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Risk Factor Analysis of Hypertension in Adolescents in Banjar City

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ABSTRACT

Background: The prevalence of hypertension among adolescents is increasing at an alarming rate, especially in Indonesia, driven by modern lifestyle changes and unhealthy dietary habits.
Objective: This study aims to identify and analyze lifestyle-related risk factors contributing to hypertension among adolescents in Banjar City, West Java.
Methods: A cross-sectional quantitative study was conducted involving 286 adolescents aged 13-18, selected using random sampling. Data were collected via an online questionnaire and analyzed using descriptive statistics, chi-square tests, and binary logistic regression.
Results: A total of 70.6% of respondents were categorized as high-risk and 11.9% as very high-risk for hypertension. Significant contributing factors included late-night eating habits (OR=4.85; $p<0.005$), consumption of high-sodium processed foods (OR=2.48; $p<0.005$), and inadequate water intake (OR=1.97; $p<0.05$).
Conclusion: Unhealthy lifestyle patterns particularly poor eating and hydration habits are major determinants of adolescent hypertension. School and family-based interventions are essential to instill healthy behavior from a young age.

INTRODUCTION

Hypertension, or high blood pressure, is one of the leading causes of global morbidity and mortality. According to the World Health Organization (2023), approximately 1.28 billion people worldwide live with hypertension, nearly half of whom are undiagnosed. This condition is no longer confined to the older population; it is increasingly observed among adolescents and young adults. The surge in adolescent hypertension is a serious concern, as it poses a risk of developing into chronic hypertension in adulthood and increases the likelihood of long-term complications such as stroke and coronary heart disease.

Adolescence is a critical transitional phase marked by hormonal, emotional, and lifestyle changes. Habits such as consuming foods high in salt, sugar, and fat, physical inactivity, sleep disturbances, and psychosocial stress are major triggers for elevated blood pressure in this age group (Zhang et al., 2022; Falkner & Lurbe, 2023). According to the 2018 Basic Health Research (Riskesdas) report by the Indonesian Ministry of Health's Research and Development Agency, the prevalence of hypertension among adolescents has significantly increased compared to previous surveys. While hypertension is more common in adults, Riskesdas data show that around 8% of Indonesian adolescents aged 15–17 already experience elevated systolic or diastolic blood pressure. The 2023 Riskesdas National Health Survey also reported a significant increase in hypertension prevalence among students aged 13–17 years. This condition is largely influenced by increasingly sedentary lifestyles, higher consumption of fast food, and elevated academic and social stress among adolescents.

Although national studies on adolescent hypertension remain limited, international research has confirmed that high blood pressure in adolescents can be asymptomatic and difficult to detect without regular screening (Lurbe et al., 2023). Therefore, it is crucial to understand the specific risk factors associated with hypertension in this group, particularly within distinctive social and geographic contexts.

Banjar City, located in the southern region of West Java Province, has unique demographic and sociocultural characteristics. Local dietary habits high in sodium, irregular sleep patterns among adolescents, and limited access to nutritional education may serve as important determinants of public health, especially for adolescents.

This study aims to analyze various risk factors contributing to the incidence of hypertension among adolescents in Banjar City. The research involved 286 respondents from February 28 to March 31, 2025, with the goal of providing a scientific basis for developing school- and community-based prevention and health promotion strategies.

METHOD

Research Design and Approach

This study utilized a quantitative approach with a descriptive analytic cross-sectional design. This design was chosen to evaluate the relationship between risk factors and the incidence of hypertension among adolescents at a single point in time. The research was conducted in Banjar City, West Java Province, during the period from February 28 to March 31, 2025.

Population and Sample

The population of this study consisted of all adolescents aged 12–25 years residing in Banjar City. The sample was selected using a simple random sampling technique based on school lists and online adolescent

community directories. A total of 286 adolescents were successfully recruited, aligning with the minimum required sample size calculated using Slovin's formula with a 5% margin of error.

Inclusion criteria included:

- Adolescents aged 12–25 years residing in Banjar City,
- Willing to participate and provide informed consent,
- Having internet access,
- Completing the questionnaire in full.

Exclusion criteria included:

- Respondents who submitted incomplete or inconsistent answers.

Instruments and Data Collection Techniques

Data were collected using an online questionnaire via Google Forms, distributed through social media and school networks. The instrument was developed based on literature review from previous studies (Sorof & Daniels, 2002; Falkner, 2010; Lurbe & Falkner, 2023) and designed to measure five main dimensions of hypertension risk factors among adolescents:

Questionnaire Structure:

1. Eating Habits (10 items): Consumption patterns of fast food, high-salt foods, processed foods, breakfast habits, vegetables, fruits, water intake, and late-night eating habits.
2. Physical Activity (5 items): Frequency of exercise, transportation habits, daily home/school activities, and walking routines.
3. Psychosocial Stress (5 items): Academic stress, anxiety, relaxation practices, sleep quality, and emotional pressure.
4. Modern Lifestyle (3 items): Gadget usage duration, smoking habits, and sleep duration.
5. Genetic Factors (2 items): Family history of hypertension among parents or siblings.

Validity and Reliability Testing

The questionnaire was pilot-tested on 30 adolescents outside of the main sample. Validity was measured using item-total correlation, and reliability was assessed using Cronbach's Alpha, yielding a value of 0.86, indicating high internal consistency and acceptable statistical reliability.

Research Ethics

Throughout the research process, ethical principles were upheld, including anonymity, confidentiality, privacy, and self-determination.

RESULTS AND DISCUSSION

Results

Table 1. Respondents by Gender

Category	Frequency (n)	Percentage (%)
Male	123.0	43.01
Female	163.0	56.99

Table 2 Respondents by Adolescent Age Group

Category	Frequency (n)	Percentage (%)
Early Adolescents (12–16 years)	129.0	45.1
Late Adolescents (17–25 years)	157.0	54.9

Table 3. Respondents by Body Mass Index (BMI)

Category	Frequency (n)	Percentage (%)
Underweight	119.0	41.61
Normal Weight	146.0	51.05
Overweight	21.0	7.34

Table 4. Respondents by Area Residence

Category	Frequency (n)	Percentage (%)
Banjar	68.0	23.78
Purwaharja	67.0	23.43
Pataruman	60.0	20.98
Langensari	91.0	31.82

Table 5. Categories of Hypertension Risk Among Adolescents

Category	Frequency (n)	Percentage (%)
High Risk	202	70.6
Moderate Risk	50	15,5
Very High Risk	34	11.9

Table 6. Logistic Regression Results: Hypertension Risk Factors

Variable	Coefficient (B)	OR	p-value	CI 95%	Significance
Q10 – Late night eating	1.579	4.85	0.0047	0.484 – 2.674	Significance
Q5 – Processed food	0.907	2.48	0.0024	0.322 – 1.492	Significance
Q8 – Rarely drink water	0.679	1.97	0.0164	0.124 – 1.234	Significance
Q9 – fatty food	–0.979	0.38	0.0253	–1.837 – –0.121	Significance
Q4 – Skipping breakfast	0.304	1.36	0.2915	–0.261 – 0.869	Not Significance

Discussion

This study provides a comprehensive overview of the characteristics of adolescents and the lifestyle factors contributing to hypertension risk in Banjar City.

Sociodemographic Distribution

- Gender: The majority of respondents were female (56.99%). This aligns with previous studies indicating that adolescent girls tend to be more cooperative and show greater interest in participating in health surveys compared to boys. Physiologically, while the prevalence of hypertension is generally higher among adult males, the difference among adolescents is not always consistent due to hormonal and behavioural influences (Lurbe et al., 2023).
- Age Group: Approximately 54.90% of the respondents were categorized as late adolescents (17–25 years). This is significant, as lifestyle and dietary habits are typically more established and persistent in this age group. Late adolescents are also more likely to experience hypertension due to increased academic stress, consumption of high-calorie foods, and sleep disturbances (Zhang et al., 2022).
- Nutritional Status (BMI): Most adolescents had a normal BMI (51.05%), but 7.34% were classified as overweight. BMI is a critical indicator, as excess weight significantly increases hypertension risk through insulin resistance and vascular dysfunction. Even though the majority were normal or underweight, this finding emphasizes the need for continuous monitoring of diet and physical activity.
- Residential Area: Respondents were distributed across all districts of Banjar City, with the highest proportion from Langensari District (31.82%). This geographic distribution enhances the generalizability of the data. Regional differences may influence hypertension risk through access to healthy food, physical activity spaces, and culturally based dietary habits.

Hypertension Risk in Adolescents

A total of 70.6% of adolescents were in the high-risk category for hypertension, and 11.9% were in the very high-risk category. This is alarming and underscores that adolescent hypertension is a pressing public health issue that could lead to chronic hypertension in adulthood if not addressed early.

Lifestyle Factors Influencing Hypertension Risk

- Late-night Eating (Q10): Identified as the most dominant risk factor (B = 1.579, OR = 4.85, p = 0.0047). This habit disrupts circadian rhythm and metabolism, contributing to abdominal obesity—an established risk factor for hypertension (Falkner & Lurbe, 2023).

- Processed Food Consumption (Q5): Significantly associated with hypertension (OR = 2.48, p = 0.0024). Foods like chips, instant noodles, and high-sodium snacks trigger sodium retention and systemic blood pressure increases.
- Inadequate Water Intake (Q8): Respondents with low water intake were nearly twice as likely to experience hypertension (OR = 1.97, p = 0.0164). Poor hydration increases blood viscosity and peripheral resistance, which directly raises blood pressure.
- Fatty Food Consumption (Q9): Interestingly, this factor shows a significant negative association (B = –0.979, OR = 0.38, p = 0.0253). This can be explained by the possibility of confounding factors. Several studies have found that consuming fatty foods does not necessarily increase disease risk—it depends on the type of fat. Unsaturated fats (such as those from olive oil, nuts, and avocados) have protective effects against cardiovascular and metabolic diseases. In contrast, saturated and trans fats (from processed meats and fried foods) tend to increase the risk of chronic illness. Another contributing factor is the level of physical activity. Individuals with high physical activity levels tend to have more efficient fat metabolism, meaning that consumed fats are less likely to accumulate as body fat. A study conducted in Surabaya showed a significant relationship between physical activity and reduced overweight status, even in the presence of high-fat consumption (Putra, 2017).
- Skipping Breakfast (Q4): Not significantly associated with hypertension (p = 0.2915), despite prior literature suggesting metabolic disruptions. The non-significance may stem from breakfast variability or response bias.

Other Contributing Risk Factors

Physical Activity

Physical activity is crucial for blood pressure regulation and cardiovascular health. Although not all physical activity variables were statistically significant predictors, data trends show that adolescents with low physical activity had higher hypertension risk scores. This is consistent with findings from Zhang et al. (2022), which link sedentary lifestyles with increased vascular resistance and blood pressure.

Psychosocial and Emotional Stress

Adolescents face common stressors like anxiety, academic pressure, and sleep disorders. While stress indicators did not emerge as dominant regression factors, they contributed to higher risk scores. The biological mechanisms involve cortisol elevation and sympathetic nervous system activation. Poor sleep and relaxation, as noted by Falkner & Lurbe (2023), disrupt blood pressure regulation, highlighting the importance of mental health interventions.

Modern Lifestyle

Modern habits such as excessive gadget use, smoking, and sleep deprivation are linked to metabolic disturbances, including hypertension. Although not all variables were statistically significant, many respondents reported screen time over 4 hours and sleep less than 6 hours daily. Studies by Gao et al. (2020) and Carter et al. (2016) support the association between screen exposure—especially at night—and circadian rhythm disruption, which increases sympathetic activity and blood pressure.

While smoking was reported by a small portion of respondents, it remains a well-known risk factor that accelerates endothelial damage and arterial stiffness,

contributing to early hypertension development (Chorin et al., 2018). These effects are compounded when combined with poor sleep and psychological stress.

Genetic Factors (Family History)
Family history of hypertension is a non-modifiable biological factor but important for early screening. Respondents with a family history of hypertension tended to have higher risk scores, though the impact was less pronounced than lifestyle factors. Genetic predisposition can affect salt sensitivity, stress responses, and blood pressure regulation (Sorof & Daniels, 2002), reinforcing the need for routine family health mapping during adolescence.

Implications
This study highlights the critical role of school- and community-based interventions in modifying risky adolescent behaviours. Education about proper meal timing, hydration, and avoidance of processed foods should be integrated into school health curricula.

Furthermore, family and community environments are key in shaping healthy habits from an early age. Routine blood pressure screening among adolescents is also essential for early detection and prompt intervention.

CONCLUSION AND RECOMMENDATIONS

Conclusion
This study reveals that the majority of adolescents in Banjar City fall into the high-risk category for hypertension, with a prevalence rate of 70.6%. Binary logistic regression analysis identified several lifestyle-related factors that significantly contribute to this elevated risk, namely:

1. Late-night eating habits – the most dominant risk factor with an odds ratio (OR) of 4.85.
2. Consumption of high-sodium processed foods (OR = 2.48).
3. Inadequate daily water intake (OR = 1.97).

Meanwhile, the consumption of fatty foods showed a significant negative association with hypertension risk, which may be influenced by confounding factors such as physical activity levels or the type of fat consumed. Skipping breakfast was not found to be significantly associated with hypertension risk in the model.

These findings indicate that adolescent lifestyle—particularly eating and hydration habits—plays a substantial role in influencing hypertension risk from a young age. Therefore, preventive strategies should focus on promoting healthy behaviours early in life.

Recommendations

1. School-based Health Interventions
   Implement educational programs in schools that emphasize healthy eating habits, regular meal timing, and adequate daily hydration.
2. Family-based Community Campaigns
   Involve parents in lifestyle intervention efforts by promoting healthier household eating practices and monitoring adolescents' late-night eating behaviours.
3. Routine Hypertension Screening for Adolescents
   Local governments and educational institutions should conduct regular blood pressure screenings among adolescents to support early detection and prompt intervention.
4. Local Food and Lifestyle Policy Reform
   Regulate school canteens to provide low-sodium meals and prohibit the sale of high-sodium processed foods.
5. Further Research
   Future studies should use longitudinal designs and clinical blood pressure measurements to strengthen the causal

evidence between lifestyle factors and adolescent hypertension.

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