Relationship between body mass index, handgrip, and cognitive status on frailty status in elderly women

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ABSTRACT

Background: Decreased health due to the aging process is characterized by a decrease in the function and work of the body's organs which triggers the risk of disability and frailty, especially in postmenopausal women prone to sarcopenia which can worsen the condition of the elderly. The aim of the study is to determine the relationship between body mass index, handgrip, and cognitive status on frailty status in elderly women at some elderly integrated health services (*posyandu lansia*), Semarang City, Indonesia.

Methods: This study used a cross sectional design with a consecutive sampling method of 70 subjects. Subjects measured vital signs, weight and height. Subjects were then assessed for handgrip strength, cognitive status and frailty status. Univariate and bivariate data analysis used SPSS 25.0 with the Spearman correlation test.

Results: A total of 70 elderly women followed this study with an average age of 65.96 years. As many as 67.1% of elderly women have hypertension. There are 70% of all elderly women with pre-frail status and 4.3% with frail status. There is no significant relationship between body mass index and frailty status (p=0.328). There is no significant relationship between handgrip and frailty status (p=0.476). There is no significant relationship between cognitive status and frailty status (p=0.664).

Conclusion: The elderly women at the some elderly integrated health services, Semarang City mostly have pre-frail status. There is no significant relationship between body mass index, handgrip, and cognitive status on frailty status in elderly women.

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INTRODUCTION

Based on the government regulation of the Republic of Indonesia number 43 of 2004, an elderly person is someone who has reached the age of 60 (sixty) years and over.[1] In nearly five decades, the percentage of elderly Indonesians has approximately doubled (1971-2019). In 2019, the percentage of elderly people reached 9.60% or around 25.64 million people.[1]

One of the problems faced by the elderly is caused, among others, the problem of declining health due to aging, which affects the function and work of the body's organs. One of the characteristics of a decline in health is not only a decrease in organ function, but also an increase in the risk of disability and frailty. Moreover, postmenopausal women are prone to sarcopenia, causing functional disorders, physical disabilities and fractures. All of these things can worsen status frailty.

Obesity is associated with increased coronary artery disease, stroke, increased risk of death and is a recent concern in the elderly.[2,3] Excess adipose tissue leads to decreased physical ability, increased metabolic instability, increased inflammation and low antioxidant capacity.[2,4,5] This was a significant increase of 56% in those aged 60 to 69 years and by 36% in those aged over 70 in 2000 compared to 1991.[2,6] Fat mass tends to peak at the age of 60-70 years followed by a decrease in skeletal muscle mass and fat mass distributed in different parts of the body in this age group.[2]

The frailty criterion according to Fried is defined as being greater than or equal to the following three criteria: unintentional weight loss of 10 lbs. or greater, self-reported fatigue, muscle weakness determined by grip strength, slow walking speed [<0.8 m/s], and low physical activity.[2] Grip strength is one component that can be used as a simple and objective measure of frailty syndrome.[7] Poor grip strength in later life is one of the risk factors for disability, morbidity and mortality, which is at the core of the definition of sarcopenia and frailty.[7]

One of the problems that need attention in the elderly is a decline in cognitive function, it is hoped that only a slight decrease in cognitive function will occur during the aging process. Cognitive disorders can be caused by degeneration of nerves, vascular and metabolic disorders.[8]

The purpose of this study was to determine the relationship between body mass index, handgrip,

and cognitive status on fraility status in elderly women at some elderly integrated health services, Semarang City.

METHOD

The method in this study used cross sectional with consecutive sampling method. The sample consisted of 70 elderly women over 60 years of age who were enrolled in *Posyandu lansia* for elderly in Semarang City. Sampling was conducted in August-September 2018. Samples were recorded by *Posyandu lansia* officers and evaluated according to inclusion criteria. The sample was then recruited after fulfilling the predetermined inclusion criteria, the inclusion criteria were women over 60 years of age, able to communicate, and willing to participate in research. The exclusion criteria in this study were patient with acute infection, previous history of stroke, and moving residence.

Samples from the study that met the inclusion criteria and were not included in the exclusion criteria were then measured for vital signs, weight and height measurements. The research sample was then assessed for grip strength using a handgrip dynamometer and assessed for cognitive status using a mini-mental state examination (MMSE). There is cognitive impairment when the MMSE score is less than 24 points.[8] The CHS based fraility questionnaire is a simple, noninvasive and validated

screening tool to assess each component of fraility in the elderly. The status of fraility in the elderly can be categorized into three groups. The total number of fraility index values divided by 40 will result in the fraility score used in assessing the fraility status of the elderly. Elderly can be categorized as normal/ fit/robust status if they have a score of ≤0.08, if they have a score> 0.08 - <0.25, and the status is fragile/frail if the score is ≥0.25. Filling out the questionnaire can be done independently by the elderly or conducted by interview by Integrated health service for elderly (*posyandu lansia*) officers.[9]

The data that has been collected is processed using the SPSS 25.0 program. The statistical analysis used was univariate and bivariate analysis. Univariate statistical analysis aims to describe the characteristics of each variable studied, while bivariate analysis aims to analyze the factors that are thought to be associated with fraility status in elderly women. The statistical test in this study used the Spearman correlation test.

RESULTS

A total of 70 samples of elderly women were collected, with the lowest age being 60 years and the highest being 84 years, where the average age was 65.96 years. The subjects of this study had the characteristics of the majority of hypertension, namely 67.1%. The BMI status obtained ranged from 18.4 kg/m² to 40.7 kg/m² with an average BMI of 25.32 kg/m², with 48.6% of elderly women having an overweight-obese BMI. The results showed that 64.3% of the women were elderly in Integrated health service for elderly (*posyandu lansia*) in Semarang has good grip strength. As much as 11.4% of all elderly women in this study had impaired cognitive status. The fraility status of the total sample of the study showed that most of the women were elderly or 70% had a pre-frail status, 4.3% were frail (Table 1).

The results of the bivariate analysis in this study showed that there was no significant relationship between body mass index and frailty status (p=0.328) in elderly women. There is no significant relationship between handgrip and frailty status (p=0.476). There is no significant relationship between cognitive status and frailty status (p=0.664) (Table 2).

DISCUSSION

The condition of frailty is a result of the physiological accumulation of the aging process or related diseases from the decreased threshold of the body's physiological system which results in a worse level of health.[10-12] In this study, it was found that

Table 1. Characteristics of a sample of elderly women at Integrated health service for elderly (*posyandu lansia*) in Semarang City

Characteristics	Total (n=70)	%
Age		
60-69 years	54	77.1%
≥70 years	16	22.9%
Blood pressure		
Normal	23	32.9%
Hypertension	47	67.1%
BMI		
Underweight	1	1.4%
Normal	35	50%
Overweight-obese	34	48.6%
Handgrip		
Strong	45	64.3%
Weak	25	35.7%
Cognitive status		
Normal	62	88.6%
MCI-Dementia	8	11.4%
Frailty status		
Fit	18	25.7%
Pre-frail	49	70%
Frail	3	4.3%

Description: BMI = body mass index, MCI = mild cognitive impairment

Table 2. Bivariate analysis of BMI, handgrip and cognitive status on frailty status in elderly women in Integrated health service for elderly (*posyandu lansia*) in Semarang City

Variable	Frailty status			p-value
	Fit N = 18	Pre Frail N = 43	Frail N = 3	
Body mass index				
Underweight	0 (0%)	1 (1.4%)	0 (0%)	0.328
Normal	11 (15.7%)	23 (32.9%)	1 (1.4%)	
Overweight-obese	7 (10%)	25 (35.7%)	2 (2.9%)	
Handgrip				
Strong	11 (15.7%)	31 (44.3%)	3 (4.3%)	0.476
weak	7 (10%)	18 (25.7%)	0 (0%)	
Cognitive status				
Normal	16 (22.9%)	44 (62.9%)	2 (2.9%)	0.664
MCI-Dementia	2 (2.9%)	5 (7.1%)	1 (1.4%)	

Description: BMI = body mass index, MCI = mild cognitive impairment

the highest age in elderly women was 84 years with an average age of 65.96 years. This is related to the composition of the elderly population in Indonesia which is increasing rapidly due to a decrease in birth rates and mortality, accompanied by an increase in life expectancy.[13]

One of the changes that occur in the elderly is increased body fat mass. Fat mass is a risk factor for age-related diseases, such as coronary heart disease and type 2 diabetes mellitus.[2] Fat free mass (FFM) constituents are skeletal muscle mass, body cell mass, total body water, and bone mineral mass. The peak of FFM in men is reached in the mid-30s and decreases further thereafter, whereas in women, it stabilizes in young adulthood until around age 50 when it begins to decline progressively with age. The homeostatic system that regulates FFM is impaired in old age.[2] In this study, it was found that 48.6% of elderly women with a body mass index (BMI) were overweight-obese, of all these elderly women, most of them had hypertension, 34.3%, this is one cause of coronary heart disease. This study showed that there was no relationship between BMI and frailty status (p = 0.328), this could be influenced by the number of study subjects, however, most of the 35.7% elderly with overweight-obese BMI had pre-frail conditions. This number is more than the elderly with normal BMI.

Component *frailty* in the elderly what can be measured in an easy and simple way is grasping strength. This study shows that elderly women from several *Posyandu lansia* in Semarang City have good grasping strength. The elderly with good grip strength have a fit / robust condition (15.7%) more than the elderly who have weak grip strength with a fit / robust condition (10%). This study shows that there is no relationship between handgrip and frailty status. Previous research conducted by Joanna, et al. which states that handgrip has an indirect relationship on frailty status, handgrip has a unidirectional relationship with IADL, MMSE and Barthel index. Weakness in grasping can occur and is influenced by various factors, namely physical inactivity and body fat.[7]

One of the conditions faced by the elderly is cognitive impairment. This study did not show any relationship between cognitive status with frailty status in elderly women from various *Posyandu lansia* elderly in Semarang City. As much as 11.4% of the total elderly women experienced cognitive impairment, 7.1% of whom had pre-frail conditions. This is different from the research conducted by Allan, et al. which shows a relationship between cognitive status and frailty status in the elderly.[8] This difference can occur due to education level factors, place of residence, and functional dependency.

CONCLUSION

The status of frailty among elderly women in several Integrated health services for elderly (*posyandu lansia*) in Semarang City, most of them have pre-frail status. There is no relationship between body mass index, handgrip, and cognitive status on frailty status in elderly women.

CONFLICT OF INTEREST

The author declares there is no conflict of interest regarding publication of this article.

ETHICAL CONSIDERATION

All study protocol has been approved by Committee of Ethics, Faculty of Medicine Universitas Diponegoro/Kariadi Hospital Semarang, Indonesia. All study procedures in accordance with Helsinki's declaration of human rights.

FUNDING

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