The Effect of Deep Breathing Relaxation on Stress Levels in Hypertension Patients

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ABSTRACT

Introduction: Hypertension is a significant risk factor for morbidity and mortality associated with cardiovascular disease. The relationship between hypertension and stress is bidirectional, where hypertension can trigger stress through physiological and emotional response mechanisms. Stress activates the nervous system by increasing the production of hormones such as cortisol and adrenal.

Objective: This study aims to analyze the effect of deep breathing relaxation on stress levels of hypertension patients.

Method: This study used a quasi eksperiment one-group Pretest-Posttest design conducted in May 2025 at the Tambora District Health Center, West Jakarta. The sample size was 34 with a purposive sampling technique. Stress levels were measured using the Depression Anxiety Stress Scale (DASS-21) questionnaire. The intervention provided was deep breathing relaxation for 14 days.

Result: The results showed that the average stress level before the intervention 21.71 in the moderate category, then after the intervention the stress level score decreased to 10.41 in the normal category. The Wilcoxon test showed a p-value of 0.00 (p<0.05), indicating a significant difference between stress levels before and after deep breathing relaxation.

Conclusion: This study concluded that deep breathing relaxation is effective in reducing stress levels in hypertension patients and can be used as a non-pharmacological intervention for hypertension patients that is easily implemented in primary health care.

Keywords: deep breathing relaxation, hypertension, stress

Introduction

Hypertension is a significant risk factor for morbidity and mortality associated with cardiovascular disease and ranks as a leading cause of disability globally (Kementrian Kesehatan RI, 2024). According to the World Health Organization (WHO), the prevalence of hypertension worldwide has reached 33%, indicating that approximately one in three individuals globally suffers from this condition (WHO, 2023). The findings of the 2023 Indonesian Health Survey (SKI) indicate that the prevalence of hypertension in Indonesia is 30.8% (SKI, 2023). The survey results indicate that in the Special Capital Region of Jakarta, the prevalence of hypertension reached 33.43%. West Jakarta has the third highest prevalence of hypertension among all provinces in Jakarta(Kementerian Kesehatan Republik Indonesia, 2018).

Hypertension can have physical and psychological effects, one of which is stress. The relationship between hypertension and stress is bidirectional, where hypertension can trigger stress through physiological and emotional response mechanisms. Stress activates the nervous system by increasing the production of hormones such as cortisol and adrenal hormones. Physiological responses in the organism occur when the brain perceives stress due to stressor stimuli. The brain involved in this emotional response is designated as the limbic system, which then communicates with the autonomic nervous system through the hypothalamus, through the reticular to the sympathetic nervous system. This sympathetic nervous system function produces effects that include increased blood pressure (Hidayati, Purwanto, & Siswantoro 2022). Then stress has the potential to trigger the emergence of hypertension, because the involvement of the sympathetic nervous system during the physiological stress response triggers an increase in the release of the hormone adrenaline, then increases the heart rate and induces vasoconstriction, which culminates in an increase in blood pressure. (Ibrahim, Sari, & Fakhruzzaman 2023).

Failure to adequately manage stress can significantly increase the risk of developing hypertension (Hidayati et al., 2022).Therefore, effective stress management is a crucial factor in the preventive and therapeutic management of hypertension. Stress management techniques that can be used include deep breathing relaxation therapy, progressive muscle relaxation, Benson relaxation, visualization (guided imagery), aromatherapy, and yoga (Herien, 2024).. A highly effective intervention is the application of deep breathing relaxation techniques. This relaxation technique was chosen because it is simple, easy to understand, and does not require special equipment. Deep breathing relaxation involves slow deep breathing exercises.

Numerous studies have explored the physiological effects of deep breathing relaxation techniques, while psychological impacts, such as reducing stress and anxiety levels, have not been comprehensively studied. Therefore, further research related to stress in hypertension is essential. Psychologically, hypertension can potentially cause stress. Stress is a triggering factor for increased blood pressure, so stress management plays a crucial role in hypertension therapy. Furthermore, this deep breathing relaxation method has no side effects and is free (Folkman, 2020). With this intervention, hypertension patients can develop effective stress management strategies in addition to pharmacotherapy, namely medication (Ibrahim, Sari, & Fakhruzzaman 2023). The Depression Anxiety Stress Scale (DASS21) is a measuring tool or instrument used in this study to assess stress levels in hypertension patients. The involvement and role of nurses in efforts to reduce stress levels are crucial.

Objective

This study aims to analyze the effect of deep breathing relaxation on stress levels of hypertension patients.

Method

This study employed a quantitative approach with a quasi-experimental method using a One Group Pretest-Posttest Design, without a control group. The research was conducted at Tambora District Health Center, West Jakarta, with deep breathing relaxation given as an intervention for hypertensive patients. The study population consisted of 5,177 hypertensive patients recorded at Tambora Public Health Center from January to March 2025. The sample was selected through purposive sampling and included 34 respondents who met the inclusion criteria, namely being diagnosed with hypertension, aged over 18 years, and willing to participate from the beginning to the end of the study. Exclusion criteria were patients with respiratory disorders or comorbidities that affected breathing patterns. The sample size was calculated using G*Power software with an effect size of 0.5, alpha of 0.05, and power of 0.80, resulting in a total of 34 participants.

The instrument used in this study was the Indonesian version of the Depression Anxiety Stress Scale (DASS-21) questionnaire, which has been validated and demonstrated good reliability with a Cronbach's Alpha of 0.912. The questionnaire used a Likert scale ranging from 0 to 3, and the total score was multiplied by 2, where higher scores indicated higher levels of stress. Data collection was carried out using the DASS-21 questionnaire administered before and after the 14-day intervention. The researcher provided clear instructions, reminded participants via WhatsApp, and conducted six self-observations. The collected data were then edited, coded, entered into statistical software, cleaned, and tabulated for analysis. Univariate analysis was performed to describe the characteristics and frequency distribution of respondents, while bivariate analysis was conducted using the Wilcoxon Signed-Rank test to evaluate differences in stress levels before and after the intervention.

Result

Statistical technique used to analyze a single variable independently to describe the basic parameters of the data obtained. These parameters include frequency distribution, mean, median, standard deviation, maximum, minimum, and 95% CI.

Table 1. Participant Characteristics: Age and Duration of Illness
Descriptive Statistics of Age and Duration of Illness (n = 34)

Characteristic	Mean	Median	Min-Max	Std. Deviation	95% CI Lower	95% CI Upper
Age (years)	56.97	58.00	35–80	10.75	53.32	60.72
Duration of Illness (years)	4.74	3.00	0–25	5.648	2.76	6.71

The findings from Table 1, reveal that among 34 participants, the mean age was 56.97 years, rounded to 57 years, with a standard deviation of 10.75 years. The median age was 58 years, and the age range spanned from 35 to 80 years. The 95% confidence interval (CI) for the mean age was 53.32 to 60.72 years. Regarding duration of illness, the mean was 4.74 years (rounded to 5 years), while the median was 3 years, indicating that half of the

participants had been ill for 3 years or less. The extended duration in a few cases likely increased the overall mean. The standard deviation was 5.648, showing high variability. The 95% CI ranged from 2.76 to 6.71 years, indicating where the true population mean likely lies.

Table 2. Gender, Education, and Occupation Characteristics (n=34)

Characteristic	Frequency	Percentage
Gender		
- Male	6	17.6%
- Female	28	82.4%
Education		
- Elementary School	16	47.1%
- Junior High School	15	44.1%
- Senior High School	3	8.8%
Occupation		
- Laborer/Employee	12	35.3%
- Unemployed	10	29.4%
- Housewife	7	20.6%
- Entrepreneur	5	14.7%

Table 2 illustrates that the majority of participants in this study were female, representing 82.4% of the total 34 participants, while male participants comprised only 17.6%. The data also show that the highest level of education attained by most participants was elementary school (47.1%), followed by junior high school (44.1%), and only 8.8% had completed senior high school. In terms of occupation, the largest group of participants were laborers or employees (35.3%), followed by unemployed individuals (29.4%), housewives (20.6%), and a smaller proportion were entrepreneurs (14.7%).

Table 3. Stress Score Before and After Deep Breathing Relaxation
Descriptive Statistics of Stress Scores (n = 34)

Characteristic	Mean	Median	Min-Max	Std. Deviation	95% CI Lower	95% CI Upper
Pre-Test Stress	21.71	22.00	12–30	4.004	20.31	23.10
Post-Test Stress	10.41	9.00	4–20	4.083	8.99	11.84

Based on Table 3, the pre-test average stress score for participants was 21.71, with a median of 22.00, with the lowest stress score being 12 and the lowest being 30. The standard deviation of 4.004 indicates moderate variation in stress levels among participants. This could be due to external factors influencing the stress score of 21.71, which falls within the moderate category. The increased stress levels could be influenced by age, given that the average age of participants was 57 years. At this stage of life, individuals are vulnerable to stress due to various influences, including physical changes associated with the aging process, decreased organ function, and increased susceptibility to chronic diseases.

Among the predominantly female participants, it was noted that women often exhibited higher levels of stress compared to their male counterparts, due to the competing

demands of fulfilling the roles of homemaker (when engaged in professional pursuits) and mother. Education also played a role, as 41.71% of participants had only a primary school education, which could impact their ability to manage stress effectively. Furthermore, occupational role played a significant role, with the majority of participants working as laborers. Laborers typically face high workloads, relatively low job rewards, and precarious job security. Such circumstances can exacerbate stress in individuals with hypertension.From Table 3, pre-test mean stress score was 21.71, with a median of 22, ranging between 12 and 30. The standard deviation of 4.004 indicates moderate variability. Stress scores in this range fall into a moderate stress category. Factors like age (mean 57 years), gender (majority female), education (41.71% only elementary education), and occupation (majority laborers) may have influenced stress levels. From Table 3, the post-test mean stress score decreased to 10.41, with a median of 9.00, and a range between 4 and 20. The standard deviation was 4.083. This drop in score demonstrates the effectiveness of deep breathing relaxation, which activates the relaxation response by lowering sympathetic nervous system activity.

Bivariate analysis is a statistical approach that investigates the relationship between two different variables (LP2M, 2023). The tests used are the normality test and the Wilcoxon Signed Rank Test.

Table 4. Wilcoxon Signed Rank Test Results Results of the Wilcoxon Signed Rank Test (n = 34)

Variable	Negative Rank	Positive Rank	Ties / P-Value
Stress Level	34	0	0 / 0.000

Based on Table 4, the Wilcoxon Signed Ranks Test revealed that all 34 participants experienced a reduction in stress scores after undergoing deep breathing relaxation, as indicated by a Negative Rank of 34 and a Positive Rank and Ties of 0, showing no increase or unchanged scores post-intervention. The calculated Z-value of -5.113 and a highly significant p-value of 0.000 (p < 0.05) confirm a statistically significant difference between pre- and post-test stress levels, with post-test scores being consistently lower. This uniform reduction highlights deep breathing relaxation as a practical, effective intervention, especially for participants facing chronic stressors such as physically demanding labor, limited financial resources, and low educational attainment. Most participants were older adults (average age 57) and predominantly female, a group often burdened by dual responsibilities of work and household, further amplifying stress vulnerability. Despite these challenges, the simplicity and accessibility of the breathing technique enabled participants to engage fully with the sessions, reporting noticeable improvements in relaxation, reduced tension, and better sleep quality feedback that aligns with the statistical evidence of stress reduction following the intervention.

Discussion

The findings of the descriptive analysis indicated that the average age of participants was 57 years. According to the World Health Organization (WHO), individuals aged over 45 years exhibit considerable vulnerability to chronic health conditions, including hypertension, which is intricately associated with psychological stress (WHO, 2020). Findings by (Puspitasari, Suprayitno, & Bustami 2021) stated that at this stage, it can be anticipated that the volume of thoughts increases, stressors become more persistent, and responsibilities multiply,

coinciding with a decline in organ function and overall physiological deterioration. Consequently, this provides an explanation as to why older individuals encounter various forms of stress as they navigate this stage of life.

Based on the analysis above, individuals aged 57 years tend to experience stress due to various factors. At this age, a person undergoes physical changes due to the aging process, declining organ function, and an increased risk of chronic disease. Consequently, deep breathing relaxation can be an appropriate choice for hypertension sufferers aged 50 years and above to manage stress.

The findings of this study reveal that the majority of the participants were women. This observation is further supported by data from (SKI, 2023), which indicate that women have a higher prevalence of hypertension compared to men, with a rate of 11.2% for women compared to 5.9% for men. A research study by (Alisa & Trivina, 2020) states that the prevalence of hypertension in women increases after the onset of menopause. This increase is associated with the hormonal fluctuations experienced by women and their heightened susceptibility to psychological stress. The findings by (Juni & Rahman 2024) indicate that women often exhibit higher stress levels compared to men. This is attributed to their conflicting roles as homemakers (when also engaged in employment) and mothers.

The analysis suggests that gender, particularly being female, is associated with a higher vulnerability to stress due to both physiological and psychosocial factors. Consequently, deep breathing relaxation is deemed appropriate for implementation as it can help reduce the physical and psychological tension frequently experienced by women.

The results of this study show that the majority of participants had suffered from hypertension for a significant duration, with an average of five years. This observation is consistent with research conducted by (Yuniartika & Murti, 2020) who reported that individuals with hypertension may also experience psychological disorders. The chronic nature of hypertension requires prolonged treatment, thereby increasing the risk of complications. Findings by (Santi & Adriani 2024) reveal that a longer duration of experience with hypertension is associated with a deeper understanding of the condition and an increased awareness of its life-threatening complications, including psychological disorders such as stress and anxiety.

Based on the above description, it can be stated that a prolonged duration of hypertension is linked to an increased risk of perceived chronic stress. This is caused by the burden of treatment, activity limitations, and anxiety regarding the potential complications associated with the disease.

The majority of respondents reported having a basic level of education, with 47.1% having completed elementary school. This observation aligns with a study by (Seitz & Steger, 2025) which states that limited coping achievement renders individuals more vulnerable to stress.

These findings are consistent with previous research conducted by (Zhang et al., 2024) which demonstrated that a lower level of education can affect the understanding of healthy lifestyle practices. Furthermore, it is associated with inadequate stress management and limited access to relevant information on hypertension. Educational attainment significantly influences an individual's comprehension of health-related information and their strategies for managing stress. Findings by (Sari & Mutmainna 2024) state that education significantly shapes an individual's mindset and their capacity to process information. Those with lower educational levels tend to experience more stress and demonstrate challenges or delays in information processing, thereby affecting their health-related behaviors and lifestyle choices.

Based on the above findings, education is a factor associated with stress in individuals with hypertension. Participants with lower educational levels tended to experience higher stress. This may occur due to limited knowledge and understanding of stress, as well as a lack of effective coping mechanisms for stress. Therefore, deep breathing relaxation can be utilized as a suitable intervention, as it is easy to understand and can be performed without requiring a formal higher education.

The majority of participants worked as laborers or wage earners, constituting 35.3% of the sample. This finding aligns with research conducted by (Lawalata et al., 2024), which states that significant factors for stress include a high workload and poor workplace relationships. Findings by (Arif, Malaka, & Novrikasari 2021) state that work-related stress manifests as a physical and emotional response that arises when job demands do not align with the available competencies, resources, and employee needs. This situation may stem from excessive work demands and relentless pursuit of targets, which is exacerbated by suboptimal relationships with colleagues. Consequently, such conditions can be a hindrance to workers, potentially leading to increased stress levels.

Based on the findings of this study, supported by the previous research presented above, it can be concluded that individuals working as laborers are often confronted with heavy physical workloads, work pressure, and unsupportive work environments; therefore, it can be stated that laborers are vulnerable to stress.

The results for the stress level before the relaxation intervention showed an average pre-test stress score of 21.71, which falls into the moderate category. This score can be attributed to external influencing factors. Elevated stress scores may also be influenced by age-related factors, as the participants' average age was 57 years. At this life stage, individuals are highly vulnerable to stress due to numerous factors. They undergo physical changes from the aging process, declining organ function, and an increased risk of chronic disease.

Among the participants, who were predominantly female, it was frequently observed that women exhibited higher stress levels compared to men. This is attributed to their conflicting responsibilities as homemakers (while also being engaged in professional work) and mothers. The level of education also contributed significantly, as 47.1% of participants had only attained an elementary school education, which can affect their ability to manage stress effectively. Furthermore, occupation plays a crucial role, as the majority of participants were laborers. Laborers typically endure high workloads, have relatively low status, and experience unstable job security. Such conditions can exacerbate stress in individuals suffering from hypertension.

These results are consistent with the research by (Wahyuni & Pratiwi, 2021) which showed that stress has a significant relationship with blood pressure in hypertensive patients. This finding is reinforced by (Pujiastuti et al., 2022) who concluded that there is a significant relationship between stress levels and the incidence of hypertension. This is further supported by (Halawa et al., 2023) , whose results indicate a correlation between stress levels and hypertensive events.

Other findings also explain that hypertension exerts psychological effects similar to stress through the mechanism of increased sympathetic nervous system activation. This condition triggers the release of stress hormones such as adrenaline and cortisol, consistently leading to increased anxiety and stress, which culminates in elevated blood pressure (Natasha, Anugrahini, & Arna 2024). Based on the above exposition, it can be concluded that there is an interconnection between hypertension and stress. This occurs because hypertension and stress have a bidirectional relationship; hypertension can trigger stress

through physiological and emotional response mechanisms. Consequently, the higher the stress level, the higher the pre-deep breathing relaxation stress score, as measured by the Depression Anxiety Stress Scale (DASS-21) questionnaire. In this instrument, a higher score indicates a greater level of experienced stress.

The results for the stress level following the deep breathing relaxation intervention showed a score of 10.41, which falls within the normal category. The median value also decreased from 22.00 to 9.00. During the post-test phase, participants reported feeling more relaxed, experiencing improved sleep quality, and having reduced concerns about health issues. This improvement is evidenced by the fact that participants applied the deep breathing relaxation technique properly and correctly, diligently following the procedure twice daily (morning and evening) as instructed. Furthermore, participants also adopted healthier lifestyle practices, such as managing rest periods and reducing stress-inducing activities. Moreover, this deep breathing relaxation assisted participants in achieving a calm state, as the technique functions by reducing sympathetic nervous system activity and activating the relaxation response, thereby alleviating tension and stress.

These findings are consistent with research by (Azhar et al., 2023) which reported a mean stress score of 13.35 before deep breathing relaxation therapy, which decreased to 11.54 afterward. This study's results are further strengthened by the research of (Elliya et al., 2021), who found a pre-intervention stress score of 21.53, followed by a reduction to 16.29 after the relaxation technique. Support is also provided by (Idhayanti et al., 2022), who stated that before the deep breathing relaxation technique was administered, the majority of participants experienced moderate stress [9 respondents (40.9%)] and mild stress [8 respondents (36.4%)]. Subsequently, a reduction in stress levels was observed, with 7 individuals (31.8%) reporting no stress and 8 individuals (40.9%) experiencing moderate stress.

Other findings state that relaxation exercises can aid focus and induce an internal state of calm (Mayo Clinic, 2025). Relaxation practices offer numerous benefits, notably the reduction of stress, anxiety, and tension levels. Deep breathing relaxation is performed through deliberate, rhythmic, and comfortable abdominal breathing conducted with closed eyes (Argaheni et al., 2023).

Based on the results of this study, a decrease in the stress level score is evident following the implementation of deep breathing relaxation. This occurs because deep breathing relaxation works by stimulating the sympathetic nervous system, lowering heart rate, and creating a sense of calm. This assists participants in coping with pressure, thereby enabling a reduction in their stress scores.

The findings obtained from the Wilcoxon Signed Rank Test yielded a Z value of -5.113 with a p-value of 0.000 (p < 0.05). This result confirms that the null hypothesis (H_o) is rejected and the alternative hypothesis (H_a) is accepted, meaning there is a statistically significant difference between stress levels before and after the administration of deep breathing relaxation. The decrease in stress scores across all respondents indicates that deep breathing relaxation is effective in reducing stress, even in vulnerable populations.

This occurs because Slow Deep Breathing (SDB) can elicit a physiological response; it functions by decreasing sympathetic nervous system activity and increasing parasympathetic nervous system activity. This induces a reduction in heart rate and blood pressure, a decrease in muscle tension, and a lessening of stress-related symptoms (Cahyani, 2024).

This phenomenon is supported by the findings of (Idhayanti, Fugianti, & Chunaeni 2022) who state that Slow Deep Breathing is an abdominal breathing method performed in a

deliberate, comfortable, and rhythmic manner, often with closed eyes, to produce a relaxation effect. Previous research by (Herawati et al., 2025) demonstrates that the deep breathing relaxation technique is effective for patients with hypertension. Furthermore, a study by (Anggraini, 2020) presents evidence confirming the efficacy of the deep breathing relaxation technique in managing blood pressure among hypertensive individuals. These observations are further corroborated by research conducted by (Azhar et al., 2023)), which validates the effectiveness of the deep breathing relaxation technique for stress reduction.

Based on the above exposition, a significant difference exists in the stress levels of hypertensive patients at the Tambora District Community Health Center in West Jakarta. This outcome occurred because, after implementing the deep breathing relaxation technique, participants' responses indicated a reduction in stress levels, increased feelings of calm, and a decrease in sleep difficulties. This is due to the mechanism of this relaxation technique, which functions to alleviate symptoms such as stress.

This study utilized a pretest-posttest design without a control group. This design limits the researchers' ability to evaluate the effectiveness of deep breathing relaxation in isolation from other factors that could influence stress levels. The presence of uncontrolled external factors—such as family conditions, economic status, work, and environment—may have potentially confounded the participants' stress levels. Future research is recommended to employ a controlled design to enhance the validity of the findings and facilitate broader application of the results.

Conclusion

The participants in this study were predominantly older adults, mostly female, with low educational backgrounds, employed as laborers, and had been living with hypertension for over a year. Prior to the deep breathing relaxation intervention, their average stress score was 21.71, categorized as moderate, likely influenced by age, gender, chronic illness duration, low education, and physically demanding occupations factors closely linked with stress and hypertension in a bidirectional physiological-emotional feedback loop. After the intervention, the average stress score significantly decreased to 10.41, falling within the normal range, supported by participant reports of improved relaxation, better sleep, and reduced health-related worry. The consistent application of the relaxation technique—twice daily following proper procedures combined with healthier lifestyle adjustments contributed to the lowered stress. The Wilcoxon test further confirmed the intervention's efficacy with a highly significant p-value of 0.000 (p < 0.05), demonstrating a notable difference between pre- and post-test stress levels. The technique's success, even among high-risk individuals with limited access to health education, affirms its physiological basis: deep breathing works by reducing sympathetic nervous system activity, heart rate, and muscle tension, making it a feasible and scalable intervention for stress reduction in hypertensive populations. Based on these findings, recommendations include incorporating this intervention into nursing curricula and community health programs, encouraging hypertensive patients to practice it independently, and urging health centers such as the one in Tambora, West Jakarta to integrate it into preventive care. Future research should employ controlled, longer-duration designs, measure stress levels periodically throughout the intervention, and account for environmental factors to further validate the long-term impact and contextual effectiveness of deep breathing relaxation.

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