

**EFFECTS OF ALTERNATE NOSTRIL BREATHING ON CARDIO-RESPIRATORY VARIABLE IN HEALTHY YOUNG ADULTS.****ANUPKUMAR DADARAO DHANVIJAY<sup>1</sup>, NITIN DHOKNE<sup>2</sup>, ARBIND KUMAR CHOUDHARY<sup>3\*</sup>,  
SADAWARTE SAHEBRAO KISHANRAO<sup>4</sup> AND LALITA CHANDAN<sup>5</sup>**<sup>1,5</sup>*Department of Physiology, Seth Gordhandas Sunderdas Medical College and King Edward Memorial Hospital, Mumbai.*<sup>3,4</sup>*Department of Physiology, People's College of Medical Sciences and Research Centre, Bhopal.*<sup>2</sup>*Department of Physiology, Government Medical Colleges and Hospital, Nagpur.***ABSTRACT**

Pranayama gradually diminish sympathetic dominance, resulting in better balance between sympathetic and parasympathetic system. In the present study, our aim of practicing alternate nostril breathing exercises (Nadi shodhana pranayama) is to achieve positive body health. In the present study an attempt has been made to investigate the effect of Alternate Nostril Breathing for 12-weeks on some cardio-respiratory parameters such as pulse rate, blood pressure, respiratory rate, Peak Expiratory Flow Rate on healthy young volunteers. We observed, Nadi shodhana pranayama caused reduction in pulse rate, respiratory rate and increase in Peak Expiratory Flow Rate. There was a reduction in systolic and diastolic blood pressure in total population (both males and females). Therefore, this simple exercise can be prescribed to hypertensive patients (with proper monitoring) along with the medical therapy. The increase in PEFR by alternate nostril breathing practice obviously offers an increment in cardiorespiratory efficiency and it can be advocated to the patients of early bronchitis and as a preventive measure for COPD.

**KEY WORDS:** Nadi shodhana, Pulse rate, Respiratory rate, Blood pressure.

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## INTRODUCTION

Yogic breathing techniques are termed as 'Pranayama'. 'Prana' can be explained as the vital life force that regulates all activities in the universe. 'Ayama' means control or regulation. According to Yoga, pranayama consists of various ways of inhaling, exhaling and retention of Prana. Different types of Pranayama (breathing exercises) produce different physiological responses in normal young volunteers. Savitri Pranayama, Kapalbhathi, Bhastrika Pranayama, Nadi Suddhi Pranayama (Alternate nostril breathing), are well known among them. These breathing exercises are reported to reduce anxiety and stress<sup>1</sup>. Prana, the vital energy pervades the whole body, following flow pattern called Nadis, which are responsible for maintaining all individual cellular activity. The word Nadi means 'channel' or flow of energy and shodhana means purification. Other names: Alternate nostril breathing, Anuloma – Viloma pranayama. Nadi shodhana therefore means that practice which purifies the body. The practice of Nadi shodhana is an art of controlling the breath. During the practice the subject tries to keep his or her attention on the act of breathing leading to concentration which in turn de-stress the subject and improves overall health and well-being<sup>2</sup>. The practice of Nadishodhana is an art of controlling the breath. During the practice the subject tries to keep his or her attention on the act of breathing leading to concentration which in turn de-stress the subject and improves the pulmonary functions. In the present study an attempt has been made to investigate the effect of practise of Alternate Nostril Breathing for 12 weeks on some cardio-respiratory parameters such as pulse rate, blood pressure, respiratory rate, Peak Expiratory Flow Rate on healthy young volunteers.

## MATERIALS AND METHODS

*Equipment used:*-Automatic Sphygmomanometer (Omron), Peak Flow Meter (Wright's), Mercury Manometer. *Study Design:*-The present study was conducted in a well-known tertiary care hospital in Mumbai. The participants of the study were 60 medical

students of age group 17 to 25 years. Permission to conduct the study was taken from the institutional ethics committee (No: ECR/229/Inst/MH/2013). *Selection of subject:* The study was carried out on 60 medical students in age group of 17-22 years of tertiary health centre of Mumbai. They were first explained about the purpose of the study. Prior to testing, required pre-test instructions were given and tests were properly explained and demonstrated. *Inclusion criteria:* Healthy males and female between the age group of 17-22 years without preference to any sex. Students who are having sedentary life style were included. Co-operative volunteers likely to adhere to project were included. *Exclusion criteria:* Students who have undergone any major surgery were excluded. Students having abnormal findings on history and clinical examination and complaining of any symptoms were excluded. Volunteers with any major illness like hypertension, diabetes mellitus, and history of heart disease and on any medication were excluded. All those who have not given written informed consent. Those who were doing other form of exercises were excluded. *Consent Taking:* The subjects were instructed about the nature of the study and the study procedure. Written informed consent was taken from each student prior to the procedure. Proper informed consent of volunteers fulfilling inclusion criteria was obtained before the procedure. *Study Procedure:* History taking, general examination and systemic examination were performed. Volunteers were instructed not to practice any other exercise or any yogic exercises other than prescribed one. Each Alternate Nostril Breathing session consist of 15 minutes in the morning on an empty stomach. Volunteer should sit in an easy and steady posture (either in a lotus posture i.e. Padmasana or a comfortable sitting posture i.e. Sukhasana) with the head, neck and trunk erect and in a straight line and keep the body still during practice of Alternate Nostril Breathing in a calm and quiet room. Practice of Alternate Nostril Breathing is performed in following steps. The volunteer was asked to close one of his /her nostril (say right nostril) by his thumb and slowly breathe in up to maximum,

through left nostril. He/she was asked to close his/her other nostril (left) by his/her ring finger and open the right nostril to exhale slowly up to maximum. Then he/she is instructed to inhale through same right nostril (with left nostril closed) and then to open left nostril and exhale as per above. These three steps completes one cycle of Nadisuddhi. Each cycle takes approximately 1 minute. Each volunteer had practiced such cycles for 15 minutes daily in the morning for 12 weeks (Figure 1). Following parameters were recorded on all the volunteers before and after the practice of alternate nostril breathing daily for a period of 12 weeks. *Pulse rate*: - Placing three fingers on the radial artery, pulse rate at complete rest was measured per minute for three times and average was taken and noted. *Blood pressure*: - Volunteer was asked to lie on the bed. With the help of sphygmomanometer, systolic and diastolic pressure was measured in mm of Hg. Blood pressure was recorded three times and average was noted. *Respiratory rate*: - One inspiration followed by expiration as one respiratory cycle. Counting of respiratory rate was done with special care because if person become conscious of his breathing the respiratory rate changes. To avoid this, volunteer was engaged in talk to distract his attention. Respiratory rate was noted as abdominal movements per minute. *Peak Expiratory Flow Rate*: It was measured by using Wright's Peak Flow Meter. Volunteer was first demonstrated how to forcefully blow in the Peak Flow meter. He must first take deep inspiration and then forcefully blow into Peak flow meter. Reading is taken as the marking on Peak Flow Meter which is expressed in litres/meter. In this way, reading was taken for three times and maximum reading is taken as final reading.

### **Statistical Analysis**

Data are expressed as mean  $\pm$  standard deviation (SD). All data were analyzed with

the SPSS for windows statistical package (version 17.0, SPSS Institute Inc., Cary, North Carolina. Statistical significance between the different groups was determined by. Paired "T" test and the significance level were fixed at  $p < 0.05$ .

## **RESULTS**

### ***Comparison of Pre and Post Heart rate***

The results are summarized in (Figure 2) with mean  $\pm$  SD. In the entire individual either male or female, the heart rate was significantly decreased after the practice of alternate nostril breathing, when compare to without practice of alternate nostril breathing.

### ***Comparison of Pre and Post Systolic and diastolic blood pressure***

The results are summarized in (Figure 3, 4) with mean  $\pm$  SD. In all the individual either male or female, after the practice of alternate nostril breathing, the systolic and diastolic blood pressure was significant decreased, when compare to without practice of alternate nostril breathing.

### ***Comparison of Pre and Post Respiratory rate***

The results are summarized in (Figure 5) with mean  $\pm$  SD. In the entire individual either male or female, the respiration rate was significant decreased after the practice of alternate nostril breathing, when compare to without practice of alternate nostril breathing.

### ***Comparison of Pre and Post peak expiratory flow rate (PEFR)***

The results are summarized in (Figure 6) with mean  $\pm$  SD. In all the individual either male or female, after the practice of alternate nostril breathing, the peak expiratory flow rate was significant decreased, when compare to without practice of alternate nostril breathing.

**Figure 1**  
*Steps in alternate nostril breathing*



**Figure 2**  
*Effect of alternate nostril breathing on heart rate. Each value represents mean  $\pm$  SD. \* Showed significant changed between pre and post alternate nostril breathing individuals .*

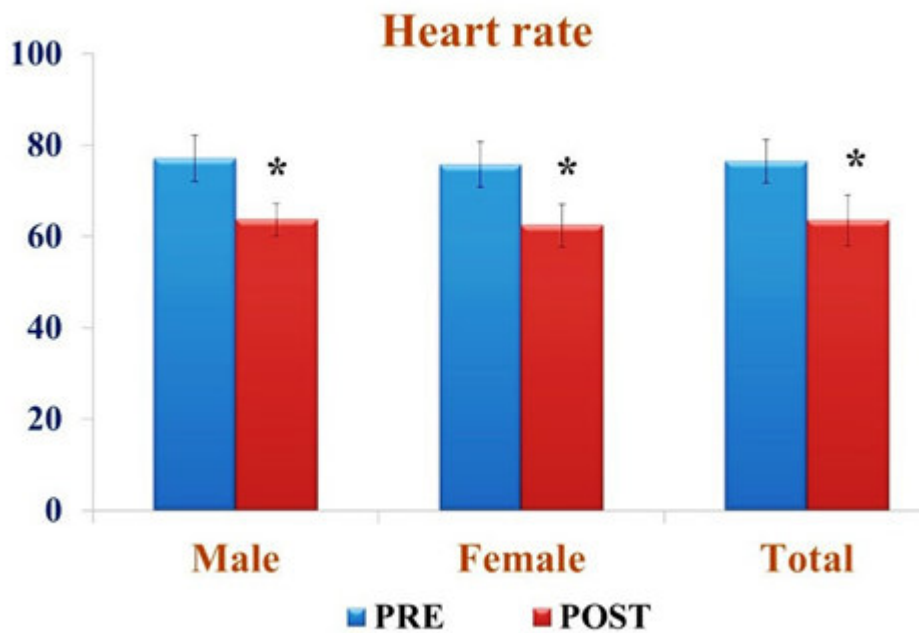


Figure 3

Effect of alternate nostril breathing on systolic blood pressure. Each value represents mean  $\pm$  SD. \* Showed significant changed among pre and post alternate nostril breathing individuals.

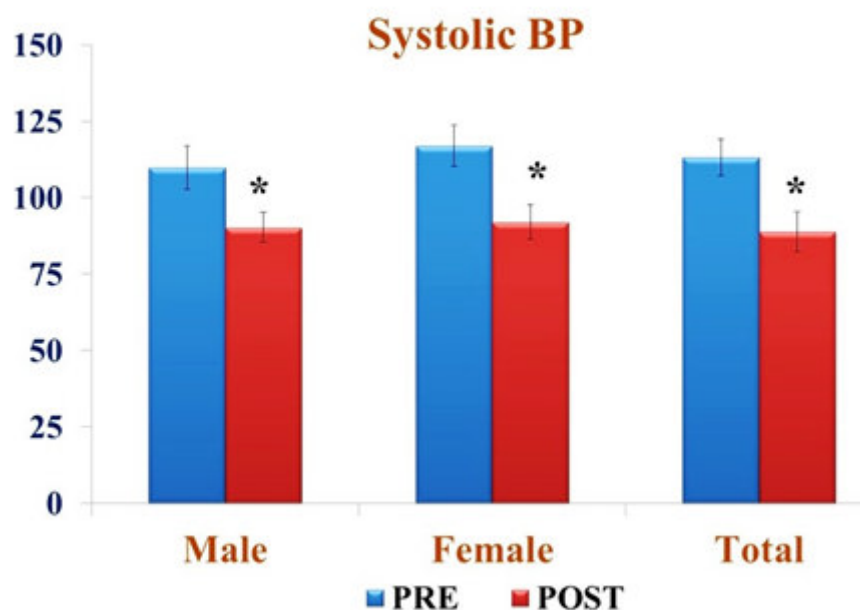
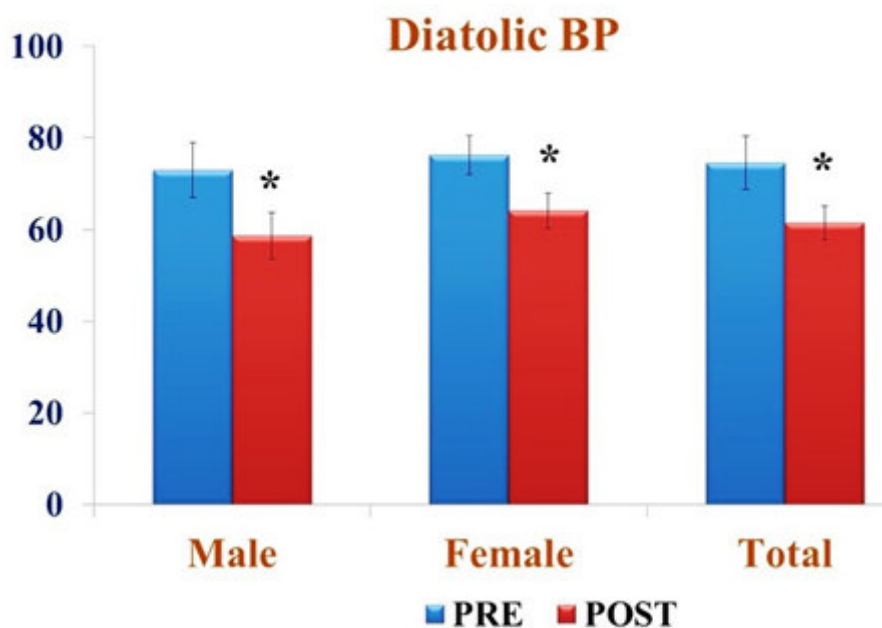


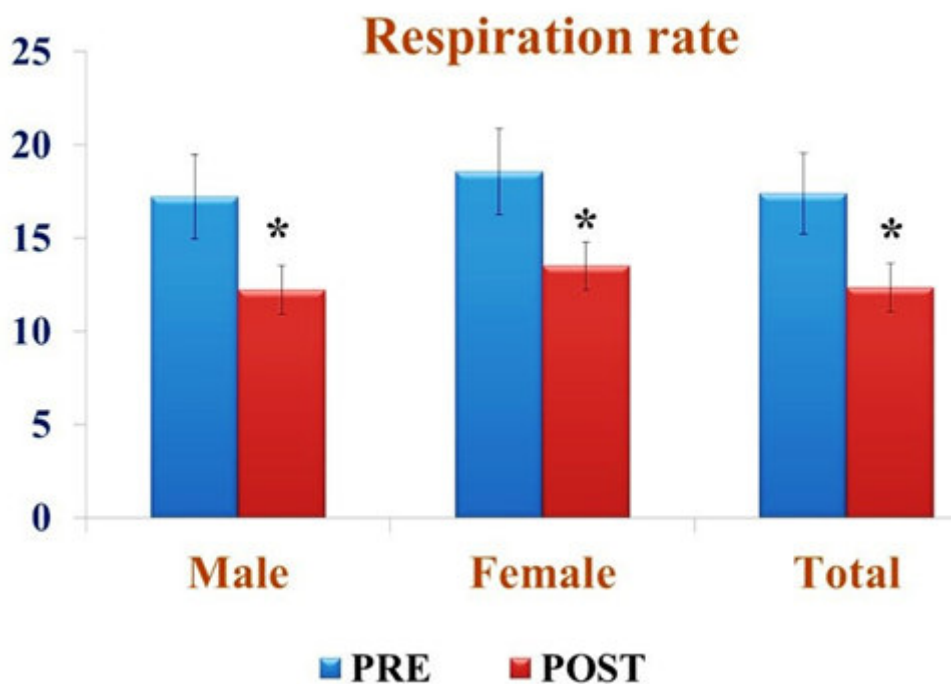
Figure 4

Effect of alternate nostril breathing on diastolic blood pressure. Each value represents mean  $\pm$  SD. \* Showed significant changed among pre and post alternate nostril breathing individuals.



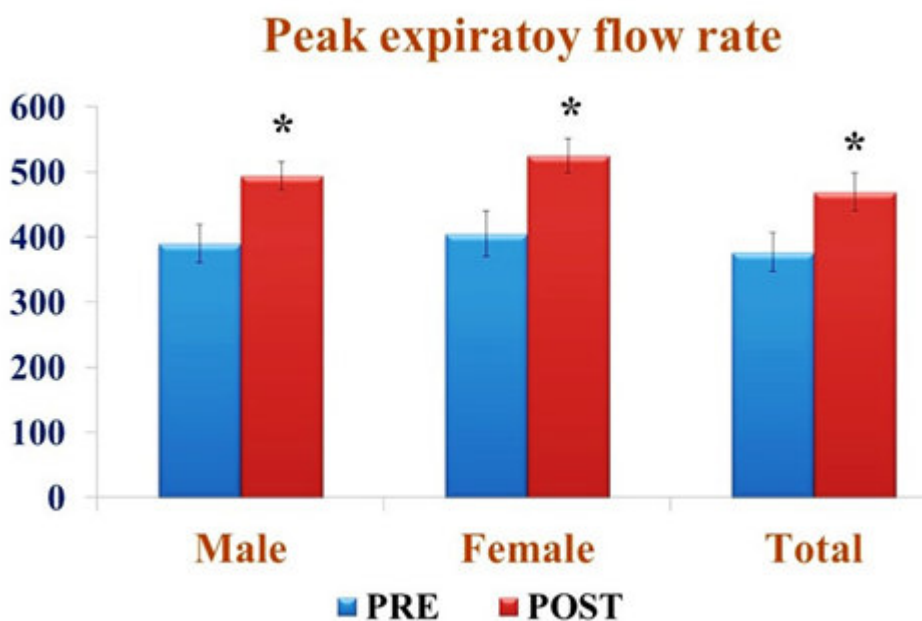
**Figure 5**

*Effect of alternate nostril breathing on respiration rate. Each value represents mean  $\pm$  SD. \* Showed significant changed among pre and post alternate nostril breathing individuals .*



**Figure 6**

*Effect of alternate nostril breathing on peak expiratory flow rate. Each value represents mean  $\pm$  SD. \* Showed significant changed between pre and post alternate nostril breathing individuals .*



## DISCUSSION

Any kind of stress, physical or mental if continued for prolonged period, results in sympathetic dominance as evidenced by gradual rise in blood pressure, heart rate, respiratory change, increase in metabolic activity, gastrointestinal changes even resulting ultimately in ulcer, endocrine disturbances. Pranayama gradually diminish sympathetic dominance, resulting in better balance between sympathetic and parasympathetic system. Some observations by clinicians claiming the beneficial effects of certain yogic practices in patients having hypertension, diabetes mellitus, gastrointestinal disorders, epilepsy etc may also be explained along the same line. In the present study, our aim of practicing alternate nostril breathing exercises is to achieve positive body health. Pranayama essentially consists of a voluntary control on the breathing and probably due to this fact; many people refer it to as a breathing exercise. Practice of Nadi shodhana enhances voluntary regulation of the breathing to make respiration rhythmic and to calm the mind. It reduces stress, gives more relaxation, gives energy and vitality and improves overall health and wellbeing<sup>3</sup>. With this exercise, we breathe through only one nostril at a time, differ from normal breathing alternate from one nostril to the other at various times during the day. In a healthy person the breath will alternate between nostrils about every two hours. People which are not in optimum health, this time period vary considerably and further reduce our vitality<sup>4</sup>. Heart rate is the indicator of the autonomic activity of the heart. Increase in heart rate indicates increased sympathetic activity and decrease in heart rate indicates increased parasympathetic activity. Bhargava et al<sup>5</sup> carried out a study in 20 healthy young men who practiced Nadishuddhi Pranayama for 4-weeks showed a decreased heart rate due to the increasing vagal tone and decreasing sympathetic discharges. Telles et al<sup>6</sup> showed reduction in heart rate in a three months yoga training given to 40 physical education teachers. Madanmohan et al<sup>7</sup> found significant decrease in oxygen consumption, heart rate and diastolic blood pressure. Pal et al<sup>8</sup> found there was a significant decrease in basal heart rate in slow breathing group after

three months of practice of slow breathing exercise and said that the practice of slow breathing exercise improves the vagal activity thus lowering the resting heart rate. Subbalakshmi et al<sup>9</sup> showed the immediate effect of alternate nostril breathing of Nadishodhana pranayama for 20 minutes, a significant decline in basal heart rate was observed. Left nostril breathing produced decreased systolic, diastolic and mean blood pressures<sup>10</sup>. Madanmohan et al<sup>7</sup> found significant decrease in heart rate and diastolic blood pressure after yoga. Srivastava<sup>11</sup> et al (2005) studied the effect of alternate nostril breathing on cardio respiratory and autonomic variables for 8 weeks and found decrease in systolic blood pressure in both sexes. The mechanism of how pranayamic breathing interacts with the nervous system affecting metabolism and autonomic functions remains to be clearly understood. It is our hypothesis that voluntary slow deep breathing functionally resets the autonomic nervous system through stretch induced inhibitory signals and hyperpolarization currents propagated through both neural and non-neural tissue which synchronizes neural elements in the heart, lungs, limbic system and cortex. During inspiration, stretching of lung tissue produces inhibitory signals by action of slowly adapting stretch receptors (SARs) and hyperpolarization current by action of fibroblasts. Both inhibitory impulses and hyperpolarization current are known to synchronize neural elements leading to the modulation of the nervous system and decreased metabolic activity indicative of the parasympathetic state. Joshi et al<sup>12</sup> have revealed that six weeks of pranayam breathing course resulted in improved ventilatory functions in the form of lowered respiratory rate and improved ventilatory functions in the form of peak expiratory flow rate. Similar beneficial effects were also observed by Makwana et al<sup>13</sup> after 10 weeks of yoga practice. Yadav et al<sup>14</sup> deliberate the effect of yogic practice on pulmonary functions in young females. In that study they found that yoga and pranayama results in a decline in respiratory rate and an increase in PEF. Sivapriya et al<sup>15</sup> effect of Nadishuddhi pranayama on respiratory parameters in

school students and found significant decrease in respiratory rate following its practice, there is reduction in sympathetic reactivity and improvement in pulmonary functions with practice of pranayama, this may allow bronchodilatation by correcting the abnormal breathing patterns and reducing the muscle tone of inspiratory and expiratory muscles which leads to better oxygenation of alveoli. Due to improved breathing patterns, respiratory bronchioles may be widened and perfusion of large number of alveoli can be carried significantly. Subbalakshmi et al<sup>9</sup> showed the immediate effect of alternate nostril breathing. Following practice of Nadishodhana pranayama for 20 minutes, a significant decline in basal respiratory rate was observed. Puja et al<sup>16</sup> observed the effect of alternate nostril breathing on normal volunteers for 4 weeks and found significant change respiratory rate. Candy et al<sup>17</sup> found that alternate nostril breathing increases PEFR in asthmatic patients. Reduced sympathetic activity is mainly responsible for decrease in respiratory rate. During yoga practice, one consistently and consciously over-rides the stimuli to respiratory centres, thus acquiring control over the respiration<sup>7</sup> (Madanmohan et al., 2005). Slow pranayamic breathing produce state of restful alertness which decreases the anxiety and help to reduce respiratory rate. Practice of slow controlled breathing causes repeated stimulation of stretch receptors which causes habituation of reflex (Hering Breuer reflex). It

gradually reduces different vagal traffic and leads to vagal blockade.

## CONCLUSION

Considering the facts, it can be opined that regular practice of alternate nostril breathing, type of Pranayama causes parasympathetic predominance as other slow breathing type Pranayama does (viz. Savitri Pranayama). The major effects of alternate nostril breathing were fall in DBP and rise in PEFR. Therefore, this simple exercise can be prescribed to hypertensive patients (with proper monitoring) along with the medical therapy. The increase in PEFR by alternate nostril breathing practice obviously offers an increment in cardiorespiratory efficiency and it can be advocated for the patients of early bronchitis and as a preventive measure for COPD.

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## CONFLICT OF INTEREST

The author(s) declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

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