Effect of Alternate Nostril Breathing on Blood Pressure among Hypertensives in a Selected Urban Community of Gurugram (Haryana)

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Abstract

High blood pressure is the most common chronic medical problem prompting visits to Community health care providers in US (80%) and India (25% rural and 33% urban). There has been an alarming increase in the hypertension burden worldwide. Antihypertensive drugs and lifestyle modifications including exercises remains mainstay of treatment. This study aimed to determine effect of alternate nostril breathing on blood pressure among hypertensive patients. It was a quasi-experimental study employing a pre-test post-test control group design. Sixty purposively selected participants were randomly allocated into experimental and control groups (30 each). Blood pressure was measured using a calibrated digital sphygmomanometer. The experimental group received an intervention of ANB, administered twice daily for 10 minutes over 15 days. Both the groups continued their hypertension medication throughout the study. Systolic and diastolic blood pressure readings were taken on day 1 (baseline) and day 15 (post-test). The majority of participants were females and over 60 years of age. A significant decrease in both systolic and diastolic blood pressure was observed in the experimental group, which was statistically significant ($p<0.001$). Control group also showed significant difference in both systolic and diastolic readings from day 1 to day 15 ($p<0.001$), likely due to ongoing hypertension medication. To conclude, alternate breathing exercise was effective in reducing both systolic and diastolic blood pressure.

Key words: Alternate breathing exercise, Blood pressure, Hypertension

An estimated 1.28 billion adults aged 30-79 worldwide have hypertension, with two-thirds residing in low- and middle-income countries like India. It is a chronic medical condition where arterial blood pressure (BP) is consistently elevated (Naish, 2014). Usually, it does not produce any symptoms (CDC, 2015). Also known as "silent killer" in the later stages, it may cause such complications as heart attacks, strokes, or chronic kidney disease (Chobanian et al, 2003).

The normal blood pressure is defined as a systolic BP of less than 120 mmHg and a diastolic BP of less than 80 mmHg. Hypertension is defined as having a systolic BP of 140 mmHg or higher and/or a diastolic BP of 90 mmHg or higher for which drugs are advised (Chobanian et al, 2003; Kumar et al, 2016). Approximately 1 in 5 adults (21%) with hypertension manage to control it through prescribed medications and lifestyle changes (Prabhakaran et al, 2013; Fisher & Williams, 2005).

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Review of Literature

In a randomised controlled trial by Kalaivani et al (2019) wherein a total of 170 hypertensive patients underwent alternate nostril breathing exercise two times a day for 10 mins for 5 days, a significant reduction in systolic and diastolic BP was released.

In another study, Saravanan et al (2019) recruited 40 hypertensive patients in the age group of 45-65 years of both the genders. Gray scale and Doppler ultrasound of the left brachial artery were done to assess the diameter of arteries immediately after 30 min of alternate nostril breathing (ANB). A significant increase in vessel diameter ($p < 0.001$), and decrease in PSV ($p = 0.040$), RI ($p < 0.001$) were observed showing that sympathetic activity in hypertensive patients is reduced.

In yet another one group pre-test post-test study by Soliman (2020) on efficacy of alternate nostril breathing for controlling blood pressure, anxiety and heart rate among Egyptian hypertensive patients was significantly decreased revealed in blood pressure readings.

Need for the study: Breathing exercises as ANB stimulate the primary and parasympathetic

nervous system and the vagus nerve, which helps to slow down heart rate, lower blood pressure, and calm body and mind (Kalaivani et al, 2019). Hence, these exercises are effective as non-pharmacological intervention to reduce blood pressure as per the available evidence. Despite the promising benefits very few studies have been conducted to evaluate effectiveness of alternate nostril breathing in a diverse population as those in a community in India. Additionally, community-based approaches could help in identifying practical challenges of implementing ANB on diverse population.

Objectives

1. To assess the pre- and post blood pressure levels among hypertensive patients in the experimental and control group.
2. To compare the post-intervention blood pressure levels between control and experimental group.
3. To determine the association between blood pressure levels with selected demographic and clinical variables.

Research Hypothesis

H_1: There is a significant effect of alternate breathing exercises on blood pressure among hypertensives.

H_2:There is a significant association of blood pressure levels with selected demographic variables.

Material and Methods

Quasi experimental research with pre-test post-test control group design was used. The research setting was Urban Bhora Kalan village, Gurugram, Haryana. The target population was hypertensive patients. The accessible population was the hypertensive subjects available at the selected urban community. The sample size was determined to be 30 in each group. For selecting the research setting and the samples, a purposive sampling technique was used due to the limited number of hypertensives available in the selected community and to have a detailed understanding of the phenomenon (ANB) among hypertensives. The subjects were randomly allocated (30 each) to experimental and control groups using flip of a coin. Validity of the tool (demographic sheet, BP recording sheet, self-assessment sheet of daily exercise and the intervention procedure of alternate nostril breathing) was ascertained with the help of 6 medical surgical nursing experts.

Validity of digital sphygmomanometer: Visual inspection for the leaks, cracks or wear and tear on the cuff, tubing and gauge was done. Functional check using switching on the power and checking zero position of the gauge needle was performed. A calibrated reference manometer was used to compare the readings of the research instrument and was found to be within ±3 mmHg of the reference manometer. For the accuracy testing multiple readings for the same person and comparison of the readings with the other reference manometer was done and compared. The leakage test was performed by inflating the cuff and monitoring the pressure for one minute. The instrument was stored in a cool place as temperature alterations can affect the readings.

Intervention of the research study: Participants in the experimental group performed alternate nostril breathing exercises twice daily for 10 minutes each session over 15 days, in addition to their routine hypertension treatment. Control group participants continued their usual care, including hypertension medication and their normal daily routines. The experimental group received a demonstration of the breathing exercises at the primary health care centre when they sought treatment. Blood pressure readings for both groups were taken on day 1 (baseline) and day 15 using an automated digital sphygmomanometer.

Procedure for alternate breathing exercise: Patients were instructed to sit comfortably with their head, neck, and back aligned in a straight line during the alternate nostril breathing demonstration sessions, held in a calm and quiet room at the primary health centre. They were guided to close one nostril (e.g., the right nostril) with their thumb and inhale slowly and deeply through the left nostril. Then, they were to close the left nostril with their ring finger, open the right nostril, and exhale slowly and completely. Next, they inhaled through the right nostril (with the left nostril closed) and then exhaled through the left nostril as previously instructed. This alternate nostril breathing exercise was performed for 10 minutes, twice daily. Participants were instructed to continue this routine twice a day for 15 days. Throughout the intervention period, the researcher followed up with the experimental group at their homes to ensure no changes in their antihypertensive medications and to encourage consistent practice of the breathing exercises.

During the second assessment, on Day 15 of the intervention, participants' blood pressure was measured and recorded. The control group continued to receive routine standard treatment without the alternate nostril breathing exercise, and their blood pressure was assessed in the same manner as the experimental group. After completing the post-assessment data collection, the alternate nostril breathing exercise was taught to all participants.

Ethical considerations: The study was conducted after approval from the Institutional Research Review Committee. Written permission was also obtained from the village sarpanch, with an explanation that the study involved only nostril breathing exercises and blood pressure recording, without any active interventions. Written consent was obtained from each participant, and they were informed that participation was entirely voluntary and that they could withdraw from the study at any time without providing a reason.

Data collection procedure: In the preliminary phase, 60 diagnosed hypertensive patients were identified in the selected community. On the first day, baseline data were collected using specified data collection tools. The experimental group received a demonstration of the breathing exercise in small groups of 5-6 participants. Return demonstrations were conducted, and feedback was provided to address any questions, ensuring complete comprehension by the participants. The control group continued with routine care. Participants were given a self-assessment sheet, and the exercise duration was explained. Follow-up recordings were conducted at the participants' homes on day 15.

Data analysis procedure: The data obtained was analysed with IBM SPSS Statistics 29. Both descriptive and inferential statistics were used with calculation of frequency, percentage, standard deviation, chi square test and independent and paired t test.

Results

Table 1 depicts demographic variables of the study participants. Majority of study participants were females and over 60 years old in both the experimental (40% male, 57% female) and control group (53.3% male, 47% female). Most participants were unemployed and had an education level up to high school. The majority in both groups had been suffering from hypertension and receiving treatment for more than five years. Nearly all participants were vegetarians. A chi-square test showed no significant differences between the groups, indicating that the groups were comparable in terms of their demographic attributes.

Table 1: Distribution of participants based on demographic and clinical variables (N1+N2=30+30)

S. No	Variable	Exp Grp (N1=30)	Control Grp (N2=30)	Total (N=60)	Chi square/Fisher's exact test	p- value
1	*Age (years)* a. 30-40 b. 41-50 c. 51-60 d. >60	 2 (6.6) 7 (23.4) 9 (30.0) 12 (40.0)	 4 (13.3) 8 (26.7) 2 (6.7) 16 (53.3)	 6 (10.0) 15 (25.0) 11 (18.3) 28 (46.7)	 5.759	 0.124
2	*Gender* a. Male b. Female	 13 (43.3) 17 (56.7)	 16 (53.3) 14 (46.7)	 29 (48.3) 31 (51.70	 0.438	 0.606
3	*Occupation* a. Govt employee b. Private employee c. Self-employed d. Unemployed	 1 (3.4) 2 (6.6) 7 (23.3) 20 (66.7)	 2 (6.6) 3 (10.0) 8 (26.6) 17 (56.8)	 3 (5.0) 5 (8.3) 15 (25.0) 37 (61.7)	 0.851	 0.837
4	*Education* a. No formal education b. High school c. Intermediate d. Graduate	 23 (76.7) 5 (16.7) 2 (6.6)	 21 (70.0) 6 (20.0) 3 (10.0)	 44 (73.3) 11 (18.3) 5 (8.3)	 0.382	 0.826
6	Duration of hypertension a. 0-5 years b. 5-10 years	 27 (90.0) 3 (10.0)	 24 (80.0) 6 (20.0)	 51 (85.0) 9 (15.0)	 1.176	 0.472
7	*Duration of taking medications for hypertension* a. 0-5 years b. 6-10 years	 27 (90.0) 3 (10.0)	 25 (83.3) 5 (16.7)	 52 (86.6) 8 (13.4)	 0.577	 0.706
8	*Dietary pattern* a. Vegetarian b. Non-vegetarian c. Eggetarian	 29 (96.7) 1 (3.3)	 30 (100.0) 0 (0.0)	 59 (98.3) 1 (1.67)	 1.017	 1.00

p<0.05, significant

Table 2: Inter-group comparison of SBP readings on day 1 and day 15 among experimental and control group using paired t test (N=30)

Group	Day 1 (Mean ±SD)	Day 15 (Mean ±SD)	Mean difference	Paired t-test
Experimental group	157.2±17.3	149.7±14.7	7.4±5.1	t=8.023 p=0.001*
Control group	154.6±17.3	153.1±17.2	1.5±1.2	t=6.707 p=0.001*

p≤0.001 *Significant

Table 3: Inter-group comparison of DBP readings on day 1 and day 15 among experimental and control group using paired t test (N=30)

Group	Day 1 (Mean±SD)	Day 15 (Mean±SD)	Mean difference	Paired t-test
Experimental group	93.5±8.6	86.5±7.5	7 ±4.4	t=8.618 p=0.001*
Control group	95.6±7.4	93.9±7.3	1.7±0.8	t=11.470 p=0.001*

Table 4: Comparison of SBP readings on day 1 and day 15 among experimental and control group using independent t test (N=30)

Group	Day 1 (Mean ±SD)	Independent t test	Day 15 (Mean ±SD)	Independent t test
Experimental group	157.2±17.3	t=0.568 p=0.001*	149.7±14.7	t=0.420 p=0.001*
Control group	154.6±17.3	–	153.1±17.2	

Table 5: Comparison of DBP readings on day 1 and day 15 among experimental and control group using independent t test (N=30)

Group	Day 1 (Mean ±SD)	Independent t test	Day 15 (Mean ±SD)	Independent t test
Experimental group	93.5±8.6	t=8.618 p=0.001*	86.5±7.5	t=11.470 p=0.001*
Control group	95.6±7.4	–	93.9±7.3	

Table 2 depicts within group comparison of SBP readings on day 1 and day 15 among experimental and control group which showed a mean difference of 7.4±5.1 and 1.5±1.2 which was found to be statistically significant using paired t tests with t=8.023; p=0.001 & t=6.707; p=0.001 respectively. Similarly, Table 3 shows that the mean difference of DBP of 7±4.4 and 1.7±0.8 was also found to be statistically significant but clinically meaningless. It may be due to continuation of the hypertensive drugs. However, the intervention group reported reduction in the BP as shown by the readings and perceived improvement in overall wellbeing. Reduction in hypertension-related symptoms shows that ANB was effective in the intervention group. However, the control group did not report any such improvement.

Tables 4 and 5 illustrate the inter-group comparison of SBP and DBP readings using independent t test from day 1 to day 15, which was also found to be significant with p=0.001. None of the demographic /clinical variables showed significant association using Fishers exact test (Table 6).

Table 6: Association between level of baseline SBP and DBP with selected demographic/clinical variables using fisher's exact test

S. No	Variable	SBP (mean±SD)	DBP (mean±SD)
1	*Age (years)*	148.6±18.9	91±7.3
	30-40	147.8±8.1	95.7±6.2
	41-50	164.1±22.7	95.2±6.2
	51-60	158.5±16.5	94.5±9.6
	> 60	p = 0.674	p =0.893
2	*Gender*		
	a. Male	153.8±15.9	93.3±9.1
	b. Female	157.8±18.4	95.8±7.1
		p =0.465	p = 0.440
3	*Occupation*		
	a. Govt employee	158±25.9	101.6±3
	b. Private	142.4±1.6	89.8±5.9
	employee	150.4±15.4	92±4.2
	c. Self employed	159.8±17.3	95.7±8.8
	d. Unemployed	p = 0.090	p=0.218
4	*Education*		
	a. No formal	157±17.1	94.5±8.3
	education	153.1±17.5	93.4±5.9
	b. High school	152.4±19.6	97.4±10.4
	c. Intermediate	p = 0.811	p = 0.226
5	Duration	154.6±16.9	94.5±8.3
	a. 0-5 years	163.1±18.1	94.7±6.7
	b.5-10 years	p = 0.548	p = 1.000
6	*Duration of taking hypertension drugs*	154.7±16.8	4.5±8.5
	a. 0-5 years	163.6±19.2	95.2±7.1
	b. 6-10 years	p = 0.548	p=1.000

Discussion

The researcher conducted this study to assess the effect of alternate nostril breathing exercises on blood pressure in hypertensive patients in an urban community in Haryana. The majority of study participants were over 60 years old and female, with the experimental group consisting of 40 percent males and 57 percent females, and the control group consisting of 53.3 percent males and 47 percent females. Most participants were unemployed and had an education level up to high school. The majority in both groups had been suffering from hypertension and receiving treatment for more than five years. These findings are consistent with a study by Kalaivani et al (2019) which found that among 170 patients, half were aged 51–60 years, most were female, and the majority had completed primary level education.

The current study observed a reduction in both systolic and diastolic blood pressure after 15 days

of continuous alternate nostril breathing exercises. The mean systolic blood pressure decreased from 157.2 to 149.7 mmHg, and the mean diastolic blood pressure decreased from 93.5 to 86.5 mmHg. The paired t-test results ($p < 0.001$) indicated that these reductions were statistically significant. These findings suggest that alternate nostril breathing is effective in reducing hypertension at 0.05 level of significance, the results align with those of Kalaivani et al (2019) which also reported significant reductions in systolic BP, diastolic BP, heart rate, and rate pressure product after five days of alternate nostril breathing exercises. However, the present study did not account for heart rate and rate pressure product.

Similar findings were reported by Sandeep et al (2015), who assessed the effect of alternate nostril breathing on cardiovascular functions in hypertensive patients at a hospital in Punjab and found comparable results. Additionally, Mohamed et al (2013) reported similar reductions in blood pressure and heart rate among 120 newly diagnosed essential hypertension patients in a general government hospital. A study by Naik et al (2012) on the effect of left nostril breathing in hypertensive patiental revealed similar results wherein mean pulse rate dropped from 84.73±1.89 per minute to 81.80±1.84 minute and systolic BP dropped from 144.50±3.68 mmHg to 133.83±3.6 mmHg and diastolic BP from 100.96±2.48 mmHg to 94.83 ± 2.4 mmHg.

On comparing level of SBP and DBP among both groups mean difference in systolic BP of 7.4 and diastolic BP of 7 from day 1 to day 15 was noticed which was higher in experimental group to control group (SBP 1.5, DBP 1.7). However this difference was found to be significant in both the groups. This may be due to continuation of the hypertension drugs by the patients in the control group. These results are contrary to the findings of the study by Kalaivani et al (2019) and another study by D'Silva et al (2014) where the control group did not show any significant difference in terms of pre and post-test levels of blood pressure.

Limitations: Both the experimental and control groups continued taking their antihypertensive medications during the study period. The extraneous variables, as other forms of exercise and dietary habits could not be controlled, which may limit the generalisability of the study.

Recommendation

Alternate nostril breathing exercises have a role in reducing the blood pressure levels among hypertensives.

Nursing Implications

Alternate breathing exercise is a simple exercise which can be taught to the hypertensives in hospital or community setting by the nurses. It can be used in the nursing practice wherein the practical nurses can use pamphlets, brochures and through instructional videos. The findings of the study can be used in the community outreach programmes as workshops and support groups of hypertensives who can teach ANB to the people of community. It can be integrated in the health care plans and used for empowering patients. Further research on a diverse population with robust designs as RCT can be conducted to establish the cause-and-effect relationship.

Conclusion

The results of the current study show that alternate breathing exercise carried out two times a day for 10 minutes duration is an effective intervention in reducing the systolic and diastolic pressure among hypertensives.

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