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Correlation Of Body Mass Index and Grip Muscle Strength In Elderly Women

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ABSTRACT

Elderly (elderly) is closely related to problems with the musculoskeletal system. With increasing age, the elderly experience aging process that will decrease the production of synovial fluid in the joints, decrease muscle tone and decrease muscle strength. One of the muscle disorder is a decrease in hand grip muscle strength. Hand grip muscle strength can be influenced by several factors, one of which is body mass index (BMI). This study was conducted in May 2021 with the aim of knowing the relationship between body mass index and hand grip muscle strength in elderly women aged 60-67 years in Kemoning Village, Klungkung Regency, Bali. The research design used was cross sectional and obtained a sample of 12 people. Hand grip muscle strength was measured using the Hand Grip Dynamometer, while body mass index (BMI) was obtained from the calculation of body weight (kg) height (m^2). The results of the study used the *Pearson Product Moment* correlation test with the value of Sig. (2-tailed) 0.000 and correlation closeness 0.887. This shows that there is a very strong significant correlation between BMI and hand grip muscle strength in elderly women aged 60-67 years. The hand grip muscle strength of the elderly with the thin category is smaller than the normal category.

Keywords: *Elderly; Body Mass Index; Hand Grip Muscle Strength*

INTRODUCTION

Aging (getting old) is a condition that occurs in human life. Aging is the process of slowly losing the ability of body tissues to maintain normal structure and function [1]. The aging process is characterized by a decrease or physical change, the loss of tissue in the nervous system, muscles and other tissues slowly [2]. Elderly (elderly) is closely related to problems with the musculoskeletal system. With increasing age, the elderly experience aging process that will decrease synovial fluid in the joints, decrease muscle tone and decrease muscle strength [3]. Decreased muscle strength is caused by many factors, one of which is a decrease in muscle mass. On average 5-13% of the elderly over 60 years have low muscle mass, with the prevalence increasing to 50% of people over the age of 80 [4]. Reduced muscle mass and strength is known as sarcopenia which can result in a person losing muscle function. The measurement of muscle strength and muscle mass is very important [5]. Hand grip strength is the ability of a muscle or group of muscles in the upper extremity of the body that can contract to withstand and accept the maximum load [6]. Hand grip muscle strength can be influenced by several factors, one of which is body mass index (BMI). Because low muscle strength is associated with low weight and high body fat mass, it is important to maintain a healthy weight throughout your life so that you can develop good muscle strength in the future and have an impact on your health. am. Handgrip strength is an isometric estimate of upper limb strength, but is considered an estimate of "total strength" because it also correlates with the strength of other muscles. Hand grip muscle strength is moderately correlated with overall body weight in the older and oldest populations. This study is in line with Bassi *et al.* [7] which states that a correlation study between hand grip muscle

strength and BMI has shown a significant correlation in women aged 60-69 years in the dominant hand. Based on the background of the problem above, the authors are interested in conducting research to determine the relationship between body mass index and hand grip muscle strength in elderly women aged 60-67 years in Kemoning Village, Klungkung Regency, Bali

METHODS

a. Methodology

Study Design

This study is a correlation study of the relationship between BMI and hand grip strength in a 60-67 years old women.

Subject Recruiment

Elderly people willing to make sample, a 60-67 years old woman by presenting an ID card, selection criteria for this study in the form of elderly people without a sensory system (visual and auditory) and the elderly who are not taking painkillers. Exclusion criteria in the form of elderly people with chronic musculoskeletal disorders in their hand.

Sampling Method

Sample were collected at Banjar Kemoning Hall and split into two sessions. Before the study, the sample was instructed to follow the health protocol by washing hand, wearing a mask, and keeping a distance. The first step is to inform the sample of the objectives, benefits, and explanations of the research phase. In addition, the sample is fully ID by presenting the researcher's ID card. Then instruct the sample to sign the availability latter, fill out a consent form and collect the sample according to inclusion and exclusion and exclusion factors. Next, control in the form of blood pressure, pulse, temperature, breathing, height, weight and finally measure the strength of the hand with a hand grip dynamometer.

b. Material and Procedures

Material

Body mass index (BMI) or quartet index is an ideal weight level calculated from a person's weight and height. BMI can be seen as an alternative to direct body fat measurement. In addition, the BMI method is simple and inexpensive, and checks for weight classes that can cause health problems (weight in kilograms divided with the aid of using the rectangular of peak in meters kg/m^2). Hand grip muscle strength using a Hand Grip Dynamometer.

Procedures

The procedures for measuring the strength of the hand muscle are that the subject is standing relaxed, the arm is hanging freely, does not touch other parts of the body, the arm can be bent slightly, and the position of the arm is to keep you as comfortable as possible. Human hands should be dry. The handle of the dynamometer is held as comfortably as possible and the second joint segment slides under the handle (grasping position). The subject presses as hard as possible and is held for 2-3 second. Repeat with each hand and rest for 30 second with each repeat.

c. Data Analysis

The data obtained from this study was analyzed using descriptive statistics. The data is tested with the Shapiro-wilk test. The relationship between BMI and hand strength uses the Pearson Product Moment correlation coefficient.

RESULT

a. Descriptive Analysis

Table 1. Descriptive Statistics Analysis of BMI

Score	N	Min	Max	Median	Mean	Standard Deviation
IMT	12	156	227	180.5	184.3	22.637

Based on Table 1 descriptive analysis above obtained the results of BMI values in the sample obtained a minimum value of 156, a maximum of 227, a median of 180.5, a mean of 184.3 and a standard deviation of 22,637.

Table 2. Descriptive Statistics Analysis of Hand Grip Muscle Strength

Score	N	Min	Max	Median	Mean	Standard Deviation
Hand Grip Muscle Strength	12	137	245	201.5	192.5	31.165

Based on Table 2 descriptive analysis above obtained the results of hand-held muscle strength value in the sample obtained a minimum value of 137, a maximum of 245, a median of 201.5, a mean of 192.5 and a standard deviation of 31,165

b. Normality Test

Table 3. Data Normality BMI and Hand Grip Muscle Strength

	Shapiro Wilk Test				
	N	Statistic	Df	Sig	Information
BMI	12	.922	12	.301	Normally Distributed
Hand Grip Muscle Strength	12	.916	12	.255	Normally Distributed

Based on Table 3 normality test data body mass index and muscle strength handheld using *Shapiro Wilk Test* obtained body mass index value Sig=.301 which means the result is greater than 0.05 while the value of muscle strength handheld Sig =.255 which means the result is greater than 0.05. These results show normally distributed data.

c. Hypothesis Test

Table 4. *Pearson Product Moment* BMI and Hand Grip Muscle Strength

Uji *Pearson Product Moment*			
		BMI	Hand Grip Muscle Strength
BMI	Pearson Correlation	1	.887**
	Sig. (2-tailed)		.000
	N	12	12
Hand Grip Muscle Strength	Pearson Correlation	.887**	1
	Sig. (2-tailed)	.000	
	N	12	12

Based on Table 4 shows the significant value of BMI and the value of hand-held muscle strength is 0.000 which means there is a correlation between BMI and the strength of the hand-held muscles. Pearson *correlation* values obtained for correlation levels are very strong this corresponds to the correlation value of 0.887 in Table 4, while answering the hypothesis made by researchers that there is a link between BMI and muscle strength in elderly women aged 60-67 years.

Based on the specified asterisk (*) SPSS: If the Pearson correlation value contains an asterisk (*) or (**), there is a correlation between the variables in the analysis. Conversely, if the Pearson correlation value does not have an asterisk, then there is no correlation between the variables in the analysis. An asterisk (*) indicates a significant correlation of 1% or 0.01. On the other hand, the two asterisks (**) show a correlation of 5% significance or 0.05.

DISCUSSION

a. Sample Characteristics

In this study, researchers took samples of elderly women aged 60-67 years. The age is still in the category of elderly (elderly) with ages ranging from 60-74 years [8,9]. In the elderly, muscle strength decreases faster than muscle mass. If the decrease in fast-type muscle fibers is greater than that of slow-type muscle fibers, it will have an impact or affect muscle strength [10]. Muscle strength and muscle mass decrease with age, leading to sarcopenia, which is associated with impaired muscle function. The process of sarcopenia involves an age-related decline in anabolic steroid hormones, growth factors, degeneration of the nervous system, decreased muscle protein synthesis, poor nutrition, chronic disease and physical inactivity [7].Columbia University Medical Center conducted a study and found that the decline in muscle strength in aging occurs due to the leakage of calcium from a protein group in muscle cells called ryanodine which then triggers a circuit that limits muscle fiber contraction. When there is less calcium available, muscle contractions become weak [11]. One of the

declines in muscle strength is in the strength of the hand grip muscles. Hand grip strength decreases with age in both men and women, in both dominant and non-dominant hands [7]. A decrease in muscle strength or mass is accompanied by a decrease in protein synthesis capacity (anabolism resistance). Aging is associated with decreased levels of testosterone, IGF1, and insulin, leading to decreased protein synthesis through decreased activity of the IGF1 / Akt / mTOR pathway. A decrease in the rate of protein synthesis during the aging process is also accompanied by a decrease in the ability of muscle repair mechanisms. In sarcopenia, the processes of autophagy and apoptosis are also interrupted, and the process of protein synthesis and degradation is out of balance. As muscle mass gradually decreases over time, atrophy occurs and the process of apoptosis occurs when the size of the muscle fibers reaches the minimum critical value. The process of apoptosis also involves denervation and loss of neurons. Denervation and loss of neurons results in decreased muscle capacity and decreased muscle metabolism

b. Relationship between Body Mass Index and Hand Grip Muscle Strength

Based on data analysis that has been carried out by testing the level of correlation between BMI and hand grip muscle strength, the results obtained by the Pearson correlation test are significant with a positive correlation with a very strong value from the 12 samples. This study is in line with the research of Bassi et al[7] which stated that the correlation between hand grip strength and body mass index has shown a significant correlation in women in all age groups, in the dominant hand. A significant correlation occurred at the age of 60-69 years. The results of this study are the more normalweight the body mass index, the stronger the value of hand grip muscle strength. This study is in line with Salam & Chinnakalai[12] finding that the body mass index in the normalweight category has a higher hand grip strength compared to the overweight and obese categories, but in the study of Smrithi Shetty et al in Salam & Chinnakalai[12] it was revealed that the index body mass in the lean category has a smaller hand grip strength than the normalweight and overweight categories. This may be as a result of a higher percentage of skeletal muscle mass than fat mass which is largely responsible for body weight resulting in better hand grip muscle strength [13]. In this study it can be concluded that there is a significant correlation between BMI and hand grip muscle strength in elderly women aged 60-67 years. Limitation of this study was based on a population of older women. Therefore, these results can only be generalized to the elderly, not the young adults of the general population. This survey included only a small number of participants and may not represent the older female population. Our goal due to limited data on hand strength, a similar study should be conducted on older women in Bali.

CONCLUSION

Based on the results of research and discussion, it can be concluded that elderly women aged 60-67 years underwieght category have smaller hand grip muscle strength, but in the normal BMI category they have high hand grip muscle strength compared to those in the thin category. The results obtained after taking measurements that there is a very strong significant correlation between body mass index and hand grip muscle strength.

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