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The Relationship between Physical Activity and Hypertension among Obese Adolescents in Malang City

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ABSTRACT

Adolescent obesity has become an increasingly prevalent public health issue, particularly in urban areas such as Malang City. One of the serious complications of obesity is hypertension. Low levels of physical activity are a major risk factor contributing to increased blood pressure in obese adolescents. This study aims to determine the relationship between physical activity levels and the incidence of hypertension among obese adolescents in Malang City. This research employed a quantitative design with a cross-sectional approach. A total of 60 obese adolescents aged 10–19 years were selected from Pandanwangi and Sawoajajar sub-districts in Malang City using purposive sampling. Physical activity data were collected using the PAQ-A (Physical Activity Questionnaire for Adolescents), while blood pressure was measured using a digital sphygmomanometer. Data analysis was conducted using the chi-square test to assess the relationship between the two variables. The results showed that, based on BMI, 44 respondents (73.3%) were classified as Obesity Grade 1. The majority of respondents, 32 (53.3%), had low physical activity levels (categorized as inactive), and 33 respondents (55%) had pre-hypertension. The analysis revealed a significant relationship between physical activity level and the incidence of hypertension among obese adolescents, with a significance value of 0.000 ($p < 0.05$). Adolescents with low levels of physical activity had a higher risk of developing hypertension compared to those with moderate to high activity levels. Low physical activity levels are closely associated with an increased incidence of hypertension in obese adolescents. Therefore, physical activity-based interventions need to be enhanced among adolescents to prevent long-term complications of obesity, including hypertension.

Keywords: adolescents, hypertension, malang city, obesity, physical activity

BACKGROUND

Obesity in adolescents is a public health problem that continues to increase globally as well as in Indonesia. High blood pressure (hypertension) that occurs during adolescence has the potential to persist into adulthood and contributes to the risk of cardiovascular diseases in the future (Marlina, 2015 and Pradana, 2023). The prevalence of hypertension among Indonesian adolescents shows an increasing trend, especially among those who are obese. According to Riskesdas 2018 data, about 12.3% of obese adolescents (aged 15–19 years) were identified as having hypertension. Health profile data from Malang City in 2022 showed that hypertension has been one of the top 10 diseases for three consecutive years since 2020. In 2022, the estimated number of hypertension sufferers aged ≥15 years reached 228,720 people, consisting of 111,978 males and 116,742 females. However, only 56.2% (around 128,525

people) have received health services. Putri (2025) explained the results of her study on adolescents in the working area of Tanjungpinang health center, with a sample of 30 people. The hypothesis test used was chi-square. The results showed a significant relationship between obesity and the incidence of hypertension in adolescents with a p-value of 0.003 ($p \leq 0.05$). It is hoped that in the future, adolescents can control their body weight within the ideal range so that the risk of hypertension can be minimized. Furthermore, the incidence rate of hypertension in individuals aged ≥18 years is 34.1%, an increase from the Riskesdas 2018 figure of 25.8% (Research and Development Agency of the Ministry of Health, Indonesia).

Factors directly influencing overweight status include genetic factors, intake levels of fat, carbohydrates, protein, and physical activity (Putri, 2015; Arlinda, 2015; Mokolensang, 2016). Light physical activity increases the risk of overweight status due to an imbalance in energy expenditure (Febriani, 2018). According to research conducted by Sihombing Marice (2017), adequate levels of physical activity are significantly related to the incidence of hypertension. Individuals with low physical activity have a 1.61 times greater risk of developing hypertension compared to those with high physical activity. Individuals with a higher Body Mass Index (BMI) have a greater risk of experiencing hypertension, while physical activity was not associated with hypertension. The government and health services need to enhance the promotion of healthy lifestyles, particularly through healthy eating programs, to encourage the public to maintain an ideal body weight and reduce the incidence of hypertension (Hodimatum, 2019).

Obesity not only causes physical problems but also impacts cognitive issues. According to research by Berger, S. (2017), obese individuals experience a decrease in the number of T cells in the body, resulting in reduced immunity. Cognitive problems also occur in obese adolescents; research by Wang et al. (2015) showed that obese adolescents experience cognitive slowing compared to non-obese adolescents, which can affect their academic performance. Adolescents were chosen as the target population because they constitute one-fifth of the total population. Adolescents are the next generation of the nation and represent one of the most potential and quality human resources if good nutritional needs are met from an early age. Adolescence is a period when routines and behaviors, including risky ones such as unhealthy eating patterns and lack of physical activity, begin to form and tend to continue into adulthood. Early intervention has the potential to prevent chronic conditions later in life. Adolescents often receive less health monitoring, although they are vulnerable to the development of non-communicable disease risk factors such as obesity, hypertension, and smoking (Setiawan, 2025).

The high prevalence of overweight status in Malang City also occurs because Malang is an educational city, serving as a new alternative for education from elementary to university levels. There are various types of schools in Malang to meet the educational needs of different social layers. Some favored secondary schools are located in the city center, close to shopping centers and culinary hubs. This has contributed to lifestyle changes among students, making them more consumptive, including in their food choices, with an increase in modern food consumption among adolescents in Malang City. Based on the description above, the researcher wants to examine the relationship between Physical Activity and Hypertension in Obese Adolescents in Malang City.

METHODS

This study used a quantitative design with a cross-sectional approach. A total of 60 obese adolescents aged 10 to 19 years were selected from the Pandanwangi and Sawoajajar sub-districts in Malang City using purposive sampling technique. Physical activity data were collected using the PAQ-A (Physical Activity Questionnaire for Adolescents), while blood

pressure was measured using a digital sphygmomanometer. Data analysis was conducted using the chi-square test to examine the relationship between the two variables.

RESULTS

Table 1. Characteristics of respondents based on Age

Category	N	%
Early Adolescents (10-14 years)	14	23.3 %
Late Adolescents (15-19 years)	46	76.7 %
Total	60	100 %

Based on Table 1, the majority of respondents, 46 individuals (76.7%), are late adolescents aged 15-19 years

Table 2. Characteristics of respondents based on BMI

Category	N	%
Overweight	16	26.7 %
Obesity class 1	44	73.3 %
Total	60	100 %

Based on Table 2, the majority of respondents based on BMI are 44 individuals (73.3%) in the obesity class 1 category

Table 3. Characteristics of respondents based on Blood Pressure

Category	N	%
Normal	27	45 %
Pre hypertension	33	55 %
Total	60	100 %

The characteristics of respondents based on blood pressure show that most, 33 individuals (55%), fall into the prehypertension category.

Table 4. Characteristics of respondents based on Physical Activity/Exercise

Category	N	%
1-2 times/week	28	46.7 %
No exercise	32	53.3 %
Total	60	100 %

Based on Table 4, the majority of respondents based on physical activity are 32 individuals (53.3%) in the no exercise category

CONCLUSION

The results of the study showed that the majority of respondents based on BMI were 44 individuals (73.3%) in the obesity class 1 category, the majority of physical activity was 32 respondents (53.3%) categorized as not exercising, and the majority based on blood pressure were 33 respondents (55%) in the prehypertension category. The analysis results indicated a significant relationship between physical activity levels and the incidence of hypertension in obese adolescents with a significance value of 0.000. Adolescents with low physical activity levels had a higher risk of developing hypertension compared to those with moderate to high physical activity levels. Low physical activity levels are closely associated with increased incidence of hypertension in obese adolescents. Physical activity-based interventions need to be enhanced among adolescents to prevent long-term complications of obesity, including hypertension. These findings are consistent with research by Wellman et al. (2020), which

reported that participants in the study engaged in moderate and vigorous physical activity approximately 7 and 5.5 sessions per week, respectively. After adjusting for factors such as age, gender, mother's education, alcohol consumption, and smoking, more intense physical activity compared to light activity during the past year was associated with a reduced risk of blood pressure in the hypertensive range. Adjustment for BMI did not alter the results. These findings support the importance of adolescents regularly engaging in at least moderate-intensity physical activity to prevent hypertension.

Another supporting study by Maskanah (2019) found a significant relationship between physical activity and blood pressure. It is expected that healthcare workers actively involve families to optimize physical activity for patients with hypertension (Maskanah, 2019). Regular physical activity lowers blood pressure through several mechanisms. First, physical exercise causes dilation of arteries and the formation of new blood vessels, which reduces blood flow resistance. Second, physical activity decreases sympathetic nervous system activity and norepinephrine levels, thereby reducing vasoconstriction. Third, exercise strengthens the heart muscle and improves cardiac efficiency, which helps lower resting blood pressure.

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