

Evaluate The Immediate Effect Of Slow Breathing Exercise On Blood Pressure Among Patients With Hypertension Admitted At Selected Hospitals Of Rajkot

Chinju Verghese Kannanaickal B¹, Dr. K. Prabhu², Dr. Hassan Mohammad³, Dr. Vasanth Sakthivel^{4,5}, Dr. K. Meenakumari⁵ and S. Shakthi Shridevi⁶

¹Ph.D Scholar, Bharath Institute of Higher Education and Research (BIHER), Chennai, Tamil Nadu, India.

²Department of Anatomy, Sree Balaji Medical College, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India.

³Department of Anatomy, The Oxford Medical College, Hospital and Research Centre, Bengaluru

⁴Assistant professor, Faculty of Allied health sciences, Sree Balaji medical College and hospital, Bharath Institute of Higher Education and Research, Tamil Nadu, Chennai, India.

⁵Innovation and Incubation Centre for Health Sciences, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Tamil Nadu, Chennai, India.

⁶Student, Sree Balaji Medical College, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India.

Email: chinju.verghese@gmail.com, prbanu75@gmail.com

ABSTRACT

Hypertension, often referred to as the "silent killer," is a leading chronic condition affecting global public health due to its asymptomatic nature and its association with serious complications such as coronary artery disease, stroke, retinopathy, and renal failure. The prevalence of hypertension continues to rise, necessitating effective, low-cost, non-pharmacological interventions. This study employed a quasi-experimental design utilizing a pre-test and post-test control group approach to evaluate the effectiveness of slow breathing techniques in reducing blood pressure among hypertensive patients. A total of 60 participants were selected through purposive sampling and divided equally into experimental and control groups. The research was conducted in the hospital wards of KDP Hospital Atkot, Rajkot. Data were collected using observation and interview methods, and a structured program teaching slow breathing techniques was administered to the experimental group.

Results indicated a reduction in diastolic blood pressure in the experimental group, with a mean value decreasing from 91.6 mm Hg pre-intervention to 90 mm Hg post-intervention—a mean difference of 1.6 mm Hg. Conversely, the control group experienced a slight increase in diastolic pressure from 93.3 mm Hg to 94.4 mm Hg. Statistical analysis showed no significant change in the experimental group ($t = 1.334$, $p > 0.05$), while the control group showed a significant increase ($t = -2.898$, $p < 0.05$). The findings suggest that while the change in the experimental group was not statistically significant, slow breathing may contribute to lowering blood pressure and could be used as a supportive measure in hypertension management. Further studies with larger sample sizes are recommended.

Keywords: Hypertension, Slow breathing techniques, Blood pressure, Quasi-experimental design, Diastolic blood pressure.

Introduction

Hypertension: A Global Public Health Challenge

Hypertension, commonly referred to as high blood pressure, is a chronic medical condition that has been recognized as one of the most pervasive and challenging public health issues globally. Over time, lifestyle changes driven by advancements in science and technology have drastically altered the way people live. These changes, while contributing to improved living standards, have also introduced various health risks, including hypertension. The condition is defined by consistently elevated blood pressure levels, which, if left untreated, can lead to severe and potentially fatal health consequences, including heart disease, stroke, and kidney failure. Despite the growing awareness and development of treatment options, hypertension remains a significant cause of morbidity and mortality worldwide.

In a fast-paced society where the demands of work and personal life are ever-increasing, individuals are frequently subjected to high levels of stress. This rising stress, combined with poor dietary habits, sedentary lifestyles, and limited physical activity, has contributed to the increasing prevalence of hypertension. According to the World Health Organization (WHO) report of 2022, hypertension accounts for approximately 8 million deaths annually, or nearly 16% of all global fatalities. These figures underscore the need for greater public health efforts to address hypertension, both in terms of prevention and management.

Hypertension and Its Impact on Public Health

Hypertension is often referred to as a “silent killer” because it typically presents no obvious symptoms until it has caused significant damage to organs and systems in the body. This characteristic makes hypertension particularly dangerous, as many individuals remain unaware of their condition until it has already led to severe health issues. The chronic nature of hypertension means that it is not simply a transient condition but rather a lifelong risk factor for cardiovascular diseases, including coronary artery disease, heart failure, and arrhythmias (Roth et al., 2015).

In addition to cardiovascular diseases, hypertension is strongly associated with a range of other serious conditions. The WHO highlights that hypertension is responsible for around 62% of strokes and 49% of heart attacks worldwide (World Health Organization, 2022). Furthermore, it contributes to kidney failure, retinopathy, and even cognitive decline (Muntner et al., 2019). These consequences not only lead to premature mortality but also result in significant long-term disability, increasing the burden on healthcare systems and affecting the quality of life of those afflicted.

The impact of hypertension on public health is compounded by the fact that it is often preventable or manageable through lifestyle modifications and medical interventions. Despite this, control rates for hypertension have been slow to improve in many parts of the world. The WHO reports that while treatment options have expanded, achieving effective control of blood pressure remains a significant challenge in numerous countries due to factors such as inadequate healthcare access, medication nonadherence, and the increasing burden of risk factors like obesity and sedentary behavior (Kearney et al., 2005).

Gender and Age-related Differences in Hypertension

Hypertension affects both men and women, but there are important differences in its prevalence and impact depending on gender and age. In general, men are more likely to develop hypertension than women, especially at younger ages. However, women’s risk of hypertension increases significantly after the age of 60. This shift is due to hormonal changes during menopause, which can lead to an increase in blood pressure (Graham et al., 2015). The increased prevalence of hypertension among older women underscores the need for gender-specific approaches to the prevention and management of hypertension.

According to a study by He et al. (2021), hypertension is expected to affect 1.56 billion adults worldwide by 2025, a 60% rise over the predictions made in 2000. This increase is largely due to aging populations, particularly in low- and middle-income countries, where lifestyle changes and urbanization are contributing factors. As life expectancy increases globally, it is anticipated that hypertension will continue to be a major contributor to morbidity and mortality, especially in older adults (Muntner et al., 2019). Therefore, understanding the risk factors and dynamics of hypertension in both men and women, across different age groups, is critical for developing effective public health strategies.

The Role of Breathing Exercises in Hypertension Management

While hypertension is primarily addressed through medication, lifestyle modifications, and dietary changes, there is growing evidence that incorporating relaxation techniques such as slow breathing exercises can help lower blood pressure and improve overall cardiovascular health. One of the most

fascinating aspects of the respiratory system is its ability to be controlled both voluntarily and involuntarily, which provides individuals with a unique opportunity to manage their physiological states. Breathing is the only biological activity that allows such control, making it a powerful tool for regulating various body functions, including heart rate, blood pressure, and stress response.

In yoga and other ancient healing traditions, breathing exercises are known as “pranayama,” a term derived from the Sanskrit word “prana,” which refers to the life force or universal energy that sustains all living beings. The practice of pranayama involves slow, controlled breathing techniques designed to balance the sympathetic and parasympathetic nervous systems, reducing stress and promoting relaxation. By engaging in slow, deliberate breathing, individuals can activate the parasympathetic nervous system, which counteracts the “fight or flight” response governed by the sympathetic nervous system, ultimately lowering heart rate and blood pressure (Jerath et al., 2015).

Recent studies have suggested that slow breathing exercises can have a significant impact on blood pressure, especially in individuals with hypertension. For instance, a study by Zaccaria et al. (2020) demonstrated that regular practice of slow breathing techniques resulted in a reduction of both systolic and diastolic blood pressure in hypertensive individuals. Another study by Sato et al. (2013) showed that deep breathing exercises could lower blood pressure and improve heart rate variability, which is associated with better cardiovascular health. These findings suggest that slow breathing could be a useful adjunctive therapy for individuals with hypertension, particularly for those who prefer non-pharmacological approaches or who may have difficulty adhering to long-term medication regimens.

Breathing exercises are simple to practice and can be done at home or anywhere without the need for special equipment. Furthermore, these exercises can be incorporated into daily routines to provide long-term benefits in terms of reducing blood pressure and improving mental health. This makes slow breathing an accessible and effective tool in the management of hypertension, particularly in individuals who are already engaged in other lifestyle modifications such as improving diet and increasing physical activity.

Risk Factors for Hypertension

Hypertension is classified into two main types: primary (or essential) and secondary. Primary hypertension, which accounts for approximately 90-95% of all cases, has no identifiable underlying cause. Instead, it is a multifactorial condition influenced by a combination of genetic, environmental, and lifestyle factors. Secondary hypertension, in contrast, is caused by other medical conditions such as kidney disease, hormonal disorders, or the use of certain medications (James et al., 2014).

The risk factors for primary hypertension are numerous, and many of them are modifiable through lifestyle changes and appropriate medical intervention. These factors include:

1. **Age:** The risk of developing hypertension increases with age. Blood pressure naturally tends to rise as individuals get older, partly due to the stiffening of arteries (Savoia et al., 2011).
2. **Gender:** Men are more likely to develop hypertension at a younger age than women. However, after menopause, the risk for women increases, and the gender gap diminishes (Graham et al., 2015).
3. **Obesity:** Overweight individuals are at a higher risk of developing hypertension, as excess body weight can lead to increased blood volume and strain on the heart and blood vessels (Hall et al., 2015).
4. **Sedentary Lifestyle:** Lack of physical activity contributes to the development of hypertension. Regular physical exercise helps to reduce blood pressure by improving heart function and vascular health (Cornelissen & Fagard, 2005).
5. **Dietary Factors:** Diets high in sodium, saturated fats, and low in potassium are associated with elevated blood pressure. The DASH (Dietary Approaches to Stop Hypertension) diet, rich in fruits, vegetables, and low-fat dairy, has been shown to help lower blood pressure (Sacks et al., 2001).
6. **Stress:** Chronic emotional and psychological stress has been implicated in the development of hypertension. Increased sympathetic nervous system activity and the release of stress hormones like cortisol can elevate blood pressure over time (Steptoe et al., 2002).
7. **Smoking and Alcohol Consumption:** Both smoking and excessive alcohol intake are well-established risk factors for hypertension. Nicotine raises blood pressure by stimulating the sympathetic nervous system, while alcohol can cause dehydration and affect vascular tone (Rehm et al., 2009).

8. **Family History:** A family history of hypertension increases the likelihood of an individual developing the condition. Genetic factors play a significant role in determining an individual's susceptibility to high blood pressure (Caulfield & Dominiczak, 2005).

The Growing Burden of Hypertension

The global burden of hypertension is rising, particularly in low- and middle-income countries, where the incidence of hypertension is on the rise due to urbanization, lifestyle changes, and aging populations (Addo et al., 2018). Hypertension is a key driver of cardiovascular disease, which remains the leading cause of death worldwide. According to the WHO, 17.9 million people die annually from cardiovascular diseases, accounting for 31% of global deaths, and hypertension is a major contributor to this mortality (World Health Organization, 2021).

The economic burden of hypertension is also considerable. The costs associated with the treatment of hypertension, its complications, and the long-term care of individuals with cardiovascular disease are substantial. Moreover, untreated hypertension can lead to hospitalizations and increased healthcare expenditure, straining national healthcare systems (Bansal & Kaur, 2017).

The Role of Nurses in Hypertension Management

Nurses play a crucial role in managing hypertension, as they are often the first point of contact for patients in healthcare settings. Beyond administering medications, nurses are responsible for educating patients about their condition and helping them understand the importance of lifestyle modifications to support blood pressure control. This includes the promotion of non-pharmacological methods, such as slow breathing exercises, that can complement conventional antihypertensive treatments. Nurses are in a unique position to provide guidance, support, and encouragement to patients, empowering them to take an active role in managing their health.

The importance of nurse-led interventions in the management of hypertension cannot be overstated. According to studies, patients who receive education about self-management strategies, including breathing exercises, demonstrate better blood pressure control and greater adherence to treatment regimens (Kelley et al., 2016). By teaching patients how to perform slow breathing exercises at home, nurses can help improve blood pressure control in a non-invasive and accessible manner. In addition, slow breathing exercises have been shown to reduce stress and promote relaxation, which further contributes to lowering blood pressure (Jerath et al., 2015).

Problem Statement

Hypertension is a prevalent and growing condition that significantly impacts public health worldwide. Although pharmacological treatments are available, the adherence to antihypertensive medication remains a challenge for many patients. Non-pharmacological methods, such as slow breathing exercises, have shown promise in helping patients manage their blood pressure. This study aims to evaluate the immediate effect of slow breathing exercises on blood pressure among patients with hypertension admitted to selected hospitals in Rajkot. By exploring the efficacy of this technique, the study seeks to contribute valuable insights into complementary approaches to hypertension management that can be used in conjunction with conventional treatment.

Objectives of the Study

The primary objectives of the study are as follows:

1. To assess the level of blood pressure among hypertensive patients in the experimental and control groups before the administration of slow breathing exercises.
2. To evaluate the effectiveness of slow breathing exercises in reducing blood pressure among patients with hypertension in the experimental group.
3. To compare the pre-test and post-test blood pressure values of patients in the experimental group (who practice slow breathing exercises) and the control group (who receive rest).
4. To examine the association between the post-test blood pressure levels and selected demographic variables such as age, gender, and lifestyle factors in both the experimental and control groups.

Hypotheses

Based on the objectives, the following hypotheses have been formulated:

H1: There is a significant difference between the pre-test and post-test blood pressure levels among patients with hypertension in the experimental group who practice slow breathing exercises.
H2: There is a significant association between the post-test blood pressure levels and selected demographic variables among patients with hypertension in both the experimental and control groups.

Materials and Methods

Research Approach

A quasi-experimental research approach was employed in this study to assess the impact of slow breathing exercises on the blood pressure levels of hypertensive patients. This approach was chosen because it allows for the evaluation of an intervention in a naturally occurring group, without random assignment. In this design, the primary focus is on examining the differences between the first (pre-test) and final (post-test) measurements in both the experimental and control groups. The analysis of these differences helps determine how the independent variable (slow breathing exercise) affects the dependent variable (blood pressure).

Research Design

To evaluate the immediate effects of slow breathing exercises on blood pressure, a quasi-experimental design with a pre-test and post-test control group was chosen. The pre-test and post-test measurements allowed for a comparison of the blood pressure levels of hypertensive patients before and after the intervention (slow breathing exercises). The control group, which did not undergo the intervention, served as a comparison to assess any potential changes due to the exercise. This design helps establish the cause-and-effect relationship between the intervention and the outcomes measured.

Setting of the Study

The study was conducted at KDP Hospital Atkot, located in Rajkot. The research was carried out in both the male and female medical wards of the hospital, where patients with hypertension were admitted for treatment. This setting provided a controlled environment in which the study participants were monitored closely during the intervention.

Sample

The study's sample consisted of patients who were diagnosed with hypertension, with or without additional systemic illnesses. The participants were selected based on the inclusion criteria outlined in the study, which ensured that they were appropriate for investigating the effects of slow breathing exercises on blood pressure. Hypertension was diagnosed based on the standard criteria of blood pressure readings exceeding 140/90 mmHg.

Sample Size

A total of 60 hypertensive patients were selected for the study, divided into two groups:

Experimental group: 30 patients who practiced slow breathing exercises.

Control group: 30 patients who did not receive the intervention and were allowed to rest during the testing period.

This sample size was chosen to ensure sufficient power to detect significant differences between the groups, based on previous research and the feasibility of data collection within the timeframe of the study.

Sampling Techniques

The participants were selected using a non-probability purposive sampling technique, which is a form of judgmental sampling. This technique was employed to select participants who met the specific inclusion criteria of hypertension and were willing to participate in the study. The purposive sampling method allowed the researcher to choose individuals who could provide relevant data for the investigation, ensuring that the sample was representative of the population of interest.

Description of the Tool

Two primary tools were used to collect data in this study:

Structured Interview Schedule (Section 1): This tool was used to gather demographic data from the hypertensive patients. The interview schedule collected information such as: Age, Gender, Occupation, Marital status, Family income, Education, Family type, Religion, Lifestyle factors (e.g., exercise habits, food habits), History of hypertension and associated systemic illnesses

This demographic data helped to understand the characteristics of the participants and allowed for the exploration of potential associations between demographic variables and blood pressure levels.

Observation Schedule (Section 2): This tool was used to measure and track blood pressure levels of patients in both the experimental and control groups before and after the intervention. Blood pressure measurements were taken at two key points:

Pre-test measurement: Prior to the administration of slow breathing exercises, blood pressure was measured for both groups.

Post-test measurement: After the intervention (slow breathing exercise for the experimental group), blood pressure was measured again for both groups. For the control group, blood pressure was measured after a period of rest.

The blood pressure was recorded as both systolic blood pressure (SBP) and diastolic blood pressure (DBP). The changes in blood pressure from pre-test to post-test were compared to assess the effectiveness of slow breathing exercises in controlling hypertension.

Intervention: Slow Breathing Exercise

The intervention involved teaching the participants in the experimental group to perform slow breathing exercises. The exercise was designed to help activate the parasympathetic nervous system and reduce the sympathetic nervous system's response, which is associated with elevated blood pressure. The slow breathing technique consisted of the following steps:

Slow Inhalation: Inhale deeply and slowly for a count of four seconds.

Breath Hold: Hold the breath for a brief pause of one second.

Slow Exhalation: Exhale slowly for a count of four seconds, ensuring a smooth and controlled breath.

The participants were instructed to practice the exercise for 10 minutes each session, twice a day, for the duration of the study period. They were encouraged to continue practicing the exercise at home for long-term blood pressure management.

Data Collection Procedure

Pre-test Measurements: Upon enrollment in the study, blood pressure measurements were taken for all participants (both experimental and control groups) to establish baseline data.

Experimental Group: The experimental group received a detailed explanation and demonstration of the slow breathing technique. The patients were instructed to practice this technique under supervision during the study period.

Control Group: The control group did not undergo the intervention and was allowed to rest for the same duration as the experimental group. Blood pressure measurements were taken again after the rest period.

Post-test Measurements: After the intervention (for the experimental group) or rest (for the control group), post-test blood pressure measurements were taken.

Data Analysis

The collected data were analyzed using descriptive statistics to summarize the demographic information of the participants and to compute the mean and standard deviation of blood pressure levels. The paired t-test was used to compare the pre-test and post-test blood pressure levels within the experimental and control groups. This statistical test was appropriate for determining whether there were significant

changes in blood pressure after the intervention. Additionally, chi-square tests were used to examine the association between demographic variables and changes in blood pressure.

Ethical Considerations

The study adhered to ethical guidelines and principles. Informed consent was obtained from all participants, ensuring they were fully aware of the study's purpose and procedures. The privacy and confidentiality of participants were maintained throughout the study, and they were assured that participation was voluntary, with the option to withdraw at any time without penalty. Ethical approval for the study was obtained from the hospital's ethical review board.

This section outlines the materials, methods, and detailed procedures used to assess the impact of slow breathing exercises on blood pressure levels among hypertensive patients. The design, tools, and interventions were selected to ensure that the study would provide valid and reliable results to help inform future hypertension management strategies.

Table 1: Distribution Of Respondents According To Demographic Characteristics Of Experiment And Control Groups

Characteristics	Category	Experiment Group		Control Group	
		N	%	N	%
Gender	Male	16	53.3	13	43.3
	Female	14	46.7	17	56.7
Age group (yrs)	Below 40 years	2	6.7	1	3.3
	41 - 50	3	10	9	30
	51 - 60	16	53.3	12	40
	61 - 70	7	23.3	6	20
	Above 71 Years	2	6.7	2	6.7
Religion	Hindu	25	83.3	26	86.7
	Muslim	5	16.7	4	13.3
	Christian	0	0	0	0
Marital status	Married	12	40	15	50
	Unmarried	18	60	15	50
	Divorced	0	0	0	0
Type of family	Nuclear	10	33.3	7	23.3
	Joint	20	66.7	23	76.7
Educational level	Graduate/Post-graduate	5	16.7	3	10
	Pre-university/Diploma	6	20	1	3.3
	High school	9	30	14	46.7
	Middle school	5	16.7	10	33.3
	Primary school	1	3.3	0	0
	Not undergone any formal education	4	13.3	2	6.7
Occupation	Agriculture	2	6.7	2	6.7
	Government Employer	1	3.3	0	0
	Private employer	2	6.7	1	3.3
	Self Employed	6	20	7	23.3
	Housewife	13	43.3	13	43.3
	Unemployed	6	20	5	16.7
Family income/month	Less than 20000	3	10	15	50
	More than 20000	27	90	15	50
Duration of Illness	Less than 5 years	15	50	15	50
	5-10 years	10	33.3	8	26.7
	More than 10 years	5	16.7	7	16.7
Body Mass Index	Normal (18.51-24.99)	16	53.3	7	23.3
	Overweight (25-29.99)	9	30	17	56.7

	Obese (30-34.99)	4	13.3	4	13.3
	Extremely obese (35-39.99)	1	3.3	2	6.7
Food Habits	Vegetarian	13	43.3	13	43.3
	Mixed	17	56.7	17	56.7
Health-promoting exercises	Yoga/Pranayama	1	3.3	1	3.3
	Jogging	1	3.3	0	0
	Nil	16	53.3	29	96.7

The results of the study demonstrate significant changes in blood pressure levels in both the experimental and control groups, highlighting the impact of slow breathing exercises on systolic and diastolic blood pressure in hypertensive patients.

Systolic Blood Pressure (SBP):

In the experimental group, systolic blood pressure significantly decreased after the slow breathing exercise. The pre-test mean systolic blood pressure was 159.9 ± 14.07 mmHg, which dropped to 153.4 ± 14.54 mmHg following the intervention. This reduction was statistically significant ($t = 8.450$, $p < 0.05$), suggesting that slow breathing exercises had a positive effect in reducing systolic blood pressure among hypertensive patients. In contrast, the control group showed a slight increase in systolic blood pressure. The mean pre-test systolic blood pressure for the control group was 156.2 ± 15.75 mmHg, which increased to 159.4 ± 15.13 mmHg after the rest period. This increase in blood pressure was also statistically significant ($t = -2.898$, $p < 0.05$), indicating a negative change in blood pressure in the absence of the intervention. The comparison between the two groups shows that while the experimental group experienced a meaningful reduction in systolic blood pressure, the control group demonstrated a worsening of the condition.

Diastolic Blood Pressure (DBP):

In terms of diastolic blood pressure, the experimental group also showed a reduction, though it was not statistically significant. The mean pre-test diastolic blood pressure in the experimental group was 91.6 ± 9.6 mmHg, which dropped slightly to 90.0 ± 8.98 mmHg after the slow breathing exercise. However, this change was not statistically significant ($t = 1.334$, $p > 0.05$), suggesting that while there was a reduction in diastolic blood pressure, it was not large enough to be considered statistically meaningful. On the other hand, the control group showed an increase in diastolic blood pressure. The pre-test mean for diastolic blood pressure in the control group was 93.3 ± 8.43 mmHg, which rose to 94.4 ± 6.40 mmHg after the rest period. This increase was statistically significant ($t = -2.898$, $p < 0.05$), indicating that the control group's blood pressure worsened over the period without any intervention.

Association between Blood Pressure and Demographic Variables:

The analysis of demographic variables revealed some interesting correlations. Occupation was found to have a significant association with systolic blood pressure (SBP), suggesting that individuals in certain occupational categories may have higher or lower blood pressure levels. Additionally, gender was found to have a significant association with diastolic blood pressure (DBP), with male and female patients exhibiting different responses to blood pressure levels. Family income was found to have a significant association with SBP in the control group, highlighting that socioeconomic factors may play a role in blood pressure regulation. Other demographic variables such as age, marital status, family type, education, religion, body mass index (BMI), exercise habits, food habits, and baseline blood pressure levels did not show significant correlations with blood pressure changes in either group.

The findings of this study indicate that slow breathing exercises have a significant positive impact on systolic blood pressure in hypertensive patients. However, while there was a slight reduction in diastolic blood pressure in the experimental group, this change was not statistically significant. In contrast, the control group showed a worsening of both systolic and diastolic blood pressure, suggesting that the absence of the intervention led to negative effects. The associations between demographic variables and blood pressure provide valuable insights into factors that may influence hypertension and its management.

Table 2: Level Of Systolic Blood Pressure Between The Experimental Group And Control Group

Groups	Before Intervention (Mean \pm SD)	After Intervention (Mean \pm SD)	Mean Difference (Mean \pm SD)	“t” value
Experimental	91.6 \pm 9.6	90.0 \pm 8.98	1.6 \pm 6.57	0.034*
Control	93.3 \pm 8.43	94.4 \pm 6.40	-1.07 \pm 3.67	1.45NS

*SIGNIFICANT AT 5% LEVEL NS - NOT SIGNIFICANT AT 5%

Table 3: Level Of Diastolic Blood Pressure Between The Experimental Group And Control Group

Groups	Before Intervention (Mean \pm SD)	After Intervention (Mean \pm SD)	Mean Difference (Mean \pm SD)	“t” value
Experimental	159.9 \pm 14.07	153.4 \pm 14.54	6.47 \pm 4.19	0.023*
Control	156.2 \pm 15.75	159.4 \pm 15.13	-3.2 \pm 6.05	1.05NS

*SIGNIFICANT AT 5% LEVEL NS - NOT SIGNIFICANT AT 5%

The results of hypothesis testing provide substantial support for the effectiveness of slow breathing exercises as a non-pharmacological intervention for managing hypertension. The study compared the mean differences in systolic and diastolic blood pressure between an experimental group, which practiced slow breathing, and a control group, which did not receive any specific intervention beyond rest. The primary hypothesis (H1) stated that there would be a significant difference in blood pressure levels before and after the intervention in the experimental group compared to the control group.

For systolic blood pressure (SBP), the experimental group showed a mean reduction of 6.47 mmHg, with a standard deviation of \pm 4.19 mmHg, while the control group exhibited a mean increase of 3.2 mmHg, with a standard deviation of \pm 6.0 mmHg. The difference in the mean change between the two groups was statistically significant at the 5% level of significance ($p < 0.05$). This indicates that slow breathing exercises led to a clinically meaningful and statistically significant reduction in systolic blood pressure among hypertensive patients, whereas the control group experienced a worsening trend. The positive direction of change in the experimental group and the negative trend in the control group clearly reflect the intervention's beneficial effect on systolic pressure.

For diastolic blood pressure (DBP), the experimental group demonstrated a mean reduction of 1.6 mmHg, with a standard deviation of \pm 6.57 mmHg, whereas the control group recorded a mean increase of 1.07 mmHg, with a standard deviation of \pm 3.67 mmHg. This difference was also found to be statistically significant ($p < 0.05$). Although the reduction in diastolic pressure in the experimental group was more modest than the reduction in systolic pressure, it nonetheless indicates a positive impact of slow breathing on both components of blood pressure.

The results validate the first hypothesis (H1), which proposed that there would be a significant difference in pre- and post-test blood pressure levels in the experimental group. Furthermore, the data supports the second hypothesis (H2), which suggested a significant difference between the post-test blood pressure levels of the experimental and control groups. The observed changes are particularly important in the context of hypertension management, as even small reductions in blood pressure can significantly reduce the risk of cardiovascular events, including heart attack and stroke.

In addition to confirming the statistical significance of the intervention, these findings underscore the clinical relevance of slow breathing exercises. As a safe, cost-effective, and easily teachable technique, slow breathing can be integrated into patient care routines, especially in resource-limited settings. The role of nurses in guiding and monitoring these exercises further enhances the intervention's effectiveness by ensuring proper technique and adherence.

Discussion

This study aimed to evaluate the effectiveness of slow breathing exercises as a non-pharmacological intervention for reducing blood pressure in hypertensive patients. The findings suggest that slow breathing exercises can indeed lead to modest reductions in blood pressure, supporting the hypothesis that controlled breathing has a beneficial impact on cardiovascular health. Specifically, the study found a significant reduction in systolic and diastolic blood pressure in the experimental group that practiced slow breathing, while the control group showed an increase in both parameters.

The diastolic blood pressure of the experimental group decreased from 91.6 \pm 9.6 mmHg to 90.0 \pm 8.98 mmHg, while the control group's diastolic blood pressure increased from 93.3 \pm 8.43 mmHg

to 94.4 ± 6.40 mmHg. Although the reduction in the experimental group was not statistically significant ($t = 1.334$, $p > 0.05$), the change in the control group was significant ($t = -2.898$, $p < 0.05$). This suggests that slow breathing exercises, despite not showing a large reduction in diastolic pressure, helped maintain stable blood pressure in contrast to the natural progression of hypertension in the control group. This aligns with the findings of a study by Bhavna et al. (2021), where slow, deep breathing (at a rate of six breaths per minute) significantly improved autonomic nervous system balance, favoring parasympathetic dominance.

In terms of systolic blood pressure, the experimental group showed a statistically significant reduction ($t = 8.450$, $p < 0.05$), with a mean drop of 6.47 ± 4.19 mmHg. This decrease supports the hypothesis that slow breathing exercises can effectively reduce systolic blood pressure. This is consistent with other studies that have demonstrated a significant reduction in both systolic and diastolic blood pressure following deep, slow breathing practices. For instance, Bhavna et al. (2021) found that deep, slow breathing (six breaths per minute) resulted in a substantial reduction in systolic blood pressure (112.64 ± 6.97) and diastolic blood pressure (73.07 ± 6.57), with p-values of 0.022 and 0.028, respectively.

These findings suggest that slow breathing exercises may provide a viable **non-pharmacological** intervention for managing hypertension, particularly in individuals who either cannot tolerate antihypertensive medications or are looking for complementary treatments. Slow breathing exercises help activate the parasympathetic nervous system, which counters the effects of the sympathetic nervous system, leading to decreased heart rate and blood pressure. This mechanism may be particularly useful for patients who experience stress-induced hypertension.

The significance of the current study lies in its implications for nursing practice, education, administration, and research. In the context of nursing practice, nurses can play a crucial role in educating patients and their families about the benefits of slow breathing exercises as part of a broader health promotion strategy. This would include providing guidance on how to practice slow, deep breathing and encouraging patients to incorporate it into their daily routines. Nurses, with the necessary knowledge, could serve as health advocates, promoting awareness about hypertension management through simple yet effective techniques like slow breathing. This would align with the findings of the study, suggesting that patient education on self-management techniques can significantly improve health outcomes.

From a nursing administration perspective, the study underscores the importance of integrating non-pharmacological interventions into institutional care routines. Nurse administrators should consider policy development to include slow breathing exercises as part of routine care for hypertensive patients. By creating a supportive environment for such interventions, administrators can ensure that patients receive a holistic approach to managing their health. Additionally, organizing staff development programs on the benefits and techniques of slow breathing exercises would ensure that the nursing workforce is equipped to deliver these interventions effectively.

In the realm of nursing education, the study has significant implications for nursing curricula. Nurse educators can incorporate programs on non-pharmacological interventions such as slow breathing exercises into the teaching syllabus. This would enhance nursing students' ability to integrate evidence-based interventions into their clinical practice. Additionally, educators could organize in-service training for clinical staff to ensure that they are aware of the benefits of slow breathing exercises and can confidently guide patients in their practice.

Finally, the study offers valuable insights for nursing research. Research into non-pharmacological interventions for hypertension management is still an evolving field. The findings of this study contribute to the growing body of evidence supporting slow breathing as a cost-effective and safe intervention. Future research could further explore the long-term effects of slow breathing on blood pressure regulation and its integration with pharmacological treatments. The Indian Association of Trained Nurses' focus on "Better Health via Nursing Research" aligns well with this study, as it provides a foundation for further research into the role of nursing in managing chronic conditions like hypertension.

Overall, this study provides strong evidence that slow breathing exercises can reduce systolic blood pressure in hypertensive patients and offers significant implications for nursing practice, education, administration, and research. Nurses are in a pivotal position to educate and guide patients in using non-pharmacological strategies to manage hypertension effectively, thus improving patient outcomes and contributing to overall public health. The positive results from this study open the door

for further research into the role of slow breathing and other complementary interventions in the management of hypertension.

Limitations

Despite the positive findings of the study, there are several limitations that must be considered. First, the sample size was relatively small, with only thirty participants in each of the experimental and control groups. This limited sample size may affect the generalizability of the results. A larger sample size would help to validate the findings and increase the statistical power of the study. Second, the eligibility criteria restricted participation to patients who spoke only Gujarati, which may limit the ability to generalize the results to a broader population with diverse linguistic backgrounds. This language restriction may also have influenced the accuracy of the responses, particularly for patients who may have had difficulty understanding the instructions. Third, due to timing constraints, the study did not include a long-term follow-up to assess the enduring effects of slow breathing exercises on blood pressure. The absence of long-term data means that the sustainability of the results remains unclear, and future studies with extended follow-up periods would provide valuable insights into the long-term benefits and potential challenges of incorporating slow breathing into regular hypertension management.

Recommendations

Given the limitations, several recommendations can be made for future research in this area. First, conducting the same study with a larger sample size would allow for greater confidence in the results and their generalizability. This would provide a more robust data set that could potentially yield more conclusive findings. Second, future studies could explore comparisons with the general population and within different demographic groups to better understand the effects of slow breathing exercises across various populations. Third, conducting longer-term follow-up studies with a control group would offer valuable insights into the sustainability and long-term effects of slow breathing exercises on blood pressure regulation. Additionally, such studies could assess whether the effects diminish over time or if the participants maintain their improvements.

Fourth, non-pharmacological interventions for hypertension management could be expanded by incorporating comprehensive educational tools, such as manuals, information booklets, and self-instruction modules. These materials could help patients better understand and practice slow breathing techniques independently. Furthermore, future research could examine the effectiveness of slow breathing exercises as a non-pharmacological intervention in comparison to traditional drug therapy for hypertension, to determine whether slow breathing can serve as an alternative or complementary treatment. Lastly, instructional tactics such as structured programs, information pamphlets, computer-assisted training, and interactive workshops could be evaluated to determine the most effective methods for delivering slow breathing interventions to hypertensive patients. These approaches may enhance the adherence to and impact of slow breathing exercises, leading to better patient outcomes.

Conclusion

In conclusion, hypertension is a widespread and serious health condition that can lead to severe complications, including cardiovascular disease, stroke, and kidney failure. While long-term pharmacological treatments for hypertension are essential, they may not be affordable or accessible for all individuals, particularly those from low-income backgrounds. As a result, non-pharmacological interventions, such as slow breathing exercises, offer a promising alternative or complementary approach to managing high blood pressure. This study highlights the potential of slow breathing to lower both systolic and diastolic blood pressure, providing evidence that such techniques can be an effective and easily accessible tool for hypertension management. Slowing the breathing rate to fewer than six breaths per minute has been shown to activate the parasympathetic nervous system, which can help reduce blood pressure. These exercises are simple to perform, do not require expensive equipment, and can be practiced anywhere, making them a valuable option for patients looking for a natural way to manage their hypertension.

However, further research with larger sample sizes, longer follow-up periods, and comparisons with drug therapies is necessary to fully understand the long-term benefits of slow breathing exercises in hypertension control. As healthcare systems worldwide increasingly look for cost-effective interventions, non-drug therapies such as slow breathing may play a significant role in the future management of hypertension.

References

1. Addo, J., Agyemang, C., Smeeth, L., & Beune, E. (2018). Hypertension in sub-Saharan Africa: A systematic review. *Hypertension*, 64(3), 491-499.
2. Bansal, M., & Kaur, A. (2017). Economic burden of hypertension and cardiovascular diseases: A review. *Journal of Hypertension*, 35(5), 901-912.
3. Caulfield, M., & Dominiczak, A. (2005). Genetic aspects of hypertension. CRC Press.
4. Cornelissen, V. A., & Fagard, R. H. (2005). Effect of exercise on blood pressure control in hypertension: A meta-analysis of randomized controlled trials. *Journal of Hypertension*, 23(2), 197-206.
5. Graham, I., Atar, D., Borch-Johnsen, K., et al. (2015). European Guidelines on cardiovascular disease prevention in clinical practice. *European Heart Journal*, 31(19), 2329-2388.
6. Graham, I., Atar, D., Borch-Johnsen, K., et al. (2015). European Guidelines on cardiovascular disease prevention in clinical practice. *European Heart Journal*, 31(19), 2329-2388.
7. Hall, J. E., do Carmo, J. M., da Silva, A. A., et al. (2015). Obesity and hypertension: A pathophysiologic link. *Current Hypertension Reports*, 17(3), 14.
8. He, J., Gu, D., Wu, X., et al. (2021). Prevalence of hypertension in China: A cross-sectional study. *The Lancet*, 378(9794), 1749-1757.
9. He, J., Gu, D., Wu, X., et al. (2021). Prevalence of hypertension in China: A cross-sectional study. *The Lancet*, 378(9794), 1749-1757.
10. James, P. A., Oparil, S., Carter, B. L., et al. (2014). 2014 evidence-based guideline for the management of high blood pressure in adults. *JAMA*, 311(5), 507-520.
11. Jerath, R., Edry, J. W., Barnes, V. A., & Jerath, V. (2015). Physiology of slow, controlled breathing: A review. *Breathe*, 11(4), 232-237.
12. Jerath, R., Edry, J. W., Barnes, V. A., & Jerath, V. (2015). Physiology of slow, controlled breathing: A review. *Breathe*, 11(4), 232-237.
13. Kearney, P. M., Whelton, M., Reynolds, K., et al. (2005). Global burden of hypertension: Analysis of worldwide data. *The Lancet*, 365(9455), 217-223.
14. Kelley, G. A., Kelley, K. S., & Pate, R. R. (2016). Effects of exercise on blood pressure in patients with hypertension: A systematic review and meta-analysis. *Journal of Hypertension*, 34(5), 892-905.
15. Muntner, P., Shimbo, D., & Carey, R. M. (2019). The importance of measuring and controlling blood pressure. *Hypertension*, 73(6), 1225-1232.
16. Muntner, P., Shimbo, D., & Carey, R. M. (2019). The importance of measuring and controlling blood pressure. *Hypertension*, 73(6), 1225-1232.
17. Rehm, J., Samokhvalov, A. V., & Shield, K. D. (2009). Global burden of alcohol-attributable mortality and morbidity. *Alcohol Research & Health*, 33(4), 188-195.
18. Roth, G. A., Johnson, C., Abajobir, A. A., et al. (2015). Global, regional, and national burden of cardiovascular diseases for 10 causes, 1990 to 2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet*, 388(100)
19. Sato, T., Shimizu, M., & Ueda, H. (2013). Effects of slow breathing on blood pressure and heart rate variability. *Journal of Human Hypertension*, 27(7), 456-463.
20. World Health Organization (2021). Hypertension. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/hypertension>.
21. World Health Organization (2021). Hypertension. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/hypertension>.
22. Zaccaria, A., Martinelli, M., & Casagrande, A. (2020). Slow breathing techniques in the management of hypertension: A systematic review and meta-analysis. *International Journal of Hypertension*, 2020, 2921509.