



## **A Study to Compare the Effect of Slow Breathing Exercise and Anulom Vilom Pranayam On Blood Pressure, Heart Rate and Respiratory Rate In Patients With Primary Hypertension: An Interventional Study**

<sup>1</sup>Kalyanee Jivrajani, <sup>2</sup>Yagnik Dave\*, <sup>3</sup>Rahul Chhatlani, <sup>4</sup>Pragna Gondaliya

1. Assistant Professor (M.P.T. Cardio-Respiratory), Faculty of Physiotherapy, Marwadi University Rajkot.
2. Assistant Professor (M.P.T. Cardio-Respiratory), Faculty of Physiotherapy, Marwadi University Rajkot.
3. Assistant Professor (M.P.T. Neuromuscular) Faculty of Physiotherapy, Marwadi University Rajkot.
4. Associate Professor (M.P.T Cardio-Respiratory), Shri K.K Sheth Physiotherapy College Rajkot.

**For Correspondence :** [yagnikdave93@gmail.com](mailto:yagnikdave93@gmail.com)

### **ABSTRACT**

*Hypertension means persistent increase in both SBP and DBP. Breathing exercise controlled at 6 rate/min are known as slow breathing exercises. Alternate nostril breathing (ANB) or Anulom-Vilom Pranayama is the techniques of Pranayama that consists of slow, deep, quiet breaths using one nostril at a time. There is a lack of consensus regarding the better non pharmacological treatment approach between the effect of slow breathing exercise and Anulom-Vilom Pranayama, so this study is aimed at finding a better non-pharmacological treatment for patients with primary hypertension. 60 subjects who fulfilled the selection criteria were selected for the study with age Group: - 35-65 years. Subjects divided into 2 Groups: Group A - Slow breathing exercise, Group B -Anulom-Vilom Pranayama for 20 minutes twice a day for 1 week. Pre and post treatment evaluation of BP, HR and RR were taken and results were compared. The result of present study supports the experimental hypothesis in Group A which shows a significant difference for pre & post SBP ( $p<0.05$ ) HR ( $p<0.05$ ) and RR ( $p<0.05$ ) but accepts null hypothesis for DBP ( $p>0.05$ ). The result also supports the experimental hypothesis in Group B which shows a significant difference for pre and post SBP ( $p<0.05$ ) HR ( $p<0.05$ ) and RR ( $p<0.05$ ) but accepts null hypothesis for DBP which shows no significant difference in pre and post data ( $p>0.05$ ). Inter Group comparison of both groups suggested that there was a significant difference for SBP ( $p<0.05$ ) HR ( $p<0.05$ ) and RR ( $p<0.05$ ) but no significant difference for DBP( $p>0.05$ ). Out of the two techniques, Anulom-Vilom Pranayama had more significant effect on improving SBP, HR and RR. Both, slow breathing exercise and Anulom-Vilom Pranayama had no significant effect on DBP.*

**Keywords:** Slow breathing exercises, Alternate Nostril Breathing, BP, Autonomic imbalance, Essential Hypertension

Received 11.11.2021

Revised 13.01.2022

Accepted 31.01.2022

### **INTRODUCTION**

Persistent increase in systemic arterial blood pressure is known as hypertension [1]. Hypertension means increase in blood pressure both in systolic BP and diastolic BP [2]. It is ranked as fourth top most disease on the basis of its prevalence. Hypertension is a major health problem and biggest of the challenges of the 21<sup>st</sup> century [3]. It has been well documented as a major risk factor for cardiovascular disease, as well as other maladies including renal disease, stroke, heart failure, and peripheral artery disease [4].

There are two main types of hypertension, "Primary" hypertension, also known as essential or idiopathic hypertension and "Secondary" hypertension which has some underlying cause [4]. Essential hypertension is the most prevalent type, affecting 90-95% of hypertensive patients. With this type of hypertension, there is no single identifiable cause. The pathogenesis of hypertension is multifactorial and can trigger the risk as genetic factors which play an important role [4]. Breathing exercises controlled at 6 rate per minute(rpm) are known as slow controlled breathing exercises and are characterized by increased tidal volume (respiratory amplitude) and decreased respiratory rate [2]. It increases baroreflex sensitivity and reduces sympathetic activity and chemoreflex activation [4]. Yoga practice includes voluntary breath

regulation, which allows a practitioner to modify physiological functions and mental state within physiological limits. There are several voluntarily regulated breathing techniques which include changes in the rate and depth of respiration and the nostril breathed through. The mechanism by which ANYB alters the blood pressure is complex. ANYB acts on an inherent rhythm that influences autonomic functions, which is the nasal cycle. The nasal cycle is an ultradian rhythm which results in a variation in the patency and efficiency of the right and left nostrils [5].

#### NEED OF THE STUDY

Hypertension is a widespread health problem and has no warning signs or symptoms, and many people don't realize they have it. Despite the significance of the problem with respect to overall health; and its undesirable health consequences, high blood pressure is still not adequately controlled and far from being optimal. The side effects and cost of antihypertensive drugs have stimulated the search for a non-pharmacological approach to control BP either as a first line or adjunctive treatment [6]. There is a lack of consensus regarding the better non pharmacological treatment approach between the effect of Slow Breathing Exercise and Anulom Vilom Pranayama on blood pressure, HR and RR in patients with essential hypertension. So, the need of the study is to find the effective non pharmacological treatment for reducing blood pressure, HR and RR in patients with essential hypertension.

#### METHODOLOGY:

- STUDY DESIGN: Interventional study
- SAMPLING TECHNIQUE: Subjects were selected by Purposive Sampling and were allocated to Group A and Group B by Random Sampling.
- SOURCE OF DATA: From Rajkot city
- STUDY POPULATION: Patients with Primary Hypertension
- SAMPLE SIZE: 60 subjects

#### MATERIALS USED: (figure 1)

- Mercury Sphygmomanometer
- Stethoscope
- Stop watch
- Pen
- Paper
- Assessment form
- Consent form
- Data collection sheet
- Couch
- Pillow
- Weighing machine
- Measure tape



Figure 1 : Materials used

#### CRITERIAS FOR SELECTION:

##### INCLUSION CRITERIAS:

- Age: 35-65 years [2].
- Gender: male & female both were included [2].
- Having blood pressure above or equal to 140 / 90 mm of Hg diagnosed by a physician at least six months prior to study should be on stable anti-hypertensive treatment for a minimum of two months prior to the study and no change in medications during participation in the trial [6].

**EXCLUSION CRITERIAS:**

- Secondary hypertension due to liver, heart, renal failure
- Recent cardiovascular events, pulmonary diseases, diabetes mellitus, neuropathies, cardiac arrhythmias
- Autoimmune diseases
- Cigarette smoking
- Alcohol consumption
- Use of oral contraceptives
- Use of neuroleptics/anti- arrhythmic and lithium
- Impaired cognitive function [7]
- Nasal abnormalities such as nasal polyps [8]

**METHOD:**

After taking the consent 60 subjects will be selected according to inclusion criteria and were randomly allocated into 2 groups. Blood pressure, HR and RR will be measured prior and after the intervention. GROUP A: 30 subjects received Slow Breathing Exercise (6 breaths/min) for 20 minutes twice daily for 5 days/week for 1 week. GROUP B: 30 subjects received Anulom-Vilom Pranayama Training for 20 minutes twice daily for 5 days/week for 1 week [9].

**TECHNIQUE FOR SLOW BREATHING EXERCISE<sup>7</sup>: (Figure 2)**

One has to sit comfortably in an easy and steady posture on a fairly soft seat. Patients were asked to take deep breath in through nose and then were asked to exhale completely through mouth. I: E = 4:6. This completes 1 cycle of slow breathing.



**Figure: 2**

**TECHNIQUE FOR ANULOM-VILOM PRANAYAMA: (Figure 3)**

The patients sat cross-legged (sukhasana) with their spine erect and their eyes closed, throughout each session. The breathing practice began by exhaling through the left nostril with right nostril occluded ; then inhaling through the left nostril ; followed by exhaling through the right nostril with left nostril occluded ; then inhaling through the right nostril and exhaling through the left nostril. This completed 1 cycle of ANYB .The approximate duration of 1 cycle was 10-12 seconds [8].



**Figure:3**

**RESULTS:**

Data of 30 subjects were analysed using SPSS V.20 and MS Excel 2010.

- Within the group: paired t- test
- Between the group: unpaired t-test

**Table 1: Intra group comparison of SBP, DBP,HR and RR in the study for Group A SLOW BREATHING EXERCISE**

Parameters	Mean $\pm$ Std. Deviation		T	P	Result
	Pre	Post			
SBP(mmHg)	145.46+2.96	141.26+3.12	9.70	<0.05	S
DBP(mmHg)	88.26+3.51	88.06+3.50	1.79	>0.05	NS
HR(bpm)	82.06+5.14	77.20+5.51	18.93	<0.05	S
RR(BPM)	19.76+2.62	16.00+2.71	20.50	<0.05	S

**Table 2: Intra group comparison of SBP, DBP,HR and RR in the study for Group B ANULOM-VILOM PRANAYAMA**

Parameters	Mean $\pm$ Std. Deviation		T	p	Result
	Pre	Post			
SBP(mmHg)	145.80+3.68	140.00+4.60	19.78	<0.05	S
DBP(mmHg)	89.20+2.99	89.06+2.76	1.43	>0.05	NS
HR(bpm)	81.26+7.02	75.33+6.74	18.67	<0.05	S
RR(BPM)	20.60+3.57	16.13+3.48	16.28	<0.05	S

## DISCUSSION

The result of present study supports the experimental hypothesis in Group A which shows a significant difference for pre & post SBP, HR and RR ( $p < 0.05$ ) but accepts null hypothesis for DBP which shows no significant difference in pre and post data ( $p > 0.05$ ). The result also supports the experimental hypothesis in the Group B which shows a significant difference for pre and post SBP, HR and RR ( $p < 0.05$ ) but accepts null hypothesis for DBP which shows no significant difference in pre and post data ( $p > 0.05$ ). Inter Group comparison of both groups suggested that there was a significant difference for SBP, HR and RR ( $p < 0.05$ ) but no significant difference for DBP ( $p > 0.05$ ). During slow breathing exercise Bernardi L et al., (2001) found that increase in tidal volume due to slow breathing rate activates the Hering breuer reflex which in turn reduces chemoreflex sensitivity and thus enhance baroreflex sensitivity.<sup>10</sup> According to a study done by G. Vasuki et al slow breathing exercise brings about generalized decrease in the excitatory pathways regulating respiratory and cardiovascular system. This could be the reason for decrease in SBP, HR and RR following Slow breathing Exercise Training. Slow breathing exercise showed no significant effect on DBP which could be compared with the study done by A.V.Turankar et al who stated that no change in BP could be due to the shorter duration of study [9, 10]. In Group B who underwent Anulom- Vilom Pranayama, there was significant improvement in SBP, HR, and RR which can be explained by in accordance to a study done by Prakash Patel(2014) who stated that Anulom-Vilom Pranayama affects brain hemisphere by alternately stimulating the right-brain and then the left-brain. This process is brought about by the action of the air flowing through the nostrils that stimulate the contra-lateral (opposite) side of the brain. It alters cardio respiratory and autonomic parameter [6]. The absence of changes in the DBP in Group –B, following Anulom-Vilom Pranayama practice could be related to the fact that diastolic blood pressure is considered a more stable component of blood pressure and it may be speculated that the duration of practice of ANB could have an influence on it. These results were similar to the study done by Shirley Telleys et al [8]. Between the 2 groups, there was significant improvement in SBP, HR and RR in Group B the possible justification for it could be that Sympathetic or parasympathetic activity alternates automatically in our body which is important for our survival. This naturally occurring alternate breathing cycle gets disrupted due to hectic and stressful life and it leads to different ailments. Anulom-Vilom Pranayama tries to make balance between sympathetic and parasympathetic nervous system and helps to maintain the normal function of autonomic nervous system.

## CONCLUSION

The present study showed that slow breathing exercise and Anulom-Vilom Pranayama has a significant effect on reducing SBP, HR and RR in patients with Primary Hypertension. However both these techniques did not had any significant effect on DBP. Hence it can be concluded that practise of Anulom-Vilom Pranayama have significant improvement in reducing SBP, HR and RR however no significant effect on DBP which can be attributed to the shorter duration of the study.

## LIMITATION OF STUDY

- Sample size was small.

- Result of this study cannot be generalized on patients with secondary hypertension.
- The duration of essential hypertension was not taken into consideration in the present study.
- Result of present study could not consider the effects of medications on hemodynamic parameters.

#### FURTHER RECOMMENDATIONS:

- The study can be done with larger sample size.
- The study duration or the training protocol can be longer.
- Study can be done in secondary hypertension.
- Study can also be conducted on patients with recent cardiovascular events, pulmonary diseases, diabetes mellitus, neuropathies, cardiac arrhythmias with precaution.

#### REFERENCES

1. K Sembulingam, Prema Sembulingam (2013), Essential of Medical Physiology 6<sup>th</sup> edition, Jaypee brothers, Chapter 103 Arterial Blood Pressure, 615.
2. Balasubramanian Sundaram, Purvesh J Maniyar, Varghese John P, Vijay Pratap Singh(2012) Slow breathing training on cardio-respiratory control and exercise capacity in persons with essential hypertension- A randomized controlled trial. *Indian Journal of Physiotherapy and Occupational Therapy*.; 6(2):22-7.
3. Nisha Shinde, Shinde KJ, Khatri SM, DeepaliHande, VichareBhushan(2013)Immediate effect of Jacobson's progressive muscular relaxation in hypertension. *Scholars Journal of Applied Medical Science*. 1(2): 80-5.
4. Labiba Abd El-kader Mohamed, Naglaa Fawzy Hanafy, Amel Gomaa Abd El- Naby(2013) Effect of slow deep breathing exercise on blood pressure and heart rate among newly diagnosed patients with essential hypertension. *Journal of Education and Practice* 5(4):36-459
5. Shirley Telles, Sadhana Verma, Sachin Sharma, Ram Gupta, Acharya Balkrishna (2017) Effect of alternate nostril breathing exercise on blood pressure and stress vigilance test *Med Sci Monit Basic Res*,23: 392-398
6. Prakash patel (2012) Influence of alternate nostril breathing on cardiorespiratory functions among hypertensive subjects *Ijcrr vol 04 issue 10*.
7. Kalyanee Jivrajani, Yagnik Dave, Vidhi Talati. A Study to Compare the Effect of Slow Breathing Exercise and Jacobson's Progressive Muscular Relaxation on Blood Pressure, Heart Rate and Respiratory Rate in Patients with Primary Hypertension: An Interventional Study. *International Journal of Scientific Research and Reviews* 2019, 8(2),4512-4522
8. Telles, S., Sharma, S. K., & Balkrishna, A. (2014). Blood pressure and heart rate variability during yoga-based alternate nostril breathing practice and breath awareness. *Medical science monitor basic research*, 20, 184.
9. A.V. Turankar, S. Jain, S.B. Patel, S.R. Sinha, A.D. Joshi, B.N. Vallish, P.R. Mane & S.A. Turankar(2013) Effects of slow breathing exercise on cardiovascular functions, pulmonary functions & galvanic skin resistance in healthy human volunteers - a pilot study *Indian J Med Res* 137, 916-921.
10. Bernardi, L., Gabutti, A., Porta, C., & Spicuzza, L. (2001). Slow breathing reduces chemoreflex response to hypoxia and hypercapnia, and increases baroreflex sensitivity. *Journal of hypertension*, 19(12), 2221-2229.

#### CITATION OF THIS ARTICLE

Kalyanee Jivrajani, Yagnik Dave, Rahul Chhatlani, Pragna Gondaliya. A Study To Compare The Effect of Slow Breathing Exercise and Anulom Vilom Pranayam On Blood Pressure, Heart Rate and Respiratory Rate In Patients With Primary Hypertension: An Interventional Study. *Bull. Env. Pharmacol. Life Sci*, Vol 11[3] Feb 2022 : 125-129.