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# the Relationship between A Skinfold Thicknesses with Level of High Sensitivity C-Reactive Protein in Elderly Woman

## Original Article

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**Abstract**
Aging causes changes in body composition such as a decrease in muscle mass and an increase in adiposity associated with inflammation. High sensitivity C-reactive protein is the marker of inflammation. This study aimed to analyze the relationship between Skinfold Thicknesses with the Level of High Sensitivity C-Reactive Protein in Elderly women. This observational study used a cross-sectional design. Subjects were determined using consecutive sampling and adjusted for inclusion criteria with minimal sample were 53 subjects. Data collected were skinfold thicknesses measured with skinfold caliper and serum HsCRP analyzed by Enzyme-linked Immunosorbent Assay (ELISA), physical activity level measured by International Physical Activity Questionnaire, and dietary intake measured by food recall 3 x 24 hours. Data analysis using Ranks Spearman correlation test. The median value thickness of the biceps is 17.94 ± 10.60 mm, the thickness of the triceps skinfold thickness is 23.40 ± 8.06 mm, the subscapular skinfold thickness is 14.95 ± 7.48 mm, the suprailiac skinfold thickness is 17.00 ± 8.85 mm while the median HsCRP serum 2.09 ± 2.11 mg/L is classified as moderate. There was a relationship between suprailiac skinfold thickness (r = 0.45 p = 0.001) and subscapular (r =0.40 p =0.003). However, there was no relationship between biceps skinfold thickness (r =0.29 p =0.34) and triceps (r=0.75 p =0.47) with HsCRP levels. There was a significant relationship between suprailiac and subscapular skinfold thickness. However, there was no significant relationship between biceps and triceps skinfold thickness.

**Keywords**: *skinfold thicknesses, HsCRP levels, elderly women*

## INTRODUCTION

Changes in body composition that are typical of the aging process are a decrease in fat-free mass and an increase in fat mass [1]. As we age after the age of 30, body fat mass increases along with a decrease in fat-free mass. When reaching the age of 20 years to 70 years, the decrease in skeletal muscle mass causes a decrease in body fat-free mass by up to 40%. The highest body fat-free mass will occur at the age of 20-30 years while body fat mass will accumulate at most at the age of 60-75 years. After the age of 75 years, both fat mass and fat-free mass will decrease slowly [2]. Changes in body composition in the elderly (elderly) are influenced by hormonal and lifestyle changes. Old age is associated with decreased secretion of growth hormone and sex steroid hormones. These hormones play a role in protein metabolism, fat deposition and bone mass formation in men and women [1–3]. A study by Kuk found that women's body fat is greater than that of men by 46% and 29.4%, respectively [4].

Increased fat mass in the elderly is at risk of increasing inflammation, one of the markers of inflammation is high sensitivity C Reactive Protein (HsCRP). The accumulation of fat mass in the subcutaneous tissue represents a physiological state for excessive intake such as a high-calorie diet and lack of energy expenditure such as a sedentary lifestyle. This acts as a metabolic response in which excess free fatty acids and glycerol will be stored as triglycerides in adipose tissue chronically [5]. The production of these free fatty acids can lead to an inflammatory response, an increase in the production of the proinflammatory cytokine IL-6 which will increase levels of C Reactive Protein (CRP), so that it will make the serum HsCRP also increase [6,7]. High sensitivity C Reactive Protein (HsCRP) is an inflammatory marker whose analytical sensitivity can measure very low CRP levels so it is used as a marker of chronic inflammation such as cardiovascular disease [8]. So that the inflammation marker that is considered the best at this time is HsCRP because it is stable, and there is standardization from WHO besides that the CRP measurement can only distinguish someone who has a low and acute level of inflammation, while the HsCRP measurement can determine chronic inflammation including atherosclerosis [9]. Risk of cardiovascular disease classified as low if the measurement results for serum HsCRP levels <1 mg/L, moderate if the levels if serum HsCRP levels are 1-3 mg/L and high if HsCRP levels >3 mg/L [10]. The results of measuring HsCRP levels can indicate the risk of cardiovascular disease in the future so that intervention can be carried out as early as possible.

There are various methods of measuring body fat to measure fat mass, one of which is the measurement of subcutaneous fat thickness as measured by a skinfold caliper including the biceps on the front upper arm, triceps on the back of the upper arm, the subscapular shoulder blade, and suprailiac on the side of the waist [11]. Measurement of subcutaneous fat thickness is a standard indicator for anthropometric measurements of fat distribution. In addition, the method of examination is quite cheap, simple, and non-invasive. Based on the data, NHANES I and NHANES II recommend using a combination of thick areas of subcutaneous fat, such as an area of the upper limb on the triceps and one area of the limb on the subscapular. Basically, the more areas of subcutaneous fat thickness that are used to see the distribution of body fat, the more valid it will be [12]. Research conducted in Mexico conducted a study of subcutaneous fat thickness in four areas, namely the triceps, biceps, subscapular, and suprailiac sections on HsCRP levels. based on the study explained that all measurements resulted in a significant relationship in obese and normal children [13].

Research on subcutaneous fat thickness on HsCRP in adolescent and pediatric subjects has been conducted explaining that there is a significant relationship, but research in the elderly has never been carried out, whereas based on physiological changes in the elderly, fat mass increases in fat mass so that HsCRP is predicted to be higher. Based on this background, the authors wanted to examine the relationship between HsCRP levels in elderly women in Semarang City by measuring the thickness of subcutaneous fat in order to determine the risk of cardiovascular disease in the future so that prevention can be done early on.

## MATERIAL AND METHODS

This research is included in the scope of community nutrition. This type of research is an observational study with a cross-sectional design. The selection of research subjects used a consecutive sampling technique. The research was carried out from the process of selecting subjects to take blood samples. The subjects of this study were elderly women aged 60-75 years who lived in RW 11, Jomblang Village, Candisari District, Semarang City.

Inclusion criteria in this study were willing to fill out informed consent, have their blood taken, elderly women aged 60-75 years, and do not experience any disease when taking blood such as type diabetes mellitus, hypertension, kidney failure, heart disease, bronchial asthma, not smoking, not currently experiencing acute infectious diseases such as sore throat, cough, and runny nose, while the exclusion criteria in this study were resignation and death. The research sample size was calculated using the correlative hypothesis test formula using the minimum correlation in previous studies of 0.445713. Thus, the minimum number of samples and an additional 10%dropoutt for this study were 54 people. However, during the study there was 1 subject who dropped out due to having an acute infectious disease, namely sore throat, cough, and runny nose when taking blood samples. So that the total subjects who met the inclusion criteria and were willing to be research subjects were 53 people.

The dependent variable in this study was the level of high-sensitivity C-reactive Protein (HsCRP) obtained by taking 5 ml of venous blood by laboratory personnel. Before taking blood, do not fast first. The levels of HsCRP were measured using the ELISA (Enzymelinked Immunosorbent Assay) method. Data on HsCRP levels were categorized as low if < 1 mg/L, moderate 1-3 mg/L, and high > 3 mg/L [10]. The independent variable in this study was subcutaneous fat thickness (thickness of triceps, biceps, subscapular, suprailiac fat). Measurement of subcutaneous fat thickness using a digital skinfold caliper MF-290 with an accuracy of 0.1 mm was performed on the right side of the body. The subcutaneous tissue is clamped and lifted to the base of the muscle surface using a measuring thumb and forefinger. The caliper clamps the skinfold base 1 cm distally and perpendicular to the clamp. The results of the clamp are read 2-3 seconds clamped, measurements are made 2 times. The difference in the results of 2 measurements and is still included in the average thickness of the sub-skin fat measurement which is said to be precise, which ranges between the biceps 0.1-0.2 mm, triceps 0.1-3.7 mm, subscapular 0.1 -7.4 mm, and suprailiac 0.1-3.2 mm [12].

Data collected by subject identity data included name, gender, age, address, history of drug use, history of disease, physical activity, measurement of the subcutaneous fat thickness of triceps, biceps, subscapular, suprailiac, biochemical data in the form of serum HsCRP levels. The data that has been collected will be analyzed using the SPSS computer program. Univariate analysis to describe subject characteristics, HsCRP levels, subcutaneous fat thickness, and sample intake used the Kolmogorov-Smirnov test. Bivariate analysis used the Rank-Spearman test to see the relationship between triceps, biceps, suprailiac, and subscapular subcutaneous fat thickness variables with HsCRP levels and confounding variables namely physical activity, energy intake, fat, carbohydrates, fibers, vitamins A, C, D, E. and selenium because the data is not normally distributed [14].

## RESULTS

Table 1. Characteristics of the subject's age, educational history, physical activity, HsCRP levels

| **Characteristics of the subject's** | **n** | **%** |
|---|---|---|
| **Age (years)** | | |
| 60-69 | 50 | 94.3 |
| 70- 79 | 3 | 5.7 |
| **Educational history** | | |
| No school | 12 | 22.6 |
| Elementary school | 33 | 62.3 |
| Middle school | 5 | 9.4 |
| High school | 2 | 3.8 |
| Academy | 1 | 1.9 |
| **Physical activity** | | |
| Heavy | 2 | 3.7 |
| Moderate | 36 | 67.9 |
| Light | 15 | 28.3 |
| **HsCRP levels** | | |
| Low | 14 | 26,4 |
| Moderate | 23 | 43,4 |
| High | 16 | 30,2 |

Based on the results of the study, data on the characteristics of each subject were obtained. Subject characteristics data are shown in table 1. Table 1 shows that the most age ranges from 60-69 years in the young elderly category (94.3%) while 70-79 years in the middle elderly category

(5.7%). The majority of them have elementary school education (62.3%), no school (22.6%), junior high school (9.4%), high school (3.8%) and academy (1.9%). Subjects had physical activity classified as heavy (3.8%) moderate (67.9%) and light (28.3%). Subjects' HsCRP levels were classified as high (30.2%), moderate category (43.4%), and low category (26.4%).

Based on table 2, the median thickness of biceps fat is 16.25 ± 10.60 mm, median thickness of triceps fat is 23.40 ± 8.06 mm, subscapular thickness is 14.95 ± 7.48 mm, and suprailiac thickness is 17.00 ± 8.85 mm. While the median serum HsCRP 2.09 ± 2.11 mg/L was moderate.

Table 2. Subcutaneous Fat Thickness and HsCRP

| **Variables** | **Min** | **Max** | **Median ± SD** |
|---|---|---|---|
| Thickness of biceps (mm) | 2.50 | 42.50 | 16.25 ± 10.60 |
| Thickness of triceps (mm) | 5.15 | 40.00 | 23.40 ± 8.06 |
| Subscapular thickness (mm) | 6.65 | 37.40 | 14.95 ± 7.48 |
| Suprailiac thickness (mm) | 4.00 | 43.35 | 17.00 ± 8.85 |
| HsCRP serum level (mg/L) | 0.18 | 9.00 | 2.09 ± 2.11 |

The results of this study (Table 3) showed that there was no significant relationship between triceps and biceps fat thickness and HsCRP levels (p>0.05), while there was a significant relationship between subscapular and suprailiac fat thickness and HsCRP levels (p<0.05). Based on the correlation test, it was shown that the triceps, biceps, subscapular, suprailiac fat thickness showed a positive relationship, which means that the higher the subcutaneous fat thickness in the four areas, the higher the HsCRP level.

Table 3. The Relationship between Subcutaneous Fat Thickness and HsCRP Levels

| **Variabel** | **HsCRP** | |
|---|---|---|
| | **r** | ***p*[a]** |
| Thickness of biceps | 0.29 | 0.34 |
| Thickness of triceps | 0.75 | 0.47 |
| Subscapular thickness | 0.40 | 0.003 |
| Suprailiac thickness | 0.45 | 0001 |

[a] Uji *Rank-Spearman*

## DISCUSSION

This study was conducted on 53 female research respondents who met the inclusion and exclusion criteria. The age range in this study is 60-75 years. Considerations for choosing this age because body fat mass will accumulate at most at the age of 60-75 years. A study by Kuk found that women's body fat is greater than that of men by 46% and 29.4%, respectively. This is due to a higher percentage of body fat and thicker adipose tissue in women than in men [4]. Excess adipose tissue can secrete inflammatory adipokines such as interleukin (IL)-6 and Tumor Necrosis Factor (TNF ) which in turn can stimulates the liver to produce CRP [15]. After the age of 75 years, both fat mass and fat-free mass will decrease slowly [2]. According to a study conducted by Strandberg that aging is associated with increased levels of HsCRP in elderly men and women, [16] this is because in someone who In old age, there is an imbalance between pro-oxidants and enzymatic antioxidants due to lack of antioxidants. This results in increased susceptibility to oxidative damage that accelerates aging and age-related diseases. Oxidative stress is associated with inflammation so that it can affect inflammatory markers, one of which is HsCRP [17].

The results of this study showed that there was a significant relationship between suprailiac (r=0.45 p=0.001) and subscapular (r= 0.40 p=0.003) fat thickness and serum HsCRP levels. A positive r value indicates that the relationship between the two variables is said to be in the same direction. The higher the suprailiac and subscapular subcutaneous fat thickness, the higher the HsCRP level. Subscapular and suprailiac fat thickness is a fat deposit in the upper body that has a pathogenic function as indicated by the presence of inflammatory and endocrine responses. In the upper subcutaneous fat has a limited ability to store excess energy causing an increase in free fatty acid flux to the portal vein and systemic circulation. The increase in free fatty acids so that to compensate for this the body will release inflammatory mediators such as cytokines TNF-α, ILβ, IL-6 she so that there is an increase in HsCRP [18]. However, in this study, triceps fat thickness (r=0.29 p=0.34) and biceps (r=0.75 p=0.47) did not show a significant relationship compared to subcapular and suprailiac fat thickness which was more significant. Thick fat in the triceps and biceps is a subcutaneous tissue in the limbs which is protective against the metabolic syndrome because it is associated with low blood glucose, triglycerides, high HDL, insulin sensitivity and reduces the risk of type 2 diabetes mellitus and metabolic syndrome so that they have high inflammatory cells, less than subcutaneous fat in the abdominal area so it is unable to release free fatty acids and does not produce large amounts of pro-inflammatory cytokines such as tumor necrosis factor-alpha (TNF-α) [19–22].

Subcutaneous fat accumulation describes the physiological state for excessive intake such as a high-calorie diet and lack of energy expenditure such as a sedentary lifestyle. This acts as a metabolic response in which excess free fatty acids and glycerol will be stored as triglycerides in adipose tissue chronically [5]. When the storage capacity of subcutaneous fat is excessive or its ability to produce new adipocytes is impaired, hypertrophy will occur. Adipocyte hypertrophy usually leads to dysfunctional adipocytes that cause adipocyte dysfunction, undergo cell death and contribute to adipose tissue inflammation, dysfunction, and pathology. One of the hallmarks of adipose tissue enlargement is chronic low-grade inflammation [23].

Physical activity in this study also showed that there was no significant relationship with HsCRP levels, because most of the subjects had moderate physical activity (67.9%), mild (28.3%), severe (3.7%). According to theory, increased physical activity is an important component of weight loss. Consistent physical activity greatly helps increase weight, reduce fat mass. While light activity in this study was influenced by a sedentary lifestyle. The type of physical activity carried out is sitting up to 5 hours/day. Abnormal or excessive accumulation of fat in adipose tissue can lead to obesity which results in impaired health of myocardial infarction, heart failure, diabetes [24].

## CONCLUSION

There is a significant relationship between subscapular and suprailiac subcutaneous fat thickness, while there is no relationship between triceps and biceps fat thickness.

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## CONFLICTS OF INTEREST

| | | |
|---|---|---|
| Conflict of interest | : | Authors state no conflict of interest. |
| Disclosure statement | : | No author has any financial interest or received any financial benefit from this research. |

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