JUSINDO, Vol. 8 No. 1, January – June 2026
p-ISSN: 2303-288X, e-ISSN: 2541-7207

The Relationship Between Age, Stress Levels, Physical Activity, and Sleep Quality and The Incidence of Hypertension Among The Elderly

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Keywords:
Age; Stress Level; Physical Activity; Sleep Quality; Hypertension; Elderly.

Abstract

Hypertension is a condition of elevated blood pressure >140/90 mmHg, which is influenced by various factors. One non-modifiable factor is age, as increasing age leads to a decrease in blood vessel elasticity, which increases the risk of hypertension. Furthermore, modifiable factors such as low physical activity, stress levels, and poor sleep quality also play a role in increasing blood pressure. To determine the relationship between age, stress levels, physical activity, and sleep quality with the incidence of hypertension. This study is an observational study with a total sampling technique and uses the Spearman rank test. The sample in this study were elderly people at the Aisyiyah Pajangan Branch with a population of 120 elderly people and 71 elderly people suffered from hypertension. The variables in this study were age, stress level, physical activity and sleep quality as independent variables and hypertension as dependent. The measuring instruments used were the Perceived Stress Scale (PSS-10) for stress levels, the Physical Activity Scale for Elderly (PASE) for physical activity, the Pittsburgh Sleep Quality Index (PSQI) for sleep quality and a sphygmomanometer to measure blood pressure. There is no relationship between age and hypertension p=0.463 (p>0.05), there is no relationship between stress levels and hypertension p=0.324 (p>0.05), there is a relationship between physical activity and hypertension p=0.023 (p<0.05), and there is no relationship between sleep quality and hypertension p=0.413 (p>0.05). There is no relationship between age, stress level, sleep quality and the incidence of hypertension and there is a relationship between physical activity and the incidence of hypertension.

INTRODUCTION

A person is categorized as elderly if they are over 60 years old who has experienced significant changes and declines in physical, psychological, and social aspects of social life (Amelia et al., 2024). Based on data from the World Health Organization (WHO), by 2030 around 1 in 6 people in the world will be 60 years old and older. The number of elderly people is projected to increase from 1 billion in 2023 to 1.4 billion in 2030 (WHO, 2025). In the Southeast Asian region by 2050, the elderly population is estimated to reach around 8% of the total population, which is around 142 million people, which is estimated to continue to increase up to 3 times (Siregar, 2023).

According to data from the Central Statistics Agency (2023), the percentage of the elderly population in Indonesia has increased by 4% in the last ten years. In 2022, the number of elderly people reached 11.75% of the total population, with a life expectancy recorded at 71.85 years (Arywibowo & Rozi, 2024). One of the provinces with the highest percentage of elderly is the Special Region of Yogyakarta, which in 2024 will reach 16.8% among its regions, Bantul Regency has a fairly large distribution of the elderly population, with the age category of 60–64 years old at 49.5%, age 65–69 years old at 35.6%, age 70-74 years old at 26.2%, and elderly aged 75 years and above as much as 31.5% (BPS, 2024).

The increase in the number of elderly people is closely related to the increase in life expectancy, which affects social, economic, and health aspects. As we age, the function of the body's organs decreases due to natural processes or diseases, with health problems for the elderly generally in the form of degenerative non-communicable diseases. Degenerative diseases are divided into neoplastic, nervous system disorders, and cardiovascular, where hypertension is a form of cardiovascular disease (Ministry of Health, 2022). Hypertension is a condition when systolic blood pressure exceeds 140 mmHg and diastolic blood pressure exceeds 90 mmHg (Kusuma et al., 2025). Globally, the World Health Organization (2024) reports that the number of people with hypertension is estimated to reach 1.4 billion people and this figure is projected to increase to 29.2% by 2025, while in the Southeast Asian region the prevalence reaches 36%. In Indonesia, the prevalence of hypertension in the elderly group is recorded at 32.5% (Nirmala & Prajayanti, 2025). In Yogyakarta, the number of patients undergoing treatment for hypertension in 2025 will reach 58.31% (Yogyakarta Health Office, 2025). Meanwhile, in the Bantul area, there are 15,785 people who suffer from hypertension (Health Office, 2024).

Hypertension is called the "silent killer" because it often has no obvious symptoms, so many sufferers are unaware until complications appear (Karpman, 2020; Organization, 2023). This condition is further aggravated by stress. Stress arises due to pressure from the surrounding environment that stimulates physiological and psychological responses, thus triggering an increase in blood pressure in people with hypertension, especially when combined with physical inactivity that exacerbates vasoconstriction (Marwaha, 2022; Ushakov et al., 2017). Stress does not look at age and is categorized into three levels: mild, moderate, and severe (Situmorang et al., 2020).

Regular physical activity can reduce the occurrence of atherosclerosis, one of the main causes of hypertension, thus helping to maintain blood pressure stability (Saladini, 2024). The World Health Organization (2022) reported that globally the prevalence of adult physical inactivity reached 31% (1.8 billion people) in 2022, with a sharp increase after the age of 60 to >40% in some regions such as the Eastern Mediterranean (40%) and Southeast Asia (40%). Seniors ≥60 years old experience a significant spike in physical inactivity, thus contributing to an increased risk of hypertension. Based on the Indonesian Health Survey (SKI), the Ministry of Health found that in Indonesia the elderly who lack physical activity are 52.8 percent. Lack of physical activity has a 20% to 30% higher risk of death compared to moderately active people (WHO, 2022).

The results of a meta-analysis involving 181,000 elderly people in various countries showed that 47.12% had poor sleep quality, 40.81% experienced short sleep duration, and 21.15% experienced symptoms of insomnia (Du et al., 2024). In the hypertensive patient group, the prevalence of poor sleep quality reached 52.5% of the total 13,920 respondents. In addition, the elderly with hypertension were recorded to have a 2,625 times higher risk of falling due to sleep disorders (Arsic et al., 2022). This risk is greater than in the younger age group because it is influenced by age factors, low levels of physical activity, and the presence of comorbidities (Berk et al., 2023; Ciumărnean et al., 2021; Yu et al., 2017).

In general, the incidence of hypertension is influenced by two groups of factors, namely irreversible factors and modifiable factors. Irreversible factors include age, gender, and genetic history. Meanwhile, factors that can be changed include obesity, smoking habits, lack of

physical activity, excessive salt consumption, dyslipidemia, high alcohol consumption, and stress (Luh et al., 2020). Some of these factors, age is one of the main determinants that is closely related to the incidence of hypertension (Nawi et al., 2021). This happens because the natural aging process causes changes in the heart, blood vessels, as well as the hormonal system. As we age, the cardiovascular system experiences decreased function which contributes to endothelial dysfunction and increased arterial stiffness, especially those associated with systolic hypertension in the elderly (Laurent & Boutouyrie, 2020). Aging causes a decrease in cardiovascular function that triggers hypertension in the elderly.

Hypertension arises due to risk factors that work together, so one factor alone is not enough to cause hypertension (Fitriayani et al., 2020). Psychological factors play a role as a trigger for an increase in blood pressure, especially in late adulthood and the elderly. Stress as one of the psychological factors that often arise with age, synergize with changes in the cardiovascular system that increase the burden on the heart (M. Sari et al., 2025)

Based on these factors, there are physical activities that have a direct role in influencing blood pressure. A person who rarely does physical activity tends to have a higher heart rate, so the heart muscle has to work harder every time it contracts. The greater the heart's effort to pump blood, the higher the pressure exerted on the artery walls, which ultimately increases peripheral resistance and triggers an increase in blood pressure (Makawekes et al., 2020). In the elderly group, physical inactivity is closely related to an increased risk of the occurrence of Isolated Systolic Hypertension (HST), where the risk is higher compared to individuals who regularly do sports activities (Ragazzoni et al., 2025; Xie et al., 2021).

According to the National Sleep Foundation (2025), sleep disorders include various conditions that affect the quality, timing, or duration of sleep thereby inhibiting a person's ability to function optimally. Data shows that about 57% of the elderly experience a decrease in sleep quality due to the aging process that changes sleep patterns and decreases the function of the central nervous system. This condition can cause daytime sleepiness, increase the risk of falling, interfere with cognitive function, and trigger disorientation, which overall has an impact on a decrease in quality of life. Physiological changes such as decreased melatonin production also make it more difficult for the elderly to start or maintain sleep, and this can be exacerbated by comorbidities such as hypertension (National Sleep Foundation, 2025). Lack of sleep can interfere with metabolic processes and the functioning of the endocrine system, thereby increasing the risk of cardiovascular problems such as hypertension. Poor sleep quality also weakens the immune system, which is characterized by feeling tired and weak quickly, and triggers an increase in the stress hormone cortisol and sympathetic nerve activity (Ningtyas, 2024). Both responses play a role in increasing blood pressure.

Sleep quality is a complex combination of duration, latency, efficiency, to sleep disorders such as apnea, where disturbances in one of these aspects can reduce sleep quality even though the sleep duration appears normal (Fabbri et al., 2021). This problem becomes crucial as the elderly population soars and hypertension rates as a silent killer, considering that the interaction between age factors, stress levels, lack of physical activity, and poor sleep quality can worsen metabolic disorders and blood pressure. In response to the projected population of the elderly ≥60 years old which will reach 2.1 billion by 2050, the World Health Organization (WHO) initiated the Decade of Healthy Ageing 2021-2030 program which focuses on functional ability and independence through the age-friendly cities strategy, ICOPE integrated service approach,

and innovative research to create physical, mental, and social balance for the elderly (Rudnicka et al., 2020).

Japan has implemented strategic regulations through Long Term Care Insurance (LTCI) to support healthy ageing and independence for the elderly (Nakatani, 2019), which is in line with policies in Indonesia through Permenkes No. 65 of 2015 and No. 25 of 2016 which emphasize the crucial role of physiotherapy in promotive, preventive, curative, and rehabilitative services. Physiotherapy services are an integral part of controlling hypertension in the elderly by restoring movement function through physical activity, muscle strengthening, and community-based education to reduce the risk of cardiovascular complications. The urgency of this research lies in understanding the relationship between age (arterial stiffness), stress levels (vasoconstriction hormones), physical activity (vascular fat), and sleep quality (cortisol spikes) as the main triggering factors for hypertension, which is also in line with the natural human journey described in the Qur'an Surah Al-Mu'min: 67. A preliminary study at PCA Pajangan, Bantul, showed that 42 out of 70 members experienced hypertension due to lifestyle factors and demographic challenges in Yogyakarta as the province with the largest proportion of elderly, so appropriate physiotherapy interventions were needed to improve their quality of life amid limited access to health.

The urgency of this research is underscored by the projected increase of the elderly population aged ≥60 years, which is expected to reach 2.1 billion globally by 2050. In response, the World Health Organization initiated the Decade of Healthy Ageing 2021-2030 program, which focuses on functional ability and independence through age-friendly cities strategies, integrated ICOPE service approaches, and innovative research to create physical, mental, and social balance for the elderly (Rudnicka et al., 2020). Preliminary studies conducted at PCA Pajangan, Bantul, showed that 42 out of 70 elderly members experienced hypertension related to lifestyle factors and demographic challenges. As the province with the largest proportion of elderly in Indonesia, Yogyakarta requires appropriate interventions to improve the quality of life for its aging population amid limited access to healthcare. This research is urgent because understanding the specific relationships between modifiable risk factors and hypertension can inform targeted, evidence-based interventions for the elderly population.

Based on the background by considering the high risk of hypertension in the elderly and the importance of factors that affect it. Given that hypertension is one of the diseases that many elderly suffer from, and the prevalence of sufferers continues to increase from year to year. Therefore, this study aims to comprehensively analyze the relationship between age, stress levels, physical activity, and sleep quality on the incidence of hypertension in the elderly. More specifically, the specific objectives of this study were to identify how age factors are related to increased blood pressure, test the influence of stress levels on cardiovascular stability, and evaluate the contribution of physical activity and sleep quality in influencing the risk of hypertension in the elderly group.

RESEARCH METHODS

This quantitative study used an analytical observational design with a cross-sectional approach to analyze the relationship between independent variables (age, stress level, physical activity, and sleep quality) and the incidence of hypertension in the elderly as dependent variables. The research population included 120 elderly people in the Aisyiyah Branch

Executive (PCA) Pajangan, Bantul, with a sample of 71 respondents selected through a total sampling technique based on strict inclusion and exclusion criteria. The research instruments include PSS-10, PASE, PSQI questionnaires, and blood pressure measurements using sphygmomanometers, all of which have passed research ethics procedures such as ethical clearance and informed consent. The collected data is then processed through the stages of editing, coding, entry, and tabulating before being analyzed univariate and bivariate using the Spearman Rank correlation test to determine the direction, strength, and significance of the relationship between variables.

RESULTS AND DISCUSSION

Research Results

A. Description of Research Data

1. Univariate Analysis

a. Stress levels

From the measurement results using *the Perceived Stress Scale* (PSS-10) to determine the level of stress, the results are presented in the table as follows:

Table 1. Perceived *Stress Scale* (PSS-10) Measurement Results

Category	Frequency (F)	Percentage (%)
Lightweight	17	23,9
Medium	54	76,1
Weight	0	0
Total	71	100

Based on the table above, it can be seen that the highest score in the medium category with a frequency of 54 (23.9%) respondents and the lowest score in the heavy category with a frequency of 0 (0%) respondents.

b. Physical Activity

From the measurement results using *the Physical Activity Scale for Elderly* (PASE) to find out the level of physical activity, the results are presented in the table as follows:

Table 2. Physical *Activity Scale for Elderly* (PASE) Measurement Results

Category	Frequency (F)	Percentage (%)
Less	36	50,7
Medium	35	49,3
Good	0	0
Total	71	100

Based on the table above, it can be seen that the highest score in the low category with a frequency of 36 (50.7%) respondents and the lowest score in the good category with a frequency of 0 (0%) respondents.

c. Quality of sleep

From the measurement results using *the Pittsburgh Sleep Quality Index* (PSQI) to determine the level of sleep quality, the results are presented in the table as follows:

Table 3. *Pittsburgh Sleep Quality Index* (PSQI) Measurement Results

Category	Frequency (F)	Percentage (%)
Good	14	19,7
Bad	44	62,0
Very bad	13	18,3

Total	71	100

Based on the table above, it can be seen that the highest score in the bad category with a frequency of 44 (62%) respondents and the lowest score in the very bad category with a frequency of 13 (18.3%) respondents.

d. Hypertension

From the measurement results using *a Sphygmomanometer* to find out the number of hypertension levels, the results are presented in the table as follows:

Table 4. *Sphygmomanometer Measurement Results*

Category	Frequency (F)	Percentage (%)
Hypertension I	57	80,3
Hypertension II	11	15,5
Hypertension III	3	4,2
Total	71	100

Based on the table above, it can be seen that the highest score in the hypertension category I with a frequency of 57 (80.3%) respondents and the lowest score in the hypertension category III with a frequency of 3 (4.2%) respondents.

2. Bivariate Analysis

a. Age with Hypertension

From the results of bivariate analysis, the relationship between age and hypertension is presented in the table as follows:

Table 5. Relationship between Age and Hypertension

Category		Hypertension			Total
		Hypertension I	Hypertension II	Hypertension III	
Age	Seniors 60-74 years old	52	10	3	65
	Elderly aged 75-90 years old	4	1	0	5
	Very old >90 years old	1	0	0	1
	Total	57	11	3	71

Table 5 shows that from 71 respondents, the highest score was obtained in the elderly category 60-74 years old with a total of 65 respondents, hypertension I which was 52 respondents, hypertension II which was 10 and hypertension III which was 3 respondents. The lowest score in the category of very old people >90 years old with hypertension I was 1 respondent.

The correlation test of age with hypertension, from the results of bivariate analysis using *the spearman rank* test is presented in the table as follows:

Table 6. Spearman Rank Test Analysis Results

Variabel	*Correlation coefficient*	*Sig (p)*
Age	0,088	0,463

From table 6, it can be seen that there is no insignificant correlation between age and hypertension $p = 0.463$ ($p>0.05$). *The correlation based on the direction of the relationship is positive, while the correlation strength that occurs is 0.088, which means that the correlation strength is very weak.*

b. Stress Levels with Hypertension

From the results of bivariate analysis, the relationship between stress level and hypertension is presented in the table as follows:

Table 7. Relationship between Stress Levels and Hypertension

	Category	Hypertension			Total
		Hypertension I	Hypertension II	Hypertension III	
Stress levels	Lightweight	12	5	0	17
	Medium	45	6	3	54
	Weight	0	0	0	0
	Total	57	11	3	71

Table 7 shows that from 71 respondents, the highest score was obtained in the medium category with a total of 54 respondents, hypertension I as many as 45, hypertension II as many as 6, and hypertension III as many as 3. The lowest score was in the mild category with a total of 17 respondents, hypertension I as many as 12, and hypertension II as many as 5 respondents.

The correlation test of stress level with hypertension, from the results of bivariate analysis using *the spearman rank* test is presented in the following table:

Table 8. Spearman Rank Test Analysis Results

Variabel	*Correlation coefficient*	*Sig (p)*
Stress Levels	-0,119	0,324

From table 8, it can be seen that there is no insignificant correlation between stress levels and hypertension $p = 0.324$ ($p>0.05$). *The correlation based on the direction of the relationship is negative, while the correlation strength that occurs is 0.119, which means that the correlation strength is very weak.*

c. Physical Activity with Hypertension

From the results of the bivariate analysis, the relationship between physical activity and hypertension is presented in the table as follows:

Table 9. Relationship between physical activity and hypertension

	Category	Hypertension			Total
		Hypertension I	Hypertension II	Hypertension III	
Physical activity	Less	25	9	2	36
	Medium	32	2	1	35
	Good	0	0	0	0
	Total	57	11	3	71

Table 9 shows that from 71 respondents, the highest score in the understated category was obtained with a total of 36 respondents, hypertension I as many as 25, hypertension II as many as 9, and hypertension III as many as 2 respondents. The lowest score was in the moderate category with a total of 35 respondents, hypertension I as many as 32, hypertension II as many as 2, and hypertension III as many as 1 respondent.

The correlation test of physical activity with hypertension, from the results of bivariate analysis using *the spearman rank* test is presented in the following table:

Table 10. Spearman Rank Test Analysis Results

Variabel	*Correlation coefficient*	*Sig (p)*

Physical activity	-0,270	0,023

From table 10, it can be seen that there is a significant correlation between physical activity and hypertension $p = 0.023$ (*$p<0.05$). The correlation based on the direction of the relationship is negative, while the correlation strength that occurs is 0.270, which means that the correlation strength is weak.*

d. Quality of Sleep with Hypertension

From the results of the bivariate analysis, the relationship between sleep quality and hypertension is presented in the table as follows:

Table 11. Relationship between Sleep Quality and Hypertension

		Hypertension			
	Category	Hypertension I	Hypertension II	Hypertension III	**Total**
Quality of sleep	Good	10	3	1	14
	Bad	36	7	1	44
	Very bad	11	1	1	13
	Total	57	11	3	71

Table 11 shows that from 71 respondents, the highest score in the bad category was obtained with a total of 44 respondents, hypertension I as many as 36 respondents, hypertension II as many as 7 respondents and hypertension III as many as 1 respondent. The lowest score was in the very poor category with a total of 13 respondents, hypertension I as many as 11 respondents, hypertension II as many as 1 respondent and hypertension III as many as 1 respondent.

The correlation test of age with hypertension, from the results of bivariate analysis using *the spearman rank* test is presented in the table as follows:

Table 12. Spearman Rank Test Analysis Results

Variabel	*Correlation coefficient*	*Sig (p)*
Quality of sleep	-0,099	0,413

From table 12, it can be seen that there is no insignificant correlation between sleep quality and hypertension $p = 0.413$ (*$p>0.05$). The correlation based on the direction of the relationship is negative, while the correlation strength that occurs is 0.099, which means that the correlation strength is very low.*

1. Relationship between Age and Hypertension Incidence

Age is one of the non-modified risk factors that has a role in the incidence of hypertension. As you get older, blood pressure will increase. Physiologically, increasing age causes various changes in the cardiovascular system, especially decreased arterial stiffness, increased peripheral resistance, and decreased endothelial function. This condition causes blood vessels to become stiffer so that blood pressure increases. (Zainal et al., 2025).

Based on the results of the spearman rank test, the results were obtained $p = 0.463$ ($p>0.05$), so it can be said that there is no relationship between age and the incidence of hypertension statistically. This is in line with previous research which obtained the results of $p = 0.486$ ($p>0.05$) which means that there is no significant relationship between age and the incidence of hypertension (Zainal et al., 2025). This shows that increasing age is not always the main factor that determines the occurrence of hypertension in the elderly. The absence of a

relationship can occur because the number of elderly people 60-74 years old who experience hypertension I is 65 (91.5%) respondents, a non-smoking lifestyle of 71 (100%) respondents, a normal BMI of 30 (42.3), a diet that does not consume excess salt as many as 46 (64.8%) respondents.

Based on table 4.15, elderly blood pressure occurs in hypertension I, namely 65 (91.5%) respondents, in line with previous research which found that most elderly respondents > 60 years old have hypertension I as much as 79 (68.1%) (Windani et al., 2019).

Age is not necessarily the main determining factor for the incidence of hypertension in the elderly group. The insignificance of the relationship can be caused by several factors. First, the respondents in this study were almost entirely in the elderly group, so the relatively homogeneous age range caused the data to vary small and the relationship between variables to be statistically difficult to detect. Second, hypertension is a condition that is influenced by various other factors such as physical activity and lifestyle habits, so that the influence of age can be covered by other factors that are more dominant (Karayiannis, 2022; Damayanti & Isnaini, 2023). In addition, age as a risk factor for hypertension should be analyzed simultaneously with other risk factors in order to provide a more comprehensive and comprehensive picture of the health condition of the elderly.

In this study, most of the respondents did not have a smoking habit. This is likely influenced by the characteristics of respondents who are dominated by women. In general, the prevalence of smoking behavior in women is lower than in men, especially in the elderly age group. In line with previous research which stated that there was no significant relationship between smoking habits and the incidence of high blood pressure, in the study respondents who did not smoke were more than respondents who had a history of smoking, this was due to the majority of female respondents in both the case and control groups (Windani et al., 2019).

Physiologically, smoking is known to increase blood pressure through various mechanisms, such as stimulation of the sympathetic nervous system due to nicotine content that causes vasoconstriction of blood vessels, increased heart rate, and increased peripheral resistance. In addition, exposure to chemicals in cigarettes can also trigger endothelial dysfunction and increase the stiffness of blood vessels which contributes to increased blood pressure. Therefore, individuals who have a smoking habit tend to have a higher risk of developing hypertension compared to individuals who do not smoke (Münzel et al., 2025).

Respondents with many categories of normal BMI in this study were 30 (42.3%) where individuals with normal BMI tended to have a lower risk of hypertension compared to individuals who were overweight or obese. Physiologically, individuals with a normal Body Mass Index (BMI) have a more balanced fat tissue composition so that it does not trigger an increase in sympathetic nervous system activity or excessive fluid retention. This condition plays a role in maintaining the elasticity of blood vessels and maintaining a balance of blood volume, so that blood pressure can remain in a stable condition. On the other hand, weight gain, especially in overweight and obesity conditions, can contribute to increased blood pressure. Excessive accumulation of body fat can stimulate the activity of the sympathetic nervous system as well as lead to sodium retention in the body. This condition can increase blood volume and blood vessel resistance, so that blood pressure can gradually increase and potentially cause hypertension (Suharni, 2023).

Previous studies have also shown a relationship between BMI and blood pressure, where individuals with higher BMI have a greater risk of hypertension compared to individuals with normal BMI. This shows that weight gain is one of the risk factors that can trigger hypertension through changes in hemodynamic and metabolic mechanisms in the body (Meilani et al., 2026).

High salt consumption can affect changes in blood pressure. Sodium chloride intake that exceeds 6 grams per day, or the equivalent of more than one tablespoon, can increase the risk of increased blood pressure. Physiologically, normal amounts of salt play an important role in maintaining the electrolyte balance of cells and helping to maintain the body's fluid balance. However, when consumed in excess, sodium can cause fluid retention in the body so that blood volume increases. The increase in blood volume is not accompanied by the dilation of blood vessels, so the pressure on the blood vessel walls becomes higher and has the potential to cause hypertension (Elvira & Anggraini, 2019). This is reinforced by previous research that states that there is a relationship between the consumption of foods high in salt and the risk of hypertension. As many as 88% of respondents with hypertension consume foods high in salt and processed foods such as instant noodles, salted fish, soy sauce, and shrimp paste, which have a high sodium content and unknowingly contribute to an increase in blood pressure (Nurhasanah et al., 2025). This shows that the higher the salt consumption, the greater the risk of a person experiencing high blood pressure.

Thus, it can be concluded that age does not have a significant relationship with the incidence of hypertension in the elderly. This shows that increasing age is not always the main factor that determines the occurrence of hypertension. This condition was followed by respondents' non-smoking habits, low-salt diet, and normal BMI, which affected blood pressure conditions in the elderly. In addition, some elderly people may have implemented a healthy lifestyle such as not smoking, maintaining a diet, and reducing salt consumption, so that it can help maintain stable blood pressure even though it continues to grow. This shows that lifestyle factors have a role in controlling blood pressure in the elderly.

2. The Relationship between Stress Level and Hypertension Incidence

Stress can affect blood pressure through the activation of the sympathetic nervous system and the release of stress hormones, such as adrenaline and cortisol, which lead to an increase in heart rate, blood frequency, peripheral vascular resistance as well as narrowing of blood vessels so that blood pressure increases (Delalio et al., 2021).

The results of the study showed that the incidence of hypertension was higher in the elderly with moderate stress levels of 54 respondents than in the elderly with mild stress levels of 17 respondents and severe. Based on the relationship between stress level and hypertension incidence using the spearman rank test, the results were obtained $p = 0.324$ ($p>0.05$), then it is said that there is no relationship between stress level and hypertension incidence statistically. This is in line with previous research that obtained $p = (0.080)$ ($p \geq 0.05$), meaning that there is no meaningful relationship between stress levels and the incidence of hypertension in the elderly (Husnaniyah & Melita, 2022). This suggests that stress is not always the main factor affecting blood pressure in the elderly. The factor that caused insignificance was that as many as 53 respondents still lived with their spouses and families so they tended to be calmer and full of motivational support. The insignificance of this relationship can also occur because the increase in blood pressure due to stress is generally temporary and will return to normal once

the stress condition subsides or the individual is able to adapt to the stress experienced. This explains that stress does not always cause chronic hypertension.

At the time of filling out the questionnaire with PSS-10, the most score was a score of 0 (never) in question number 10 there were 47 respondents answering 0 (never), namely with the question "How often do you feel difficulties that accumulate so that you are unable to overcome them?". This shows that the elderly never feel that they have many difficulties or problems.

Individuals who live with a partner tend to have lower levels of stress than those who live alone (Suparti & Handayani, 2018). Elderly people who live with their spouses have the opportunity to share with each other and work together in facing various life problems. Partner support plays an important role in creating calm, increasing motivation, and helping the elderly in accepting the aging process they experience. This support makes the elderly more able to find the meaning of life and feel satisfaction in their lives. In addition, partner support helps the elderly solve problems, because the existence of emotional support can increase confidence and strengthen motivation in facing various challenges that may arise (Refialdinata & Gutri, 2022).

Family support is important for individuals in resolving problems. If there is support, then confidence increases and motivation increases. The family plays a role in guiding and providing solutions. The positive expression given is in the form of appreciation in order to make positive thoughts in the elderly where we can provide information and state that he is appreciated and accepted despite mistakes (Lidia et al., 2020).

Based on this explanation, it can be concluded that the low stress level in this study can be caused by the large number of respondents who still live with their spouses and families, so that motivational support can increase the confidence of the elderly in facing various life challenges. In addition, the characteristics of respondents can also affect the results of the study. If most of the respondents were at the level of mild to moderate stress, then the variation of the data became so limited that the association between stress and hypertension was difficult to detect significantly. Although physiologically stress can increase blood pressure through the activation of the sympathetic nervous system and the release of stress hormones, these increases are generally temporary and do not always develop into chronic hypertension.

3. The Relationship of Physical Activity with the Incidence of Hypertension

The results of this study showed that there was a significant relationship between physical activity and the incidence of hypertension in the elderly with the results of the spearman rank test $p = 0.023$ ($p < 0.05$). Seniors with low levels of physical activity have a greater tendency to experience hypertension compared to seniors who do regular physical activity. These findings indicate that physical activity is an important factor in maintaining blood pressure stability in the elderly age group. These findings are in line with previous research that showed that there was a significant relationship between physical activity and the incidence of hypertension in the elderly ($p < 0.05$), where the elderly with low physical activity had a higher risk of developing hypertension (Intan et al., 2025). There was a relationship in this study because many elderly people had less activity as many as 36 respondents and medium 35 respondents, less physical activity was also caused by 53 elderly people who did not work.

Physical activity plays a role in improving the performance of the cardiovascular system. When a person performs physical activity regularly, the heart will work more efficiently so that the volume of blood pumped per pulse increases, peripheral resistance decreases, and the

elasticity of blood vessels increases. This process directly helps lower blood pressure both acutely after exercise and long-term if activities are done regularly. Previous research has shown that the elderly with higher levels of physical activity have a lower incidence of hypertension compared to the elderly with low or moderate physical activity (Handayani et al., 2023). In addition, physical activity can also help regulate weight and improve insulin sensitivity, all of which are risk factors for hypertension. Other studies have also reported that physical activity, such as walking, swimming, or light gymnastics, effectively helps lower blood pressure and improve overall cardiovascular health in hypertensive seniors (Sasarari et al., 2024)

Regular physical activity can increase the production of nitric oxide in the endothelium of blood vessels. Nitric oxide functions as a vasodilator that helps blood vessels stay elastic and able to adapt to changes in blood flow. In the elderly who are less active, there is an increase in arterial stiffness which leads to an increase in systolic blood pressure.

In addition to the general level of physical activity, the respondents' occupational characteristics may also be factors that affect the incidence of hypertension in this study. Based on the results of the study, as many as 53 respondents were not working. This condition has the potential to affect low levels of daily physical activity, as individuals who are not working tend to have more limited regular activities compared to individuals who are still actively working. Lack of physical activity can lead to decreased cardiovascular fitness, reduced elasticity of blood vessels, as well as increased peripheral resistance (Lidia et al., 2020). When a person lacks activity, his heart will work harder to pump and faster in each contraction. In the elderly, the status of not working is often followed by a more sedentary lifestyle, such as sitting more, resting, or doing light activities for a short duration. Lack of activity by the elderly is an influence that can cause an increase in blood pressure.

In addition, gender can also affect physical activity patterns that result in hypertension. Males are more physically active than females, because males' power and speed are higher. In men, high levels of testosterone can improve performance in strenuous and intense physical activity (Ariyani et al., 2024). According to this study, the number of respondents was higher in women so the performance was much lower than that of men.

Based on the results of the study and supported by physiological theories and previous research, it can be concluded that physical activity has a significant role in the incidence of hypertension in the elderly. Lack of physical activity by the elderly is an influence that can cause a blood increase. Seniors with regular physical activity such as walking, light gymnastics, or gardening showed better cardiovascular adaptability than inactive seniors. Physical activity not only helps to reduce blood pressure levels, but also improves stamina, body balance, and quality of life. Therefore, regular increase in physical activity is an effective preventive strategy in controlling hypertension in the elderly.

4. The Relationship between Sleep Quality and the Incidence of Hypertension

Sleep quality is a state that individuals live to get freshness and fitness when they wake up from their sleep. Sleep quality is said to be good if it does not show signs of sleep deprivation and does not experience problems in sleep (Ningtyas, 2024). Individuals who experience sleep deprivation are at risk of metabolic and endocrine system disorders that contribute to the

occurrence of hypertension. Poor sleep quality can also reduce the body's immune system, characterized by being easily tired and weak, as well as triggering changes in levels of the stress hormone cortisol and increased activity of the sympathetic nervous system, resulting in an increase in blood pressure. Hypertensive people need good sleep quality to improve health and restore body condition to stay healthy (Ningtyas, 2024).

Based on the results of the spearman rank test, the results of p = 0.413 (p>0.05) showed that there was no significant relationship between sleep quality and the incidence of hypertension. This is in line with previous research which showed that there was no significant relationship between sleep quality and the incidence of hypertension in the elderly with a p-value = 0.669 (p > 0.05) (Saputra & Daniati, 2021). The results showed that statistically there was no statistically significant relationship between sleep quality and the incidence of hypertension, but in terms of frequency distribution, it was seen that respondents who experienced hypertension were more in the group with poor sleep quality. This condition shows a tendency but is not statistically strong enough to be declared to have a meaningful relationship. This difference between statistical test results and frequency distribution can be explained by the fact that the Spearman Rank statistical test not only looks at numbers, but also considers the strength of relationships, data variations, and proportions between groups. This shows that, although descriptively the number of elderly people with poor sleep quality is more likely to experience hypertension, the strength of the very weak relationship is also one of the reasons why the results of statistical tests do not show significance, because the relationship that occurs is not strong enough to have a real influence on the incidence of hypertension.

Sleep needs for each person are different depending on the habits they bring during their development, and their health conditions. Many respondents have irregular sleep schedules, because every day the sleep schedule is different. Sleep quality measurement was carried out using the Pittsburgh Sleep Quality Index (PSQI) instrument which consisted of several assessment components, one of which was the use of sleeping pills in the past week. Based on the results of the study, most elderly respondents stated that they did not take sleeping pills for the past week so that their sleep quality tended to be good because they did not need sleeping pills to maintain their sleep quality. This condition shows that the sleep disorders experienced by the respondents may still be relatively mild and do not require pharmacological intervention. Filling out the inappropriate sleep duration point questionnaire can also affect the overall sleep quality results.

Theoretically, the use of sleeping pills is generally given to individuals who have quite severe sleep disorders, such as chronic insomnia, which can significantly affect sleep quality and impact the physiological condition of the body. Severe sleep disturbances can increase the activity of the sympathetic nervous system as well as trigger the release of stress hormones that have the potential to increase blood pressure. However, if sleep disorders do not require the use of sleeping pills, then the disorder is usually still within the body's tolerance limits so that it does not cause significant physiological changes to the cardiovascular system (Medic, 2018).

In the elderly, physiological changes due to aging such as decreased melatonin production, decreased circadian rhythm, and comorbid diseases make sleep quality prone to problems in general. However, this complex sleep disorder is not always directly related to blood pressure, especially when other factors such as vascular changes due to aging are already prevalent in the elderly.

The type of job respondents can affect the quality of sleep. Elderly people who do not work have time to rest during the day, so many elderly people do not experience heavy physical burdens that interfere with their sleep quality at night (Mohani et al., 2018). Meanwhile, the elderly who work with a heavy physical workload and are routinely carried out can cause fatigue and physical discomfort that can interfere with sleep (Ariyani et al., 2024). This is in accordance with the results of the study where there were 53 respondents who were not working and 18 respondents who mostly worked as farmers who carried out heavy physical activities on a daily basis ranging from hoeing to harvesting and lifting crops.

Another factor that can explain the insignificance of the results of this study is the subjective method of measuring sleep quality, such as using the PSQI questionnaire. Subjective assessments of sleep quality do not always objectively describe physiological conditions that are clinically more influential on hypertension. Thus, there may be a discrepancy between the respondents' perception of sleep quality and the actual physiological impact on the cardiovascular system.

In addition, in cross-sectional research designs, variable measurements are carried out at a specific time so that it cannot describe long-term causal relationships. Hypertension is a chronic condition that develops over a long period of time, while sleep quality can change over time. This can cause the relationship between the two variables to not be detected significantly in statistical analysis.

Taking these aspects into account, it can be concluded that although theoretically sleep quality has the potential to affect blood pressure, in the elderly population in this study sleep quality was not proven to be a significantly related factor to the incidence of hypertension. Other factors such as physical activity, comorbid conditions, and physiological changes due to the aging process may have a more dominant role in influencing blood pressure in the elderly.

These findings imply that hypertension prevention interventions in the elderly should be more focused on modifiable risk factors that have been shown to be significant in this study, such as increased physical activity, rather than focusing solely on improving sleep quality.

CONCLUSION

The study concluded that physical activity had a significant association with hypertension incidence, while the variables of age, stress level, and sleep quality did not show a similar relationship. Based on these findings, it is recommended for the elderly to routinely do light physical activities such as gymnastics or walking at least 3-5 times a week, as well as for the institution where the research is conducted to facilitate a structured physical activity program to reduce the risk of hypertension. In addition, the next researcher is expected to expand the scope of the study by increasing the number of samples and exploring other supporting variables to obtain more comprehensive results related to the triggering factors for hypertension in the elderly.

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