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Effect of Slow Deep Breathing Therapy on Blood Pressure in Elderly Hypertensive Patients: A Pre-Experimental Study

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Abstract

Introduction*:According to WHO data, the prevalence of hypertension in the elderly is 29%, with Indonesia ranging from 26% to 31%. In East Java, the prevalence is 26.2%, while Jember Regency has 198,562 residents in the Sukowono area, ranking second in hypertension cases. Data from the elderly posyandu in Sumber Wringin Village shows that 10.3% of elderly individuals suffer from hypertension. Managing hypertension in the elderly requires treatment options that minimize side effects while preventing morbidity, mortality, and maintaining normal blood pressure. One effective technique is slow deep breathing therapy. This study aimed to examine the difference in blood pressure before and after administering slow deep breathing therapy to hypertensive patients at the elderly posyandu.* ***Methods:*** *This research employed a pre-experimental design with a one-group pretest-posttest approach. The study population consisted of 40 hypertensive patients at the elderly posyandu, with a sample size of 36 individuals selected through simple random sampling.* ***Results:*** *Data collection involved observation sheets and blood pressure measurements. The data were analyzed using the Wilcoxon signed-rank test. Before the intervention, the majority of respondents (58.3%) were categorized as having severe hypertension. After the intervention, 55.6% of respondents experienced moderate hypertension. Statistical analysis showed a significant difference in blood pressure before and after slow deep breathing therapy, with a p-value of 0.000 (<0.05).* ***Conclusion:*** *Slow deep breathing is very effective in lowering blood pressure in hypertensive patients. It is recommended for hypertension management, with a duration of 10–15 minutes per session, performed twice daily in the morning and evening, to promote sustained blood pressure improvements.*

Keywords: *Blood Pressure, Hypertension, Slow Deep Breathing*

Introduction

An elderly person is someone aged 60 years and above. As individuals age, their health conditions tend to decline, making them more susceptible to various diseases. This increases the risk of degenerative diseases—health conditions caused by the deterioration of tissues or organs over time. The aging process in the elderly leads to changes in physical, mental, social, economic, and physiological aspects. One significant change is the alteration in the structure of large veins, which can contribute to the development of hypertension (auritius Septa Kristiawan, 2019).

Hypertension in the elderly affects approximately 25% of people worldwide and is

estimated to cause more than 7 million deaths each year, accounting for about 13% of total global deaths (Robert E. Kowalski, 2022). The World Health Organization (WHO) recorded at least 839 million cases of hypertension in the elderly in 2021, with projections reaching 1.15 billion by 2030, accounting for approximately 29% of the global population. Hypertension in the elderly is more prevalent among women (30%) compared to men (29%) (WHO., 2021). The 2020 Household Health Survey by the Indonesian Ministry of Health reported that approximately 26–31% of elderly individuals across various provinces in Indonesia suffer from hypertension(Watiningrum et al., 2022). The prevalence of hypertension among the elderly in East Java is 26.2%(RI, 2018). According to data from the Jember Health Office in 2021, a total of 198,562 residents in the Sukowono area were recorded as having hypertension, ranking second in the highest number of cases(Dinkes Kabupaten Jember, 2021). Based on data from the elderly *posyandu* in Sumber Wringin Village, Sukowono District, from January to September 2023, 10.3% of the elderly population suffered from hypertension.

Several factors contribute to hypertension in the elderly, including age, lifestyle changes, and unhealthy dietary habits such as excessive sodium intake. Other risk factors include smoking, alcohol consumption, and lack of physical activity or exercise, all of which can trigger hypertension.If left untreated, hypertension forces the elderly heart to work harder, which can lead to damage in the blood vessels of the heart, kidneys, brain, and eyes. Hypertension (high blood pressure) can lead to various serious complications if not properly managed. These complications typically arise because persistently high blood pressure damages blood vessels and vital organs. The main complications of hypertension include: 1) Complications in the Brain a) Stroke**:** High blood pressure can cause blood vessels in the brain to rupture (hemorrhagic stroke) or become blocked (ischemic stroke), b) Vascular dementia: Chronic hypertension can reduce blood flow to the brain, increasing the risk of cognitive impairment and dementia, 2) Complications in the Heart a) Heart failure**:** The heart must work harder to pump blood, which can cause the heart muscle to thicken (left ventricular hypertrophy) and eventually weaken, b) Heart attack (myocardial infarction)**:** Hypertension accelerates the process of atherosclerosis (hardening and narrowing of the arteries), which can lead to blockages in the coronary arteries c) Arrhythmia (irregular heart rhythm): Structural changes in the heart caused by high blood pressure can disrupt the heart's electrical system, 3) Complications in the kidneys : kidney failure**:** High blood pressure damages the blood vessels in the kidneys, impairing their filtering function and potentially leading to chronic kidney disease, 4) Complications in the Eyes : hypertensive retinopathy: High blood pressure can damage the blood vessels in the retina, leading to vision problems and even blindness, 5) Other Systemic Complications : a) Aneurysm: High blood pressure can weaken the walls of arteries,

leading to the formation of aneurysms, which may rupture and become life-threatening b) metabolic syndrome: Hypertension is often associated with other conditions such as obesity, insulin resistance, and high cholesterol levels. Hypertension is also a major cause of stroke and heart attacks (Laurale, 2021). Efforts to manage hypertension in the elderly include both pharmacological and non-pharmacological therapies. Non-pharmacological approaches to lowering blood pressure include meditation, yoga, progressive relaxation, music therapy, and breathing exercises. One effective non-pharmacological therapy for primary hypertension is *slow deep breathing* exercises. This technique falls under both relaxation and breathing exercises, providing significant benefits for the body's hemodynamics. *Slow deep breathing* enhances fluctuations in respiratory frequency intervals, which improves baroreflex effectiveness and helps regulate blood pressure(Falo et al., 2023).

Slow deep breathing also enhances central inhibitory rhythms, reducing sympathetic nerve activity, which leads to a decrease in blood pressure when the baroreflex is activated (Setyaningrum & Suib, 2019). Slow breathing can help lower blood pressure (Fahri Permata, Juli Andri, Padila Padila, 2021). This is because it activates the parasympathetic nervous system (the 'rest and digest' system) and reduces the activity of the sympathetic nervous system (the 'fight or flight' system). As a result, the blood vessels dilate and the heart rate slows down, which naturally leads to a reduction in blood pressure. Additionally, slow deep breathing influences an increase in tidal volume, activating the Hering-Breuer reflex(Aswad, 2020a). This activation results in reduced chemoreflex activity, enhanced baroreflex sensitivity, decreased sympathetic nerve activity, and ultimately, lower blood pressure (Joseph., 2020). Based on the aforementioned explanation, the researcher is interested in analyzing the effect of slow deep breathing therapy on blood pressure in hypertensive patients at the elderly *posyandu*.

Methods

This study employed a pre-experimental design with a one-group pretest-posttest approach. The population consisted of 40 hypertensive patients at the elderly *posyandu*, with a sample of 36 individuals selected using simple random sampling. Inclusion Criteria: 1) Hypertensive patients at the elderly *posyandu, 2)* Diagnosed with hypertension for at least one month, 3) Blood pressure measurement of at least 140 mmHg at the *posyandu, 4)* Able to communicate effectively, 5) Willing to sign an informed consent form. Exclusion Criteria: 1) Hypertensive patients with dementia, 2) Elderly individuals with complications such as hypertension + diabetes mellitus. Research Instruments & Data Analysis: Data collection was conducted using observation sheets and blood pressure measurements. The study used the

Wilcoxon signed-rank test for data analysis. Research Procedure: 1) Participants signed an informed consent form before proceeding, 2) Baseline blood pressure was measured before the intervention, 3) Slow deep breathing therapy was administered for 10–15 minutes, twice daily (morning and evening) for 4 consecutive days**,** 4) Post-intervention blood pressure was measured, 5) Blood pressure was assessed using a calibrated digital sphygmomanometer**,** and results were recorded on the observation sheet**.** This study received ethical approval from the Ethics Committee of dr. Soebandi University, Jember, with approval number 211/KEPK/UDS/V/2024. The research was conducted in June 2024.

Results

1. General data

Table 1 Frequency Distribution Based on Age, Gender, Current Diseases, Smoking Habits, History of High Blood Pressure and Treatment History of Research Respondents in Sumber Wringin Village in 2024

characteristics	Frequency	Percentage
Age		
56-65 years 65	25	69,4%
years	11	30,6%
total	36	100%
Gender		
Male	13	36,1%
Female	23	63,9%
Total	36	100
Smoking Habit		
Non-smoker	23	63,9%
Smoker	13	36,1%
Total	36	100%
History of High Blood Pressure		
No	13	36,1%
Yes	23	63,9%
Total	36	100%
Medical Treatment History		
None	36	100%

Source: Primary Data, June 2024

From Table 1 above, it shows that the majority of respondents are aged 56-65 years, accounting for 69.4%. Most of the respondents are female, making up 63.9%. The majority do not have a smoking habit, with 63.9%. A history of high blood pressure is present in most respondents at 63.9%. All respondents have no history of medical treatment, accounting for 100%.

2. Specific Research data

Table 2 Blood Pressure in Hypertensive Patients Before Slow Deep Breathing Therapy in Hypertensive Patients at the Elderly Posyandu in Sumber Wringin Village in 2024

Blood Pressure Before Intervention	Amount	Percentage
Light	4	11,1
Medium	11	30,6
Heavy	21	58,3
Total	**36**	**100**

Source: Primary Data, June 2024

From Table 2 above, it shows that the majority of severe blood pressure cases before the intervention were 58.3%.

Table 3 Blood Pressure in Hypertensive Patients After Slow Deep Breathing Therapy in Hypertensive Patients at the Elderly Posyandu in Sumber Wringin Village in 2024

Blood Pressure Before Intervention	Amount	Percentage
Light	16	44,4
Medium	20	55,6
Heavy	0	0
Total	**36**	**100**

Source: Primary Data, June 2024

From Table 3 above, it shows that the majority of moderate blood pressure cases after the intervention were 55.6%

Table 4 Differences in Blood Pressure Before and After Slow Deep Breathing Therapy in Hypertension Patients at the Elderly Posyandu in Sumber Wringin Village in 2024

Tekanan	Sebelum		Sesudah		*p value*
	Jumlah (n)	Persentase (%)	Jumlah (n)	Persentase (%)	
Light	4	11,1	16	44,4	
Medium	11	30,6	20	55,6	0,000
Heavy	21	58,3	0	0	
Total	**36**	100	**36**	100	

Source: Primary Data, June 2024

Table 4 above shows that the p-value of the Wilcoxon Signed Ranks Test is 0.000. The decision-making is based on the significance level ($\alpha = 0.05$), and since the p-value is less than 0.05, the alternative hypothesis (Ha) is accepted. This means that there is a difference in blood pressure before and after the administration of slow deep breathing therapy in hypertensive patients at the Elderly Health Post (Posyandu Lansia).

Discussion

Blood Pressure in Hypertensive Patients Before Undergoing Slow Deep Breathing Therapy at the Elderly Health Post (Posyandu Lansia)

The results of the study showed that most participants had severe blood pressure levels before undergoing slow deep breathing therapy. The occurrence of hypertension in the elderly is influenced by several factors that contribute to increased blood pressure. One of the contributing factors is age and lifestyle. Age is a major trigger of hypertension, which commonly develops when a person reaches old age, particularly in individuals aged 60 and above. Older adults experience a decline in beta-adrenergic receptor response, which plays a role in the development of primary hypertension(Kustin et al., 2023a). The decreased sensitivity of beta-adrenergic receptors can lead to vasoconstriction, which acts as a triggering factor for hypertension. The function of beta-adrenergic receptors is to help regulate blood pressure, as they are responsible for promoting vasodilation (Upoyo & Taufik, 2019).

Hypertension can also be caused by an unhealthy lifestyle. Some elderly participants in this study were found to have poor lifestyle habits. These behavioral patterns may contribute to increased blood pressure among the elderly. The aforementioned factors are conditions that exacerbate the occurrence of hypertension in older adults (Kustin et al., 2023b). Unmanaged hypertension can lead to serious health complications if not addressed appropriately (Kustin et al., 2024). Individuals with hypertension may remain asymptomatic for years, and the condition can go undetected and untreated, potentially leading to death. Therefore, it is crucial for hypertensive patients to receive early intervention. One form of non-pharmacological treatment that can be applied is slow deep breathing therapy (Upoyo & Taufik, 2019). The results of this study are in line with research conducted by Hoesny, in which the preliminary data collection prior to the intervention showed that the majority of respondents had severe blood pressure levels, with 29 respondents (60.4%) falling into this category(Hoesny et al., 2020).

The researcher believes that, in response to this issue, healthcare professionals—particularly nurses—need to take specific actions for the elderly, who are vulnerable to cardiovascular diseases due to the decline in bodily functions associated with aging. These actions are essential to help maintain blood pressure within a normal range. Nurses play a vital role in assisting hypertensive patients. Their responsibilities include educating and informing older adults about the importance of maintaining a healthy and balanced lifestyle, as well as encouraging the regular practice of slow deep breathing therapy, especially for elderly individuals with hypertension.

Blood Pressure in Hypertensive Patients After Undergoing Slow Deep Breathing Therapy at the Elderly Health Post (Posyandu Lansia)

The results of the study showed that most participants had moderate blood pressure levels after undergoing slow deep breathing therapy. The therapy was administered for 10–15 minutes, twice a day—once in the morning and once in the evening—for four consecutive days. This intervention was found to reduce blood pressure and promote relaxation, with participants reporting feeling lighter and more at ease after the sessions. This effect occurs because slow deep breathing therapy helps regulate breathing in a deep and slow manner. Relaxation therapy is widely used in daily life as a method to manage hypertension. In general, relaxation therapy involves a reduction in cognitive, physiological, and behavioral activity. During relaxation, muscle fibers elongate, the transmission of nerve impulses to the brain decreases, brain activity is reduced, and other bodily functions also slow down. The characteristics of the relaxation response include a decrease in heart rate, respiratory rate, blood pressure, and an increase in oxygen consumption (Aswad, 2020b). Slow deep breathing therapy can lead to a reduction in sympathetic output, which in turn decreases the production of epinephrine. The researcher was interested in conducting slow deep breathing therapy because: 1) This breathing technique can significantly lower blood pressure by activating the parasympathetic nervous system and reducing the activity of the sympathetic nervous system, 2) The therapy is a natural method without drug side effects, making it safe to be used as a complementary or alternative treatment for hypertension patients, especially those who are sensitive to medication or wish to reduce their drug intake, 3) Breathing exercises can be done anytime and anywhere without the need for special equipment, making them easily accessible and practical for daily life, 4) Besides lowering blood pressure, this therapy also helps manage stress and anxiety—common triggers of hypertension that are often difficult to control, 5) By lowering blood pressure and reducing stress, hypertension patients can experience overall health improvements and a better quality of life (Ningrum et al., 2024a).

This hormone, when received by alpha receptors, affects the smooth muscles of blood vessels, resulting in vasodilation. Vasodilation in the blood vessels reduces peripheral resistance, which subsequently leads to a decrease in blood pressure. Deep and slow breathing during slow deep breathing exercises improves oxygen saturation and increases oxygen consumption in the body. The increase in oxygen levels stimulates the oxidation of nitrite. This nitrite oxidation enters the brain and lungs, promoting a calming effect on the body. Additionally, nitrite oxidation enhances the elasticity of blood vessels, further contributing to vasodilation, which ultimately results in a reduction in blood pressure (Ningrum et al., 2024b). "The results of this study are

supported by research conducted by Hoesny, in which the final data collection after the intervention showed that the majority of respondents had mild blood pressure levels, with 37 respondents (77.1%) falling into this category (Hoesny et al., 2020).

The researcher believes that regularly practicing slow deep breathing therapy can stimulate the release of endorphins, which help the body feel relaxed. In addition, this therapy also activates the parasympathetic nervous system more dominantly than the sympathetic nervous system. This shift affects the function of the baroreceptor system, leading to vasodilation of blood vessels and a reduction in heart rate, which ultimately results in lower blood pressure. Despite the aging process in the elderly, it is highly important to implement slow deep breathing therapy to help reduce blood pressure. Moreover, due to its simplicity, this therapy can be independently performed by elderly individuals at home.

Pre- and Post-Therapy Blood Pressure Differences in Elderly Hypertensive Patients

The results of the study show that the Wilcoxon Signed Ranks Test yielded a p-value of 0.000. Decision-making is based on the significance level ($\alpha = 0.05$), and since the p-value is less than 0.05, the alternative hypothesis (Ha) is accepted. This indicates that there is a significant difference in blood pressure before and after the administration of slow deep breathing therapy in hypertensive patients at the Elderly Health Post (Posyandu Lansia).

Slow deep breathing is one of the relaxation methods. During relaxation, muscle fibers elongate and the transmission of nerve impulses to the brain decreases. Relaxation therapy is used to prevent muscle tension caused by stress, as such tension can affect the body's overall balance. One way to achieve relaxation is by regulating breathing through the slow deep breathing technique. Slow deep breathing is a conscious relaxation technique that involves slow and deep breathing patterns. This method influences blood pressure by increasing baroreceptor sensitivity, reducing sympathetic nervous system activity, and enhancing parasympathetic nervous system activity in individuals with primary hypertension. Breathing exercises improve both physical and mental health by increasing the fluctuation of respiratory frequency intervals, which in turn enhances baroreflex effectiveness (Ningrum et al., 2024b).

The results of this study are consistent with research conducted by Suranata on the effects of slow deep breathing and alternate nostril breathing on reducing blood pressure in hypertensive patients. The study showed that slow deep breathing exercises had a significant effect on both systolic and diastolic blood pressure in patients with hypertension, with a p-value of 0.000 (Penurunan et al., 2019). Another study conducted by Aswad on the effectiveness of slow deep

breathing therapy and relaxation music on blood pressure in hypertensive patients at Panti Werda Ilomata in Gorontalo City also reported a significant result, with a p-value of 0.000(Aswad, 2020b).

The researcher believes that slow deep breathing therapy can influence the cerebral cortex and the medulla, which are positively associated with relaxation in the nervous system and can affect the mechanisms involved in lowering blood pressure. Slow and deep breathing can increase oxygen levels in the body, thereby stimulating the body's chemoreceptors. This stimulation triggers a vasodilation response in the blood vessels, which reduces vascular resistance and consequently lowers blood pressure. In individuals experiencing stress, the sympathetic nervous system becomes more active, leading to increased production of adrenaline, which causes a rise in blood pressure. Additionally, blood pressure tends to increase with age, making both men and women susceptible to hypertension at the age of 60 and above. One non-pharmacological approach that can be used to lower blood pressure is slow deep breathing therapy.

This is valid in practice, as the benefits are evident through the observed decrease in blood pressure following the intervention. This therapy induces vasodilation of blood vessels, resulting in reduced cardiac muscle contraction and heart rate, which ultimately leads to a decrease in blood pressure. Moreover, no adverse effects were observed during the course of the study (Rahman & Astutik, 2023). Therefore, the researcher concludes that slow deep breathing therapy is a highly effective non-pharmacological nursing intervention that can be performed by nurses to lower blood pressure. This intervention is also simple and can be practiced independently by individuals with hypertension. It is hoped that slow deep breathing exercises can be implemented by nurses as part of nursing care for managing hypertensive patients through non-pharmacological approaches to help reduce blood pressure.

Conclusion

The study showed that before the intervention, most respondents were in the category of severe blood pressure, while after the intervention, the majority were in the moderate blood pressure category. Furthermore, there was a significant difference in blood pressure before and after the administration of slow deep breathing therapy in hypertensive patients. This study is expected to serve as baseline data for similar future research and to provide valuable input for subsequent studies in developing new research topics. Future researchers may also expand upon the existing variables by exploring additional related variables. Moreover, the findings of this study can offer important information to respondents, helping them gain a better understanding

of blood pressure and the application of slow deep breathing therapy for individuals with hypertension.

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Conflict of Interest

There were no conflicts encountered in this study; the research was conducted purely for data collection purposes.

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