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Stress, Dietary Habits, and Their Relationship with Hypertension among the Elderly in Sukabumi, Indonesia: A Cross-Sectional Study

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ABSTRACT

Hypertension in the elderly is a major health concern driven by modifiable factors such as stress and diet. Stress, a response to stressors that disrupt an individual's ability to cope, has been linked to the onset of hypertension. Similarly, dietary patterns, which reflect the quality of food and beverages consumed, play a significant role in a person's health and the development of hypertension. This study aims to explore the relationship between stress, diet, and hypertension incidence among the elderly in Sukabumi City and Regency. A cross-sectional study of 339 adults aged 60–79 years was conducted in Sukabumi (cluster random sampling across health centres). Stress was measured with the Perceived Stress Scale, diet with a modified Food-Frequency Questionnaire, and hypertension by blood-pressure readings. Most participants were female (74 %) and unemployed (80 %); 81 % had only primary-school education. Hypertension prevalence was 54 %. Moderate stress (53 %) and poor diet (55 %) predominated. Hypertension was significantly associated with both stress ($\chi^2 = 4.2$, $P < 0.001$) and diet ($\chi^2 = 152.6$, $P < 0.001$). Stress and poor dietary patterns are significantly associated with the incidence of hypertension among the elderly in Sukabumi. It is recommended that health centers enhance health promotion activities related to hypertension prevention for the elderly in the region.

Key Messages:

Moderate stress and poor dietary habits are prevalent among the elderly, contributing to a higher risk of hypertension, indicating the need for targeted health interventions focused on stress management and dietary improvements.

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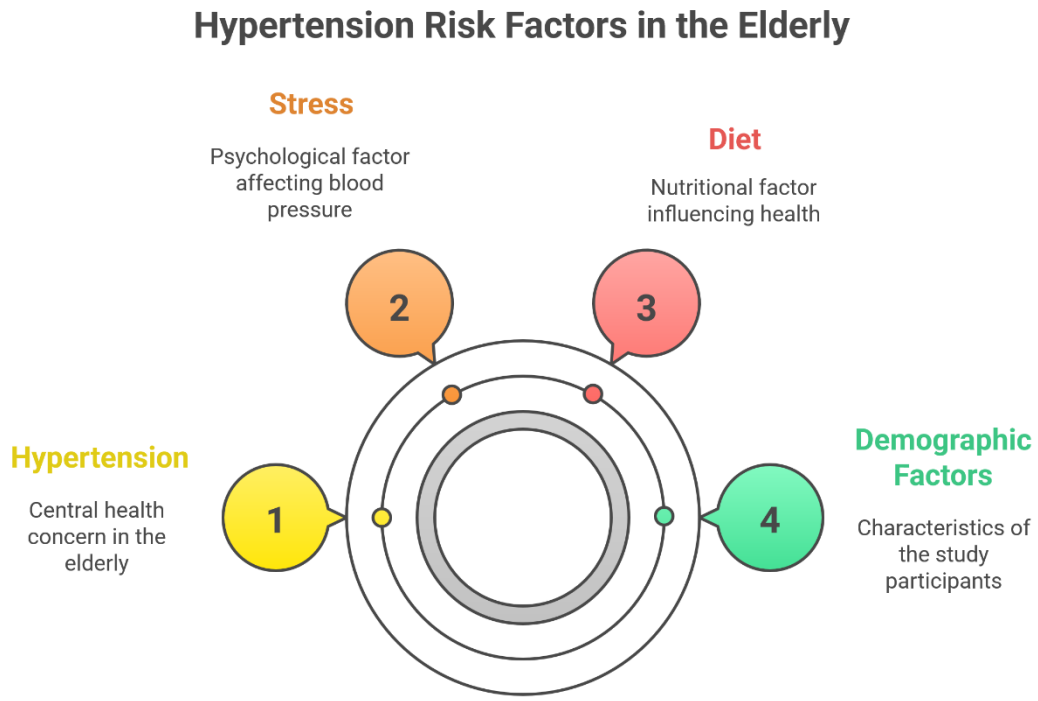
GRAPHICAL ABSTRACT



INTRODUCTION

Elderly is a stage of life where individuals experience aging which is characterized by decreased physical function, such as decreased muscle mass, maximum heart rate, increased body fat, and decreased brain function (1). The elderly population is included in the vulnerable group, which requires special attention in planning health programs. Aging is a natural process that causes a decrease in the body's ability to repair itself and maintain function, which leads to a gradual decline in health. Various health problems, both non-communicable diseases such as hypertension, stroke, diabetes, and infectious diseases such as pneumonia, often attack the elderly (2). Hypertension is one of the diseases that most often attacks the elderly, because age factors affect the elasticity of blood vessels and the body's blood pressure regulation mechanisms.

Hypertension is a medical condition that occurs when a person's blood pressure remains high for a long period of time. WHO defines hypertension as a condition with systolic blood pressure ≥140 mmHg or diastolic ≥90 mmHg (3). Hypertension is known as a "silent killer" because it often does not show clear symptoms in sufferers, even though high blood pressure can gradually damage blood vessels and vital organs. In the elderly, hypertension is often found in old age and is a major risk factor for serious complications, such as stroke, heart disease, kidney failure, and visual impairment. Based on data from the 2018 Riskesdas, the prevalence of hypertension in the elderly aged 65-74 years reached 45.9%, and in the elderly aged 75 years and over it reached 63.8% (4). This figure shows how important the prevention, detection, and management of hypertension are among the elderly. Globally, hypertension is also a major health problem, with the prevalence continuing to increase with age. According to the Global Burden of Disease 2019 report, around 1.13 billion people worldwide are living with hypertension, and more than 70% of them are over 50 years old. The prevalence of hypertension in the world is estimated to reach more than 30% of the global population, with higher rates in developing countries, including Indonesia (5). This shows that hypertension is a health problem that requires serious attention at the global level.

Several factors contribute to the occurrence of hypertension in the elderly. The main factors include physiological changes that occur with age, such as decreased elasticity of blood vessels and decreased capacity of the heart to pump blood (6). In addition, lifestyle factors such as unhealthy diet, lack of physical activity, smoking habits, and alcohol consumption also increase the risk of hypertension. A diet high in salt, saturated fat, and processed foods is closely associated with increased blood pressure. Smoking

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habits and alcohol consumption also contribute to narrowing of blood vessels, which in turn can increase blood pressure (7,8). Continuous emotional stress is also a factor that can worsen hypertension in the elderly.

Stress is one of the psychological factors that can affect blood pressure in the elderly. Acute stress can cause a temporary increase in blood pressure through the release of stress hormones, such as adrenaline and cortisol, which cause an increase in heart rate and vasoconstriction (narrowing of blood vessels) (9,10). In the elderly, chronic stress can cause a long-lasting increase in blood pressure, which in turn can trigger or worsen hypertension. The negative impact of chronic stress may be related to dysfunction of the sympathetic nervous system and endothelium, which increase inflammation and increase blood vessel resistance (11). Prolonged stress can worsen damage to blood vessels, increasing the risk of heart disease, stroke, and kidney disease in the elderly with hypertension.

Unhealthy diets, especially those high in salt, saturated fat, and sugar, play a significant role in increasing the risk of hypertension in the elderly. Processed foods, high in sodium, and low in potassium can cause fluid retention in the body, which increases blood volume and, ultimately, increases blood pressure (12). In addition, consuming foods high in saturated fat and cholesterol can increase the risk of blood vessel blockage (atherosclerosis) which triggers increased blood pressure (13). The relative risk of suffering from hypertension in someone who has abnormal nutrition is 5 times higher compared to people who have normal nutritional status (14). Conversely, a diet containing fruits, vegetables, and sources of healthy fats such as fish and nuts can help maintain blood pressure within normal limits.

Stress and poor diet are closely related in increasing the risk of hypertension in the elderly. Stress can cause disturbances in eating patterns, such as overeating or consuming unhealthy foods, which ultimately worsens hypertension (15). When someone experiences stress, the body tends to respond by eating more foods high in salt and fat as a way to get temporary comfort (16). This habit can worsen existing high blood pressure. In addition, chronic stress contributes to hormonal imbalances that can increase blood vessel resistance and worsen hypertension. Research shows that healthy dietary changes can help reduce the negative impact of stress on blood pressure, while effective stress management can improve diet and quality of life in the elderly with hypertension (17).

Several previous studies have investigated the relationship between stress, diet, and hypertension in the elderly. For example, a study showed that chronic stress is associated with increased blood pressure in the elderly, A high-sodium diet is closely associated with hypertension in the elderly population (18). However, most studies only examine one of these risk factors separately and have not considered the interactive relationship between stress and diet in influencing the incidence of hypertension in the elderly. In addition, there are few studies that focus on the elderly in Indonesia, especially regarding the combined effect of stress and diet on hypertension in the local population, which creates a gap in the existing literature (7). This study has high urgency because the prevalence of hypertension is increasing in the elderly in Indonesia. Hypertension that is not managed properly can worsen the quality of life of the elderly, cause disability, and increase premature mortality (19).

This study offers novelty by analyzing the interactive relationship between stress and dietary patterns on the incidence of hypertension among the elderly in Indonesia, particularly in West Java Province. Most previous studies have focused on either stress or dietary factors independently, without considering their combined effects on blood pressure in the elderly (7,16,20). Additionally, this research contributes uniquely by adopting a local context, reflecting the cultural and dietary habits of the Indonesian population, which may differ significantly from other countries. Given the limited research that examines the relationship between stress, diet, and hypertension comprehensively in the elderly in Indonesia, this study aims to identify and analyze the role of stress and diet on the incidence of hypertension in the elderly in Health Center Working Area in Sukabumi.

METHODS

Design

This study used a correlational design with a cross-sectional approach. The correlational design was chosen because it aims to determine the relationship between stress variables and diet with the

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incidence of hypertension in the elderly. The cross-sectional approach allows data collection to be carried out at a certain time, making it more efficient in terms of time and resources. With this design, researchers can identify patterns of relationships between variables simultaneously.

Study Participants and Selection

The population in this study consisted of all elderly individuals aged 60–79 years within the Health Center Working Area in Sukabumi, totaling 369 people. The sampling technique used cluster random sampling to ensure good representation of the entire population. Based on the Slovin formula with a 5% margin of error, the required sample size was 339 individuals. The final cluster selection resulted in a total sample of 339. The inclusion criteria were elderly individuals aged 60–79 years who were present at the research location and willing to participate. Respondents who declined participation were excluded. Data collection was conducted from February to August 2024..

The research instruments consisted of questionnaires and blood pressure measuring devices (tension meter and stethoscope). Stress variables were measured using a modified Perceived Stress Scale (PSS) questionnaire. The results were categorized into mild stress (≤14), moderate (>14 ≤21), and severe (>21) based on an ordinal scale (21). . Dietary variables were measured using the Food Frequency Questionnaire using a Likert scale with good interpretation if the score was >58 and poor if the score was ≤58 (22). For hypertension variables, measurements were taken using a tensiometer, with the results categorized as hypertension if blood pressure was ≥140/90 mmHg or not hypertension if <140/90 mmHg. Validity and reliability tests of the instrument were conducted using SPSS version 26.0. All questions on stress and diet variables were declared valid with a p-value <0.05, while their reliability was in the fairly strong category with Cronbach's Alpha values of 0.601 for stress and 0.677 for diet, respectively.

Collecting Data

Data collection was conducted directly using questionnaires and observations. Researchers visited selected respondents to provide and explain the questionnaire. This process provides flexibility for respondents to answer questions without pressure. Primary data was obtained from respondents' answers to the questionnaire, while secondary data was taken from journals, Health Center Working Area at West Java Province reports, and other literature references.

Statistical Analysis

The collected data were analyzed using SPSS software version 26.0. Data analysis includes univariate and bivariate analysis. Univariate analysis is used to describe the frequency distribution of each research variable, including respondent characteristics. Bivariate analysis is conducted to test the relationship between independent variables (stress and diet) with dependent variables (hypertension incidence) using the Chi-Square test. The results of the analysis are declared significant if the p-value <0.05. The data processing process involves several stages, including editing to verify the completeness of the data, coding to provide numeric codes to variables, scoring to change answers into numbers, and cleaning to check for data errors before being analyzed.

Ethical Consideration

This study has been approved by the STIKES Sukabumi Research Ethics Committee and is carried out in accordance with the principles of research ethics (No. 000722/KEP STIKES SUKABUMI/2024).

RESULTS

This study involved 339 respondents. Data tabulation based on demographic characteristics, including age, gender, education, and occupation, can be seen in Table 1.

Table 1. Distribution of Respondent Characteristics (n=339)

Characteristics	n	%
Age		
60-69 years	177	52.2
70-79 years	162	47.8
Gender		
Man	87	25.7
Woman	252	74.3

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Characteristics	n	%
Education		
Primary School	276	81.4
Junior High School	42	12.4
Senior High School	12	3.5
College	9	2.7
Work		
Work	69	20.4
Doesn't work	270	79.6

Based on Table 1, the majority of respondents were aged 60-69 years (52.2%, n=177), while the rest were aged 70-79 years (47.8%, n=162). In terms of gender, the majority of respondents were female, comprising 74.3% (n=252), while male respondents made up 25.7% (n=87). Regarding education level, most respondents had completed primary school, representing 81.4% (n=276), while only 2.7% (n=9) had college education. In terms of employment, the majority of respondents were not working (79.6%, n=270), and only 20.4% (n=69) were employed.

The results of descriptive analysis for stress variables, diet, and hypertension incidence in the elderly in Health Center Working Area in Sukabumi. These data show the frequency distribution and percentage for each category in the three variables studied.

Table 2. Descriptive Analysis of Stress Variables, Diet Patterns, and Hypertension Incidence

No.	Variables	Category	n	%
1.	**Stres**	Mild Stress	159	46.9
		Moderate Stress	180	53.1
2.	**Dietary habit**	Good	153	45.1
		Not good	186	54.8
3.	**Hypertension Incident**	Yes	183	54.0
		No	156	46.0
Total			339	100

Table 2 shows the frequency distribution and percentage for the variables of stress, diet, and hypertension incidence in the elderly in the Health Center Working Area in Sukabumi. In the stress variable, most respondents experienced moderate stress, with 180 respondents (53.1%) included in this category, while 159 respondents (46.9%) experienced mild stress. For the diet variable, the majority of the elderly had poor dietary habits, with 186 respondents (54.8%), while 153 respondents (45.1%) had good dietary habits. Regarding the incidence of hypertension, more than half of the respondents, 183 people (54.0%), experienced hypertension, while 156 people (46.0%) did not experience hypertension.

This analysis aims to see the relationship between stress and diet with the incidence of hypertension in the elderly. The results of the chi-square test are presented as follows:

Table 3. Relationship between Stress and Diet with Hypertension Incidence in the Elderly

Variables	Hypertension Incident				Total		P-value
	Yes		No				
	n	%	n	%	n	%	
Stress							
Mild Stress	81	50.9	78	49.1	159	100.0	0,001
Moderate Stress	102	57.7	78	43.3	180	100.0	
Dietary habit							0,001
Good	33	21.5	120	78.4	153	100.0	
Not Good	150	80.6	36	19.3	186	100.0	

Based on Table 3, the 159 respondents with mild stress, 50.9% (n=81) had hypertension and 49.1% (n=78) did not have hypertension. Meanwhile, of the 180 respondents with moderate stress, 57.7% (n=102) had hypertension and 43.3% (n=78) did not have hypertension. The results of the analysis showed

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a P-value of 0.000 (P-value < 0.05), which indicated a significant relationship between stress and the incidence of hypertension. In the dietary habit variable, of the 153 respondents with a good diet, 21.5% (n=33) had hypertension and 78.4% (n=120) did not have hypertension. Conversely, of the 186 respondents with a poor diet, 80.6% (n=150) had hypertension and 19.3% (n=36) did not have hypertension. The results of the analysis also showed a P-value of 0.000 (P-value < 0.05), indicating a significant relationship between diet and the incidence of hypertension in the elderly.

DISCUSSION

The results of the study showed that most elderly people experienced moderate stress (53.1%), while the rest experienced mild stress (46.9%). Stress contributes to increased blood pressure through activation of the sympathetic nervous system, which triggers the release of adrenaline and cortisol hormones, causing vasoconstriction that increases blood pressure. Elderly people with higher levels of stress are at risk of developing hypertension due to physiological changes, such as decreased blood vessel elasticity with age. Previous research supports this finding by stating that chronic stress in the elderly is closely related to an increased risk of hypertension through its effects on the cardiovascular system (23). In addition, other factors such as gender also influence, where women are more susceptible to hypertension due to decreased estrogen levels after menopause (24,25). Decreased estrogen reduces protection against blood vessels, thereby increasing the risk of cardiovascular disease.

Most respondents had low education (81.4% were elementary school graduates), which resulted in unhealthy lifestyles and increased the risk of hypertension. Low levels of education were closely related to a lack of understanding of the importance of a healthy lifestyle, including controlling blood pressure through appropriate diet and physical activity (26,27). Elderly people with low education tend to be unaware of the risks of consuming foods high in sodium and fat, which are the main triggers of hypertension. In addition, daily activities such as farming or gardening can also increase blood pressure due to heavy physical activity that is not balanced with good stress management (28). While farming involves regular physical activity, the elevated blood pressure observed in this group may stem from chronic physical exertion without sufficient recovery, combined with other lifestyle factors such as inadequate nutrition, prolonged sun exposure, or occupational stress unique to this setting. Occupational stress is another significant determinant affecting the blood pressure of farmers. Various studies highlight that farmers frequently encounter a myriad of stressors, including financial insecurity, unpredictable weather patterns, time pressures, and regulatory challenges (29,30). These stressors have been linked to psychological and physiological manifestations, including anxiety and chronic elevations in blood pressure. For instance, a mixed-methods analysis illustrated that farming-related stressors are notably higher compared to other occupations, leading to chronic physical health issues, including hypertension (30). The interaction of such stressors with lifestyle behaviors further complicates the health landscape for farmers, thus necessitating targeted interventions.

Decreased physical health due to aging, such as decreased muscle strength and endurance, exacerbates the inability of the elderly to carry out daily activities, thus triggering stress. Stress due to physical limitations and activity contributes to increased blood pressure in the elderly (31). Family support and education about a healthy lifestyle are important steps to reduce the impact of low education on the health of the elderly.

The majority of elderly people have poor diets (54.8%), characterized by the habit of consuming foods high in sodium, fat, and sugar, which are one of the main factors causing hypertension. Excessive sodium consumption increases blood volume, while excessive fat triggers plaque formation in blood vessels, thereby increasing blood pressure. Nutritional status is one of the factors that can increase a person's risk of hypertension (32). Consumption of poor quality will result in unbalanced health and nutritional conditions,resulting in various diseases (33).

Elderly people with poor diets tend to have higher blood pressure than those who maintain a balanced diet, because this habit worsens cardiovascular conditions (34). In addition, decreased taste and smell function in the elderly makes it difficult for them to enjoy healthy foods, so they prefer foods with strong flavors, such as salty or sweet foods. Poor diets are correlated with an increased prevalence of

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hypertension in the elderly (35). Efforts to improve diets, such as reducing salt and fat consumption and increasing fruit and vegetable intake, are very important to reduce the risk of hypertension in this population. Family education and support are also needed to help the elderly understand the importance of a healthy diet in maintaining their blood pressure (36).

Gender influences diet and hypertension, with women at higher risk of hypertension than men, especially after menopause. The decline in estrogen levels post-menopause reduces the protection of blood vessels, increasing the risk of hypertension. Poor eating habits and low physical activity are major factors that worsen this condition. Elderly women, especially those who are unemployed, tend to have limited access to information about healthy eating patterns and are more prone to consuming foods high in sodium and fat (37). Elderly women are more likely to suffer from hypertension due to a combination of hormonal and lifestyle factors (38). In addition, low levels of education further exacerbate the lack of understanding of the importance of maintaining a healthy diet. Health education by family and the surrounding environment is very important to help the elderly, especially women, understand how to maintain blood pressure through a healthy diet and appropriate physical activity (39). These efforts can significantly reduce the risk of hypertension and improve the quality of life of the elderly.

The results of the chi-square test showed a significant relationship between stress, diet, and the incidence of hypertension in the elderly (P-value <0.05). Elderly people with moderate stress have a higher prevalence of hypertension than those with mild stress. This can be explained by the activation of the sympathetic nervous system due to stress, which triggers an increase in blood pressure through the release of adrenaline and cortisol hormones. On the other hand, poor diet, such as excessive consumption of foods high in sodium and fat, is also an important factor contributing to hypertension. Previous research state that the combination of poor diet and stress significantly increases the risk of hypertension (40). These findings emphasize the need for effective stress management strategies and dietary improvements, such as reducing salt consumption, increasing fiber intake, and educating about the importance of a healthy lifestyle (41). Such interventions can be key to reducing the incidence of hypertension in the elderly and improving their overall quality of life.

The relationship between stress, diet, and hypertension can be understood through physiological mechanisms and behavioral habits. Prolonged stress continuously activates the sympathetic nervous system, causing vasoconstriction or narrowing of blood vessels, thereby increasing blood pressure (42). In addition, stress can also affect a person's diet, where individuals who experience stress tend to seek comfort through consuming foods high in salt, fat, or sugar, which directly contribute to increased blood pressure (43). Not good diet worsens hypertension through physiological mechanisms such as increased fluid retention due to excessive sodium consumption and plaque buildup in blood vessels due to high fat intake. The combination of these two factors creates a mutually reinforcing circle, where stress affects diet and vice versa, Not Good diet worsens stress and hypertension (31,44).

This study emphasizes the importance of interventions in stress management and diet in the elderly to prevent and control hypertension. Health education through campaign programs that emphasize the importance of a low-sodium, low-fat diet and balanced food consumption can be an effective step in reducing hypertension rates. In addition, families play a key role in supporting the elderly to maintain a healthy diet and lifestyle, such as avoiding foods that can trigger high blood pressure. Regular light physical activity, such as walking or elderly gymnastics, is also highly recommended to improve cardiovascular health and maintain stable blood pressure. Community support and health care facilities in providing education and routine monitoring for the elderly are also needed to ensure the sustainability of this intervention. With these steps, it is hoped that the quality of life of the elderly can be improved and the incidence of hypertension can be reduced significantly.

Study Limitations : This cross-sectional design precludes causal inference; stress and diet were self-reported and thus subject to recall and social-desirability bias; Cronbach's α values of 0.60–0.68 indicate moderate internal consistency; the sample was limited to one health-center catchment area, potentially restricting generalisability; and unmeasured factors such as medication adherence, seasonality, and genetic predisposition may have confounded the observed associations.

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CONCLUSION

This study highlights the significant relationship between moderate stress, poor dietary habits, and the incidence of hypertension among the elderly in Sukabumi, emphasizing the importance of targeted interventions in nursing practice and public health. These findings underscore the need for stress management and dietary education programs to reduce hypertension risk in this population. Future research should focus on developing and evaluating specific interventions using longitudinal or randomized controlled designs to assess the long-term effectiveness of these strategies in improving cardiovascular health among the elderly.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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