Determination of Lifestyle Factors on the Incidence of Hypertension in Peri-Urban Areas

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ABSTRACT
Hypertension cases in developing countries, including Indonesia, continue to rise annually, with a particularly high burden in densely populated provinces such as West Java. If left unmanaged, hypertension may progress to severe complications that threaten individual health and quality of life. Identifying lifestyle-related determinants that significantly contribute to hypertension is essential so that individuals can modify behaviors that increase their risk. This study aimed to analyze the lifestyle factors most strongly associated with the incidence of hypertension among residents living in a peri-urban area. A descriptive–correlative design with an analytical cross-sectional approach was employed. The study involved 434 respondents diagnosed with hypertension and residing in a peri-urban region, specifically Mangkubumi District, located at the administrative border between the regency and the city. Variables assessed included sodium intake, physical activity, stress level, obesity status, and smoking history. Statistical analysis was conducted to determine the relationship between each lifestyle factor and hypertension incidence. The findings revealed that sodium (salt) intake and low levels of physical activity were significantly associated with hypertension ($p < 0.05$). Conversely, stress level, obesity, and smoking history did not show significant relationships, as indicated by p-values above 0.05. Among all variables, physical activity demonstrated the strongest association with hypertension, with a p-value of 0.021. In conclusion, lifestyle factors, particularly physical activity and sodium intake, play a significant role in the occurrence of hypertension in peri-urban communities. These results underscore the importance of promoting healthier lifestyle behaviors to prevent complications related to hypertension.
Keywords: risk factors; lifestyle; peri-urban; hypertension

INTRODUCTION
Hypertension is a clinical condition frequently encountered in primary healthcare settings and has increasingly become a major public health concern due to its rising prevalence. It is defined as a state in which an individual's blood pressure reaches a systolic value above 140 mmHg and a diastolic value of 90 mmHg or higher. Although hypertension is often perceived as a common health problem, it may lead to serious and potentially irreversible consequences when left undetected or inadequately managed. Persistently elevated blood pressure can cause progressive damage to vital organs, including the kidneys—placing individuals at risk of renal failure—the heart, which may develop into coronary heart disease, and the brain, where the risk of stroke becomes substantial. These complications are particularly likely when hypertension remains asymptomatic and untreated over time [1].

According to the World Health Organization, non-communicable diseases (NCDs) account for approximately 52% of deaths in several countries, including Indonesia, with hypertension being one of the leading contributors. The global burden of hypertension is projected to continue increasing, and by the year 2025, an estimated 29% of the world's adult population is expected to be affected. Each year, hypertension is responsible for nearly 8 million deaths worldwide, with approximately 1.5 million of these occurring in the Southeast Asian region [2].

National health data from the 2018 Basic Health Research (Riskesdas) reported that the prevalence of hypertension in Indonesia reached 34.1%, a significant increase from 25.8% in 2013. Among younger age groups, the prevalence also rose sharply: in 2013, hypertension among individuals aged 18–24 years was 8.7%, increasing to 13.2% in 2018. Several Indonesian provinces experienced similar upward trends. West Java, for instance, ranked fourth in hypertension prevalence in 2013 at 29.4%, following Bangka Belitung, South Kalimantan, and East Kalimantan. By 2018, West Java had risen to the second-highest position nationally, with a prevalence of 39.6%, surpassed only by South Kalimantan [3].

West Java is a large province composed of numerous cities and regencies, with the majority of its population belonging to the Sundanese ethnic group. This community is known for dietary habits characterized by high sodium intake, including the frequent consumption of salted fish. Excessive sodium consumption is strongly associated with hypertension, and individuals who consume high levels of sodium daily are significantly more likely to develop elevated blood pressure [4]. Tasikmalaya City, one of the major urban centers in West Java, has also experienced a notable rise in hypertension cases. Data from the Tasikmalaya City Health Office in 2019 and 2020 placed hypertension as the second and third most common disease, respectively. However, in 2021, hypertension rose to the first position. The highest number of cases was recorded in Mangkubumi District, with 29,405 individuals affected, followed by Kawalu and Cihideung [5].

Mangkubumi District consists of eight sub-districts, including Mangkubumi itself. With an area of 335 hectares, it is the second-largest sub-district after Linggajaya. Geographically, Mangkubumi lies at the border between the city and the regency, and although it is administratively part of the city, its environmental characteristics and community lifestyle remain predominantly rural. For this reason, Mangkubumi is classified as a peri-urban area. The highest number of hypertension cases in Tasikmalaya is found within the working area of the Mangkubumi Community Health Center, totaling 16,584 individuals. During the COVID-19 pandemic, smoking habits increased significantly in this region. Smoking is a well-established risk factor for NCDs such as diabetes, hypertension, cardiovascular disease, and cancer. Among Mangkubumi residents, the combination of smoking and obesity further elevates the risk of developing hypertension. Health statistics indicate that 332 residents in Mangkubumi are classified as obese, a figure lower than in other districts such as Tamansari and Bantar [5]. Generally, obesity-related risks tend to be higher in economically developed countries [6].

Mild anxiety among adolescents in Mangkubumi has been reported at 67.3%. Today's youth face increasingly complex pressures and temptations compared to previous generations, contributing to heightened stress levels. When unhealthy lifestyle patterns are adopted from an early age, the risk of developing NCDs, including hypertension later in life becomes substantially greater [7]. The peri-urban Sundanese community of Mangkubumi resides in a hilly and mountainous landscape and maintains distinctive cultural and culinary traditions. Approximately 80 types of foods are commonly consumed, with 65% derived from plant sources and 35% from fish and meat. Among plant-based foods, 59% consist of young leaves, 18% flowers, 20% unripe fruits, and the remainder seeds or grains. These foods are often consumed raw as *lalab*, a traditional Sundanese dish [8].

Efforts to reduce hypertension prevalence require comprehensive interventions, including improvements in the food environment (reducing marketing pressures, ensuring access to healthier foods), modifications to the physical environment (providing affordable exercise facilities, promoting cycling and walking, and integrating daily physical activity opportunities in schools), and lifestyle-focused health promotion (encouraging healthier diets and physical activity in workplaces, and developing or refining national food-based dietary guidelines) [8].

Hypertension is one of the most important and reversible risk factors for serious conditions such as stroke, diabetes, cardiovascular disease, and renal impairment, all of which contribute significantly to morbidity and mortality. Because hypertension is multifactorial, research on its risk determinants plays a crucial role in guiding prevention and management strategies [9]. Current evidence indicates that individuals who have smoked for more than six years face an increased risk of developing hypertension [10]. Stress is also recognized as a contributing factor to the high prevalence of hypertension, particularly in the context of rapid modernization, where occupational stress has become increasingly common [11].

Hypertension serves as a critical warning sign that necessitates lifestyle modification [12]. The rising prevalence of hypertension in Tasikmalaya, especially in peri-urban areas such as Mangkubumi poses a significant threat due to its potential to cause long-term disability, particularly when the condition remains asymptomatic and untreated. Moreover, many individuals with hypertension have not yet received adequate healthcare intervention. These concerns form the basis of the present study, which seeks to explore the determinants of lifestyle factors associated with hypertension in peri-urban communities. The purpose of this study is to analyze lifestyle determinants that contribute to the incidence of hypertension in the peri-urban area of Mangkubumi.

METHODS

This study was conducted over a period of twenty days in the peri-urban area of Kelurahan Mangkubumi, a sub-district characterized by a transitional environment between rural and urban settings. The location was selected due to its high prevalence of hypertension and its unique demographic and lifestyle characteristics, which make it an appropriate setting for examining lifestyle-related determinants of hypertension. During the data collection phase, the researcher visited the community, provided explanations regarding the purpose and procedures of the study, and subsequently recruited eligible participants who met the inclusion and exclusion criteria. A total of 434 individuals diagnosed with hypertension were enrolled as research subjects.

The research employed an analytical cross-sectional design, a methodological approach that allows the exploration of associations between risk factors and health outcomes by collecting data at a single point in time. This design was selected to identify lifestyle-related determinants and stress-related factors that may contribute to the occurrence of hypertension in peri-urban populations. The sampling technique used was purposive convenience sampling, enabling the researcher to select participants who were readily accessible and met the predetermined criteria.

The study included both independent and dependent variables. The independent variables consisted of lifestyle factors, namely smoking history, physical activity history, sodium (salt) intake, obesity status, and stress level. The dependent variable was the incidence of hypertension, operationalized through blood pressure measurements. Data collection utilized several instruments: a structured questionnaire to assess lifestyle behaviors, a standardized form for recording blood pressure measurements, and the Kessler Psychological Distress Scale (K10) to evaluate stress levels. The K10 instrument had previously undergone validity and reliability testing. Blood pressure was measured using an electronic sphygmomanometer, which had been calibrated by a certified calibration company accredited by the Komite Akreditasi Nasional (KAN), ensuring accuracy and reliability of the measurements.

The collected data were processed through several analytical stages. Univariate analysis was conducted to describe the distribution of each variable. Nominal data were presented in percentages, while interval-scale variables were summarized using mean, median, standard deviation, minimum and maximum values, and 95% confidence intervals. Following this, bivariate analysis was performed using the Chi-Square test to determine the statistical association between lifestyle factors, stress levels, and the incidence of hypertension.

RESULTS

Based on the descriptive analysis in Table 1, the majority of the 434 respondents reported no stress. A smaller proportion consumed more than one teaspoon of sodium per day and were classified as obese. Most respondents had no smoking history and engaged in irregular physical activity. The prevalence of stage 2 hypertension exceeded that of stage 1 hypertension.

Based on the Chi-Square test results presented in Tables 3, 5, and 6, three variables; sodium intake, smoking history, and physical activity history demonstrated statistically significant associations with hypertension, as indicated by p-values below

Table 1. Distribution of respondents' characteristics

Variable	Frequency	Percentage
Stress Level		
-No stress	262	60.4
-Mild stress	151	34.8
-Moderate stress	19	4.4
-Severe stress	2	0.5
Sodium (Salt) Intake		
-Less than one teaspoon per day	238	54.8
-More than one teaspoon per day	196	45.2
Obesity		
-Obese	66	15.2
-Not obese	368	84.8
Smoking History		
-Yes	133	30.6
-No	301	69.4
Physical Activity History		
-Regular	29	6.7
-Irregular	405	93.3
Hypertension Status		
-Stage 1 hypertension	202	46.5
-Stage 2 hypertension	232	53.5

Table 2. Relationship between stress level and hypertension

Stress Level	Hypertension status		p-value
	Stage 1	Stage 2	
No stress	127	135	0,274
Mild stress	69	82	
Moderate stress	6	13	
Severe stress	0	2	

Table 3. Relationship between sodium intake and hypertension

Sodium Intake	Hypertension status		p-value
	Stage 1	Stage 2	
Less than one teaspoon per day	123	115	0.020
More than one teaspoon per day	79	117	

Table 4. Relationship between obesity and hypertension

Obesity Status	Hypertension Status		p-value
	Stage 1	Stage 2	
Obese	27	39	0.350
Not obese	175	193	

Table 5. Bivariate Analysis of the Relationship Between Smoking History and Hypertension (n = 434)

Smoking History	Hypertension Status		p-value
	Stage 1	Stage 2	
Yes	53	80	0.076
No	149	152	

Table 6. Relationship between physical activity history and hypertension

Physical Activity	Hypertension Status		p-value
	Stage 1	Stage 2	
Regular	20	9	0.019
Irregular	182	223	

0.05. These findings suggest that higher sodium consumption, a history of smoking, and irregular physical activity patterns are meaningfully related to the occurrence of hypertension among the respondents.

Conversely, the variables presented in Tables 2 and 4, stress level and obesity status showed p-values greater than 0.05, indicating no statistically significant relationship with hypertension in this sample. Although these factors are often cited in the literature as potential contributors to elevated blood pressure, they did not exhibit measurable associations within the context of this study population.

DISCUSSION

The findings of this study indicate that stress level does not have a significant association with the occurrence of hypertension. In the daily life of Mangkubumi residents, communal interaction plays an important role in emotional regulation. Many individuals work as laborers producing handmade sandals, a type of work that is often carried out collectively in front of their homes. This shared work environment fosters continuous communication, social bonding, and mutual adaptation among neighbors and fellow laborers, which in turn provides a natural form of emotional relief and stress buffering. Such social connectedness may help individuals cope more effectively with psychological tension, thereby reducing the potential impact of stress on blood pressure. However, previous research has reported a contrasting finding, demonstrating a significant relationship between stress level and hypertension [12]. Psychosocial risk factors such as workplace stress, marital stress, lack of social support, depression, anxiety, post-traumatic stress, childhood psychological trauma, and racial discrimination have been identified as contributors to hypertension. Evidence suggests that stress induces dysregulation of the sympathetic nervous system, the hypothalamic–pituitary–adrenal axis, and immune function through repeated acute reactivity or chronic overactivation, ultimately leading to vascular damage, vasoconstriction, and elevated blood pressure [13].

Stress is often cited by community members as one of the most common perceived causes of hypertension. In populations with high hypertension prevalence, four major themes frequently emerge from community narratives: financial limitations, household problems, generalized fear or worry, and work-related issues [14]. Psychosocial stressors such as experiences of racism or perceived discrimination may also increase hypertension risk, as these exposures heighten physiological stress responses and cardiovascular reactivity [15]. The present study aligns with the notion that although individuals may experience stress, their coping mechanisms play a crucial role in mitigating its physiological effects. Among the Mangkubumi respondents, stress was often alleviated through interpersonal communication, humor, and religious practices. The close proximity of homes and the communal nature of daily activities facilitated frequent social interaction, which served as an effective coping strategy.

This study also demonstrates a significant association between sodium (salt) intake and hypertension. The findings are consistent with the work of Purwono and colleagues, who reported a similar relationship between sodium consumption and elevated blood pressure [16]. However, other studies have found no such association, suggesting that individual variations in salt sensitivity may influence sodium's effect on blood pressure [17]. According to the World Health Organization, most individuals consume approximately 9–12 grams of salt per day, nearly double the recommended limit of 5 grams per day. To reduce morbidity and mortality, several strategies have been implemented globally, including dietary sodium reduction guidelines [18]. In Mangkubumi, sodium intake is relatively high, not only from main dishes but also from processed snacks and salted foods. The Sundanese population traditionally consumes various types of salted fish, which contain substantial amounts of sodium.

High sodium intake is an independent risk factor for hypertension and other cardiovascular diseases. Excessive salt consumption may also impair cognitive function and increase cardiovascular complications through its hypertensive effects. Dietary sodium accounts for nearly 99% of total sodium intake. WHO recommends limiting sodium intake to less than 5 grams per day, equivalent to one teaspoon to prevent hypertension and related cardiovascular conditions [19]. Salt substitutes have been shown to alter serum potassium distribution, increasing the frequency of biochemical hyperkalemia while reducing hypokalemia. However, no clear association has been detected between salt substitute use and hyperkalemia risk across different baseline health conditions, although statistical power remains limited [20]. High sodium intake may also contribute to cognitive decline and exacerbate cardiovascular complications through sustained hypertension [21]. In the Mangkubumi community, individuals must become accustomed to reducing daily sodium intake, as excessive consumption poses significant health risks. Modern food practices, including the liberal addition of salt to street foods, further increase sodium exposure.

The study further reveals that obesity does not have a significant association with hypertension. This finding is consistent with the study by Zhang and colleagues but differs from the results of Gu and colleagues, who reported a significant relationship between obesity and hypertension [21][8]. The development of obesity-related hypertension is influenced by structural and functional changes in the kidneys, including activation of intrarenal angiotensin II [19]. Obesity is generally caused by abnormal fat accumulation, often measured using body mass index (BMI) [22]. It is frequently associated with metabolic and cardiovascular abnormalities such as hypertension, diabetes, dyslipidemia, and stroke. Rising obesity rates contribute to premature mortality and reduced life expectancy [20]. In this study, respondents classified as obese did not fall into the category of severe obesity. Some individuals with higher body weight may have increased muscle mass rather than excess fat, indicating the need for additional assessments beyond BMI. The health consequences of obesity extend far beyond hypertension, encompassing a wide range of chronic diseases.

Smoking history was not significantly associated with hypertension in this study. However, several other studies have reported a significant relationship between smoking and hypertension [23][10]. Smoking plays a critical role in elevating blood pressure due to the presence of nicotine, which stimulates the release of adrenaline and increases vascular resistance. Nicotine absorbed through the lungs enters the bloodstream and circulates throughout the cardiovascular system, causing vasoconstriction. This narrowing of blood vessels forces the heart to work harder to pump blood, thereby increasing blood pressure [24]. Not all smokers develop hypertension, as the risk is influenced by factors such as duration of smoking, daily frequency, number of cigarettes consumed, and individual physiological conditions. In Mangkubumi, many residents work as laborers or farmers, resulting in lower household income. Consequently, smoking frequency tends to be lower due to financial constraints and the high cost of cigarettes.

The study also shows that physical activity history has a strong association with hypertension. This finding is consistent with previous studies reporting that insufficient physical activity is significantly related to hypertension [25][26]. Residents of Mangkubumi often prioritize work over exercise, as their occupations are home-based and allow them to earn income without leaving their homes. Environmental factors also limit opportunities for physical activity; the area is characterized by narrow pathways and steep, rocky terrain, making regular exercise difficult. Regular physical activity is essential for lowering blood pressure and improving cardiovascular health. It is recommended that individuals engage in at least 30 minutes of proper physical activity daily [27]. Routine physical activity induces beneficial physiological changes, such as strengthening the heart and smooth muscle tissue, improving cardiac capacity, and promoting more efficient and regular heart rhythms. Additionally, exercise enhances vascular elasticity through relaxation and dilation of blood vessels, reduces lipid accumulation, and improves contraction of vascular smooth muscle [28].

Despite providing valuable insights into lifestyle determinants of hypertension in a peri-urban population, this study has several limitations that should be acknowledged. First, the cross-sectional design restricts the ability to establish causal relationships between the independent variables and hypertension. Because data were collected at a single point in time, it is not possible to determine whether lifestyle factors preceded the development

of hypertension or whether hypertension itself influenced behavioral patterns. Second, the study relied heavily on self-reported data, particularly for variables such as smoking history, physical activity, and stress level. Self-reporting is susceptible to recall bias and social desirability bias, especially in a close-knit community such as Mangkubumi, where respondents may underreport behaviors perceived as negative or overreport socially acceptable habits. This may have influenced the accuracy of the findings, particularly for variables that did not show significant associations. Third, although the sample size was relatively large (n = 434), the study was conducted in one peri-urban area only, which may limit the generalizability of the results to other regions with different cultural, socioeconomic, or environmental characteristics. The unique social dynamics of the Sundanese community, such as communal coping mechanisms, dietary patterns, and work structures may not reflect conditions in other peri-urban or urban populations. Fourth, the measurement of obesity relied primarily on Body Mass Index (BMI), which does not differentiate between fat mass and muscle mass. As noted in the findings, some individuals with higher body weight may have had greater muscle mass rather than excess adiposity, potentially leading to misclassification. Additional anthropometric measures such as waist circumference or body fat percentage would have provided a more accurate assessment of obesity-related risk. Fifth, the assessment of stress using the Kessler Psychological Distress Scale (K10), although validated, may not fully capture culturally specific expressions of stress or coping strategies. The Sundanese community often uses humor, religious practices, and social interaction as coping mechanisms, which may reduce the perceived severity of stress despite underlying physiological effects. Sixth, environmental factors such as dietary sodium content in local foods, the availability of exercise facilities, and the physical terrain of Mangkubumi were not measured objectively. These contextual factors may have influenced lifestyle behaviors and hypertension risk but were not included as quantitative variables in the analysis. Finally, although the electronic sphygmomanometer used in this study had been calibrated by a certified institution, blood pressure measurements were taken only once, which may not fully reflect an individual's usual blood pressure profile. Multiple readings across different times or days would have increased measurement reliability.

CONCLUSION

Hypertension is influenced by both modifiable and non-modifiable risk factors. To prevent complications that may reduce quality of life, individuals with hypertension must routinely monitor their blood pressure and adopt healthy lifestyle behaviors. The modifiable factors identified in this study—namely sodium (salt) intake, physical activity or exercise, and smoking history—were shown to be influential determinants of hypertension in peri-urban areas. Limited access to healthcare services in geographically wide and peri-urban regions may hinder optimal utilization of health facilities. Further research is needed to explore additional factors that may contribute to the occurrence of hypertension.

Ethical consideration, competing interest and source of funding

-This research adhered to ethical principles throughout all stages of implementation. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Nursing, Universitas Indonesia, under approval number KET-085/UN2.FI2.DI.2.2.1/PPM.00.02/2023, ensuring that the study met national and institutional standards for research involving human participants.
-There is no conflict of interest related to this research,
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