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Community-Based Approach to Hypertension Screening through Cholesterol, BMI, and Physical Activity Assessment

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ABSTRACT

Hypertension remains a major public health concern worldwide, largely driven by unhealthy lifestyles such as poor diet, physical inactivity, and excess body weight. Early identification of modifiable risk factors, including cholesterol levels, body mass index (BMI), and physical activity, is crucial for preventing hypertension. This community-based screening activity was conducted on 7 August 2025, at SMA Negeri 9 Padang, targeting teachers, administrative staff, and food vendors. A total of 80 adults participated in the study using convenience sampling. The activity included health education followed by individual health screenings, which consisted of blood pressure measurement, BMI calculation, cholesterol testing using portable point-of-care devices, and physical activity assessment using structured questionnaires. The results showed that 45% of participants were classified as prehypertensive, 83.8% had high cholesterol levels, and 66.3% were overweight or obese. Most participants (72.5%) reported moderate physical activity levels, which fell short of the World Health Organization's recommendations. These findings indicate a high risk of hypertension among adults in the school community, particularly related to elevated cholesterol, excess body weight, and insufficient physical activity. We identified hypertension risk factors and provided health education and individualized screening feedback to raise awareness of cardiovascular risks and emphasize the importance of regular screening.

Keywords: hypertension risk, community screening, cholesterol, BMI, physical activity

INTRODUCTION

Hypertension is a significant public health problem that contributes significantly to the global burden of cardiovascular disease, stroke, and premature mortality. According to the World Health Organization (WHO, 2025), one in four adults worldwide experiences hypertension, with a considerable proportion remaining undiagnosed and untreated. In Indonesia, the Basic Health Research (Riskesdas) reported that the prevalence of hypertension in adults reached 34.1%, with awareness and treatment rates remaining relatively low (Kementerian Kesehatan Republik Indonesia, 2023). These conditions indicate the urgent need for community preventive and early detection initiatives.

Lifestyle and behavioral factors play an essential role in the development of hypertension. Excessive dietary intake of saturated fats and salt, physical inactivity, and increased body mass index (BMI) are major contributors to rising blood pressure and

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cardiovascular risk (Stąpor et al., 2023). In addition, elevated cholesterol levels are closely linked to endothelial dysfunction and arterial stiffness, further exacerbating hypertension (Baba et al., 2023). Therefore, screening that includes BMI measurement, cholesterol assessment, and evaluation of physical activity levels can provide a comprehensive overview of hypertension risk among community members.

Community-based screening is a practical approach for identifying at-risk individuals and promoting awareness of non-communicable diseases. Such interventions help in early detection and serve as an entry point for health education and behavior modification (Prihanti et al., 2022). Prior studies have shown that integrated community screening programs can increase health literacy and preventive practices among adults, reducing the prevalence of uncontrolled hypertension (Gao et al., 2023).

In line with this evidence, this community service activity assessed hypertension risk through evaluations of cholesterol, BMI, and physical activity among adults in the community of teachers and staff at SMA 9 Padang. The objective was to identify risk distribution, raise awareness about modifiable risk factors, and encourage proactive participation in preventive health behavior within the community.

METHOD

This community service activity was conducted at SMA Negeri 9 Padang, which is located within the working area of the Community Health Center (Puskesmas) Pasar Ambacang, Padang City, from June to August 2025. The program was designed as a follow-up initiative to previous community service activities targeting students, with this phase focusing on teachers, administrative staff, and food vendors or café owners within the school environment. These adult groups were selected because they represent individuals with busy schedules and potentially limited opportunities to access routine health checks, making them a significant target population for hypertension risk screening.

A total of 80 participants were involved in the activity, recruited using an accidental sampling technique that included all adults who voluntarily participated during the school-based screening campaign.

1. Preparation Stage

Coordination and permission were obtained from the school principal and local community health authorities (Puskesmas Pauh) to support the implementation of the activity. During this meeting, the objectives and schedule were presented and agreed upon. The preparation stage involved providing equipment and materials, including digital sphygmomanometers, tools for measuring body weight and height, cholesterol test strips, and educational leaflets on hypertension prevention. Educational materials were developed with a focus on modifiable risk factors, including cholesterol management, weight control, and promoting physical activity. In addition, briefing sessions and role assignments were conducted for the implementation team, comprising lecturers and nursing students from the Faculty of Nursing at Universitas Andalas, to ensure accurate data collection and procedural uniformity.

2. Implementation Stage

The activity was carried out in three integrated sessions. The first session consisted of a health education program delivered through group lectures that addressed the causes, risk factors, and prevention strategies of hypertension, with an emphasis on lifestyle modifications, including balanced nutrition, regular physical activity, and stress management. The second session involved individual health screening, which included blood pressure measurement performed twice using a digital sphygmomanometer after a minimum rest period of five minutes, with the average value recorded. Body mass index

(BMI) was calculated based on measured height and weight and categorized according to WHO (2023) standards. Total cholesterol levels were assessed using portable point-of-care testing devices and classified as normal (<200 mg/dL) or high (⩾200 mg/dL). Physical activity levels were assessed using a structured questionnaire adapted from the Global Physical Activity Questionnaire (GPAQ) and categorized as high, moderate, or low. The final session provided individual counseling for each participant based on their screening results, including personalized dietary recommendations, physical activity goals, and hypertension prevention advice tailored to their health status.

3. Evaluation Stage

The screening data, including blood pressure, cholesterol levels, body mass index (BMI), and physical activity, were analyzed descriptively and summarized in frequency and percentage tables. Participant feedback was collected verbally at the end of the session to assess satisfaction and understanding of the health education provided. The evaluation findings indicated that participants demonstrated improved awareness of hypertension risk factors, highlighting the importance of continued health education and routine screening as part of sustainable community-based hypertension prevention efforts.

The evaluation aimed to determine the prevalence of hypertension risk factors among school personnel and vendors and to measure the improvement in health awareness following the intervention.

RESULTS AND DISCUSSION

Tabel 1. Respondents' Blood Pressure (N= 100)

No	Blood Pressure	Frequency	Percentage (%)
1	Normal	23	28.8
2	Pre Hipertensi	36	45.0
3	Hipertensi Stage 1	14	17.5
4	Hipertensi Stage 2	7	8.8
	Total	80	100

Table 1 presents the distribution of respondents' blood pressure categories. The results show that most respondents were in the pre-hypertension category (45%), followed by normal blood pressure (28.8%), stage 1 hypertension (17.5%), and stage 2 hypertension (8.8%).

Tabel 2. Respondents' Cholesterol Levels (N= 100)

No	Cholesterol Level	Frequency	Percentage (%)
1	Normal	13	16.3
2	High	67	83.8
	Total	80	100

Table 2 shows the distribution of respondents' cholesterol levels. The results indicate that the majority of respondents had high cholesterol levels (83.8%), while only 16.3% were in the normal cholesterol category.

Tabel 3. Respondents; Body Mass Indeks (BMI) Catergories (N = 100)

No	BMI Category	Frequency	Percentage (%)
1	Underweight	4	5.0
2	Normal	21	26.3
3	Overweight	35	4.8
4	Obesitas stage 1	18	22.5
5	Obesitas stage 2	2	2.5
	Total	80	100

Table 3 presents respondents' body mass index (BMI) categories. The findings show that most respondents were classified as overweight or obese, while a smaller proportion had normal or underweight BMI.

Tabel 4. Respondents' Physical Activity Level (N=100)

No	Physical Activity Level	Frequency	Percentage (%)
1	High	10	15.0
2	Moderate	58	72.5
3	Low	12	12.5
	Total	80	100

Table 4 shows the distribution of respondents' physical activity levels. The majority of respondents reported moderate physical activity (72.5%), followed by low physical activity (12.5%) and high physical activity (15%).

The findings indicate that most respondents were in the pre-hypertension category and had high cholesterol levels, suggesting a substantial risk for cardiovascular disease. According to the American Heart Association (AHA, 2024), individuals with systolic blood pressure of 120–139 mmHg and diastolic blood pressure of 80–89 mmHg are classified as pre-hypertensive, a transitional stage toward hypertension, if lifestyle modifications—such as increased physical activity and dietary regulation—are not implemented.

Elevated cholesterol is a major risk factor contributing to increased blood pressure and the progression of hypertension (Jones et al., 2025). Higher levels of low-density lipoprotein (LDL) cholesterol can lead to endothelial dysfunction, which impairs the vascular endothelium's ability to regulate normal vascular tone (Higashi, 2023). This dysfunction reduces nitric oxide (NO) bioavailability, a natural vasodilator essential for maintaining normal blood pressure (Roy et al., 2023). Reduced NO availability results in chronic vasoconstriction and increased systemic peripheral resistance, ultimately promoting hypertension (Jiang et al., 2022). Furthermore, oxidized LDL promotes atherosclerosis, characterized by the formation of lipid plaques along arterial walls (Thangasparan et al., 2024).

Increases in body mass index (BMI) are associated with a higher incidence of hypertension, even among individuals who are not yet classified as fully obese, indicating that relatively small weight gain can still influence blood pressure (Kosami et al., 2024). Excess body fat—particularly visceral fat—promotes insulin resistance and hyperinsulinemia, which in turn stimulates sympathetic nervous system activity, resulting in greater arterial vasoconstriction and increased cardiac output, thereby elevating blood pressure (Clayton et al., 2023).

Given that most respondents in this study were categorized as overweight or mildly to moderately obese, it is reasonable to consider weight gain as a major contributing factor to their pre-hypertensive or early-stage hypertensive status. Therefore, weight-management strategies—through dietary modification, increased physical activity, and

reduction of visceral fat—are fundamental in preventing and managing elevated blood pressure in populations similar to the respondents in this study.

Huang et al. (2024) reported that individuals with moderate to high levels of physical activity had systolic blood pressure values that were 6–9 mmHg lower compared to those with low activity levels. This finding is consistent with the meta-analysis by Kunutsor & Laukkanen (2024), which showed that 150 minutes of routine aerobic exercise per week can reduce systolic blood pressure by an average of 7 mmHg among adults with pre-hypertension. Physical activity also contributes to weight control and lipid metabolism, both of which are crucial in regulating blood pressure (AHA, 2024). Aerobic exercise enhances insulin sensitivity, reduces triglycerides and LDL cholesterol, and thereby decreases arterial stiffness, thereby enhancing vascular function (WHO, 2023).

Among adults, low physical activity levels are associated with a 1.5–2-fold increased risk of hypertension compared to physically active individuals (Widyaswara Suwaryo et al., 2024). Reduced physical activity leads to elevated basal vascular tone and impaired blood pressure autoregulation due to decreased hemodynamic stimulation of the endothelium (Thijssen et al., 2010). Field findings showed that most respondents had a moderate level of physical activity (72.5%), while only 15% reported high activity and 12.5% reported low activity. This predominance of moderate activity indicates that the community has not fully met the WHO (2023) recommendation of 150–300 minutes of moderate-intensity aerobic activity per week. The activity increased participants' awareness of physical activity requirements through individualized screening feedback and health education, enabling them to recognize gaps between their current activity levels and recommended standards. To ensure sustainability, collaboration with school management and local primary healthcare services is essential to promote routine physical activity initiatives, such as scheduled group exercise programs and periodic monitoring, as part of ongoing community-based hypertension prevention efforts.

CONCLUSION

The results of this study indicate that most respondents were categorized as pre-hypertensive, had high cholesterol levels, above-normal BMI, and moderate physical activity. These findings reflect a strong association between lifestyle factors and elevated blood pressure. High cholesterol contributes to increased blood pressure through endothelial dysfunction, reduced nitric oxide production, and increased arterial stiffness. Excess body weight and obesity further exacerbate this condition by increasing insulin resistance, sympathetic nervous system activity, and sodium and fluid retention through activation of the renin–angiotensin–aldosterone system. Meanwhile, low physical activity reduces vascular elasticity and increases peripheral resistance, collectively heightening the risk of hypertension.

To ensure sustainability, future community service programs should integrate routine blood pressure and cholesterol screenings into existing community health activities in collaboration with local primary healthcare services. Continuous health education on balanced nutrition, weight management, and physical activity is recommended using culturally appropriate and participatory approaches. Training community health volunteers as peer educators may support program continuity beyond the intervention period. Additionally, regular group-based physical activity initiatives can enhance community engagement and promote healthy lifestyle behaviors. Further programs are encouraged to include longer follow-up periods to evaluate behavioral changes and health outcomes related to hypertension prevention and to expand implementation to communities with similar risk profiles.

These findings underscore the importance of preventing hypertension through the control of cholesterol, weight management, and increased physical activity. Community-based health education programs—such as balanced nutrition counseling, routine blood pressure and cholesterol screening, and group exercise activities—are recommended as sustainable interventions. Implementing these strategies is expected to reduce the prevalence of hypertension and improve overall community health outcomes.

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