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ORIGINAL ARTICLE

The relationship between physical activity and Body Mass Index among medical students

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Abstract

Preserving one's physical health and preventing diseases is of utmost importance, and leading a healthy lifestyle is essential. The absence of physical activity has been identified as a significant risk factor for obesity and chronic illnesses.This study aimed to establish an intricate relationship between physical activity level and Body Mass Index (BMI) among medical students. This analytical study used a cross-sectional design. Data were collected from October to December 2023. A total of 144 medical students enrolled at Universitas Prima, Indonesia participated in this study. Physical activity data were obtained using the International Physical Activity Questionnaire (IPAQ), whereas BMI was measured using the standard method of dividing weight in kilograms by the square of height in meters (kg/m^2). Data analysis was performed using a One-Way ANOVA statistical test. The study findings revealed a significant difference ($p < 0.05$) between physical activity levels and BMI. Students in the light activity group had an average BMI of 28.57 kg/m^2, compared to 23.27 kg/m^2 for the moderate activity group and 21.66 kg/m^2 for the vigorous activity group. This indicates that physical activity plays a crucial role in determining BMI, with moderate- and vigorous-intensity activities associated with ideal BMI ranges. This study underscores the importance of physical activity in maintaining healthy weight and reducing the risk of obesity and associated chronic diseases. Promoting physical activity among university students can be an effective strategy for promoting their overall well-being.

Keywords: physical activity, Body Mass Index (BMI), medical students

Introduction

Adolescence, a period of dramatic physical, cognitive, and social transformation, presents a unique challenge in the field of nutrition. College students caught in this developmental vortex are particularly vulnerable to various nutritional problems.[1,2] One common problem is the rise in unhealthy eating patterns. Busy schedules, academic pressures and the appeal of easily available processed foods often lead to unbalanced diets.[3] Consumption of sugary drinks, fried foods and refined carbohydrates soars, while intake of fruits, vegetables and whole grains plummets. This creates a nutritional deficit, depriving the body of vitamins, minerals and fiber necessary for optimal growth and development.[4] Iron deficiency, a leading cause of anemia in adolescents, is a prime example. During adolescence, especially in menstruating girls, the iron requirements increase significantly. A diet lacking iron-rich foods such as red meat, legumes, and fortified cereals exacerbates this deficiency. The consequences are far-reaching, impacting energy levels, cognitive function and overall health.[5,6]

Another looming threat is the increasing problem of overweight and obesity in the student population. The confluence of factors such as increased sedentary behavior fueled by excessive screen time and unhealthy food choices creates a positive energy balance.[7,8] This imbalance, where caloric intake exceeds expenditure, leads to weight gain and associated health risks such as type 2 diabetes and

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cardiovascular disease.[9] Body Mass Index (BMI), a measure of weight relative to height, can serve as a screening tool for obesity in adolescents.[10] Research has revealed that a large proportion of students fall into the overweight or obese BMI category. Recent studies have highlighted the prevalence of overweight and obesity in students. In Qatar, 42.3% of students were categorized as overweight or obese, with Qatari male students showing the highest prevalence at 47.1%.[11] Similarly, a study in Kerala, India, found that 18.2% of medical students were overweight and 20.3% were obese.[12] Unhealthy eating habits, such as skipping breakfast and consuming fatty foods, were common among obese students. In addition, students with higher BMI percentiles showed increased utilization of school-based health centers compared to their normal weight peers.[13]

Body mass index (BMI) is a simple measurement tool used to assess body weight relative to height and is often used to classify a person's nutritional status. Physical activity is the movement of the body that results in energy expenditure. Various studies have reported a close relationship between physical activity and BMI. A cross-sectional analysis of adults from four sub-Saharan African countries found that meeting physical activity guidelines of at least 150 minutes per week was associated with lower BMI in both men and women.[14] Similarly, a study of Malaysian pre-university students showed a weak negative correlation between physical activity and BMI.[15] A study of Indonesian adolescents also reported a strong association between physical activity and BMI.[16] Physical activity contributes to energy expenditure and fat burning, with inadequate activity leading to higher BMI values.[17]

Medical students have high learning loads and complex academic demands. This burden can affect their diet, physical activity, and overall health.[18] Based on the findings of initial observations at the Undergraduate Programme in Medical Sciences, Universitas Prima Indonesia, it can be concluded that medical students have low levels of physical activity and the majority have a normal BMI. This is a concern because low physical activity can increase the risk of obesity and other chronic diseases in the future. This study aimed to analyze the correlation between physical activity and BMI among medical students.

Method

This study used an analytical method with a cross-sectional design that aimed to analyze the relationship between physical activity and BMI in medical education students at Prima Indonesia University. The research and data collection were conducted from October to December 2023. A total of 144 medical education students participated in this study.

Primary data were collected to measure the level of stress and physical activity of students. Physical activity data were obtained using The International Physical Activity Questionnaire (IPAQ), a standardized and validated open-ended questionnaire to measure physical activity levels internationally. To measure BMI, researchers used a method that divides body weight in kilograms by the square of height in meters (kg/m^2). Data analysis was performed using a statistical analysis program to determine whether there were significant differences between variables. The research hypothesis was tested using One-Way ANOVA.

Results

The data obtained were analyzed with a normality test using the Kolmogorov-Smirnov formula, and the results obtained were $p > 0.05$, which indicates that the data were normally distributed. Based on the distribution results, 63 samples with mild physical activity levels, 35 samples with moderate physical activity levels, and 46 samples with high physical activity levels were obtained.

Table 1. Frequency distribution of students' physical activity

Physical activity	n	%	p*
Light	63	43,8	0,8
Moderate	35	24,3	0,2
Heavy	46	31,9	0,2

* Kolmogorov-Smirnov

Table 2 presents a detailed analysis of students' BMI according to their level of physical activity. Students with light physical activity had the highest mean BMI (28), with a minimum value of 21.7 and a maximum of 36.9. This shows that students who engage in light physical activity are more prone to being overweight or obese. Students with moderate physical activity had the lowest mean BMI (23.4), with a minimum value of 17.3 and a maximum of 27. This suggests that moderate physical activity helps maintain ideal body weight. Students with vigorous physical activity had a mean BMI of 22, with a

minimum value of 15 and a maximum of 26. This suggests that vigorous physical activity generally helps to achieve ideal body weight, although there are individual variations.

Table 2. Distribution of BMI values based on student activity

Physical activity	BMI min	BMI max	Average BMI
Light	21,7	36,9	28
Moderate	17,3	27	23,4
Heavy	15	26	22

Table 3 shows a significant difference between the level of physical activity and the BMI of students. Students with light physical activity had the highest average BMI (28.57 ± 0.35), followed by moderate (23.27 ± 0.39) and heavy (21.66 ± 0.40) activities. This was evidenced by the statistical significance value (sig.) which shows p<0.000. This means that the lower the level of physical activity of students, the higher their BMI. This shows that physical activity plays an important role in maintaining students' ideal body weight.

Table 3. Comparison of activity with BMI of students

Physical activity	BMI	Sig.
Light	28.57 ± 0.35	
Moderate	23.27 ± 0.39	.000*
Heavy	21.66 ± 0.40	

**One way ANOVA*

Discussion

The results showed that students with low physical activity had the highest average BMI, indicating that they were more prone to being overweight or obese. In contrast, college students with moderate physical activity had the lowest average BMI, indicating that moderate physical activity helps maintain ideal weight. Students with vigorous physical activity had a relatively low mean BMI, indicating that vigorous physical activity generally helps achieve ideal body weight. This means that the lower the level of physical activity, the higher is the BMI. This suggests that physical activity plays an important role in maintaining the ideal body weight.

Recent literature supports an inverse relationship between physical activity and BMI, emphasizing the role of physical activity in weight management. These studies collectively emphasize the importance of physical activity in maintaining ideal body weight. Strong evidence suggests that higher levels of physical activity are associated with prevention of weight gain in adults, especially when moderate to vigorous intensity activity exceeds 150 minutes per week.[19] Inadequate physical activity tends to lead to higher BMI values, while increased activity is associated with lower and more normal BMI ranges.[17] The relationship between BMI and physical activity is bidirectional, with studies showing that individuals with higher BMI (>25 kg/m2) perform less physical activity after anterior cruciate ligament reconstruction.[20] Furthermore, recent findings suggest the importance of considering all components of physical activity, including light-intensity activity and sedentary behavior, in understanding energy balance and weight regulation.[21]

In addition, on a broader scale, university students' physical activity can also promote academic performance. Recent literature supports a positive relationship between physical activity, physical fitness, and academic achievement in school-aged children and adolescents. Several systematic reviews and meta-analyses have found that higher levels of physical activity and fitness, especially cardiorespiratory fitness, are associated with better academic performance.[22,23] Although some studies show inconsistent results, the majority report positive or null relationships, with rare negative relationships.[24] Chronic physical activity shows moderate positive effects on academic performance, while acute physical activity shows no significant benefits.[25] Cardiorespiratory fitness has consistently emerged as the component of physical fitness most strongly associated with academic success.[23] Although the exact mechanisms remain unclear, these findings suggest that promoting physical activity and fitness in educational settings can not only improve students' health but also potentially improve their academic performance.[22,25]

Being a medical student with a busy schedule of studying and assignments can indeed lead to a healthy lifestyle, including physical activity, neglected. In fact, maintaining an ideal BMI is important for long-term health and for supporting the study focus. The literature recommends at least 30 minutes of walking daily, and combining leisure-time and work-related physical activity to reduce the risk of obesity.[26,27]

Conclusion

It can be concluded that the level of physical activity has a clear influence on the BMI of the students. The higher the level of physical activity, the lower is the risk of being overweight or obese. Therefore, it is important for university students to increase their physical activity to achieve and maintain ideal body weight, as well as improve their overall health.

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