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Effect of abdominal deep breathing on blood pressure in hypertensive patients

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Abstract
Hypertension is a global health issue that necessitates readily accessible treatments. Deep breathing may assist in lowering blood pressure by enhancing parasympathetic tone and reducing sympathetic activity. The understanding of its physiological processes and long-term effects remains limited. This study examines the application of deep breathing exercises as an adjunct therapy for hypertension, aiming to clarify the therapeutic benefits of these practices. The study employed a quantitative one-group pre-test-post-test design for its research methodology. At KDP Hospital in Atkot, a total of forty hypertension patients were deliberately selected, with twenty assigned to the experimental group and twenty to the control group. On the initial day, both groups underwent preliminary assessments. The participants in the experiment performed abdominal deep breathing exercises twice daily over the course of five days. The control group did not undergo any form of intervention. On the seventh day, post-tests were conducted. The analysis of the data utilized both descriptive and inferential statistics. The research findings indicated that both the experimental group and the control group exhibited similar pre-test results and demographic characteristics. Although both groups experienced a reduction in blood pressure, the experimental group that practiced abdominal deep breathing demonstrated a significantly greater improvement. In the post-test analysis, the systolic pressure showed a decrease from a pre-test average of 149.9 ±15.46 to 120.40±9.54, yielding a t value of 14.53 (p<0.001). Additionally, a reduction in diastolic pressure from 110.45±7.19 to 88.1±6.29 was noted, with a t value of 14.86 (p<0.001), confirming the acceptance of hypothesis H1. Several factors demonstrated a significant association with blood pressure, including the type of occupation, the presence of co-morbid conditions, and the lifestyle choices made. The results indicate that individuals with hypertension who practice abdominal deep breathing experience a notable decrease in both systolic and diastolic blood pressure through this method.

Keywords: Abdominal deep breathing, hypertension, systolic pressure, diastolic pressure

Introduction
Heart disease, stroke, and renal failure are all increased when blood pressure is consistently high, a condition known as hypertension. Approximately 1.28 billion persons, ranging in age from 30 to 79, are impacted by hypertension globally, with 66 percent residing in nations with low or medium economic levels [1]. Many people may go undetected or do not follow their treatment plans, which contributes to the poor control rates that exist even if effective treatments are available [2]. As a result, lifestyle adjustments, especially breathing exercises, are becoming recognized as valuable non-pharmacological therapies for hypertension management.

Among the many different methods of breathing, abdominal deep breathing, which is sometimes referred to as diaphragmatic breathing, has garnered the attention of the scientific community. Following a slow, deep inhale via the nose utilizing the diaphragm rather than the chest, it is followed by a slow expiration, often at a pace of six to ten breaths per minute. This technique stimulates the parasympathetic nervous system, which in turn results in decreases in heart rate, vascular resistance, and levels of stress hormones, all of which contribute to a drop in blood pressure [3, 4].

The physiological mechanisms that cause this are all well-established. Everyone knows that the sympathetic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis may become activated when we're under emotional or mental stress, which in turn can cause our blood pressure to increase. This activation leads to an increase in the release of cortisol and vascular tone [5].

Through the improvement of vagal tone, the enhancement of baroreflex sensitivity, and the promotion of a state of relaxation, abdominal deep breathing is able to reverse this reaction [6]. On top of that, it has been linked to enhanced endothelial function as well as the generation of nitric oxide, both of which are important factors in maintaining healthy blood vessels [7].

The effectiveness of slow or timed breathing exercises in lowering both systolic and diastolic blood pressure has been proven via clinical studies and meta-analyses [8, 9]. This is especially true for inpatients who have mild to severe hypertension with the condition. For example, a meta-analysis conducted by Xie and colleagues shown that slow breathing contributed to a considerable reduction in systolic blood pressure by around 6 mmHg and diastolic blood pressure by 3 mmHg [9]. In light of these findings, breathing exercises have the potential to serve not only as a method for reducing stress but also as a therapeutically useful intervention for the regulation of blood pressure.

Standard hypertension management, particularly in low-resource settings, underutilizes abdominal deep breathing despite these positive outcomes. Limited patient and health professional knowledge, lack of formal training, and clinical undervaluation of mind-body therapies are barriers [10]. The cheap cost, non-invasiveness, and convenience of use make it promising for community-based hypertension care initiatives.

The purpose of this research is to determine whether or not hypertension patients may benefit from doing abdominal deep breathing techniques in order to lower their blood pressure. The results should make it easier to include simple breathing exercises into larger plans for managing hypertension, especially in cases where patients have limited access to medications or have poor adherence.

1.1 Statement of problem.

Evaluating Abdominal Deep Breathing Exercise as an Effective Approach to Hypertension Management in a Selected Rajkot Hospital

1.2 Objectives

1. Assess and compare baseline blood pressure levels of hypertensive patients in the experimental and control groups.
2. Determine the impact of abdominal deep breathing exercises on reducing blood pressure in the experimental group.
3. Examine the association between blood pressure levels and demographic variables among patients in both groups.

1.3 Hypothesis

H_1: Patients with hypertension who practice abdominal deep breathing exercises will exhibit a significant reduction in blood pressure from pre-test to post-test, and when compared to patients in the control group.

H_2: There is a statistically significant association between hypertensive patients' blood pressure levels and their selected demographic variables in both experimental and control groups.

2. Review of literature

At Yenepoya Medical College Hospital in Mangaluru, Karnataka, Akshatha Salian and Gr Gireesh examined how belly breathing exercises affected biological markers in hypertension patients. For seven days in February-March 2021, 60 people (30 experimental and control groups) exercised abdominal breathing for five to ten minutes, three to four times times a day. Group baseline systolic and diastolic blood pressures were comparable. After intervention, the experimental group had substantially lower systolic and diastolic blood pressure, pulse rate, and respiration rate than the control group (p=0.01). Abdominal breathing exercise lowers blood pressure, heart rate, and respiratory rate, indicating it may treat hypertension without drugs [11].

In a meta-analysis including thirteen studies, Katherine Ka-Yin Yau and Alice Yuen Loke looked at the effects of diaphragmatic breathing on the physical and mental health of persons with hypertension and prehypertension. This population consistently experiences reduced systolic and diastolic blood pressure, heart rate, anxiety, and calm when they practice conscious diaphragmatic deep breathing. According to the research, these advantages were achieved after four weeks of gentle diaphragmatic breathing (six breaths/min for ten minutes, twice daily). This study's results provide credence to diaphragmatic breathing as a simple, non-pharmacological approach to managing stress and blood pressure, which might inform future research and intervention design [12].

Researchers Bergeri AS and Daruwala SS looked at how well abdominal breathing exercises controlled hypertension. The sixty hypertension patients who participated in this quantitative and quasi-experimental research were split into two groups. One group was given normal medication while the other group practiced abdominal deep breathing exercises. At the outset, most patients in both sets of measurements had moderate BP. Systolic and diastolic blood pressure in the experimental group fell to 141.66 and 92.66 mmHg, respectively, after seven days, a significant difference compared to the control group. According to these results, deep breathing exercises performed in the abdomen region have the potential to reduce blood pressure without the need of medication. Larger, longer-term trials are necessary to confirm and assess the potential benefits of deep breathing exercises for hypertension [13].

Researchers Verma N. and Verma R. used convenience sampling to look at how hypertension patients in Mohali, Punjab, fared after doing deep breathing exercises. The experimental group saw a significant decrease in mean systolic blood pressure, from 140 ± 8.929 (pre-test) to 123 ± 7.663 (post-test), whereas the control group only experienced a modest decrease from 139.37 ± 8.101 to 137.50 ± 7.21 The experimental group saw a mean diastolic blood pressure decrease from 88.50 ± 5.089 to 77.13 ± 4.921, whereas the control group experienced a little drop from 88.625 ± 5.062 to 87.50 ± 3.755 Hypertensive experimental individuals' systolic and diastolic blood pressure dropped with deep breathing [14].

Fu J, Liu Y, *et al*. investigate methods for treating hypertension and prehypertension without the use of drugs. Their meta-analysis of 22 natural blood pressure-lowering methods included 14,923 people over 120 trials. Particularly noteworthy was the DASH diet, which outperformed conventional care and other treatments by significantly lowering low blood pressure by 3.54 mm Hg and high blood pressure by 6.97 mm Hg. Moreover, for those who are

overweight or obese, the combined effect of a healthy diet and regular exercise on lowering blood pressure is a strong incentive to make positive changes to their lifestyle [15].

3. Methodology

a) **Research Approach:** A quantitative approach was employed to evaluate the effect of the independent variable on blood pressure by comparing pre-test and post-test measurements.
b) **Research Design:** A quasi-experimental design with a control group and a pre- and post-test was used in the investigation.
c) **Study Setting:** The research was conducted at K.D.P Hospital, Atkot.
d) **Target Population:** Individuals diagnosed with hypertension formed the target population.
e) **Accessible Population:** Hypertensive patients attending the OPD at K.D.P Hospital, Atkot constituted the accessible population.
f) **Sampling Technique:** Participants were selected using a purposive sampling method.
g) **Sample Size:** A total of 40 patients were included in the study.

3.1 Description of the Tool

Part- I: Population-Related Factors Age, sex, marital status, religious affiliation, level of education, profession, and income were all part of the list**.**

Part-II: Health Variables: The variables assessed also included height, body weight, body mass index (BMI), and eating habits, and sleeping patterns, history of smoking, alcohol consumption, and use of chewing tobacco.

Part- III: Assessment of Blood Pressure

1. Blood pressure _____ (mm of hg)

3.2 Data Collection Procedure

The trial received approval from hospital officials prior to its commencement. Participants received information regarding the study's objectives and methods and provided verbal consent. Purposive sampling was employed to select participants from the male and female medical wards. There were twenty participants in the experimental group and twenty in the control group.

Blood pressure measurements were obtained prior to testing for both groups. Subsequent to the pre-test, the experimental group received instruction on abdominal deep breathing techniques and their benefits for lowering blood pressure. The investigator demonstrated the method, and subjects engaged in it for 30 minutes each morning under his supervision. Participants were advised to maintain a workout regimen of 30 minutes twice daily in the evening for a duration of seven days.

The control group received no treatment throughout the study. Post-test blood pressure measurements were conducted for both the experimental and control groups on day 7. Blood pressures of all participants were measured pre- and post-test between 9:00 AM and 11:00 AM to control for diurnal variations.

3.3 Plan for Data Analysis

The acquired data were processed, tabulated, summarized, and analyzed using descriptive and inferential statistics. A paired t-test was used to compare pre- and post-test blood pressure results on the seventh day to assess the blood pressure-lowering impact of abdominal deep breathing. Also, the Chi-square test was used to examine hypertension and demographic factors.

4. Results

4.1 Distribution of subject according to demographic variables

A. General Characteristics of the Respondents.

Most responders in the experimental and control groups were 46-65, with 60% and 55% of each being male. 70% and 75% of experimental and control group members were married and Hindu. Both groups included over half students, and 55% of the experimental and 65% of the control were farmers. Both groups had identical demographics, ensuring a fair baseline for abdominal deep breathing exercise assessment.

B. Distribution of respondents according to health variables.

The participants' height, weight, and body mass index (BMI) fell into a wide range, with the majority falling between the 55-75 kg weight range and having a normal BMI (45% in both groups), according to the distribution of health indicators between the two groups. The bulk of them were 1.61-1.7 meters tall. Nearly 50% of people in both groups said they slept for fewer than 8 hours per night. There was a higher prevalence of vegetarianism; 75% of the control group and 65% of the experimental group adhered to this diet. Both the experimental and control groups' participants were heavy smokers (60% and 80%, respectively), and neither group claimed ever having been drunk. With 40% of the population in both groups saying they chew tobacco constantly, the experiment was balanced. Lastly, hypertension was present for more than a year in around 20-25% of the patients. It seems from the distribution of health-related variables that the two groups started off with similar health status indicators.

4.2 Comparisons of BMI, SBP, DBP, PR, MAP

Table 1: Comparisons of BMI, SBP, DBP, PR, MAP

Sl. No.	Parameters	Experimental group ($n = 20$)				Control group ($n = 20$)			
		Pre-test (mean ± SD)	Post-test (mean ± SD)	Mean difference	*p* value	Pre-test (mean ± SD)	Post-test (mean ± SD)	Mean difference	*p* value
1	BMI	26.69 ± 3.94	26.28 ± 3.64	0.39	0.008*	27.45 ± 4.77	27.68 ± 4.85	0.24	0.792
2	SBP	149.9 ± 15.47	120.40 ± 9.54	22.5	0.001**	141.8 ± 13.19	138.74 ± 15.29	3.04	0.471
3	DBP	110.45 ± 7.19	88.1 ± 6.29	12.44	0.001**	89.55 ± 10.98	87.73 ± 9.59	2.78	0.221
4	PR	80.71 ± 10.54	77.74 ± 9.15	2.97	0.023*	84.74 ± 8.75	83.38 ± 10.68	2.47	0.457
5	MAP	105.45 ± 11.5	91.45 ± 6.35	14	0.001**	101.98 ± 9.79	99.84 ± 11.55	3.14	0.644

There were 20 patients in each group; the table compares the two sets of mean values for body mass index (BMI), systolic and diastolic blood pressure (SBP and DBP, respectively), pulse rate (PR), and mean arterial pressure (MAP). There was a statistically significant benefit of the intervention as measured by substantial decreases in SBP (mean difference = 22.5, p = 0.001), DBP (12.44, p = 0.001), PR (2.97, p = 0.023), and MAP (14, p = 0.001) in the experimental group. Low body mass index (BMI) was significantly reduced (0.39, p = 0.009). The control group, on the other hand, showed no statistically significant changes across any parameters, with small mean differences and p-values. These results indicate that the intervention successfully reduced cardiovascular risk factors and blood pressure in the intervention group as compared to the control group.

4.3 Comparison of pre-test and post-test level of blood pressure among hypertensive patients

Table 2: Comparison of pre-test and post-test level of blood pressure among hypertensive patients in experimental group.

Blood Pressure	Assessment	Mean	SD	t value	p value
Systolic	Pre-test	149.9	15.46	14.55	0.001**
	Post-test	120.4	9.54		
Diastolic	Pre-test	110.45	7.19	14.86	0.001**
	Post-test	88.1	6.29		

The data shows that both the systolic and diastolic blood pressure were dramatically reduced as a result of the intervention. An important t-value of 14.55 and a p-value of 0.001 indicate that the mean systolic blood pressure decreased from 149.9 ± 15.46 (pre-test) to 120.4 ± 9.54 (post-test). The average diastolic blood pressure dropped dramatically from 110.45±7.19 to 88.1± 6.29, with a t-value of 14.86 and a p-value of 0.001. The intervention reduced blood pressure on both the systolic and diastolic sides. The findings demonstrate that deep abdomen breathing significantly reduced systolic and diastolic blood pressure in the participants. Yes, we accept H1.

Table 3: Comparison of pre-test and post-test level of blood pressure among hypertensive patients in control group.

Blood Pressure	Assessment	Mean	SD	t value	p value
Systolic	Pre-test	140.8	14.17	12.23	0.321
	Post-test	137.74	16.21		
Diastolic	Pre-test	89.45	10.78	6.34	0.745
	Post-test	86.73	9.53		

Nobody in this group saw a notable shift in their blood pressure, according to the data. After the test, the average systolic blood pressure dropped from 140.8 ± 14.17 to 137.74 ± 16.21, with a t-value of 12.23 and a p-value of 0.321, which shows no statistical significance. The mean diastolic blood pressure dropped somewhat from 89.45 ± 10.78 to 86.73 ± 9.53, with a t-value of 6.34 and a p-value of 0.745 that don't indicate significance. Results like these demonstrate that intervention had no effect on this group's systolic or diastolic blood pressure.

4.4 Comparison of experimental and control group blood pressure readings in hypertensive individuals.

Table 4: Analysing the experimental and control groups' blood pressure readings in hypertensive patients.

Blood Pressure	Group	Mean	SD	t value	p value
Systolic (pre-test)	Experimental	149.9	15.46	1.11	0.073
	Control	140.8	14.17		
Diastolic (pre-test)	Experimental	110.45	7.19	1.017	0.062
	Control	89.45	10.78		
Systolic (post-test)	Experimental	120.4	9.54	7.78	0.001*
	Control	137.74	16.21		
Diastolic (post-test)	Experimental	88.1	6.2.9	5.94	0.001*
	Control	86.73	9.53		

Hypothesis 1 of the study was that hypertensive patients who practiced abdominal deep breathing exercises would have significantly lower blood pressure both before and after the exercise, as well as compared to the control group. The results strongly corroborate this prediction. Both the experimental and control groups' pre-intervention systolic and diastolic blood pressure readings were statistically indistinguishable (p = 0.073 and p = 0.062, respectively). But following the intervention, the experimental group's systolic and diastolic blood pressures were significantly lower than the control group's (systolic mean 137.74, SD 16.21 and diastolic mean 86.73, SD 9.53), with highly significant t-values (7.78 and 5.94) and p-values (0.001 for both), proving that the intervention was successful in reducing blood pressure.

4.4 Relationship between hypertension patients' chosen demographic characteristics and their blood pressure readings.

The provided data strongly support the second hypothesis (H2), which states that the selected statistically relevant demographic characteristics for both the experimental and control groups are significantly associated with the blood pressure levels of hypertension patients. There was a very significant correlation between systolic blood pressure and the demographic variables of occupational type, co-morbid diseases, and dietary pattern in the experimental group ($p<$ 0.001). Also, there was no statistically significant correlation between any of the other demographic characteristics and systolic blood pressure. Significant relationships between systolic blood pressure and age, unhealthy behaviors, and sleep pattern were also seen in the control group. However, when looking at the other demographic variables, no such link was seen. These results provide credence to the previously proposed hypothesis (H2) by showing that various demographic variables are significantly related to blood pressure readings in the two groups of hypertensive patients.

5. Discussion

Prior to the intervention, the systolic and diastolic blood pressures of the experimental and control groups were comparable (p = 0.073 and 0.062, respectively). The control group's blood pressure readings were 137.74 (standard deviation 16.21) mm Hg and 86.73 (standard deviation 9.53) mm Hg after the intervention, while the experimental group's readings were substantially lower at 120.4 (standard deviation 9.54) and 88.1 (standard deviation 6.29). The t-values and p-values were both highly significant.

The present study demonstrated that abdominal breathing exercises effectively reduced blood pressure, aligning with similar findings from other studies.

For instance, a study conducted in Faridkot, Punjab, showed that the mean blood pressure in the experimental group (104.6 ± 3.69) was significantly lower than in the control group (116.5 ± 6.3), with a t-test value of 2.293 and p = 0.02, indicating a significant difference in post-test readings [16].

Similarly, a study conducted by Saxena T and Rajeev K found that hypertension individuals whose blood pressure was 116.7 ± 7.57 before the test and 111.16 ± 7.41 after the test, proving that abdominal breathing exercises reduce blood pressure. The efficacy of abdominal breathing exercises in hypertension management is supported by these consistent findings across trials [17].

Adults (aged 18-75) with stage 1 or 2 hypertension, pre-hypertension, or isolated systolic hypertension were the focus of a meta-analysis by Herawati I and Mat Ludin AF, which combed through 339 papers. Twenty studies met the inclusion criteria. Across these studies, interventions led to systolic blood pressure reductions of 4-54.22 mmHg and diastolic reductions of 3-17 mmHg, showing significant effectiveness [18].

Researchers Malarmathi M., Renuga.N., *et al*. found that compared to abdominal breathing exercises, deep breathing exercises significantly reduced blood pressure in hypertensive individuals, dropping the mean reading from 116.77 to 111.16 mm Hg. It dropped from 120.77 (before the test) to 118.16 (after the test) for abdominal workouts. This indicates that both exercises helped lower blood pressure, with deep breathing showing a slightly greater reduction [19].

In an experiment, Elavarasi R examined how abdominal breathing exercises affect hypertensive blood pressure. The mean arterial pressure dropped from 106.36 to 94.44 (difference 11.92), the diastolic blood pressure dropped from 89 to 79.5 (different 9.5), and the systolic blood pressure dropped from 141.07 to 124.33 (difference 16.74). This indicates that blood pressure values were successfully decreased by the intervention [20].

Elsayed E, Mohammad H found that deep breathing exercises effectively lowered the mean hypertension score in 80 hypertensive individuals. A 13.34-point drop from 40 to 26.66 was the mean score. The paired t-test result of 8.603 represents a very significant decrease (p-value <0.001) [21].

Conclusion

Blood pressure was shown to be lowered in both the pre- and post-test experimental groups, according to the research. Results showed that compared to the control group, individuals whose blood pressure was monitored after doing abdominal deep breathing exercise had a much lower reading. The pre- and post-exercise systolic blood pressure reduction effects of abdominal deep breathing exercises on the experimental group. A statistically significant decrease was seen in both the pre- and post-test groups of the experimental group. As a supplementary treatment, abdominal breathing exercises effectively reduce blood pressure, heart rate, and RR in hypertensive patients. In order to bolster the results, it is possible to do a comparable research on a larger sample in a different environment. The variables that contribute to hypertension may be studied.

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Author's Contribution

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Conflict of Interest

Not available

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References

1. World Health Organization. Hypertension [Internet]. 2023 [cited 2025 Jun 20]. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension
2. Mills KT, Bundy JD, Kelly TN, Reed JE, Kearney PM, Reynolds K, *et al*. Global disparities of hypertension prevalence and control. Circulation. 2016;134(6):441-450.
3. Joseph CN, Porta C, Casucci G, Casiraghi N, Maffeis M, Rossi M, *et al*. Slow breathing improves arterial baroreflex sensitivity and decreases blood pressure in essential hypertension. Hypertension. 2005;46(4):714-718.
4. Lehrer PM, Vaschillo E, Vaschillo B. Resonant frequency biofeedback training to increase cardiac variability: rationale and manual for training. Applied Psychophysiology and Biofeedback. 2000;25(3):177-191.
5. Chrousos GP. Stress and disorders of the stress system. Nature Reviews Endocrinology. 2009;5(7):374-381.
6. Bernardi L, Gabutti A, Porta C, Spicuzza L. Slow breathing reduces chemoreflex response to hypoxia and hypercapnia, and increases baroreflex sensitivity. Journal of Hypertension. 2001;19(12):2221-2229.
7. Paul-Labrador M, Polk D, Dwyer JH, Velasquez I, Nidich S, Rainforth M, *et al*. Effects of a randomized controlled trial of transcendental meditation on components of the metabolic syndrome in subjects with coronary heart disease. Archives of Internal Medicine. 2006;166(11):1218-1224.
8. Anderson DE, McNeely JD, Windham BG. Regular slow-breathing exercise effects on blood pressure and breathing patterns at rest. Journal of Human Hypertension. 2010;24(12):807-813.
9. Xie Y, Hu F, Cheng F, Cao Y, Yao Y, Liu L, *et al*. Effects of slow breathing on blood pressure and heart rate variability in patients with essential hypertension: a meta-analysis. Journal of Hypertension. 2020;38(10):1960-1970.
10. Wu Y, Johnson BT, Acabchuk RL. Barriers to

integrating mind-body medicine into clinical practice: perspectives of clinicians. Global Advances in Health and Medicine. 2019;8:216495611988850.
11. Salian A, Gireesh G. Effectiveness of abdominal breathing exercise on biological parameters among hypertensive patients at a selected tertiary care hospital, Mangaluru, India. Journal of Clinical and Diagnostic Research. 2022.
12. Yau KKY, Loke AY. Effects of diaphragmatic deep breathing exercises on prehypertensive or hypertensive adults: a literature review. Complementary Therapies in Clinical Practice. 2021 May;43:101315.
13. Bergeri AS, Daruwala SS. Effectiveness of abdominal deep breathing exercises in managing blood pressure among hypertensive patients. Cureus. 2025 Feb 2.
14. Verma N, Verma R. The positive effect of deep breathing exercises on blood pressure values among hypertensive persons. Journal of the Indian College of Cardiology. 2024;14(2):61-63.
15. Fu J, Liu Y, Zhang L, Zhou L, Li D, Quan H, *et al*. Nonpharmacologic interventions for reducing blood pressure in adults with prehypertension to established hypertension. Journal of the American Heart Association. 2020 Oct 20;9(19).
16. Kaur A, Maheshwari P, Soin D. Effectiveness of abdominal breathing exercise on blood pressure among hypertensive patients. International Journal of Therapeutic Applications. 2015;24:39-49.
17. Saxena T, Rajeev K. Prevalence of hypertension in a rural community of coastal Karnataka. International Journal of Community Medicine and Public Health. 2017;4(8):2774-2776.
18. Herawati I, Mat Ludin AF, Mohamed M, Ishak I, Farah NMF. Breathing exercise for hypertensive patients: a scoping review. Frontiers in Physiology. 2023 Jan 25;14.
19. Malarmathi M, Renuga N, Nandhini S, Renuka KE. Effectiveness of deep breathing exercises versus abdominal breathing exercise on blood pressure among patients with hypertension. International Journal of Research Publication and Reviews [Internet]. 2022 [cited 2025 Jan 19];3(1):149-153. Available from: https://ijrpr.com/uploads/V3ISSUE1/IJRPR2292.pdf
20. Elavarasi R. An experimental study to assess the effectiveness of abdominal breathing exercise on regulation of blood pressure among patients with hypertension. Pondicherry Journal of Nursing [Internet]. 2018;11. Available from: https://scholarstor-jaypee.s3.ap-south-1.amazonaws.com/jaypee/protected/journals/PJN/11/1/10.5005_pjn-11-1-28/PJN-11-28.pdf
21. Elsayed E, Mohammad H, Nimasajai X, Selvia A, Mary A. A study to assess the effectiveness of breathing exercise in lowering high blood pressure among hypertensive patients at General Hospital, Alnamas, Kingdom of Saudi Arabia. International Journal of Science and Healthcare Research [Internet]. 2018;3(3):153. Available from: https://ijshr.com/IJSHR_Vol.3_Issue.3_July2018/IJSHR0020.pdf

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