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Analysis of the Association Between Adolescent Lifestyle and the Risk of Early-Onset Hypertension Among Grade X–XI Students at SMA PGRI 2 Banjarmasin

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ABSTRACT/ ABSTRAK

ABSTRACT. *Adolescents constitute a productive age group with a strategic role in national development. Adolescence represents a complex transitional period from childhood to adulthood, characterized by significant changes in physical, cognitive, emotional, and social domains. Hypertension is one of the most lethal non-communicable diseases worldwide and is often referred to as a silent killer because many affected individuals are unaware of their condition. This study aimed to analyze the association between the lifestyle of Grade X–XI students at SMA PGRI 2 Banjarmasin and the risk of early-onset hypertension. A quantitative approach with a cross-sectional design was employed. The study population consisted of 204 students, with a sample of 68 students selected using proportional stratified random sampling. Data were collected through questionnaires and direct blood pressure measurements. Data analysis was performed using the Spearman rho statistical test to examine the association between variables. The results demonstrated a statistically significant association between adolescent lifestyle and the risk of early-onset hypertension ($p < 0.001$), with a correlation coefficient of −0.657. This negative correlation indicates that poorer adolescent lifestyle is associated with a higher risk of early-onset hypertension.*

Kata kunci:

Aktivitas Fisik, Gaya Hidup, Hipertensi Dini, Pola Makan, Remaja

ABSTRAK. Remaja merupakan bagian dari kelompok usia produktif yang memiliki peran strategis dalam pembangunan bangsa. Pada masa remaja terjadi tahap transisi yang kompleks dari fase anak-anak menuju kedewasaan, yang ditandai oleh perubahan signifikan dalam aspek fisik, kognitif, emosional, dan sosial. Hipertensi merupakan salah satu penyakit tidak menular yang paling mematikan di dunia dan sering disebut sebagai *silent killer* karena banyak penderitanya tidak menyadari kondisi tersebut. Penelitian ini bertujuan untuk mengetahui hubungan antara gaya hidup siswa kelas X–XI di SMA PGRI 2 Banjarmasin dengan risiko penyakit hipertensi dini. Desain penelitian yang digunakan adalah pendekatan kuantitatif dengan desain *cross-sectional*. Populasi penelitian berjumlah 204 siswa dengan sampel sebanyak 68 siswa yang dipilih melalui teknik *proportional stratified random sampling*. Pengumpulan data dilakukan menggunakan kuesioner dan pengukuran tekanan darah secara langsung. Analisis data menggunakan uji statistik Spearman rho untuk mengetahui hubungan antar variabel. Hasil penelitian menunjukkan adanya hubungan yang signifikan antara gaya hidup dan risiko hipertensi dini dengan nilai signifikansi $p < 0,001$ dan koefisien korelasi sebesar -0,657. Korelasi negatif ini menunjukkan bahwa semakin buruk gaya hidup yang dijalani remaja, semakin tinggi risiko mereka mengalami hipertensi.

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INTRODUCTION

Adolescents represent a productive age group with a strategic role in national development. Adolescence is characterized by a complex transitional process from childhood to adulthood, involving physical, cognitive, emotional, and social changes. These changes play a crucial role in shaping long term health behaviors, including dietary patterns and physical activity, which ultimately influence health status in adulthood (Sabillah & Aidha, 2023; Pangestu & Putri, 2025).

Hypertension is one of the non communicable diseases with the highest mortality rates worldwide and is widely recognized as a silent killer because it often develops without clear symptoms. Although hypertension is more commonly observed in adults and older populations, its occurrence among adolescents has increased in recent years. Global data indicate that approximately one in 25 adolescents aged 12 to 19 years has hypertension, while one in ten adolescents is classified as having prehypertension (CDC, 2020). This condition may persist into adulthood and substantially increase the risk of future cardiovascular disease (Wahyudin, 2024).

Globally, the burden of hypertension continues to rise. The World Health Organization reported that in 2024 approximately 1.4 billion adults aged 30 to 79 years worldwide were living with hypertension, representing 33 percent of the population within this age group. Nearly two thirds of individuals with hypertension reside in low and middle income countries, reflecting heightened vulnerability to lifestyle and environmental risk factors (World Health Organization, 2025). The WHO also emphasizes that hypertension frequently remains undiagnosed due to the absence of prominent clinical symptoms, resulting in many cases being identified only after complications have occurred (World Health Organization, 2025).

In Indonesia, the 2018 Basic Health Research Riskesdas revealed that South Kalimantan Province had the highest national prevalence of hypertension at 44.13 percent, and hypertension has consistently ranked among the ten most prevalent diseases in the province (Suwandewi et al., 2024). At the local level, data from the Banjarmasin City Health Office in 2023 indicated cases of early onset hypertension among adolescents aged 15 to 19 years, with the highest distribution observed in several primary health care areas, including the Basirih Baru Primary Health Center. A preliminary study conducted at SMA PGRI 2 Banjarmasin also identified students with early onset hypertension accompanied by unhealthy lifestyle behaviors, such as low levels of physical activity and high consumption of salt rich foods.

Lifestyle is a major risk factor contributing to the development of early onset hypertension in adolescents. Diets high in salt and fat, frequent consumption of processed foods, and low levels of physical activity have been shown to be associated with elevated blood pressure (World Health Organization, 2025; Siswanto et al., 2020; Singh et al., 2024; Andriani et al., 2024). Excessive sodium intake increases intravascular fluid volume and vascular resistance, while high fat consumption contributes to obesity and metabolic disturbances that accelerate the development of hypertension (Izzah et al., 2020; Badriyah & Pratiwi, 2024). In addition, insufficient physical activity increases cardiac workload and peripheral resistance, ultimately leading to elevated blood pressure (Juliana et al., 2024).

Although numerous studies have examined the association between lifestyle and hypertension among adolescents, most have focused on national contexts or general populations. Research that specifically investigates the relationship between lifestyle, particularly dietary patterns and physical activity, and the risk of early onset hypertension among adolescents in senior high school settings in Banjarmasin remains limited. Therefore, locally contextualized research is needed to provide more specific and relevant evidence to inform school based health intervention planning.

Based on this background, the present study is important as a preventive effort to reduce the risk of hypertension beginning in adolescence through promotive and educational approaches in the school setting. This study aims to analyze the association between the lifestyle of Grade X and XI students at SMA PGRI 2 Banjarmasin and the risk of early onset hypertension.

RESEARCH METHOD

This study employed a quantitative approach with a cross sectional design to analyze the association between adolescent lifestyle and the risk of early onset hypertension at a single point in time. The study was conducted at SMA PGRI 2 Banjarmasin on 19 May 2025. The study population comprised all Grade X and XI students, totaling 204 students. A sample of 68 students was determined using the Slovin formula with a 10 percent margin of error and selected through proportional stratified random sampling. The inclusion criteria included students aged 15 to 19 years, willingness to participate as respondents, and cooperative behavior during the study.

The independent variable was adolescent lifestyle, while the dependent variable was the risk of early onset hypertension. Adolescent lifestyle was assessed using a questionnaire covering dietary patterns and physical activity, whereas the risk of early onset hypertension was measured through systolic and diastolic blood pressure assessments using a digital sphygmomanometer. The research instruments consisted of a lifestyle questionnaire comprising 11 Likert scale items and an observation sheet for blood pressure measurement.

The questionnaire instrument underwent validity and reliability testing at SMA Negeri 4 Banjarmasin involving 30 respondents. The validity test results indicated that 10 items were valid, with calculated correlation coefficients exceeding the critical value of 0.361, while one item was found to be invalid and subsequently removed. Reliability testing using Cronbach's Alpha yielded a value of 0.620, indicating that the instrument was reliable.

Data collection was conducted after obtaining ethical approval from the Research Ethics Committee of Universitas Muhammadiyah Banjarmasin under certificate number 187 UMB KE IV 2025. Respondents who agreed to participate and signed the informed consent form were asked to complete the questionnaire, followed by blood pressure measurements in accordance with standard procedures. Data processing involved editing, coding, data entry, and cleaning. Data analysis included univariate analysis to describe the study variables and bivariate analysis using the Spearman Rho test with a significance level of 0.05 to examine the association between adolescent lifestyle and the risk of early onset hypertension. All research procedures were conducted in accordance with the principles of anonymity and confidentiality of respondent data.

RESULTS

Respondent Characteristics

Table 1. Distribution of Respondents by Sex at SMA PGRI 2 Banjarmasin in 2025

Sex	Frequency (f)	Percentage (%)
Male	46	67.6
Female	22	32.4
Total	68	100

Based on Table 1, the majority of respondents were male, accounting for 46 students or 67.6 percent, while female respondents totaled 22 students or 32.4 percent.

Table 2. Distribution of Respondents by Age at SMA PGRI 2 Banjarmasin in 2025

Age (years)	Frequency (f)	Percentage (%)
15	7	10.3
16	24	35.3
17	28	41.2
18	8	11.8
19	1	1.5
Total	68	100

Table 2 indicates that most respondents were 17 years old, accounting for 28 students or 41.2 percent. The smallest proportion of respondents was 19 years old, with only 1 student or 1.5 percent.

Univariate Analysis

Univariate analysis was conducted to describe the distribution of adolescent lifestyle categories and blood pressure classifications among respondents.

Table 3. Distribution of Adolescent Lifestyle Categories at SMA PGRI 2 Banjarmasin in 2025

Lifestyle Category	Frequency (f)	Percentage (%)
Poor	27	39.7
Moderate	35	51.5
Good	6	8.8
Total	68	100

As shown in Table 3, more than half of the respondents were classified as having a moderate adolescent lifestyle, comprising 35 students or 51.5 percent. However, a considerable proportion of respondents, namely 27 students or 39.7 percent, were categorized as having a poor lifestyle.

Table 4. Distribution of Adolescent Blood Pressure Classification at SMA PGRI 2 Banjarmasin in 2025

Blood Pressure Classification	Frequency (f)	Percentage (%)
Normal	31	45.6
Prehypertension	35	51.5
Stage 1 hypertension	2	2.9
Total	68	100

Table 4 demonstrates that the majority of respondents were classified as having prehypertension, with 35 students or 51.5 percent, while 31 students or 45.6 percent had normal blood pressure.

Bivariate Analysis

Bivariate analysis was performed to examine the association between adolescent lifestyle and the risk of early onset hypertension using the Spearman Rho test.

Table 5. Results of the Spearman Rho Correlation Test Between Adolescent Lifestyle and the Risk of Early Onset Hypertension at SMA PGRI 2 Banjarmasin in 2025

Correlations (Spearman Rho)			
Adolescent lifestyle	***Correlations Coefficient***	1.000	**- ,657****
	Sig. (2-tailed)	.	**< ,001**
	N	68	**68**
Blood pressure	***Correlations Coefficient***	- ,657**	**1.000**
	Sig. (2-tailed)	< ,001	**.**
	N	68	**68**

The Spearman Rho analysis yielded a correlation coefficient of minus 0.657 with a significance value of p less than 0.001. These findings indicate a strong and statistically significant association between adolescent lifestyle and the risk of early onset hypertension. The negative direction of the correlation suggests that poorer adolescent lifestyle is associated with a higher risk of early onset hypertension.

DISCUSSION

Based on the study findings, a strong and statistically significant association was identified between adolescent lifestyle and the risk of early onset hypertension among students at SMA PGRI 2 Banjarmasin, with a correlation coefficient of minus 0.657 and a significance value of p less than 0.001. This correlation reflects a strong negative relationship, indicating that poorer adolescent lifestyle is associated with a higher risk of early onset hypertension. This finding is particularly important given that more than half of the respondents were classified as having prehypertension, despite the majority of their lifestyles being categorized as moderate. This condition suggests that suboptimal lifestyle patterns are sufficient to trigger elevated blood pressure during adolescence.

From a biological perspective, this association can be explained by excessive sodium and fat intake combined with low levels of physical activity. High sodium intake increases fluid retention and intravascular volume, which subsequently activates the renin angiotensin aldosterone system and increases peripheral vascular resistance (Balafa and Kalaitzidis, 2021; Destra et al., 2022). Chronic activation of this system also contributes to renal inflammation and endothelial dysfunction, thereby accelerating the development of hypertension. These mechanisms are consistent with the reported habits of respondents who frequently consumed salt rich foods and instant meals.

In addition to sodium intake, consumption of saturated fat and trans fat plays a role in increasing levels of low density lipoprotein cholesterol, which promotes atherosclerotic plaque formation and vascular narrowing (Harrison et al., 2021; Pherenis et al., 2023). This process increases cardiac workload and blood pressure from an early age. High consumption of fast food among adolescents, as reported by Sukmaningrum Marwadita and Rahayu (2024), further supports the findings of this study, as such foods are generally high in calories, fat, and salt while being low in fiber and cardioprotective micronutrients.

Low levels of physical activity also represent an important factor in explaining the study results. Insufficient physical activity contributes to reduced nitric oxide production, increased sympathetic nervous system activity, and impaired endothelial function, all of which play a role in elevating blood pressure (Sulistyowardani et al., 2023; Hayes et al., 2022). Moreover, sedentary lifestyle patterns among adolescents increase the risk of overweight and obesity, which are closely associated with hypertension through mechanisms involving increased insulin resistance and vascular load (Akbar et al., 2024; Saputri et al., 2021). These mechanisms align with the findings of the present study, in which respondents reported moderate levels of physical activity that were insufficient to provide a protective effect on blood pressure.

The findings of this study are consistent with previous research indicating that lifestyle is a major determinant of hypertension among adolescents. Studies by Diana and Hastono (2023) as well as Halim and Sutriyawan (2022) reported that excessive salt consumption and low physical activity were significantly associated with hypertension among young populations. Other studies by Marlita et al. (2022) and Melviani et al. (2022) also demonstrated that unhealthy lifestyle patterns increase the risk of hypertension among both adolescents and individuals of productive age. The consistency of these findings strengthens the validity of the present study and suggests that the observed association is not merely a local phenomenon.

The World Health Organization also emphasizes that lifestyle modification, including the adoption of a low salt diet, engagement in physical activity for at least 150 minutes per week, and weight control, constitutes the primary strategy for the prevention and management of hypertension (World Health Organization, 2025).

The practical implications of this study are highly relevant for promotive and preventive efforts within the school setting. Health education emphasizing the reduction of salt and fat intake, increased consumption of fruits and vegetables, and regular physical activity should be integrated into school health programs and extracurricular activities. For health professionals, particularly community nurses, these findings underscore the importance of routine blood pressure screening among adolescents as an early detection strategy for hypertension risk (Liu et al., 2021). From a theoretical perspective, this study supports the concept of nutrition transition and the double burden of disease, whereby younger populations in developing countries are increasingly experiencing non communicable diseases as a consequence of lifestyle changes (Ojangba et al., 2023).

Several limitations of this study should be considered when interpreting the results. The cross sectional design does not allow for causal inference, and other factors such as body mass index, psychosocial stress, sleep duration, and genetic predisposition were not comprehensively analyzed. In addition, the study was conducted in a single school, which necessitates caution in generalizing the findings. Nevertheless, this study provides a strong

empirical contribution to understanding the association between adolescent lifestyle and the risk of early onset hypertension.

Overall, this discussion confirms that lifestyle patterns characterized by high salt and fat intake and low levels of physical activity play a significant role in increasing the risk of early onset hypertension among adolescents. Therefore, lifestyle modification initiated during school age represents a key strategy for the prevention of hypertension and future cardiovascular disease.

CONCLUSION

This study demonstrates that adolescent lifestyle is significantly associated with the risk of early onset hypertension among students at SMA PGRI 2 Banjarmasin. The Spearman Rho correlation analysis yielded a correlation coefficient of minus 0.657 with a significance value of less than 0.001, indicating a strong and statistically significant association between the two variables. The negative direction of the relationship suggests that poorer adolescent lifestyle, particularly in relation to dietary patterns and physical activity, is associated with a higher risk of early onset hypertension. More than half of the respondents were classified as having a moderate lifestyle and prehypertension based on blood pressure classification. These findings indicate that suboptimal lifestyle patterns during adolescence are sufficient to increase the risk of blood pressure disorders.

Based on these findings, sustained efforts are required to enhance awareness and promote healthy lifestyle behaviors among adolescents. Students are encouraged to pay greater attention to their daily dietary patterns by limiting the consumption of foods high in salt and fat and by increasing regular physical activity for at least 150 minutes per week in accordance with World Health Organization recommendations in order to maintain blood pressure within normal limits. Schools and educators play a strategic role in shaping healthy lifestyle habits among students. Therefore, schools are encouraged to integrate balanced nutrition education and the importance of physical activity into both the curriculum and extracurricular activities. In addition, the provision of a school environment that supports healthy lifestyle practices, such as school canteens offering low salt and low fat food options, as well as the implementation of periodic school based hypertension screening programs, for example twice per year, should be considered as an early detection strategy for hypertension risk among adolescents.

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