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Original Research Article

Immediate effects of Chandra Nadi Shuddhi Pranayama on blood pressure, heart rate and rate pressure product among normal individuals: an experimental study

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ABSTRACT

Background: Chandra Nadi Shuddhi Pranayama is a type of alternate nostril breathing which is the control-positive inhalation and exhalation process. Alternate nostril breathing technique shows the best result in health improvement especially in controlling the blood pressure. It activates the parasympathetic nervous system which dilates blood vessels, decreases the heart rate which leads to reduce blood pressure. Many studies have been done to see effects of breathing exercises on cardiovascular system however, no such studies were done to see specific and immediate effect of Chandra Nadi Shuddhi on cardiovascular system. In this article, we will look how Chandra Nadi Shuddhi improves blood pressure, heart rate, and rate pressure product.
Methods: Ethical clearance and participant consent was taken. Study design was experimental study. The 80 subjects were taken by convenient sampling. Participants were asked to perform 27 rounds of the Chandra Nadi Shuddhi Pranayama and outcome measures were assessed before and immediately after performing Chandra Nadi Shuddhi. The normality of the data was assessed using parametric paired t test.
Results: Immediate effect of Chandra Nadi Shuddhi Pranayama showed that there was statistically significant decrease in blood pressure, heart rate and rate pressure product (p=0.0001, 0.0045, 0.0001 respectively)
Conclusions: There is immediate effects of Chandra Nadi Shuddhi Pranayama on individuals with normal blood pressure.These results suggest a possible role for this technique in helping to control hypertension, lower anxiety and depression, improve breathing and immunity.

Keywords: Alternate nostril breathing, Breathing technique, Blood pressure, Chandra nadi Shuddhi, Hypertension

INTRODUCTION

Chandra Nadi Shuddhi Pranayama (CNS) is a type of alternate nostril breathing (ANB) technique of controlled breathing. ANB is the control-positive inhalation and exhalation process. ANB is a simple breathing exercise of Chandra Nadi Shuddhi that does not require any artificial instruments and no extra efforts.[1] The flow of the blood and the resistance developed by arteries and veins is called blood pressure (according to WHO). Increased blood pressure that is hypertension is considered a silent killer. Pharmacological treatment can keep it under control, but there is need to identify non-pharmacological management to maintain blood pressure to prevent side effect of heavy dose medicine, which helps to control blood pressure. Practicing this breathing technique in supervision helps in adjunct to medicine to maintain blood pressure. In this whole process the heart, arteries,

veins, and lungs are involved which controls its rate with the help of the nervous system. As per Vedic text, the ANB is also known as Nadi Shuddhi and as, it is initiated with the left nostril (Chandra Nadi) it is called Chandra Nadi Shuddhi Pranayama, which means it not only controls the breath but also purifies the Nadis (arteries and veins) by increasing the concentration of oxygen.[2] Deep and long breaths with awareness starts with the diaphragmatic base and this brings relaxation to the diaphragmatic muscles and accessory respiratory muscles of the neck further relaxing the facial muscles. This relaxation impulse is carried to the organs of perception i.e. eyes, ears, tongue, nose and skin. This leads to general relaxation of the entire body, reducing stress, hence one of the factors which contribute to reduction in blood pressure. Relaxation of heart musculature helps in reduction of heart rate also the workload of heart to supply blood reduces working on the rate pressure product. Breathing not only helps in relaxing the organs but also increases the concentration of oxygen supply in the blood, making the bloodstream flow better.[10] Alternate nostril breathing is a broad term, there are various types of breathing techniques like Anulom Vilom, Nadi Shodhana, Bhramari Pranayama, Sheetali Pranayam, Kapalbhati. These techniques in combination with Chandra Nadi Shuddhi can be more beneficial for promoting overall well-being.[5,7,12]

Physiotherapy also suggests breathing techniques to improve oxygen supply, promote relaxation, reduce breathlessness and anxiety they are; pursed lip breathing technique, diaphragmatic breathing technique, resistance breathing technique. poor breathing habits increase overstimulation of the sympathetic nervous system resulting in panic attacks and anxiety. In contrast, regularize breathing habits influences parasympathetic activity slowing down the heartbeat reduce the blood pressure.[2] Hence it's important to practice correct breathing. The stress, anxiety, work pressure, sedentary lifestyle, higher living standards with less physical activity, less income and COVID-19 pandemic has made the situation worsen resulting in the unhealthy human scenario.1Control breathing pattern activates the parasympathetic nervous system which dilates blood vessels, decreases the heart rate which leads to reduce blood pressure.[1,14] Not only is the technique effective in correcting the breathing but also in disease prevention.[9] Many studies have been done to see effects of breathing exercises on cardiovascular system however, no such studies is done to see specific effect of alternate nostril breathing on cardiovascular system. Therefore, there is need to study the immediate effects of alternate nostril breathing on Blood pressure, Heart rate and Rate Pressure Product.

METHODS

This is an experimental study design with convenience sampling which includes 80 participants as sample size. The sample size was taken from primary health care centre in Kalamboli, Kharghar and Panvel in Navi Mumbai in the study period of November 2023 January 2024. For the test the participants had to meet the following inclusion criteria; Participants in age group of 30 to 60 years including both genders, participants with normal blood pressure (120/80 mmHg), individual with ability to understand the purpose of study, voluntary concern to participation. People who were included in the exclusion criteria were; hypertensive individuals (>120/80mmHg) ACSM and hypotensive Individual (<90/60mmHg) ACSM, participants under yoga, gym, aerobic training, regular smoker, alcohol or drug addiction, uncontrolled hypertension, diabetes mellitus, individual suffering from any kind of obstructive and restrictive lung disease, pregnancy, any recent surgery. Instrument used for the procedure were Automated Digital Sphygmomanometer accuracy of ±5% for HR and ±3 mm Hg for BP and Pulse oximeter.[4]

Figure 1: Participants performing Chandra Nadi Shuddhi Pranayama at Primary Health Care Centre.

Figure 2: Participants performing Chandra Nadi Shuddhi Pranayama at primary health care centre.

Clearance was obtained from the Ethics Committee of TMV's Lokmanya Tilak College of Physiotherapy. The purpose and procedure of the study was explained to the participant and a written consent was taken. Required sample was collected which includes men and women both with age group between 30 to 60 years The subjects were instructed to sit in any comfortable posture and relax for 5 min before taking pre-intervention recordings of blood pressure, heart rate, and rate pressure product. Participants were asked to sit in a comfortable sitting position with the head, neck and trunk erect in a straight line during the practice of alternate nostril breathing exercise. Participants were instructed to focus their mind on their breath and ensure it is slow, deep, and regular while attempting to utilize all sections of their lungs. They were asked to close their right nostril by their thumb and slowly breathe in up to maximum, through the left nostril. They were asked to close their left nostril by their ring finger and open the right nostril to exhale slowly up to maximum. Then, they were instructed to inhale through the same right nostril (with left nostril closed) and then to open the left nostril and exhale as instructed previously. All the participants performed 27 rounds of Chandra Nadi (left nostril) initiated Nadi Shuddhi Pranayama blood pressure, heart rate, rate pressure product was measured post the intervention. the pre and post assessment data included the values of mean, median, mode, standard deviation, t-value, and p-value of the objective measurements; blood pressure, heart rate, rate pressure product and SPO_2. Shapiro- wilk test used to see for data passing normality. Paired T test (i.e. t value) was used for the standard data analysis. P value is the probability of the study deviating towards null hypothesis.

RESULTS

Shows that there are maximum participants in the age group of 30-40 (44 i.e. 55%), followed by 41-50 (19 participants i.e. 24%), and the least in the age group 51-60 (17 participants i.e. 21%).

Table 1: Distribution of number of subjects according to age group.

Age group (in years)	No. of subjects
30-40	44
41-50	19
51-60	17

Table 2: Pre and post systolic blood pressure comparison of data.

No		N	Mean	Median	Mode	SD	t	P value
1.	**Pre-systolic BP**	80	112.23	114.5	120	8.30	5.2611	0.0001
2.	**Post-systolic BP**	80	111.03	114	118	8.16		

Table: 3 Pre and post diastolic blood pressure data.

No		N	Mean	Median	Mode	SD	t	P value
1.	**Pre-diastolic BP**	80	72.65	74.5	80	7.08	2.9218	0.0045
2.	**Post-diastolic BP**	80	72.11	74	80	7.03		

Table 4: Pre and post heart rate data.

No		N	Mean	Median	Mode	SD	t	P value
1.	**Pre-heart rate**	80	82.66	83	86	8.43	8.1551	0.0001
2.	**Post-heart rate**	80	79.76	80	80	8.58		

Table 5: Pre and post rate pressure product data.

No		N	Mean	Median	Mode	SD	t	P value
1.	**Pre-RPP**	80	9253.29	9149	9120	1181.87	8.7215	0.0001
2.	**Post-RPP**	80	8828.46	8880	9120	1067.22		

Age

Shows that there are maximum participants in the age group of 30-40 (44 i.e. 55%), followed by 41-50 (19 participants i.e. 24%), and the least in the age group 51-60(17 participants i.e. 21%).

Systolic blood pressure

A paired samples t-test showed that the participants level of systolic blood pressure decreased from pre-program (M=112.23, SD=8.30) to post-program (M=111.03, SD=8.16; t=5.2611, p<0.0001).

Diastolic blood pressure

A paired samples t-test showed that the participant's level of diastolic blood pressure decreased from pre-program (M=72.65, SD=7.08) to post-program (M=72.11, SD=7.03; t=2.9218, p<0.0045).

Heart rate

A paired samples t-test showed that the participant's level of heart rate decreased from pre-program (M = 82.66, SD=8.43) to post-program (M=79.76, SD=8.58; t 8.1551, p<0.0001).

Rate Pressure Product

A paired samples t-test showed that the participant's level of rate pressure product decreased from pre-program (M =9253.29, SD=1181.87) to post-program (M=8828.46, SD=1067.22; t=8.7215, p<0.0001).

SPO_2

Pre and post SPO2 data. A paired samples t-test showed that the participant's level of SPO2 increased from pre-program (M=98.13, SD=0.91) to post-program (M =98.94, SD=0.70; t=9.9447, p<0.0001).

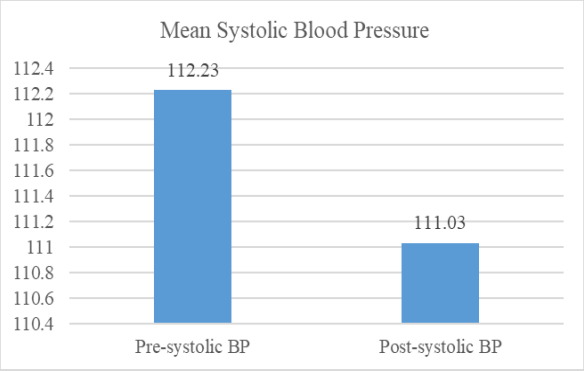

Figure 3: Significant reduction (difference of 1.17) in the mean of pre and post systolic blood pressure.

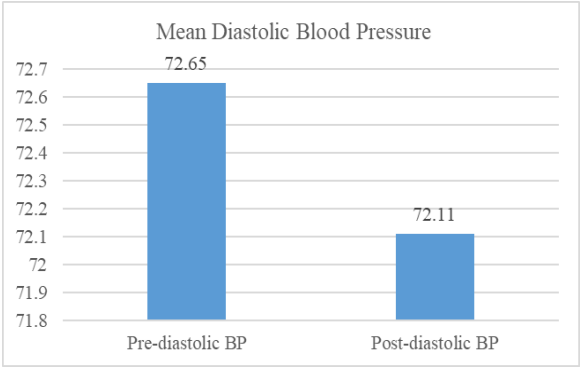

Figure 4: A slight reduction (difference of 0.54) in the mean of pre and post diastolic blood pressure.

DISCUSSION

Results of the pre and post intervention comparisons are given in statistical analysis. Chandra Nadi Shuddhi produced an immediate decrease in all the measured parameters with the decrease in BP, HR, and RPP.[6,13] Whereas the levels of SPO2 increased slightly in all participants. A total of 80 participants were involved in the research study. Participants in the study were asked to perform 27 rounds of Chandra Nadi Shuddhi Pranayama. Table 1 shows the distribution of the subjects according to their age. It indicates that there were maximum number of subjects in the age group of 30-40 years of age and least in the age group of 51-60 years.

Age plays an important role in health. The likelihood of health problems increases as we age. The selection criteria of 30 to 60 is keeping in mind the physiological changes related to age. And mostly, hypertension is diagnosed in this age group. By this breathing technique we can bring about prevention of hypertension and other related diseases. There was statistically significant difference in systolic and diastolic Blood pressure pre- and post-assessment. We observed that almost every individual's systolic blood pressure reduced after the assessment but comparatively there were not significant changes in the diastolic blood pressure. This breathing technique helps to decrease the sympathetic activity and increase the parasympathetic activity leading to vasodilatation of the arteriolar system which causes decrease in peripheral resistance.[8] This also reduces heart rate and myocardial contractility (the heart rate lowers down and gives rest to heart muscles) and this decreases the cardiac output. Therefore, decreased cardiac output and peripheral resistance reduces the systolic and diastolic blood pressure. Breathing technique reduces stress and there is relaxation of the entire body. Pranayama shows a reduction in sympathetic activity which helps in stress management. In this relaxed states, parasympathetic nerve activity overrides sympathetic nerve activity.[15] Regular practice will increase oxygenation, better nutrient supply to the artery, reduced peripheral resistance therefore very beneficial for individuals in the age group 30-60 years to prevent the likelihood of increased blood pressure or even maintain the blood pressure in hypertensive individual. When the breath is not regular, the mind is unsteady and when it is deep and regular then the mind is in calm and steady state. Therefore, one should command the breath for better life and health.[2] There was reduction in the mean of systolic BP after 27 rounds of alternate nostril breathing exercise, indicated that the difference in heart rate. The heart rate pre and post assessment was statistically significant. We observe that heart rate reduced as breathing relaxes the body and the muscles are also relaxed, this also relaxes the heart musculature hence reducing the heart rate.

Rate pressure product: Rate pressure product=heart rate×systolic BP.[4] Table 5 shows that there was reduction

in the mean of systolic BP after 27 rounds of alternate nostril breathing exercise. Reduction in heart rate and systolic BP leads to reduction in its product value. Rate pressure product helps in determining the oxygen consumption of the heart and predicts cardiac function.[3] The SPO_2 has significantly increased after the pranayama in all individuals indicating that there is immediate increase in O_2 supply.[10] As the name suggests Chandra Nadi Shuddhi Pranayama which means it not only controls the breath but also purifies the Nadis (Arteries and Veins) by increasing the concentration of oxygen.[2] It also calms down the body and brings about overall relaxation of the body so slow deep breathing improves blood oxygenation.

Limitations to the study is that it requires correct supervision. Participants learning it for the first time need repetitive instructions for controlled breathing.

CONCLUSION

There are immediate effects of Chandra Nadi Shuddhi Pranayama on individuals with normal blood pressure. It is observed that left nostril breathing decreases systolic, diastolic, and mean blood pressure thus reducing hypertension. Hence Chandra Nadi Shuddhi reduces BP. These results suggest a possible role for ANB/CNS in helping to control hypertension, lower anxiety, and depression, improve breathing and immunity.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Bhavanani AB, Madanmohan M. Immediate effect of alternate nostril breathing on cardiovascular parameters and reaction time. OIIRJ. 2014;4:297-302
2. Kanorewala BZ, Suryawanshi YC. The Role of Alternate Nostril Breathing (Anuloma Viloma) Technique in Regulation of Blood Pressure. Asia Pac J. 2022;9(2):48-52.
3. Telles S, Yadav A, Kumar N, Sharma S, Visweswaraiah NK, Balkrishna A. Blood pressure and Purdue pegboard scores in individuals with hypertension after alternate nostril breathing, breath awareness, and no intervention. Medical science monitor: Int J Exp Clin Res. 2013;19:61.
4. Kalaivani S, Kumari MJ, Pal GK. Effect of alternate nostril breathing exercise on blood pressure, heart rate, and rate pressure product among patients with hypertension in JIPMER, Puducherry. HEHP. 2019;8.
5. Garg P, Mendiratta A, Banga A, Bucharles A, Piccoli MV, Kamaraj B, et al. Effect of breathing exercises on blood pressure and heart rate: A systematic review and meta-analysis. IJCCRP. 2024;20:200-32.
6. Bhavanani AB, Sanjay Z. Immediate effect of chandra nadi pranayama (left unilateral forced nostril breathing) on cardiovascular parameters in hypertensive patients. Int. J. Yoga. 2012;5(2):108.
7. Dhungel KU, Malhotra V, Sarkar D, Prajapati R. Effect of alternate nostril breathing exercise on cardiorespiratory functions. Nepal Med Coll J. 2008;10(1):25-7.
8. Jain S, Agarwal JL. Effect of alternate nostril breathing on cardiac output and systemic peripheral resistance. Chairman, editorial board. 2014;2(2):4.
9. Dhaniwala NK, Dasari V, Dhaniwala MN. Pranayama and Breathing Exercises-Types and Its Role in Disease Prevention and Rehabilitation. J. Evol Med Dent Sc. 2020;9(44):3325-31.
10. Udhan VD, WankheDe SG, Phatale SR. Effect of Yoga on Cardio-Respiratory Health Markers: Physical Fitness Index and Maximum Oxygen Consumption (VO_2 Max). JCDR. 2018;12(8).
11. Kinabalu K. Immediate effect of 'nadi-shodhana pranayama'on some selected parameters of cardiovascular, pulmonary, and higher functions of brain. J Physiol Sci. 2005;18(2):10-6.
12. Bhavanani AB, Ramanathan M, Balaji R, Pushpa D. Differential effects of uninostril and alternate nostril pranayamas on cardiovascular parameters and reaction time. Int. J. Yoga. 2014;7(1):60-5.
13. Srivastava RD, Jain N, Singhal A. Influence on alternate nostril breathing on cardiorespiratory and autonomic functions in healthy young adults.IJPP. 2005;49(4):475.
14. Ttryambake RG. The effectiveness of pranayama on blood pressure of hypertensive patients. Benefits. 2013;2(3):7.
15. Dhadse M, Fadia A. Effect of anulom vilom pranayam on visual reaction time in young adults of Indian population. Int J Basic Appl Physiol. 2013;2:57-62.

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