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Sleep Disturbances and Elevated Blood Pressure in Elderly Populations: Evidence from a Cross-Sectional Study in Sindon, Boyolali

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Abstract:

- ***Background:***

The elderly population in Indonesia is rapidly increasing, following the global trend. This demographic shift poses complex health challenges, particularly related to hypertension and sleep disturbances. Both conditions are interrelated and may significantly reduce the quality of life in older adults. This study aimed to analyse the relationship between blood pressure and sleep quality among older adults in Sindon Village, Boyolali, from an occupational therapy perspective.

- ***Objective:***

This study aimed to analyse the relationship between blood pressure and sleep quality among older adults in Sindon Village, Boyolali, from an occupational therapy perspective.

- ***Methods:***

A cross-sectional analytic observational design was employed, involving 30 older adults selected through purposive sampling. Data collection was carried out using a demographic survey instrument, the Pittsburgh Sleep Quality Index (PSQI), and blood pressure measurements with an OMRON HEM-7121 digital sphygmomanometer. Data analysis was performed using Pearson correlation and independent mean difference tests.

- ***Results:***

The findings revealed that 70% of participants had hypertension, with a mean systolic blood pressure of 142.8 mmHg and a diastolic pressure of 85.1 mmHg. A total of 63.3% of participants reported poor sleep quality (mean PSQI = 6.4). Significant positive correlations were found between systolic blood pressure and sleep quality (r = 0.72; p = 0.001) and between diastolic blood pressure and sleep quality (r = 0.65; p = 0.002). Hypertensive participants had higher PSQI scores compared to non-hypertensive participants (7.1 vs. 4.3; p = 0.003).

- ***Conclusion:***

Elevated blood pressure is strongly associated with poor sleep quality in older adults. Occupational therapy–based interventions, such as sleep hygiene education, stress management, and environmental modifications, should be integrated into community health services to enhance quality of life and promote healthy aging.

Keywords: *Elderly, Blood Pressure, Sleep Quality, Hypertension, Occupational Therapy*.

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I. INTRODUCTION

The aging population is expanding at a rapid pace throughout the world as a result of better healthcare, easier access to medical treatment, and longer life expectancy. The World Health Organization predicts that by 2050, there will be 2.1 billion individuals aged 60 and above, with emerging nations like Indonesia accounting for more than 80% of this population. (1), The number of senior persons in Indonesia has reached 25.6 million, making up around 9.6% of the overall population, according to the Central Statistics Agency (2) estimate. Over the next twenty years, this number is projected to keep rising. An increasing number of chronic illnesses and functional impairments are affecting the independence and quality of life of the elderly, making

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the healthcare system face a formidable task as a result of the aging population.

One of the main health problems among the elderly is hypertension. *The Global Burden of Disease Study* (3). Hypertension is a leading cause of death from cardiovascular disease, stroke, and renal failure, with a prevalence of 62.5% among the world's elderly. The incidence of hypertension among the elderly in Indonesia is 57.6%, according to the Basic Health Research (4). But the rate of hypertension control is still low (less than 20%). This condition is exacerbated by low awareness, limited access to health services, and unhealthy lifestyles, such as excessive salt consumption, lack of physical activity, and stress. In addition to hypertension, sleep disorders are also common among the elderly. Physiological changes associated with ageing, such as decreased melatonin production, shifts in circadian rhythms, and alterations in the brain's sleep-regulating area, render the elderly susceptible to insomnia, restless sleep, early awakening, or reduced sleep efficiency (5). Cross-country studies show that 30–50% of older adults experience sleep disorders, with the highest prevalence among those with chronic diseases (6). In Indonesia, Prasetyo et al. (2021) discovered that 68.3% of Yogyakarta's elderly folks slept poorly, according to the Pittsburgh Sleep Quality Index (PSQI).

The relationship between hypertension and sleep quality is complex and can form a vicious cycle. Hypertension can cause symptoms such as nocturia, musculoskeletal pain, anxiety, and sleep apnoea, which disrupt sleep continuity (8). In contrast, hypertension can result from endothelial dysfunction, insulin resistance, elevated cortisol levels, and compromised sleep quality, all of which activate the sympathetic nervous system. (9). Hypertension was 1.7 times more likely to develop in the two years after a high PSQI score in older persons, according to a longitudinal study conducted by.

Occupational therapy (OT) techniques are underutilized despite the large body of medical and nursing literature examining the correlation between hypertension and sleep quality. The objective of this OT-based study is to examine the correlation between hypertension and the quality of sleep among the elderly. With primary data from elderly individuals in Sindon Village, Boyolali, these findings are expected to form the basis for the development of community-based OT interventions that are appropriate to the cultural context, such as sleep routine training, stress management education, and adaptation of the elderly's sleeping environment. The integration of OT into elderly health services has the potential to be an effective and sustainable strategy for improving quality of life, preventing functional disability, and supporting healthy ageing.

II. MATERIAL AND METHOD

The researchers in this study used a quantitative method based on a cross-sectional analytical observational design. Older adults residing in Sindon Village, Boyolali, Central Java, will have their blood pressure and the quality of their sleep studied. A total of 30 participants were chosen using a purposive sampling method from among all the senior residents of Sindon Village. People over the age of 65 who could communicate well, did not have advanced dementia, and were prepared to provide their informed permission were considered for inclusion. Meanwhile, the exclusion criteria were elderly people who were acutely ill or showed uncooperative attitudes during the data collection process. The instruments used in this study included demographic and health questionnaires, the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality, and blood pressure measurements using an OMRON HEM-7121 digital sphygmomanometer. Blood pressure measurements were taken after the respondents had rested for five minutes, then taken twice and averaged. Blood pressure classifications were established according to the American Heart Association (AHA, 2023) criteria: normal (<120/<80 mmHg), prehypertension (120-139/80-89 mmHg), and hypertension (≥140/≥90 mmHg). The ethical review board for this project granted its permission. The research was conducted in accordance with ethical research norms, as verified by the Kusuma Husada University Surakarta Ethics Committee (reference number 2985/UKH.L.02/EC/VIII/2025).

III. RESULTS

- *Demographics of Participants*

In August and September of 2025, 30 seniors from Sindon Village, Boyolali, participated in this research. From 54 to 88 years old, the respondents' ages ranged from an average of 67.2 years. According to the age distribution, thirteen respondents (43.3%) were in the young elderly (60–69 years old) age group. When broken down by gender, somewhat more women than men participated (56.7% vs. 43.3%). Of those who took the survey, 40% had finished elementary school, and 10% had gone on to get a bachelor's degree or more. The majority of responders were either housewives (33.3%) or farmers or laborers (36.7%). Most respondents were married (73.3%), with 56.7% living with their spouse and children, while 10% lived alone. In terms of medical history, half of the respondents (50%) had hypertension, while the rest reported other health conditions such as stroke, diabetes mellitus, heart disease, or no history of chronic disease. This is evident in Table 1.

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Table 1 Characteristics of Study Subjects Based on Age, Gender, and Educational Level, Occupation, Marital Status, and Medical History

Characteristics		Frequency	Percentage
Age (years old)			
45	Pre-elderly	2	6.7
60	Young elderly	13	43.3
70	Middle-aged elderly Older elderly	7	23.3
80		8	26.7
Total		30	100
Gender Male		13	43.3
Female		17	56.7
Total		30	100
Education			
Did not complete primary school		6	20
Primary school		12	40
Secondary School		5	16.6
Senior High School		4	13.3
Bachelor's degree		3	10
Total		30	100
Occupation			
Farmer/labourer		11	36.7
Housewife		10	33.3
Self-employed		5	16.7
Retired civil servant		4	13.3
Total		30	10
Marital			
Married		22	73.3
Widowed		5	16.7
Widower		3	10
Total		30	100
Living Arrangements			
Couple & children		17	56.7
Spouse		5	16.7
Children		2	6.7
Relatives		3	10
Alone		3	10
Total		30	100
History of diseases			
Hypertension		15	50
Stroke and hypertension		1	3.3
Diabetes		1	3.3
Heart disease		1	3.3
No disease		9	30
Other		3	10
Total		30	100

Source: Researcher Data Analysis (2025)

Blood pressure measurements showed that 70% of respondents were in the hypertension category, with an average systolic blood pressure of 142.8 mmHg (range 78–204 mmHg) and diastolic blood pressure of 85.1 mmHg (range 48–105 mmHg). Most were classified as stage 2 hypertension (60%), while only 10% of respondents were in the normal category. Interestingly, 16.7% of respondents actually experienced hypotension.

Table 2 Blood Pressure Measurements

Category	Criteria	Frequency	Percentage
Normal	Systolic <120 mmHg and Diastolic <80 mmHg	3	10
Elevated (prehypertension)	Systolic 120–129 mmHg and Diastolic <80 mmHg	1	3.3
Stage 1 hypertension	Systolic 130–139 mmHg or Diastolic 80–89 mmHg	3	10
Stage 2 hypertension	Systolic ≥140 mmHg or Diastolic ≥90 mmHg	18	60
Hypotension	Systolic <90 mmHg or Diastolic <60 mmHg	5	16.7
Total		30	100

Source: Researcher Data Analysis (2025)

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➢ *Descriptive Statistics*

Refer to Table 3 for the findings on sleep quality measurement from the study. The Pittsburgh Sleep Quality Index (PSQI) revealed that 63.3% of participants exhibited poor sleep quality (score ≥5), whereas 36.7% had satisfactory sleep quality (score ≤5). The mean PSQI score among participants was 6.4, with a maximum value of 11, signifying significant sleep disruption.

Table 3 Sleep Quality (PSQI)

Category	Criteria	Frequency	Percentage
Good	≤ 5	11	36.7
Poor	≥ 5	19	63.3
Total		30	100

Source: Researcher Data Analysis (2025)

Table 4. Pearson's correlation analysis shows a strong and significant positive relationship between systolic blood pressure and sleep quality (r = 0.72; p = 0.001). This indicates that the higher the systolic blood pressure, the worse the respondents' sleep quality. Similar results were found for diastolic blood pressure, which also correlated positively with sleep quality (r = 0.65; p = 0.002).

Table 4 Analysis of the Relationship between Blood Pressure and Sleep Quality

Variable	Correlation Coefficient (r)	ρ-Value
Systolic vs PSQI	0.72	0.001
Diastolic vs PSQI	0.65	0.002

Source: Researcher Data Analysis (2025)

A comparison of sleep quality in hypertensive and non-hypertensive conditions can be seen in Table 5. A comparison between the hypertensive and non-hypertensive groups shows a significant difference in sleep quality. Respondents with hypertension had an average PSQI score of 7.1, which was much higher than the non-hypertensive respondents, who only had an average score of 4.3 (p = 0.003). These results emphasise that hypertension is a risk factor closely related to sleep disorders in the elderly.

Table 5 Comparison of Sleep Quality between Hypertension and Non-Hypertension

Group	N	Average PSQI	SD	ρ - value
Hypertension	10	7.1	2.1	0.003
Non-Hypertension	20	4.3	1.8	

Source: Researcher Data Analysis (2025)

IV. DISCUSSION

The results of this study indicate that hypertension is a dominant health problem among the elderly in Sindon Village, Boyolali, with a prevalence of 70%. This figure is higher than the national prevalence according to Riskesdas (2022), which is 57.6%. The high prevalence of hypertension among respondents is likely influenced by age, low education levels, and unhealthy lifestyles. The American Heart Association/AHA (2023) emphasizes that hypertension in the elderly must be treated aggressively, while still taking into account physiological conditions related to aging, such as decreased blood vessel elasticity and changes in body metabolism. This indicates the need for individualised and continuous hypertension control strategies.

The study demonstrated that, alongside hypertension, most patients displayed inadequate sleep quality, reflected by an average PSQI score of 6.4. The conclusions reported herein align with those of Prasetyo et al. (2021). from Yogyakarta. Older adults are physiologically more susceptible to sleep disturbances due to diminished melatonin synthesis, alterations in circadian rhythms, and a reduction in deep sleep phases Hirshkowitz et al., 2015; Sack et al., 2020). External variables, like environmental noise, inadequate sleeping conditions, and specific drugs (e.g., diuretics or beta blockers), might adversely affect sleep quality (13).

There is a favorable and statistically significant correlation between the quality of one's sleep and both diastolic and systolic blood pressure. Systolic blood pressure and PSQI scores are strongly correlated (r = 0.72), suggesting that greater blood pressure is associated with worse sleep quality. These findings corroborate those of the study conducted by Zhang et al. (2022), which reported that elderly people with hypertension tend to experience shorter sleep duration, insomnia, sleep apnoea, and sleep fragmentation. The underlying mechanism of this relationship can be explained by excessive activation of the sympathetic nervous system, increased cortisol secretion, and endothelial dysfunction that interferes with the transition to deep sleep (15).

Common clinical symptoms experienced by hypertensive patients, such as nocturia and musculoskeletal pain, can also cause sleep disturbances. Nocturia, whether due to the use of diuretics or fluid retention due to heart failure, causes older adults to wake up frequently at night. This

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creates a negative cycle, where poor sleep quality worsens blood pressure, and conversely, hypertension worsens sleep disturbances (16).

These research findings underscore the significance of comprehensive therapies that address not just medical issues but also behavioral, psychological, and environmental factors. From an occupational therapy standpoint, the Person-Environment-Occupation (PEO) paradigm facilitates comprehension of the intricate relationships between individuals and their environment. and daily activities (17). For example, irregular sleep habits, exposure to blue light from electronic devices before bedtime, or intense mental activity at night are behavioural factors that can be modified through occupational therapy interventions (18).

Some relevant occupational therapy intervention strategies include sleep hygiene education, stress management training, sleep environment modification, daily activity scheduling, and community-based interventions. With an activity-based, holistic, and contextual approach, occupational therapy has the potential to be a sustainable solution in breaking the negative cycle between hypertension and sleep disorders. The integration of these interventions into elderly healthcare services is expected to improve quality of life, prevent functional disability, and support healthy ageing (Liu et al., 2023; Fernández-Castillo et al., 2022; Bennett et al., 2023; Santos et al., 2021; García et al., 2023).

V. CONCLUSION

In Sindon Village, Boyolali, a strong and statistically significant relationship exists between blood pressure and sleep quality among the elderly. There exists a positive correlation between systolic and diastolic blood pressure and the Pittsburgh Sleep Quality Index (PSQI) score ($r = 0.72$; $p = 0.001$). confirming that greater blood pressure is associated with worse sleep quality. Furthermore, the average PSQI score was greater in the hypertensive senior group (7.1 vs. 4.3; $p = 0.003$) compared to the non-hypertensive group, suggesting that hypertension is a significant risk factor for sleep disturbances in the elderly.

Based on these findings, it is recommended that elderly health management efforts be conducted holistically, taking into account both blood pressure and sleep quality. Occupational therapy-based interventions can be implemented, for example through sleep hygiene education, stress management training, sleep environment modification, and healthy daily activity management. The integration of this approach into community-based health services is expected to improve quality of life, prevent chronic complications, and support healthy ageing.

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