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RELATIONSHIP BETWEEN BODY MASS INDEX AND ACTIVITIES OF DAILY LIVING ELDERLY IN RURAL COMMUNITIES

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Research Report

ABSTRACT

Introduction: *A high Body Mass Index (BMI) is known to be associated with mortality and morbidity in the elderly. However, other studies also show the opposite results regarding high BMI as a protector against Activity Daily Living (ADL). Accurate quantification of the role of BMI in the incidence of disability in ADL. Given the increasing prevalence of overweight and obese individuals and the long life spans in the population. This study aims to determine the relationship between Body Mass Index and Daily Life Activities in population-based elderly people.* ***Methods:*** *The method used in this research is a cross-sectional observational study conducted on 167 respondents from rural areas in the Lamongan Regency, using a consecutive sampling approach. BMI scores and the Barthel Index were recorded among respondents. Data were analyzed using the Spearman Test with a significance level of p<0.05.* ***Results:*** *A total of 167 respondents came from rural areas in Lamongan Regency, dominated by 96 (57.5%) women and 71 (42.5%) men. The Spearman Test results found a weak and significant positive correlation between body weight and daily activities (r= 0.167; p<0.05). Apart from that, a significant weak positive correlation was also found between BMI and ADL (r= 0.157; p<0.05).* ***Conclusions:*** *The results of the study show that increasing the BMI value has a protective effect on ADL, so it can be concluded that higher body weight and BMI are associated with increasing Barthel ADL scores.*

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INTRODUCTION

Body Mass Index (BMI) is used as a useful population-level measure of overweight and obesity (Estrella-Castillo & Gomez-de-Regil, 2019; Nuttall, 2015). Overweight or obesity may cause many chronic illnesses. Furthermore, several studies have shown that high BMI is associated with mortality and morbidity among the elderly (Ozturk, Egici, Bukhari, & Toprak, 2017; Yue-Bin et al., 2018). Individuals with overweight and obesity are a significant public health problem due to an increased risk of hypertension, dyslipidemia, coronary heart disease, stroke, type 2 diabetes, musculoskeletal disorders, and several types of cancer (Kelishadi, 2014). High BMI also shows associations with impaired physical functioning Mobility is another important topic regarding seniors. Accurate quantification of the role of BMI in the incidence of disability in Activities of Daily Living (ADL) is necessary given the increasing prevalence of overweight and obese individuals and the long life span in the population (Sampaio et al., 2020).

Mobility difficulties are often the first sign of functional decline and may indicate the need for preventive measures (Freiberger, Sieber, & Kob, 2020). Mobility problems have been reported as a predictor of all-cause mortality, and patients with BMI >30 kg/m2 have low scores in the "Time Up to Go" test, which assesses mobility (Donini et al., 2020). Mobility problems, as well as diseases that cause cognitive impairment, are causes of addiction. Weight loss through dieting may be associated with cognitive impairment. Therefore, obesity or being overweight can have a negative impact on the performance of daily activities (ADL) in the elderly (Y. Zhang et al., 2021). It still has many controversies since some studies report that obesity is protective against ADL, but the opposite is reported in some others. Many explanations still can be debated about those issues (Donini et al., 2020).

Barthel index is a simple index of independence, which is used to score the patients' ability to perform ADLs (Yi et al., 2020). The Barthel index comprises 10 items, including the presence

or absence of fecal and urinary incontinence and the need for assistance with grooming, toilet use, feeding, transfers (e.g., from the chair to bed), walking, dressing, climbing stairs, and bathing (Y. Zhang et al., 2021). Based on those mentioned above, this study aims to investigate the association between BMI and ADL in the population-based elderly population of Lamongan Regency.

MATERIALS AND METHODS

The research was conducted in a rural area in Lamongan Regency with a cross-sectional observational study of 286 populations conducted on 167 respondents, using a consecutive sampling approach. Measurement of Body Mass Index (BMI) on physical examination, body weight, and height were measured by trained medical personnel using standard protocols. Body weight was measured to the nearest 1 kg for individuals wearing light clothing. Height is measured by observing the patient's height from the base of the feet to the highest point of the head when standing in a straight position against the wall. BMI is measured using the formula a person's weight in kilograms divided by their height in meters squared. BMI is divided into 4 categories according to WHO guidelines: underweight (BMI <18.5), normal weight (BMI 18.5 to <24.9), overweight (BMI 25.0 to <29.9), and obesity (BMI >30.0)(Yue-Bin et al., 2018).

Measurement of Daily Living (ADL) activities uses the interview method with the Barthel score. The score consists of 10 variables regarding performance in daily life such as the presence or absence of fecal incontinence, urinary continence, assistance required in care, use of the toilet, eating, transfer (e.g. from chair to bed), mobility, dressing, and climbing. stairs, and shower. Each variable has a score of 0-2, except for the bathing and grooming variables which have a score of 0-1, and mobility and moving have a score of 0-3. Higher scores indicate a higher level of independence. The Barthel index score is classified as follows: a) 0-4 points: total dependence; b) 5-8 points: severe dependence; c) 9-11 points: moderate dependence; d) 12-19 points: mild dependence; and e) 20 points: total independence. Data were analyzed in percentage terms, then Spearman tested with a significance level of $p<0.05$.

RESULTS

Table 1. Characteristic of respondent by Gender, BMI, and ADL (n = 167)

Characteristic of respondent	n	%
Gender		
Male	71	42,5
Female	96	57,5
BMI (kg/m2)		
Underweight	64	38,3
Normal Weight	77	46,1
Overweight	21	12,6
Obese	5	3,0
ADL Barthel (score)		
Moderate dependence (9-11)	2	1,2
Mild dependence (12-19)	39	23,4
Total dependence (20)	**126**	**75,4**

BMI=body mass index; ADL=activity daily living

A total of 167 elderly from rural areas of Lamongan regencies were enrolled in this study. About 71 (42.5%) respondents were males and 96 (57,5%) of them were females. Most of the respondents were normal (46,1%), followed by underweight (38,3%), overweight (12,6%), and obese (3,0%) in BMI. Based on the ADL Barthel Index assessment, most of them were total independence (75,4%), followed by mild dependence (23,4%), and moderate dependence (1,2%).

Table 2. Spearman correlation test between weight BMI and ADL Barthel (n = 167)

Parameter	r	p
ADL Barthel		
Weight (kg)	0,167	0,029
BMI (kg/m2)	0,157	0, 043

BMI: body mass index; ADL: activity daily living; *p-value: statistically significant if less than 0,05

The results of analysis using the Spearman correlation test found a significant weak positive correlation between body weight and ADL (r= 0,167; p=0,029), while between BMI and ADL (r= 0,157; p=0,043).

DISCUSSION

The elderly population in Indonesia was projected at about 26.66 million (9,03%) in 2017. Predicted 27,08 million in 2020, 33,69 million in 2025, 40,95 million in 2030 and 48,19 million in 2035 (Keating, 2022). According to the World Health Organization (WHO), 71,4 years (males: 69,1 years; females: 73,7 years) is the average life expectancy at birth, and the life expectancy over the age of 60 years was 20,4 years (males: 18,9 years; females: 21,7 years) among the global population in 2015 (Robine, Jagger, Crimmins, Saito, & Van Oyen, 2020). Similarly, 57,5% of our study group was female, which is probably the result of the longer life expectancy of women.

The research results found a positive correlation between BMI and Barthel's ADL. This is supported by previous research that obesity is protective against ADL (Chen, Cui, Zhang, & Peng, 2020). Similarly, we obtained controversial results for whether overweight increases ADL disability or has protective effects (Kivimaki et al., 2022). This is because the ability to perform ADL changes not only based on body weight but also eating habits, and eating habits in individuals who are overweight or obese can reduce the risk of malnutrition and can protect against a decrease in ADL ability, considering that nutritional status is related to ADL performance and ability in elderly (Y. Zhang et al., 2021). High waist circumference (WC) is not associated with poor physical performance and ADL disability (Andreacchi et al., 2021). The combination of a higher level of BMI and lower level of WC has been found to protect from mortality in older adults, they also had a decreased likelihood of having ADL disability (F.-L. Zhang et al., 2021).

But another study found an opposite correlation, e.g Lv YB et al. concluded that higher BMI was associated with a lower risk of disability in ADL among Chinese adults aged 80 years or older, which suggests that current recommendations for the BMI may need to be revisited (Momin et al., 2020). More attention should be paid to underweight, rather than overweight and obesity for the prevention of disability in ADL after age 80 years. Being overweight or obese is associated with a higher risk of death and disabling pathological problems before the age of 80 years (Kivimaki et al., 2022). Other research has also found that higher odds of disability among obese individuals in high-income countries may mean living longer with disability (Salinas-Rodriguez, Rivera-Almaraz, Scott, & Manrique-Espinoza, 2020). The same thing also happens in several countries with higher incomes. Obesity is an independent indicator and does not include chronic conditions (Piqueras et al., 2021). Overall, the inverse association between BMI and disability in ADL is likely multifactorial. Malnutrition, frailty, survival bias or selection bias, and reverse causation were considered potential explanations (Gill, Han, Gahbauer, Leo-Summers, & Murphy, 2020).

Many studies have shown that sarcopenia which is one of the main problems in the elderly, is associated with a decline in muscle mass and strength and is a predictor of poor outcomes, including mortality, disability, and poor quality of life (Nawawi, Justine, & Mazzuin Razali, 2020). Malnutrition and weight loss are the causes of sarcopenia which is associated with functional dependence in the elderly. Accordingly, in our study, when the BMI decreased, the ADL-performing ability decreased, possibly because of the slowing down of activity due to malnutrition or sarcopenia (Y. Zhang et al., 2021).

CONCLUSIONS

The studies show increased BMI values as a protective effect of Barthel ADL, so be concluded higher body weight and BMI are associated with increased Barthel ADL scores. In general, healthcare professionals can advise all patients to receive adequate nutrition and perform exercises to get an ideal BMI, which will protect them from most chronic diseases and help them with healthy aging.

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