4th Riau Medical Scientific and Expo 2022
Volume 2022
http://dx.doi.org/10.11594/nstp.2022.2811

NST Proceedings
OPEN ACCESS

Conference Paper

Correlation Between Body Mass Index and Biological Age in Young Adults

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ABSTRACT

Background: Biological age is influenced by several factors including nutritional status. Body mass index (BMI) is an anthropometric measurement that can be used to assess a person's nutritional status. Objective: The purpose of this study was to determine the correlation between MT and biological age. Methods: Cross-sectional study on students of the Faculty of Medicine and Faculty of Nursing, the University of Riau in March – October 2022, n= 90 people, with consecutive sampling. Results: BMI has a significant, positive, and very strong correlation with biological age ($p < 0.001$, $r = 0.965$). Conclusion: The higher the BMI, the older the biological age, so that by reducing BMI is expected to improve biological age.

Keywords: BMI, biological age, young adults

Introduction

Biological age is different from chronological age. Biological age may increase more rapidly in some people and more slowly in others while the increase in chronological age is uniform. This is caused by non-modifiable factors, such as genetics, and modifiable factors, such as lifestyle (smoking, diet, physical activity, nutritional status). Biological age reflects the heterogeneity of functional status and vulnerability to disease. Research shows that biological age can predict mortality better than chronological age and the incidence of age-related diseases such as cardiovascular disease and type 2 diabetes mellitus (Husted et al., 2020; Yoo et al., 2012). Therefore, it is important to study factors that can improve biological age to increase life expectancy.

Body mass index (BMI) is an anthropometric measurement that can be used to assess a person's nutritional status. The World Health Organization (WHO) classifies the nutritional status based on BMI into underweight, normal weight, overweight and obese groups (WHO/IASO/IOTF, 2000; Lim et al., 2017). Obesity is a major independent risk factor for cardiovascular diseases, such as hypertension, coronary heart disease, atrial fibrillation, and heart failure (Elagizi et al., 2018). Research on the correlation between BMI and biological age is still limited. Therefore, researchers were interested in conducting this research. This research was to determine the correlation between BMI and biological age in young adults.

Material and Methods

This research uses *cross sectional* method on students of the Faculty of Medicine and the Faculty of Nursing, the University of Riau in March – October 2022, n= 90 people, with *consecutive sampling*. BMI was obtained from the calculation of body weight (kg) divided by height (m^2), and for the measurement of biological age using BIA. The normality test is determined by *Kolmogorov-*

How to cite:
Nurhasanah, Wahyuni, S., Nauli, F. et al. (2022). Correlation between body mass index and biological age in young adults. *4th Riau Medical Scientific and Expo 2022*. NST Proceedings. pages 63-65. doi: 10.11594/ nstp.2022.2811

Smirnov, If the data is normal, then the test continued to *Pearson* correlation test. If the data is not normal then the test continued to the *Spearman's rho* correlation test.

Results and Discussion

This research was conducted on 90 students from the Faculty of Medicine, Riau University, with an age range of 18-22 years. The characteristics of the subjects of this study are based on gender, BMI, and biological age as follows in Table 1.

Table 1. Characteristics of research subjects

Characteristics	Total (n)	Percentage (%)
Gender		
Woman	61	67.8
Man	29	32.2
BMI		
underweight	4	4.4
Normal	28	31.1
Overweight	14	15.6
Obesity	44	48.9
Biological age		
Younger than chronological age	9	10.0
Equal to chronological age	5	5.6
Older than chronological age	76	84.4

Table 1 shows that most of the research subjects were women (67.8%), with a BMI category of obesity (48.9%) and biological age older than chronological age (84.4%). The results of the correlation between BMI and biological age are shown in Table 2.

Table 2. Test results of BMI correlation with biological age

Variable	BMI		Interpretation
	p	R	
Biological age	< 0.001	0.965	Significant, positive, very strong

Table 2 shows that BMI has a significant, positive, and very strong correlation with biological age ($p < 0.001$, $r = 0.965$).

The results showed that most of the research subjects were obese (48.9%). This is by Riset Kesehatan Dasar Indonesia (Riskesdas) in 2018 which states that the obesity rate in adults aged 18 years in Indonesia tends to increase (Kementerian Kesehatan Republik Indonesia, 2018). Unhealthy lifestyles such as frequent consumption of fast food and less exercise cause the risk of obesity to increase (Septikasari, 2018). The etiology of the obesity epidemic is still debated, it is widely accepted that the increase in body weight and overall fat tissue is the result of a chronic positive energy balance, with energy intake exceeding energy expenditure (Elagizi et al., 2018; WHO Consultation on Obesity, 2020; Abdelaal et al., 2017). Positive energy balance is believed to be driven by hyperphagia that occurs as a result of increased hunger, decreased satiety, or both (Elagizi et al., 2018; WHO Consultation on Obesity, 2020; Abdelaal et al., 2017).

The results also showed that most of the research subjects had a biological age older than the chronological age (84.4%). This can be influenced by various factors, including non-modifiable factors, such as genetics, and modifiable factors, such as lifestyle (smoking, diet, physical activity, nutritional status) (Husted et al., 2020). Investigating biological age can help to identify

individuals with a higher risk of disease and death, before the onset of clinical manifestations of the disease (Wu et al., 2021).

BMI has a significant, positive, and very strong correlation with biological age ($p < 0.001$, $r = 0.965$). The higher the BMI value, the older the biological age. The results of this study are in line with research by Djuartina et al on the elderly who stated that there is a strong correlation between biological age and BMI (Djuartina et al., 2012). A high-value of BMI can increase a person's biological age. Obesity can accelerate the aging process through increased oxidative stress and inflammation, which can increase the rate of telomere shortening. Human studies have shown that telomere shortening is directly correlated with adiposity and telomere length is inversely related to BMI (Salvestrini et al., 2019; Santos & Sinha, 2021).

Conclusion

The higher the BMI value, the older the biological age, so that by reducing BMI is expected to improve biological age. Further research is needed on other factors that influence biological age in young adults.

Acknowledgments

A sincere thanks to UPPM FK University of Riau for funding this research. Also gratitude from us to the Dean of the Faculty of Medicine and the Dean of the Faculty of Nursing, the University of Riau who has allowed us to conduct this research, and thanks you to all those who have helped to carry out this research.

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