

Risk factors of increased blood pressure among adolescents in rural areas of Indonesia

Factores de riesgo del aumento de la presión arterial entre los adolescentes de las zonas rurales de Indonesia

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SUMMARY

Introduction: Hypertension in adolescents can increase mortality and morbidity rates, affecting productivity decline in adolescents. The prevalence of hypertension in adolescents is increasing and is often not realized by adolescents. This study aimed to identify risk factors for increased blood pressure in adolescents in rural areas.

Methods: This study uses a cross-sectional study design carried out in May 2022 in one of the senior high schools in Manggarai Regency, East Nusa Tenggara. The sample in this study was students aged 13-18 years (n=44) based on the inclusion criteria. The sampling technique used was convenience sampling with data analysis using Chi-Square.

Results: The results showed that adolescents with normal blood pressure were 31 respondents (70.5%),

while an increase in blood pressure was 13 respondents (29.5%). There was a significant relationship between smoking (OR =0.173, 95 % CI 0.038-0.785, p-value 0.016) and a history of alcohol consumption (OR= 4,000, 95 % CI 1.009-15.862, p-value 0.042) with an increase in blood pressure in adolescents. Gender, family history of hypertension, physical activity, and a high salt diet did not have a significant relationship with an increase in blood pressure in adolescents with a p-value > 0.05.

Conclusion: Adolescents with smoking habits and alcohol consumption have a greater chance of experiencing an increase in blood pressure. Health workers need to screen for increased blood pressure and educate the impact of alcohol and smoking on adolescents to prevent an early increase in blood pressure.

Keywords: Adolescents, alcohol, blood pressure, smoking.

RESUMEN

Introducción: La hipertensión arterial en adolescentes puede aumentar las tasas de mortalidad y morbilidad, afectando la disminución de la productividad en los adolescentes. La prevalencia de la hipertensión en los adolescentes está aumentando y, a menudo, los adolescentes no se dan cuenta. Este estudio tuvo como objetivo identificar los factores de riesgo para el aumento de la presión arterial en adolescentes en áreas rurales.

Métodos: Este estudio utiliza un diseño de estudio transversal realizado en mayo de 2022 en una de las escuelas secundarias superiores en Manggarai

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Regency, East Nusa Tenggara. La muestra en este estudio fueron estudiantes de 13 a 18 años (n=44) según los criterios de inclusión. La técnica de muestreo utilizada fue el muestreo por conveniencia con análisis de datos mediante Chi-cuadrado.

Resultados: *Los resultados mostraron que los adolescentes con presión arterial normal fueron 31 encuestados (70,5 %), mientras que un aumento de la presión arterial fue de 13 encuestados (29,5 %). Hubo una relación significativa entre fumar (OR = 0,173, IC 95 % 0,038-0,785, valor p 0,016) y antecedentes de consumo de alcohol (OR = 4 000, IC 95 % 1,009-15,862, valor p 0,042) con un aumento en la presión arterial en adolescentes. El género, los antecedentes familiares de hipertensión arterial, la actividad física y la dietarica en sal no tuvieron una relación significativa con el aumento de la presión arterial en adolescentes con un valor de $p > 0,05$.*

Conclusión: *Los adolescentes con hábitos de tabaquismo y consumo de alcohol tienen mayor probabilidad de experimentar un aumento de la presión arterial. Los trabajadores de la salud deben detectar el aumento de la presión arterial y educar sobre el impacto del alcohol y el tabaquismo en los adolescentes para prevenir un aumento temprano de la presión arterial.*

Palabras clave: *Adolescentes, alcohol, presión arterial, tabaquismo.*

INTRODUCTION

Hypertension is a growing problem and might be happened at all periods of age (1,2). Hypertension is a long-term health problem and a leading cause of premature death in adults worldwide, including in developed and developing countries (3-6). Unfortunately, hypertension in children and adolescents is often neglected and continues into adulthood (7). A study conducted by the Centers For Disease Control (CDC) reports that one in 25 adolescents aged 12-19 years has hypertension, and one in 10 has increased blood pressure (prehypertension) (8). In Indonesia, the prevalence of hypertension in adolescents is increasing (9). Several studies conducted in Indonesia found that out of 1 200 adolescents, as many as 8 % of adolescents experienced hypertension and 12.2 % with increased blood pressure (Prehypertension). Adolescents in several high schools experienced hypertension as much as 42.4 % (9,10). In East

Nusa Tenggara Province, 11.54 % of those with hypertension came from the 18-24 year age group, and only 3.21 % of those who routinely took blood pressure measurements (11).

Hypertension in adolescents is a growing problem throughout the world, along with the obesity epidemic and lack of physical activity is a risk factor for hypertension in adolescents (7,12). Hypertension in adolescents is usually associated with cardiovascular risk factors such as obesity and other risk factors (1,12,13). Several risk factors for hypertension in adolescents include a high-salt diet, poor diet quality, sleep disturbances (quality and duration of sleep), overweight or obesity, lack of physical activity, family history of hypertension, genetic factors, and psychosocial factors such as ethnicity, level of socioeconomic status and mental health (14-16). Another study regarding risk factors for hypertension in adolescents in rural areas showed that one-fifth of the sample (22 %) who had an increase in systolic blood pressure had elevated salivary cotinine levels, which indicates tobacco use and exposure to cigarette smoke. Age, gender, waist circumference, and salivary cotinine contributed to 36.4 % of the variance in systolic blood pressure and 19.1 % of the variance in diastolic blood pressure (17). A systematic review reported the long-term impact of increased blood pressure in adolescents on cardiovascular morbidity and mortality in adulthood (7). Several recent studies have shown that individuals who maintain an ideal profile of cardiovascular risk factors in adolescence to young adulthood significantly reduce the risk of all cardiovascular diseases and have a better quality of life in adulthood (6,18,19).

Screening of risk factors for increased blood pressure in adolescents is essential to identify early and prevent the development of hypertension in adolescents. Previous research has examined risk factors for hypertension in adolescents, such as obesity and family history (20), level of knowledge (21), gender, history of hypertension, nutritional status, physical activity, and stress (9). However, no studies examine risk factors for increased blood pressure in adolescents in rural areas. Therefore, our study aimed to identify risk factors for increased blood pressure in adolescents in rural areas.

METHODS

This study uses a cross-sectional design in May 2022 in one of the senior high schools in Manggarai Regency, East Nusa Tenggara. The sampling technique used was convenience sampling based on inclusion criteria. The sample in this study was teenagers in high school who met the inclusion criteria, totaling 44 respondents. Inclusion criteria are adolescents aged 13-18 years who do not have any congenital abnormalities that have the potential to increase or decrease blood pressure. The independent variables in this study were gender, smoking, alcohol consumption, family history of hypertension, physical activity, and a high-salt diet. The dependent variable is an increase in blood pressure. The instruments used are questionnaires for screening the risk of hypertension, blood pressure meters, stethoscopes, and anthropometric measuring instruments. The hypertension risk screening questionnaire includes respondent identity (name, gender), health profile (height, weight, body mass index/BMI, blood pressure), hypertension risk factors (family history of hypertension, smoking, alcohol consumption, physical activity such as regular exercise, diet high in salt and habits of consuming vegetables and fruit, duration and sleep patterns) (9). Data analysis used bivariate analysis with Chi-Square. This research has received ethical approval from the Ethics Committee of Universitas Katolik Indonesia Santu Paulus Ruteng with no 50a/USP/R01/PE02/K/01/2022.

RESULTS

Table 1 showed the profile of risk factors for increased blood pressure in adolescents shows that most of the adolescents are female, as many as 31 (70.5 %), obese as much as 2 (4.5 %), overweight as many as 7 (15.9 %), and family history with hypertension as much as 28 (63.6 %), smoking 10 (22.7 %), no physical activity 40 (91 %), alcohol consumption 14 (31.8 %), inadequate sleep duration as many as 17 (38.6 %), did not consume vegetables and fruit as much as 22 (50 %), and increased blood pressure as many as 13 (29.5 %).

The results of bivariate analysis based on Table 2 show that there is a significant relationship between smoking (OR 0.173, 95 % CI 0.038-0.785, p-value 0.016) and a history of alcohol consumption (OR 4,000, 95 % CI 1.009-15.862, p-value 0.042) with increased blood pressure in adolescents.

DISCUSSION

The results of our study show that quite a number of adolescents have increased blood pressure. One of the risk factors that is significantly associated with increased blood pressure in adolescents is smoking. Adolescents who smoke have a higher risk of developing blood pressure than adolescents who do not smoke, with an odds ratio of 0.173. The results of this study are supported by research that states that adolescents exposed to any type of tobacco smoke are likely to experience an increase in blood pressure compared to adolescents who are not exposed to tobacco smoke, with an odds ratio of 1.31 (95 % CI 1.01-1.61) (22). Another study conducted in rural areas showed that tobacco use and exposure to cigarette smoke are significant risk factors associated with increased blood pressure in adolescents in rural areas (17,23). However, the results of this study contradict several studies which state that there is no significant relationship between smoking and hypertension or increased blood pressure in adolescents (24-26) where were randomly selected from Junior High Schools in Central Jakarta. Information about family history, race/ethnic, birth weight, physical activity levels, smoking and consumption of alcohol was gathered by questionnaire. Body weight, height, and blood pressure were measured. Hypertension was defined according to the Fourth Report of National High Blood Pressure Education Programme Working Group on High Blood Pressure in Children and Adolescent. The study included 313 adolescents with mean age 13.97 ± 1.02 years. Prevalence of hypertension was 9.6%. Bivariate analysis showed that family history of hypertension (parental hypertension; $p = 0.012$; CI 95% = 1,20-6,02. Smoking habits are one of the factors that have been shown to cause an increase in blood pressure in adolescents. Chemical substances and nicotine

Table 1
Profile of Risk factors for Increased Blood Pressure in Adolescents (n=44)

Risk factors		n	%
Gender	Female	31	70.5
	Male	13	29.5
Body Mass Index (BMI)	Underweight	6	13.6
	Normal	29	65.9
	Overweight	7	15.9
	Obesity	2	4.5
Family History of Hypertension	Yes	28	63.6
	No	16	36.4
Smoking	Yes	10	22.7
	No	34	77.3
Physical Activity	Yes	4	9.0
	No	40	91.0
Alcohol Consumption	Yes	14	31.8
	No	30	68.2
Sleep Duration	Adequate	27	61.4
	Inadequate	17	38.6
High-Salt Diet	Yes	31	70.5
	No	13	29.5
Increased Blood Pressure	Yes	13	29.5
	No	31	70.5
Total		44	100

Table 2
Bivariate Analysis: Risk Factors for Increased Blood Pressure in Adolescents (n=44)

Variable	Increase blood pressure					Total		OR	95 %CI		p-value
	Yes		No		n	%	Lower		Upper		
	n	%	n	%							
Gender											
Male	7	15.9	6	13.6	13	29.5	0.340	0.086	1.349	0.118	
Female	24	54.5	7	15.9	31	70.5					
Smoking											
Yes	4	9.1	6	13.6	10	22.7	0.173	0.038	0.785	0.016	
No	27	61.4	7	15.9	34	77.3					
Alcohol Consumption											
Yes	7	15.9	7	15.9	14	31.8	4.000	1.009	15.862	0.042	
No	6	13.6	24	54.5	30	68.2					
Family History of Hypertension											
Yes	9	20.4	19	43.2	28	63.6	0.704	0.177	2.802	0.704	
No	4	9.1	12	27.3	16	36.4					
Physical Activity											
No	11	25.0	29	65.9	40	91.0	0.379	0.047	3.034	0.347	
Yes	2	4.5	2	4.5	4	9.0					
High-Salt Diet											
Yes	10	22.7	21	47.8	31	70.5	0.630	0.141	2.806	0.543	
No	3	6.8	10	22.7	13	29.5					

Note: OR = Odds Ratio; CI: Confidence Interval

content in cigarettes can cause injury to blood vessels it can increase the risk of increasing blood pressure. Smoking habits in adolescents can be influenced by environmental factors, culture, and parents who have smoking habits. Cigarettes are often used in traditional events of the Manggarai community, East Nusa Tenggara. This is one of the factors that trigger teenagers to have a smoking habit. If this habit lasts into adulthood, adolescents are at risk of developing cardiovascular problems in adulthood.

The habit of consuming alcohol is one of the factors that contribute to increasing the risk of hypertension in adolescents. Adolescents who consume alcohol have a higher risk of increasing blood pressure compared to adolescents who do not consume alcohol, with an odds ratio of 4 000. Alcohol consumption can increase plasma cortisol. Cortisol is a type of steroid hormone where excess cortisol can cause an increase in blood pressure in normotensive individuals (27). Recent epidemiological and clinical studies have shown chronic ethanol consumption (more than three drinks per day, 30 g of ethanol) is associated with increased hypertension and increased risk of cardiovascular disease (28). A systematic review and meta-analysis found that compared with individuals who did not consume alcohol at 10 g/day and 11-20 g/day had a tendency to increase the risk of hypertension (Relative risk [RR] 1.03; 95 % CI 0.94-1.13; P=0.51) and, (RR 1.15; 95 % CI 0.99-1.33; P=0.06 (29). Cultural factors can influence alcohol consumption habits in adolescents. Alcohol is often served in every celebration, traditional ritual, and the main meal in welcoming guests. This habit is often imitated by teenagers when they gather with their peers. If the habit of consuming alcohol in adolescents is not prevented, it will impact increasing blood pressure adolescence.

CONCLUSION

Smoking habits and alcohol consumption are risk factors for increasing blood pressure in adolescents. Adolescents who have a habit of smoking and consuming alcohol have a higher risk of developing blood pressure compared to adolescents who do not smoke and consume

alcohol. Therefore, screening for increased blood pressure in adolescents and education on the impact of alcohol and smoking need to be done to prevent an increase in blood pressure and reduce mortality and morbidity due to hypertension in adulthood.

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