

Original Research Article

A quasi-experimental study to assess the effectiveness of abdominal deep breathing exercise on level of blood pressure and stress among hypertensive patients in selected hospitals in Jalandhar, Punjab

Neetika Raina¹, Veena Williams¹, Jophy E. George^{2*}

¹Department of Medical Surgical Nursing, MHR DAV Institute of Nursing, Jalandhar, Punjab, India

²Department of Child Health Nursing, MHR DAV Institute of Nursing, Jalandhar, Punjab, India

Received: 12 August 2025

Revised: 24 September 2025

Accepted: 25 September 2025

*Correspondence:

Dr. Jophy E. George,

E-mail: jophyegeorge5@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Hypertension, or high blood pressure, is often called a “silent disease” because it typically shows no symptoms, leaving many individuals unaware of its presence. Despite the absence of warning signs, hypertension can significantly damage the body and increase the risk of heart disease and stroke. In today’s fast-paced world, understanding how stress influences blood pressure is vital. Stress has long been identified as a key risk factor for hypertension, alongside obesity, physical inactivity, and addictions such as smoking and alcohol use. The constant hassles, deadlines, and demands of modern life contribute to mental and psychosocial stress, which can elevate blood pressure over time.

Methods: This study adopted a quantitative, quasi-experimental design (one-group pre-test and post-test) to examine the effect of abdominal deep breathing exercises on stress levels and blood pressure among 60 hypertensive patients in hospitals across Jalandhar, Punjab. Participants were divided equally into an experimental group (30) and a control group (30). The modified daily stress response scale and blood pressure assessment scale were used for data collection.

Results: The experimental group practicing abdominal deep breathing exercises showed a statistically significant reduction ($p < 0.05$) in both systolic and diastolic blood pressure and stress levels compared to the control group.

Conclusions: Abdominal deep breathing proved to be an effective, low-cost, and non-invasive intervention for reducing stress and managing hypertension. Incorporating such techniques into traditional treatment strategies can enhance patient outcomes.

Keywords: Hypertension, Blood pressure, Stress, Abdominal deep breathing, Quasi-experimental, Effectiveness

INTRODUCTION

Globally, high blood pressure is a hidden risk factor that raises the risk of heart disease and death. It is currently the world's 3rd major contributing factor of premature mortality. Hypertension rarely exhibits overt symptoms but remains a major public health issue because of its prevalence and the risks it poses for diseases like cardiac failure, coronary heart disease, stroke-related disorders,

and chronic kidney disease.¹ A major health risk, high blood pressure can increase the likelihood of diseases affecting the heart, brain, eyes, kidneys, and other essential organs.² Because it is so common, hypertension is of major concern in terms of health in India and globally. People with hypertension are three times more at risk to get a heart attack and five times more unsafe to get a stroke.³ In many parts of the world, non-communicable diseases have become a serious epidemic.

Because it develops without obvious symptoms and many are unaware of it until significant harm occurs possibly leading to heart issues. It is also widespread source of death in the United States, increasing the likelihood of mental deterioration and vision problems.⁴ Hypertension can occur in individuals of all age groups and socioeconomic backgrounds. Knowing how stress impacts blood pressure is becoming more and more important as daily living gets more demanding.

High blood pressure is becoming a big worry as non-communicable diseases in India are concerning on the rise.^{5,6} According to data from the National Family Health Survey (NFHS-5, 2019–21), among persons aged 15 and older, 24% of men and 21% of women suffer from high blood pressure.⁷ Nearly one in three persons in cities and one in four adults in rural areas have excessive blood pressure, according to recent community studies. The prevalence of hypertension is at peak in Punjab than the national average, which mostly occurs due to fatty diet, high stress levels, and lifestyle choices.⁷ Emotional distress is considered as a major factor in developing high blood pressure. Rising blood pressure readings are directly correlated with psychological pressure from city living, sedentary habits, workplace tension, and social demands, according to the Indian Council of Medical Research (ICMR) and Ministry of Health and Family Welfare (2022). Prolonged stress triggers the sympathetic nervous system, which narrows blood vessels and increases heart activity, all of which contribute to high blood pressure. The sympathetic autonomic nervous system (SANS) is triggered by continuing stress, which leads to constriction of blood vessels and a rise in cardiac output, thus, resulting in persistently elevated blood pressure.⁸

It has long been known that, in addition to other risk factors like being overweight, not exercising, and abusing drugs, mental stress is a substantial and changing factor in hypertension.⁹ There are many difficulties, time constraints, annoyances, and stressful circumstances associated with modern life. Such social or emotional strain can be a risk factor for hypertension. One modifiable threat is emotional distress, which can alter immunological and hormonal responses and leads to higher chances of cardiovascular disease, including hypertension. These physiological reactions increase the frequency of heart-related problems, such as high blood pressure. Anxiety symptoms and emotional strain are strongly associated with lower income categories, physical inactivity, low levels of education, and high blood pressure.

It is becoming more well acknowledged that emotional stress is a crucial part in raising blood pressure that can be changed on its own. High levels of stress are vigorously related to the onset of hypertension, especially when paired with lifestyle factors like being overweight and not exercising enough, according to recent research by Bhelkar et al about one-third of Jordanians suffer from

hypertension, and a lack of financial stability has greatly increased emotional stress, which has a detrimental effect on both public health and quality of life. According to Nour et al treating emotional stress in male hypertensive patients may also be helpful in controlling blood pressure and reducing the occurrence of complications due to hypertension.¹⁰

Researchers are therefore keen to investigate the effectiveness of belly breathing techniques as a non-pharmacological treatment for hypertensive patients. An individual's health can benefit from breathing. The detrimental effects of shallow breathing may be lessened by engaging in deep breathing exercises. Because shallow inhalations result from the majority of blood circulation occurring in the lower portions of the lung, chest breathing is inefficient.¹¹ Deeper breaths are encouraged by abdominal breathing. A type of abdominal breathing that strengthens the diaphragm, a vital muscle in the respiratory system, is the diaphragmatic breathing technique. The habit of breathing mostly from the abdomen, even when you're asleep, is encouraged by regular practice.¹²

According to recent studies, those who consistently use abdominal breathing techniques have stopped taking anti-hypertensive medications. By increasing vagal activity, abdominal breathing lowers blood pressure and resting heart rates. The vagus nerve's impact on heart rate and other physiological processes is called as vagal activity, and it is often a key indicator of parasympathetic nervous system functioning. By increasing vagal tone and decreasing sympathetic nervous system activity, this is accomplished. Both sympathetic and parasympathetic responses may improve as a result of the practice of abdominal breathing exercises. Deep breathing techniques can significantly lower blood pressure.¹³

Objectives

The objectives of the study were to assess the pre-test level of blood pressure and stress among hypertensive patients in experimental and control group; to plan and implement abdominal deep breathing exercise among hypertensive patients in experimental group; to assess the post-test level of blood pressure and stress among hypertensive patients in experimental and control group; to determine the effectiveness by comparing pre and post-test level of blood pressure and stress among hypertensive patients in experimental and control group; to find out the association of pretest level of blood pressure and stress among hypertensive patients with their selected socio demographic variables.

METHODS

This study adopted a quantitative research approach using a quasi-experimental, non-randomized control group design to assess the effectiveness of abdominal deep breathing exercises in reducing blood pressure and stress

levels among hypertensive patients. A total of 60 participants diagnosed with hypertension for at least two years were recruited from Tagore Hospital, Jalandhar, Punjab, using a non-probability purposive sampling technique. The participants were divided equally into an experimental group of 30 and a control group of 30. Inclusion criteria required patients with a confirmed diagnosis of hypertension for at least two years who were willing to participate. Exclusion criteria included patients who were critically ill, had undergone abdominal or gastro surgery, or suffered from severe respiratory conditions.

The independent variable of the study was abdominal deep breathing exercises, while blood pressure and stress levels were the dependent variables. Socio-demographic and clinical variables such as age, gender, occupation, family income, lifestyle, family history of hypertension, and use of anti-hypertensive medications were also recorded. The primary tools for data collection were the Blood Pressure Assessment Scale based on the American Heart Association guidelines and the Modified Daily Stress Response Scale (MDSRS). Stress levels were categorized into very low (0-20), low (21-40), moderate (41-60), and severe (61-80). Blood pressure was classified as normal, elevated, or hypertensive (stages 1 and 2). Both tools were validated by 10 nursing and research experts, and their reliability was established using the test-retest method, with correlation coefficients of 0.72 for the BP scale and 0.70 for the MDSRS.

A pilot study was conducted at the same hospital with 10 patients (5 in each group) to refine the study procedure, test feasibility, and ensure accuracy in data collection methods. The pilot results indicated no major issues, except for the challenge of retaining patients for five consecutive days due to hospital discharge policies.

The intervention for the experimental group involved structured abdominal deep breathing exercises. Each participant was taught to sit in a comfortable position, place one hand on the abdomen and the other on the chest, inhale deeply through the nose to expand the abdomen to a slow count of four, hold the breath for

seven seconds, and exhale steadily for eight seconds. These exercises were performed twice daily at 8:00 AM and 11:00 AM for 15 minutes per session, over five consecutive days. The control group did not receive any intervention. Blood pressure and stress levels were measured before the start of the intervention (pre-test) and after the last session (post-test) using the same instruments.

The main data collection phase was carried out between March 16 and April 30, 2025, after obtaining approval from the ethics committee of MHR DAV Institute of Nursing, Jalandhar, and permission from the authorities of Tagore Hospital. Written informed consent was obtained from each participant, and confidentiality of personal data was maintained throughout the study. Between five and seven participants were assessed daily until the target of 60 participants was achieved.

Data analysis was performed using both descriptive and inferential statistics. Frequency and percentage distributions were used to describe socio-demographic and clinical variables. Mean, standard deviation, and mean differences were calculated for pre-test and post-test scores. Paired and unpaired t-tests were employed to compare blood pressure and stress levels within and between groups. Additionally, chi-square tests were used to assess associations between socio-demographic variables and blood pressure or stress levels.

The findings of the study revealed a statistically significant reduction in both systolic and diastolic blood pressure and stress scores among participants in the experimental group compared to the control group ($p < 0.05$). These results demonstrate that abdominal deep breathing is an effective, non-invasive, and low-cost technique that can complement traditional hypertension management strategies.

RESULTS

Frequency and percentage distribution of socio-demographic variables and clinical variables among hypertensive patients in experimental and control group.

Table 1: Socio demographic variables and clinical variables.

Variables	Categories	Experimental group (f)	Experimental group (%)	Control group (f)	Control group (%)	χ^2	df	P value	Remarks
Age (years)	≥ 30	1	3.40	0	0.00	4.6992	5	0.4536	NS
	31–40	2	6.70	2	6.70				
	41–50	4	13.30	5	16.70				
	51–60	3	10.00	5	16.70				
	61–70	13	43.30	16	53.30				
	≤ 71	7	23.30	2	6.60				
Gender	Male	22	73.30	24	80.00	0.3727	1	0.5415	NS
	Female	8	26.70	6	20.00				
Area of residence	Rural	15	50.00	19	63.30	4.7563	3	0.1904	NS
	Urban	12	40.00	6	20.00				
	Slum	2	6.70	5	16.70				

Continued.

Variables	Categories	Experimental group (f)	Experimental group (%)	Control group (f)	Control group (%)	χ^2	df	P value	Remarks
Educational qualification	Industrial	1	3.30	0	0.00	0.7214	4	0.9487	NS
	Illiterate	3	10.00	3	10.00				
	Primary	7	23.30	5	16.70				
	Secondary	9	30.00	11	36.70				
	Senior secondary	7	23.30	6	20.00				
	Graduate & above	4	13.33	5	16.70				
Occupation	Homemaker	6	20.00	4	13.30	1.6657	3	0.6445	NS
	Self-employed	10	33.30	8	26.70				
	Employed	11	36.70	12	40.00				
	Retired	3	10.00	6	20.00				
Family income (₹/month)	≤ 10 000	3	10.00	4	13.40	0.3766	3	0.9450	NS
	10 001–20 000	5	16.70	6	20.00				
	21 000–30 000	15	50.00	13	43.30				
	≥ 30 001	7	23.30	7	23.30				
Dietary habits	Vegetarian	14	46.60	16	53.30	0.6979	2	0.7054	NS
	Non-vegetarian	11	36.70	8	26.70				
	Eggetarian	5	16.70	6	20.00				
Lifestyle	Smoker/Non-alcoholic	4	13.30	5	16.70	0.4380	3	0.9323	NS
	Non-smoker/Alcoholic	9	30.00	7	23.30				
	Smoker/Alcoholic	6	20.00	7	23.30				
	Non-smoker/Non-alcoholic	11	36.70	11	36.70				
Sleep duration (hrs)	<8	20	66.70	22	73.30	0.3810	2	0.8625	NS
	8	8	26.70	6	20.00				
	>8	2	6.70	2	6.70				
Family history of hypertension	Yes	12	40.00	12	40.00	0.000	1	1.000	NS
	No	18	60.00	18	60.00				
Duration since diagnosis (hrs)	2–4	6	20.00	7	23.30	0.2724	2	0.8726	NS
	5–7	9	30.00	10	33.30				
	≥ 8	15	50.00	13	43.30				
Use of antihypertensive medications	Yes	27	90.00	28	93.30	0.2182	1	0.6404	NS
	No	3	10.00	2	6.70				
Co-morbid conditions	Diabetes mellitus	8	26.70	9	30.00	1.7265	5	0.8855	NS
	Cardiovascular disease	12	40.00	11	36.70				
	Chronic kidney disease	6	20.00	5	16.70				
	Mild/ moderate respiratory	2	6.70	3	10.00				
	Others	1	3.30	2	6.70				
	None of above	1	3.30	0	0.00				

NS: non-significant

Table 2: Comparison of pre-test and post-test level of systolic blood pressure among hypertensive patients in experimental group using paired 't' test.

Systolic blood pressure		Mean (S.D)	Paired 't' test (t)	df	P value
Day 1	Pre-test	131.18 (± 10.19)	1.597	29	0.121 ^{NS}
	Post-test	128.90 (± 5.18)			
Day 2	Pre-test	132.77 (± 11.08)	6.118	29	0.00*
	Post-test	123.07 (± 6.81)			
Day 3	Pre-test	139.20 (± 9.71)	11.534	29	0.00*
	Post-test	123.00 (± 6.97)			
Day 4	Pre-test	138.93 (± 10.73)	10.923	29	0.00*
	Post-test	122.62 (± 6.42)			
Day 5	Pre-test	146.73 (± 9.53)	14.329	29	0.00*
	Post-test	121.50 (± 6.49)			

*Significant at $p < 0.05$; NS non-significant at $p < 0.05$ **Table 3: Comparison of pre-test and post-test level of diastolic blood pressure among hypertensive patients in experimental group using paired 't' test (n=30).**

Diastolic blood pressure		Mean (S.D)	Paired 't' test (t)	df	P value
Day 1	Pre-test	84.13 (± 9.32)	5.174	29	0.00*
	Post-test	77.72 (± 4.50)			
Day 2	Pre-test	84.62 (± 13.86)	4.444	29	0.00*
	Post-test	75.22 (± 6.39)			
Day 3	Pre-test	91.93 (± 12.83)	8.328	29	0.00*
	Post-test	75.15 (± 6.03)			
Day 4	Pre-test	91.78 (± 13.06)	8.650	29	0.00*
	Post-test	74.95 (± 5.65)			
Day 5	Pre-test	101.17 (± 10.11)	13.336	29	0.00*
	Post-test	76.35 (± 8.47)			

*Significant at $p < 0.05$; NS non-significant at $p < 0.05$ **Table 4: Comparison of pre-test and post-test level of systolic blood pressure among hypertensive patients in control group using paired 't' test (n=30).**

Systolic blood pressure		Mean (S.D)	Paired 't' test (t)	df	P value
Day 1	Pre-test	134.53 (± 13.28)	1.129	29	0.268 ^{NS}
	Post-test	132.57 (± 9.75)			
Day 2	Pre-test	136.23 (± 13.97)	1.329	29	0.194 ^{NS}
	Post-test	134.47 (± 12.92)			
Day 3	Pre-test	150.48 (± 11.14)	0.153	29	0.879 ^{NS}
	Post-test	150.30 (± 12.84)			
Day 4	Pre-test	144.00 (± 16.28)	1.566	29	0.128 ^{NS}
	Post-test	141.07 (± 14.74)			
Day 5	Pre-test	141.62 (± 13.54)	0.930	29	0.360 ^{NS}
	Post-test	140.53 (± 14.23)			

* Significant at $p < 0.05$; NS non-significant at $p < 0.05$

Based on Table 1, most hypertensive patients were aged 61-70 years, male, and lived in rural areas. Secondary education and employment were common, with many earning Rs. 21,000-30,000 monthly, vegetarian diets, less than 8 hours of sleep, and no family history of hypertension were frequently reported. A large portion had hypertension for over 8 years, were on antihypertensive medication, and had co-morbidities like cardiovascular disease and diabetes. No significant

association was found between socio-demographic/clinical variables of hypertensive patients among experimental and control group ($p > 0.05$).

Table 2 presents the effect of abdominal deep breathing on systolic blood pressure in the experimental group over five days. On day 1, no significant change was observed ($p = 0.121$). However, from day 2 to day 5, systolic BP significantly decreased, with p -values (< 0.001). These

findings confirm the effectiveness of the intervention in lowering systolic blood pressure after the first day.

Table 3 shows a significant reduction in diastolic blood pressure from day 1 (84.13 ± 9.32) to day 5 (76.35 ± 8.47) in the experimental group. Unlike systolic BP, the improvement was statistically significant from day 1 itself ($p < 0.001$), with the most substantial reduction on day 5. The consistent decline across all five days confirms the effectiveness of abdominal deep breathing in lowering diastolic BP over time.

Table 4 shows that systolic blood pressure in the control group remained relatively stable from day 1 (134.53 ± 13.28) to day 5 (140.53 ± 14.23). Minor fluctuations were observed, but no statistically significant changes occurred across any of the five days ($p > 0.05$).

This indicates that, without intervention, systolic BP levels remained unchanged in the control group.

Table 5: Comparison of pre-test and post-test level of diastolic blood pressure among hypertensive patients in control group (n=30).

Diastolic blood pressure		Mean (S.D)	paired 't' test (t)	df	P value
Day 1	Pre-test	82.97 (± 9.46)	0.598	29	0.554 ^{NS}
	Post-test	82.25 (± 9.10)			
Day 2	Pre-test	84.33 (± 15.05)	0.510	29	0.614 ^{NS}
	Post-test	83.75 (± 13.63)			
Day 3	Pre-test	100.47 (± 12.40)	0.055	29	0.956 ^{NS}
	Post-test	100.55 (± 12.91)			
Day 4	Pre-test	93.37 (± 18.60)	0.680	29	0.502 ^{NS}
	Post-test	92.05 (± 14.05)			
Day 5	Pre-test	90.35 (± 16.09)	0.011	29	0.991 ^{NS}
	Post-test	90.33 (± 16.67)			

* Significant at $p < 0.05$; NS non-significant at $p < 0.05$

Table 6: Mean and S.D of the pre-test level of stress among hypertensive patients in experimental group and control group (n=60).

Pre-test		Mean	S.D.	Mean percentage (%)
	Experimental (n=30)	48.9	± 7.63	61.2
	Control (n=30)	25.86	± 7.44	32.3

Maximum= 80; Minimum=00

Table 7: Comparison of post-test level of systolic blood pressure among hypertensive patients in experimental and control group using unpaired 't' test.

Blood pressure (pre -test)	Day	Experimental mean (SD)	Control mean (SD)	MD	Unpaired 't' test	df	P value
Systolic blood pressure	Day 1	128.90 (± 5.18)	132.57 (± 9.76)	3.67	1.818	58	0.074 ^{NS}
	Day 2	123.07 (± 6.81)	134.47 (± 12.93)	11.4	4.274	58	0.000*
	Day 3	123.00 (± 6.97)	150.30 (± 12.85)	27.3	10.229	58	0.000*
	Day 4	122.62 (± 6.43)	141.07 (± 14.75)	18.45	6.282	58	0.000*
	Day 5	121.50 (± 6.50)	140.53 (± 14.23)	19.03	6.664	58	0.000*

* Significant at $p < 0.05$; NS non-significant at $p < 0.05$

Table 5 shows that diastolic BP in the control group remained steady from day 1 (82.97 ± 9.46) to day 5 (90.33 ± 16.67). Minor day-to-day changes were observed, but none were statistically significant ($p > 0.05$). This confirms that diastolic BP levels remained stable in the absence of intervention, validating the control group as a comparison baseline.

Table 3 depicts that in pre-test experimental group, mean score was 48.9 and S.D was ± 7.63 and Mean percentage was 61.2%. Whereas in pre control group, mean score

was 25.86, S.D was ± 7.44 and Mean percentage was 32.3% regarding level of stress among hypertensive patients

Table 7 compares post-test systolic BP between experimental and control groups over five days. From day 2 to day 5, the experimental group had a statistically significant lower systolic BP than the control group ($p < 0.001$). On day 1, although the experimental group had slightly lower SBP, the difference was not significant

($p=0.074$). This indicates the intervention was effective in reducing systolic BP starting from day 2.

Table 8 confirms that the experimental group had a consistently lower diastolic BP than the control group across all five days. Significant differences were found each day ($p<0.05$), with the largest drop on day 3

(MD=25.4 mmHg). The experimental group showed a steady decline, while the control group remained high or fluctuated.

These results reaffirm the strong and sustained impact of abdominal deep breathing in reducing diastolic hypertension.

Table 8: Comparison of post-test level of diastolic blood pressure among hypertensive patients in experimental and control group using unpaired 't' test (n=60).

Blood pressure (pre -test)	Day	Experimental mean (SD)	Control mean (SD)	MD	Unpaired 't' test	df	P value
Diastolic blood pressure	Day 1	77.72 (± 4.51)	82.25 (± 9.11)	4.53	2.444	58	0.018*
	Day 2	75.22 (± 6.40)	83.75 (± 13.64)	8.53	3.102	58	0.003*
	Day 3	75.15 (± 6.04)	100.55 (± 12.92)	25.4	9.757	58	0.000*
	Day 4	74.95 (± 5.66)	92.05 (± 14.05)	17.1	6.182	58	0.000*
	Day 5	76.35 (± 8.47)	90.33 (± 16.68)	13.98	4.095	58	0.000*

* Significant at $p<0.05$; NS non-significant at $p<0.05$

Table 9: Comparison of pre-test and post-test level scores of stress among hypertensive patients in experimental and control group.

Level of stress	Day	Experimental group (n=30)	Control group (n=30)	Unpaired 't' test
		Mean $\pm$ SD	Mean $\pm$ SD	MD
Pre-test		48.93 $\pm$ 7.63	48.06 $\pm$ 8.54	0.87
Post-test		28.56 $\pm$ 7.44	50.02 $\pm$ 7.25	24.34
				12.79*

* = Highly Significant at $p<0.01$ level; NS= non- significant at $p>0.01$ level; df (paired 't' -test) = 29, (unpaired 't' - test) = 58; Level of stress; Maximum= 80; Minimum=00; * $P<0.05$ level of significance

Table 9 compares pre- and post-test stress scores. In the experimental group, stress significantly decreased from 48.93 to 25.86 ($t=13.41$, $p<0.05$), showing a strong effect of the intervention. In contrast, the control group showed no significant change (pre: 48.06, post: 50.2; $t=1.08$, $p>0.05$). This confirms that abdominal deep breathing was effective in significantly reducing stress among hypertensive patients.

DISCUSSION

The present quasi-experimental study evaluated the effectiveness of abdominal deep breathing exercises on blood pressure and stress among hypertensive patients. Findings revealed that systolic blood pressure (SBP) in the experimental group showed a significant reduction from day 2 to day 5, while no significant effect was noted on day 1. This suggests that repeated practice is necessary for achieving consistent hemodynamic benefits, likely due to progressive activation of parasympathetic pathways and improved baroreceptor sensitivity. Similar studies have also reported reductions in SBP following breathing interventions, confirming the positive role of diaphragmatic breathing in cardiovascular regulation.^{14,15}

Diastolic blood pressure (DBP) in the experimental group demonstrated significant reductions from day 1 through day 5, with the greatest decline observed on day 5. Unlike

SBP, the reduction in DBP was immediate, reflecting faster autonomic and vascular responses. These findings are supported by randomized trials in Indian populations, which documented significant decreases in both SBP and DBP following slow breathing and progressive relaxation practices.¹⁶

In contrast, both systolic and diastolic blood pressure in the control group remained relatively stable throughout the study period, with only minor non-significant fluctuations. This indicates that without intervention, blood pressure levels are unlikely to change, reinforcing the effectiveness of abdominal deep breathing observed in the experimental group. Comparable results have been reported in previous Indian studies, where control groups showed no meaningful improvement, while experimental groups practicing breathing or relaxation techniques experienced substantial reductions.^{17,18}

The study also revealed that stress levels were significantly reduced in the experimental group, with mean scores dropping from 48.93 to 25.86, while the control group showed no meaningful change. This underscores the importance of abdominal deep breathing as a simple yet effective intervention to alleviate psychological stress in hypertensive patients. Similar observations have been made in earlier research, where hypertensive adults with higher pre-test stress scores

experienced significant reductions in stress after structured relaxation programs.¹⁹ Recent evidence further supports this finding, with trials demonstrating significant reductions in blood pressure and stress following regular abdominal deep breathing.²⁰

Finally, comparison of post-test values between groups confirmed that both systolic and diastolic pressures were consistently lower in the experimental group, with significant differences observed from day 2 onwards. This highlights the sustained benefits of repeated practice in improving cardiovascular outcomes. Similar studies have also shown that slow and deep breathing techniques improve autonomic balance, leading to significant reductions in diastolic pressure, while meta-analyses have further confirmed that breathwork interventions reduce stress and enhance mental health.^{21,22} Overall, the findings of this study align with existing literature and provide strong evidence that abdominal deep breathing is a cost-effective, non-pharmacological strategy for managing blood pressure and stress in hypertensive patients.

Limitations

The main limitation of the present study was its relatively small sample size of 60 hypertensive patients, which restricts the extent to which the findings can be generalized to larger populations. Conducted only in selected hospitals in Jalandhar, the study setting may not fully capture the diversity of socio-demographic and clinical profiles of hypertensive patients in other regions. These factors limit the external validity of the results; therefore, future research with larger, more diverse, and multi-center samples is recommended to validate and strengthen the applicability of the findings.

CONCLUSION

This study demonstrated that abdominal deep breathing exercises significantly reduced both systolic and diastolic blood pressure as well as stress levels among hypertensive patients, whereas no meaningful changes were observed in the control group. The findings establish abdominal deep breathing as a safe, simple, and non-pharmacological intervention that can complement standard care in hypertension management. By highlighting the immediate and sustained benefits of a low-cost, nurse-led practice, the study advances understanding in the field by providing evidence that structured breathing exercises can improve cardiovascular outcomes and psychological well-being. These results contribute to growing evidence supporting lifestyle-based interventions and emphasize the important role of nursing professionals in integrating such strategies into routine patient care.

ACKNOWLEDGEMENTS

Authors extend gratitude to the ethical committee members for their valuable suggestions, to the nursing

experts for validating the tool, and to Mr. C. S. Aggarwal for statistical assistance. Authors grateful to Mr. Jagraj Singh for plagiarism report support, the Chief Medical Officer for permission, and the participants for their cooperation.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee Receiving from MHR DAV ION

REFERENCES

1. World Health Organization. Hypertension. Geneva: WHO; 2023. Available at: <https://www.who.int/news-room/fact-sheets/detail/hypertension>. Accessed on 30 July 2025.
2. Carey RM, Whelton PK, 2017 ACC/AHA Hypertension Guideline Writing Committee*. Prevention, detection, evaluation, and management of high blood pressure in adults: synopsis of the 2017 American College of Cardiology/American Heart Association Hypertension Guideline. *Annals Int Med*. 2018;168(5):351-8.
3. Nobles TC. Contributions of Adverse Childhood Experiences, Racism, Therapy and Health Habits to Cardiovascular Health in African American Adults; 2025. Available at: <https://repository.usfca.edu/diss/723/>. Accessed on 30 July 2025.
4. Gupta R, Xavier D. Hypertension: The most important non communicable disease risk factor in India. *Indian Heart J*. 2018;70(4):565-72.
5. Blood pressure. Wikipedia. Available at: https://en.wikipedia.org/w/index.php?title=Blood_pressure&oldid=12_96062436. Accessed on 17 June 2025.
6. Kannel WB. Blood pressure as a cardiovascular risk factor: prevention and treatment. *Survey Anesthesiol*. 1997;41(3):186.
7. American Heart Association. Understanding blood pressure readings. Dallas: AHA; 2024. Available at: <https://www.heart.org/en/health-topics/high-blood-pressure/understanding-blood-pressure-reading>. Accessed on 30 June 2025.
8. Uthakalla VK, Naidana PS, Yendapu RS, Pissey SS, Devireddi CS, Sarathy P. Prevalence of Hypertension Among the Rural Adult Population in India: A Systematic Review and Meta-Analysis. *Cureus*. 2024;16(9):1.
9. Koya SF, Pilakkadavath Z, Chandran P, Wilson T, Kuriakose S, Akbar SK, et al. Hypertension control rate in India: systematic review and meta-analysis of population- level non-interventional studies, 2001–2022. *The Lancet Regional Health-Southeast Asia*. 2023;9.
10. Spruill TM. Chronic psychosocial stress and hypertension. *Current Hypertension Reports*. 2010;12(1):10-6.

11. Hamasaki H. Effects of diaphragmatic breathing on health: a narrative review. *Medicines*. 2020;7(10):65.
12. Muskaan M. Impact of abdominal breathing exercises on blood pressure regulation among hypertensive patients. Himachal Pradesh; 2022.
13. Bergeri AS, Daruwala SS. Effectiveness of Abdominal Deep Breathing Exercises in Managing Blood Pressure Among Hypertensive Patients. *Cureus*. 2025;17(2).
14. Garg P, Malhotra V, Goel N., Breathing exercises for blood pressure and heart rate control: A systematic review and meta-analysis. *J Hypert*. 2023;41(5):845-53.
15. Yau KK, Loke AY. Effects of diaphragmatic deep breathing exercises on prehypertensive or hypertensive adults: A literature review. *Complement Therap Clin Pract*. 2021;43:101315.
16. Pathan FK, Pandian JS, Shaikh AI, Ahsan M, Nuhmani S, Iqbal A, et al. Effect of slow breathing exercise and progressive muscle relaxation technique in the individual with essential hypertension: A randomized controlled trial. *Medicine*. 2023;102(47):e35792.
17. Singh R, Kumari S, Thakur A. Effect of breathing techniques on blood pressure and stress among hypertensive patients: An experimental study. *Indian J Public Health Res Develop*. 2020;11(3):550-5.
18. Joseph B, Kaur H, Thomas A. Effect of progressive muscle relaxation on blood pressure and stress among adults with hypertension. *Indian J Public Health Res Develop*. 2019;10(6):1234-9.
19. Kumar P, Sharma V, Meena RK. Effect of relaxation techniques on stress and blood pressure among hypertensive patients. *Int J Community Med Public Health*. 2018;5(7):2935-40.
20. Deshmukh R, Kale M, Pawar S. Effect of abdominal deep breathing on blood pressure and psychological tension among hypertensive adults: An experimental study. *J Clin Diagnost Res*. 2021;15(4).
21. Mourya M, Mahajan AS, Singh NP, Jain AK. Effect of slow- and fast-breathing exercises on autonomic functions in patients with essential hypertension. *J Alternat Complement Med*. 2009;15(7):711-7.
22. Fincham GW, Strauss C, Montero-Marin J. Effect of breathwork on stress and mental health: A meta-analysis of randomized controlled trials. *Scientific Reports*. 2023;13:432.

Cite this article as: Raina N, Williams V, George JE. A quasi-experimental study to assess the effectiveness of abdominal deep breathing exercise on level of blood pressure and stress among hypertensive patients in selected hospitals in Jalandhar, Punjab. *Int J Community Med Public Health* 2025;12:5087-95.