

# The Effect of Deep Breathing Relaxation Techniques on Blood Pressure Changes in Elderly Patients with Hypertension

Eti Sumiati<sup>1\*</sup>, Nurlianti<sup>2</sup>, Dewi Nur Anggraeni<sup>3</sup>

<sup>1,2</sup>Sekolah Tinggi Ilmu Kesehatan Mataram, Indonesia

<sup>3</sup>Sekolah Tinggi Ilmu Kesehatan Wira Husada Yogyakarta, Indonesia

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## ABSTRACT

Hypertension is a condition characterized by an abnormal increase in blood pressure, which can lead to higher morbidity and mortality rates. The number of individuals affected by hypertension continues to rise annually, with projections estimating that by 2025, approximately 1.5 billion people will be affected, and 9.4 million deaths will occur each year due to hypertension and its complications. Among the elderly population, hypertension prevalence is notably increasing. This study aims to assess the impact of deep breathing relaxation techniques on blood pressure changes in elderly hypertension patients at the Geriatrics Clinic of Mataram Regional Hospital. A one-group pretest-posttest design was utilized, in which blood pressure measurements were taken before and after the intervention. The study involved 42 elderly hypertension patients, with data analysis conducted using the T-test. The findings revealed a significant effect of deep breathing relaxation on blood pressure reduction, as indicated by a p-value of 0.000. In conclusion, deep breathing relaxation techniques play a significant role in lowering blood pressure among elderly hypertension patients.

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## Corresponding Author:

Eti Sumiati

Sekolah Tinggi Ilmu Kesehatan Mataram, Indonesia

Email: [sumiatie070@gmail.com](mailto:sumiatie070@gmail.com)

## 1. INTRODUCTION

Hypertension is a condition where an individual's blood pressure rises above the normal threshold. According to the World Health Organization [1], approximately 1.13 billion people worldwide suffer from hypertension, meaning that one in three individuals globally is diagnosed with the condition. The prevalence of hypertension continues to increase annually, with projections estimating that by 2025, the number of affected individuals will reach 1.5 billion. Moreover, hypertension and its complications contribute to approximately 9.4 million deaths each year.

In Indonesia, data from the Sample Registration System (SRS) in 2017 reported that hypertension with complications accounted for 5.3% of deaths, making it the fifth leading cause of mortality across all age groups. The prevalence of hypertension varies among different age groups, affecting 31.6% of individuals aged 31-44 years, 45.3% of those aged 45-54 years, and 55.2% of those aged 55-74 years [2]. Specifically, in West Nusa Tenggara, the prevalence of hypertension stands at 24.9% [3]. The Geriatrics Clinic at Mataram Regional Hospital recorded 47 elderly hypertension patients in the mild to moderate stages between June and August 2020.

The high prevalence of hypertension among the elderly (ages 55-74) can be attributed to various factors, including cognitive and functional decline, frailty, multimorbidity, polypharmacy, and partial or complete loss of autonomy. The number of very elderly individuals experiencing frailty—characterized by increased vulnerability due to cumulative physiological decline—has grown significantly worldwide. Research suggests that morbidity and mortality rates are higher among elderly individuals with hypertension compared to those with lower blood pressure [4] ; [5].

Age is a strong risk factor for hypertension. Studies indicate that while the prevalence of hypertension among young adults is relatively low (2-3%), it increases significantly among the elderly, reaching approximately 65% or higher [6]. Blood pressure tends to rise with age due to structural changes in blood vessels. After the age of 45, arterial walls thicken due to collagen accumulation in the muscle layers, causing blood vessels to gradually narrow and lose elasticity. Consequently, systolic blood pressure continues to rise until around 70 years of age, while diastolic blood pressure increases until around 50-60 years before stabilizing or slightly declining. These physiological changes lead to increased peripheral resistance and sympathetic nervous system activity, while baroreceptor sensitivity declines with age .

Although aging naturally contributes to elevated blood pressure [7], hypertension requires appropriate management to prevent severe health complications, including increased morbidity and mortality [8]. One effective non-pharmacological intervention is deep breathing relaxation therapy. This technique involves controlled breathing at a frequency of 6-10 breaths per minute, promoting cardiopulmonary stretching. The stretch receptors in the aortic arch and carotid sinus relay signals via the vagus nerve to the medulla oblongata, activating baroreceptor reflexes. Additionally, vasomotor fibers in skeletal muscles release acetylcholine, inducing vasodilation. As a result, decreased cardiac output, myocardial contraction, and blood volume contribute to lower blood pressure levels [9].

## 2. METHOD

### 2.1 Research Design

This study employed a pre-experimental approach using a One-Group Pretest-Posttest Design, in which participants' blood pressure was measured before and after the intervention (deep breathing relaxation technique) [10]. The relaxation technique followed the guidelines established by Potter & Perry (2010). Blood pressure readings were recorded three times after the intervention was administered.

### 2.2 Population and Sample

The study population consisted of elderly individuals diagnosed with stage 1 (mild) and stage 2 (moderate) hypertension in August 2022, totaling 47 individuals. The sample size was determined using the Slovin formula, yielding a sample of 42 participants. The selection process utilized a purposive sampling technique, ensuring that the sample met specific inclusion criteria relevant to the study.

### 2.3 Research Instruments

Data collection was conducted through direct observation, measuring blood pressure before and after the intervention. The measurements were performed using a mercury sphygmomanometer to ensure accuracy in assessing blood pressure changes.

### 2.4 Data Analysis

The collected data were analyzed using univariate and bivariate statistical methods. The univariate analysis was used to examine data distribution and frequency, while the bivariate analysis employed a paired T-test with a significance level of  $\alpha = 0.05$  to determine the effect of deep breathing relaxation on blood pressure reduction in elderly patients.

## 3. RESULTS AND DISCUSSION

### Respondent Characteristics

Table 1. Distribution of Respondents by Gender

No	Gender	Frequency	Percentage (%)
1	Male	19	45,2
2	Female	23	54,8
	Total	42	100

The data in Table 1 indicate that most respondents were female (54.8%), while the remaining 45.2% were male.

Table 2. Distribution of Respondents by Age Group

No.	Age (Years)	Frequency	Percentage (%)
1	60-74	32	76,1
2	75-90	10	23,9
3	≥ 90.	0	0
	Total	42	100

Table 2 shows that the majority of elderly hypertension patients were between 60-74 years old (76.1%), followed by 23.9% in the 75-90 age group. No respondents were aged 90 years or older.

#### Blood Pressure Before Deep Breathing Relaxation

Table 3. Pre-Intervention Blood Pressure Classification

No.	Blood Pressure Classification (mmHg)	Frequency (n)	Percentage (%)
1	Hypertension Stage 1 (140-159/90-99)	26	62
2	Hypertension Stage 2 (160-179/100-109)	16	38
	Total	42	100

Before the intervention, most respondents had stage 1 hypertension (62%), while 38% were classified as stage 2 hypertension.

#### Blood Pressure After Deep Breathing Relaxation

Table 4. Post-Intervention Blood Pressure Classification and T-Test Results

Blood Pressure Classification (mmHg)	Blood Pressure			
	Before		After	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Normal (<130/< 85)			4	9,5
High Normal (130-139/85-89)			10	23,8
Hypertension Stage 1 (140-159/90-99)	26	62	21	50,0
Hypertension Stage 2 (160-179/100-109)	16	38	7	16,7
Total	42	100	42	100
T-Test Result: $\alpha$		.000		

After applying the deep breathing relaxation technique, blood pressure levels improved significantly. 9.5% of respondents achieved normal blood pressure, while 23.8% moved into the high-normal range. The proportion of respondents with stage 1 hypertension decreased from 62% to 50%, and those with stage 2 hypertension dropped from 38% to 16.7%.

Statistical analysis using the paired T-test showed a p-value of 0.000 ( $p < 0.05$ ), indicating a significant effect of deep breathing relaxation on blood pressure reduction.

### 3.1 Pre-Intervention Blood Pressure Analysis

The study findings indicate that before the deep breathing relaxation intervention, 62% of respondents had stage 1 hypertension, while 38% had stage 2 hypertension. The high prevalence of hypertension in older adults is associated with age-related physiological changes, including reduced physical activity, decreased organ function, and diminished cardiovascular regulation [12].

Several factors contribute to hypertension in the elderly, including increased sodium sensitivity, decreased vascular elasticity, and atherosclerotic changes. Excess sodium intake can lead to fluid retention and increased blood volume, resulting in higher arterial pressure [13]. Additionally, age-related vascular stiffness and reduced capillary efficiency further contribute to elevated blood pressure levels [10].

### 3.2 Post-Intervention Blood Pressure Analysis

Following the deep breathing relaxation intervention, blood pressure levels improved significantly. A portion of respondents achieved normal (9.5%) or high-normal (23.8%) blood pressure, while the proportion of those in stage 1 and stage 2 hypertension decreased. This suggests that deep breathing relaxation techniques effectively help regulate blood pressure.

Deep breathing exercises work by relaxing muscles, improving oxygenation, and stimulating parasympathetic nervous activity, which reduces heart rate and blood pressure [14]. These findings align with previous research showing a significant reduction in blood pressure following deep breathing relaxation in moderate-to-severe hypertension patients [15],[16].

However, some participants did not experience significant blood pressure reductions. This may be attributed to factors such as difficulty following instructions, lack of concentration, or pre-existing stress and tension. Improper breathing techniques during the intervention could have also affected the results.

### 3.3 Effect of Deep Breathing Relaxation on Blood Pressure

The paired T-test results ( $p = 0.000$ ) confirm a significant impact of deep breathing relaxation on reducing blood pressure among elderly hypertension patients at Mataram Regional Hospital's Geriatrics Clinic. The intervention led to a shift from stage 1 hypertension to normal or high-normal blood pressure in many participants.

Deep breathing relaxation serves as a non-pharmacological therapy that provides a calming effect, reduces muscle tension, and lowers cardiovascular strain. The technique stimulates baroreceptors, decreases cardiac output, and promotes vasodilation, ultimately leading to a reduction in blood pressure [17] ; [18].

Deep breathing relaxation plays a crucial role in reducing muscle tension, blood pressure, heart rate, respiratory rate, and perspiration levels. This relaxation technique facilitates increased cardiopulmonary stretch, which in turn activates the parasympathetic nervous system. As a result, myocardial contractility decreases, along with stroke volume and cardiac output, leading to a negative inotropic effect. The reduction in stroke volume and cardiac output ultimately lowers blood pressure, as it diminishes cardiac muscle contractions and overall blood volume circulation [10]; Astari, 2022; [14]

## 4. CONCLUSION

Based on the study findings, the following conclusions can be drawn Pre-Intervention Blood Pressure: Before undergoing the deep breathing relaxation technique, most respondents were classified as stage 1 hypertension (62%), while 38% were in stage 2 hypertension. Post-Intervention Blood Pressure: After the intervention, 9.5% of respondents achieved normal blood pressure, 23.8% were in the high-normal category, 50% remained in stage 1 hypertension, and 16.7% were in stage 2 hypertension. This indicates a notable improvement in blood pressure levels following the relaxation technique. Effect of Deep Breathing Relaxation: Statistical analysis using a paired T-test ( $p = 0.000$ ) confirmed a significant effect of deep breathing relaxation on blood pressure reduction among elderly hypertension patients at Mataram Regional Hospital's Geriatrics Clinic. This finding suggests that deep breathing relaxation can be an effective non-pharmacological strategy for managing hypertension in elderly individuals.

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