16-18 years[16]. In this study, respondents on average had a high percentage of fat from measuring the thickness of subcutaneous fat and center, many of them had high LDL levels. It is in line with previous research by Putri et al (2019) stating that excessive fat tissue results in free fatty acids that inhibit lipogenesis and will cause increasing lipid profile levels. Body fat strongly tied to being overweight, can increase the risk of dyslipidemia and other degenerative diseases[2].

Research by Indrayanti et al. (2019) stated that high LDL content will cause the thickening of blood vessel walls and thickened subcutaneous fat is obtained[17]. The thicker the percent of body fat, the higher the LDL cholesterol levels. Excessive consumption of fat will get more pieces of LDL stuck along the blood vessels and if HDL is not enough to release LDL resulting in blockage of blood vessels[17]. It is in line with previous research that an increase in LDL levels can occur due to excessive consumption of high-fat foods, lack of exercise will also

Amerta Nutrition

e-ISSN: 2580-1163 (Online)
p-ISSN: 2580-9776 (Print)
Damayanti et al. | Amerta Nutrition Vol. 7 Issue 2SP (December 2023). 13-17

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affect fat accumulation to excess weight which will cause adipose cells to be unable to store triglycerides adequately as well as trigger an increasing in triglycerides, which will cause hypercholesterolemia, Putri et al (2019). Increased levels of fat in the blood can occur due to the mechanism of the relationship of a high percentage of saturated fat intake from total calories[2]. Based on[18] study, if excess levels of LDL cholesterol in the blood not balanced with a lifestyle, it will tends to lack activity and diet beyond needs, there a buildup of excess fat stored in the subcutaneous fat layer or under the skin tissue[18]. The result of this study are in line with the research of Kristanti and Rustijanto (2018)[19], who stated that it causes the deposition of fat in the arteries that causes the blockage of the walls of blood vessels. Thus, if that atherosclerosis does not occur, it can be a contributing factor to the increased incidence of lipid profile disorders that lead to degenerative diseases[19].

CONCLUSIONS

Based on the results, the analysis, and the discussion of research that has been carried out, it can be concluded that there is no significant relationship between subcutaneous fat and HDL levels in female students overweight (p= 0.199). In contrary of this fact, there is a significant relationship between subcutaneous fat and LDL levels in female students overweight (p = 0.042).

The Suggestion from this research, It is hoped that this study can provide scientific information and control risk factors for dyslipidemia. This study can be used as a reference to contribute the study focusing on the relationship between subcutaneous fat thickness with HDL and LDL levels in overweight. Further research can be done not only to determine the relationship of subcutaneous fat thickness with HDL and LDL levels, but can be comprehended to the relationship of confounding variables with HDL and LDL levels, so it can obtain better and complete data to describe the meaningful results on HDL and LDL levels in the blood.

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