

Research article

Chandra Anuloma Viloma Pranayama modifies Cardiorespiratory Functions

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ABSTRACT

Background and Objectives: In recent years, there has been considerable interest in scientific research on yoga, especially on *Pranayama*. Nostril breathing exercises including Alternate nostril breathing, Left nostril breathing and right nostril breathing exercises is getting attention in the east and in the west. Left nostril breathing exercises is also called *Chandra Nadisuddhi Pranayama* or *Chandra anulomaa vilomaa Pranayama* (CAV). Very few have carried out research on *Chandra Anuloma Viloma Pranayama* (CAV). This study was carried out to see the effects of CAV on experienced yoga practitioners and naïves.

Material and Methods: The study consisted of 36 subjects divided into two groups, first group consist of 26 medical students who were naïve and the next group consist of 10 yoga practitioners. All the subjects performed 12 rounds of *Chandra Nadisuddhi Pranayama* in each session for 24 days. Variables were entered into SPSS Program and were analyzed.

Results: This study depicts fall in Pulse rate, respiratory rate, systolic blood pressure and Diastolic blood pressure after CAV *Pranayama* in both Naïves and Yoga practitioners. But the significant drop was observed in SBP only (at $p < 0.05$) among Naïves and in all parameters except respiratory rate among Yoga Practitioners.

Conclusion: The effect of the *Chandra Anuloma Viloma* (CAV) in this study was more eminent in the yoga practitioners than in the naïve group.

Key words: *Pranayama*, Left nostril breathing, *Chandra Anuloma Viloma* (CAV), cardio-respiratory function

INTRODUCTION

Traditional practices of *Yoga* documented in numerous historical and contemporary writings, suggest that individual modification of breathing patterns under the direction and guidance of a proper teacher can lead to positive, subjective, affective, cognitive and

behavioral changes. These practices endow with prospect to cope in a more empowered way to life's stresses and improve health outcomes [1].

Yogic practices develops various physiological changes which involves physical, mental and spiritual task in a

comprehensive manner, bringing about behavioural changes and claimed to have sound scientific basis [2]. Static postures of *yogasana* and controlled rhythmic breathing of *Pranayamas* involve minimal body movements and result in maximal physical and mental relaxation. The proprioceptive involvement in a well coordinated fashion with mentally relaxed state in the yogic practices helped the subjects to achieve the improvement of psychological and psychomotor components. The improvement in physiological and psychological functions improves the feeling of subjective mental well-being [3].

Pranayama is one of the eight limbs of *Asthanga Yoga* and includes different respiratory techniques and were used as important lifestyle techniques by ancient yogis. Now a day's such techniques is being used as alternative medicine and therapy and is becoming popular day by day. It is no longer the practices of yogis and Monks. *Yoga therapy* is being used and prescribed by medical practioners to treat various physical and psychological ailments [4, 5]. Slow yogic breathings or slow pranayams like *Savitri Pranayama*, *Sitkari* , *Anuloma Viloma Pranayama*, *Nadi sudhhi* are accredited as most prominent practical relaxation techniques which can be used as an adjunctive means of treatment to recover symptoms associated with autonomic imbalances[6,7], cardiovascular diseases as hypertension and respiratory disorders[6,8] like asthma and other COPD and various psychological stress related disorders [9,10]. Short term effect of slow breathing *Pranayama* includes decreased heart rate, blood pressure [6, 11] and oxygen consumption [12] where as Long term effect of pranayamic breathing includes

improvement in autonomic nervous system [13, 14].

In recent years, there has been considerable interest in scientific research on *Pranayama* in the east and in the west. The focus of the scientific studies is mainly on Nostril breathing *Pranayama* which includes mainly Alternate nostril breathing *Pranayama* followed by effect of individual Left Nostril breathing *Pranayama* and Right Nostril breathing *Pranayama*. They are all known to affect the cardiopulmonary activities and autonomic functions [15, 5, 6, 16, 19].

Chandra Anuloma Viloma (CAV) Pranayama which included breathing through Left nostril alone is also explained as *Chandra Nadisuddhi Pranayama* and expected to have cooling down or parasympathetic effect in the body [5]. Few researchers have reported the effect of Left nostril breathing exercises [17, 18]. Malhotra et al studied the effect of *CAV Pranayama* in Naïve and *Yoga Practioners* both and the study was limited in single volunteer in each group [19]. This study is carried out as extension of that study in several volunteers. This study is carried out to see the acute effect of *CAV Pranayama* on heart rate and Blood pressure of Naives and *Yoga practitioners*.

MATERIALS AND METHODS

This study was conducted by Think Tank Foundation, Jorpati, Kathmandu, Nepal in collaboration with Department of Physiology and Dept of Biochemistry, JMCTH, Janakpur Nepal. Ethical clearance was obtained from the Institutional Ethics Committee prior to the commencement of the study. The health of the participants was assessed by history and clinical examination. Participants who were clinically healthy volunteers were

included in this study. Smokers and alcoholics, individuals with mechanical or infective nasal blockage, oro-pharyngeal infections and with any major systemic disorders especially respiratory and cardiovascular disorders were excluded. Volunteers were divided into two groups, first group consist of 26 volunteers. They were naïves for yoga or inexperienced person, who had just started practicing the techniques of *Pranayama* or have not done *Pranayama* regularly. The next group consists of 10 yoga practitioners who had been practicing yoga and *Pranayama* for more than 5 years. All the subjects attended the study voluntarily. The participants were briefed about the procedure and written informed consent was obtained from each of them prior to being recruited for the study. The study was conducted in a temperature controlled, noise and light reduced peace place. All the subjects performed 12 rounds of *Chandra nadisuddhi Pranayama* in each session. Variables were measured Pre and Post each *Pranayama* session. The data were analyzed using SPSS statistical software.

Chandra Nadisuddhi Pranayama

The participants were seated in a comfortable sitting posture, with back straight while practicing the *Pranayama*. *Chandra nadisuddhi Pranayama* starts with closing the right nostril with the thumb of the right hand, followed by hold and exhalation through the left nostril and inhalation slowly through the same nostril [20]. This forms one round of *Chandra nadisuddhi Pranayama* (CAV). There is a comfortable pause (no forceful holding) between the inhalation and the exhalation. The *Pranayama* was carried out by volunteer in comfortable manner. The heart beat rate was taken immediately before and immediately after twelve cycles of the left

nostril breathing. The heart beat rate was measured by counting radial pulse. The readings were taken each day for each participant in the morning hours between 8.00 A.M and 10.00 A.M and in the evening from 4.00 P.M to 6.00 PM for 24 days. A total of 48 readings of each subjects were taken. The *Pranayama* session was performed before meals. The subjects were told not to hold the breath for an uncomfortably long period in each round.

RESULTS

All data were entered in SPSS statistical software and analyzed and are discussed below in Table 1, 2 and 3.

Demographic characteristics of the study subjects

The age of Naïve group and Yoga group were (22.24 ± 2.21 and 24.2 ± 1.04), weight (58.42 ± 2.52 and 64.12 ± 1.52, height (167.24 ± 3.46) and others demographic details are presented in Table 1.

Table 1: The demographic details of both groups of subjects

Parameters	Mean ± SD	
	Naïve group	Yoga group
Age (yrs)	22.24 ± 2.21	24.2 ± 1.04
Weight (Kg)	58.42 ± 2.52	64.12 ± 1.52
Height (cm)	167.24 ± 3.46	164.04 ± 1.04
BMI (Kg/m ²)	20.93 ± 0.92	23.83 ± 0.86
Practice of yoga (yrs)	> 5 years	< 1months

SD, standard deviation; <, less than; >, greater than

Physiological parameters, before and after CAV Pranayama among Naïve

There was decrease in Pulse rate (PR), respiratory rate (RR), systolic blood pressure (SBP) and Diastolic blood pressure (DBP) after CAV *Pranayama*. But the significant fall was seen in SBP only (at p < 0.05) (Table 2).

Table 2: Different physiological parameters, before and after CAV *Pranayama* among Naive

Parameters	Mean \pm SD	
	Pre	Post
PR (per min)	79.64 \pm 4.55	75.91 \pm 3.80
RR (per min)	17.16 \pm 0.91	15.74 \pm 0.65
SBP (mm Hg)	117.54 \pm 2.16	110.2 \pm 1.64*
DBP (mm Hg)	78.02 \pm 2.12	76.04 \pm 1.26

*, significant at $p < 0.05$

*Physiological parameters, before and after CAV *Pranayama* among Yoga Practitioner*

There was significant fall in Pulse rate (PR), systolic blood pressure (SBP) and Diastolic blood pressure (DBP) and insignificant drop in respiratory rate (RR) after CAV *Pranayama* among Yoga practitioners (Table 3).

Table 3: Different physiological parameters, before and after CAV *Pranayama* among Yoga Practitioner

Parameters	Mean \pm SD	
	Pre	Post
PR (per min)	74.71 \pm 1.95	67.04 \pm 1.71*
RR (per min)	16.21 \pm 1.10	15.07 \pm 0.93
SBP (mm Hg)	118.24 \pm 1.16	112.3 \pm 1.64*
DBP (mm Hg)	73.16 \pm 1.12	68.02 \pm 1.26*

*, significant at $p < 0.05$

DISCUSSION

Yogic practices, now a days is established as an alternative medicine [21] was a spiritual practices designed for the purpose of cultivating a steady mind systematized by Patanjali in his classical work, the Yoga Sutras [6]. Yoga has been defined as 'technologies or disciplines of asceticism and meditation which are thought to lead to spiritual experiences and a profound understanding or insight into the nature of existence [22]. Yogic techniques include meditation, regulation of respiration with a variety of breathing exercises and a number of physical exercises

and Aasana (postures) in which the focus is more on isometric exercise [23]. Yogic exercises are thus an effective ancient method used from Vedic days to improve the mental and physical health [5, 6] of the young and old individuals. It streamlines the autonomic nervous system (ANS) [23, 21] and helps to improve cardio respiratory, neurological functions and, decreases the effect of stress and improves physical and mental health [24]. It also has been shown to decrease heart rate and blood pressure [25, 26, 27]. They induce relaxation response which consists of a generalized reduction in both cognitive and somatic arousal as observed in the modified activity of the hypothalamic - pituitary axis and the autonomic nervous system [28].

Yoga makes use of voluntary regulation of the breathing to make respiration rhythmic and to calm the mind. Breathing is a vital process which starts at the time of birth and stops at the death. In yogic philosophy life force or vital force is called Prana. The process of controlling the Prana is called *Pranayama*. *Pranayama* is derived from two Sanskrit words, namely, Prana, which means vital force or life energy, ayama means to prolong [29]. Versions of *Pranayama* vary from single nostril breathing to belly breathing. *Pranayama* consists of three phases: *Puraka* (inhalation), *Kumbhaka* (retention) and *Rechaka* (exhalation) that can be either fast or slow. So, *Pranayama* is the science related to essential strength supplying energy and controlling the body mind complex [22].

Pranayamic breathing exercises have been reported to affect the ANS in different ways depending on the breathing technique, duration of practice and the period of recording of the autonomic parameters [24]. *Pranayama*, the yogic system of breathing, is

based on the belief that right nostril dominance corresponds to sympathetic arousal and left nostril breathing corresponds to parasympathetic arousal [27]. Pranayamic breathing practiced exclusively via either nostril has opposite effects on right nostril breathing increases sympathetic activity while left nostril decreases it. [17, 30]

When the respiratory cycle of inhalation and exhalation is completed through the left nostril alone the practice is called "*Chandra Anulomaa Vilomaa Pranayam*" which means a heat dissipating or cooling liberating practice [31]. This study found remarkable fall of pulse rate, respiratory rate, systolic blood pressure and diastolic blood pressure after CAV *Pranayama* among Naïve group but the fall was found to be significant in SBP only (at $p < 0.05$). Similar findings were also obtained in the study conducted by V. Malhotra et al. [19]. Further, The significant decrease in Pulse rate, systolic blood pressure and Diastolic blood pressure was observed after CAV *Pranayama* among Yoga practitioners of this study. A study conducted by Dane et al, who made their subjects exercise before studying the effect of nostril breathing on heart rate, found an increase in heart rate with both left probably due to the overall effect of exercise on heart rate [32]. A reduction in heart rate after left nostril breathing has been reported in one of the study[33], while others have reported no significant changes in the heart rate after left or right nostril breathing exercises.[34,35] Jain et al, working with subjects who were asked to practice single nostril breathing reported a drop in heart rate with left nostril breathing in males but not in females [36]. Left nostril breathing produced a marked decrease in sympathetic activity to the sweat glands whereas other subdivisions did not change as much relatively smaller changes in

baseline oxygen consumption and heart rate [37]

Decrease in heart rate and blood pressure in subjects practicing yoga indicates predominance of the parasympathetic system and relatively reduced sympathetic tone [38, 39]. This may be due to the conditioning effects of yoga on autonomic functions and mediated through the limbic system and higher areas of central nervous system [40]. Regular practice of yoga increases the baroreflex sensitivity and decreases the sympathetic tone thereby restoring blood pressure to normal level in patients of essential hypertension [41]. *Pranayama* decreases basal sympathetic tone and increases basal parasympathetic activity The exact mechanism by which particular nostril breathing influences the function of the autonomic nervous system is not well known, though it has been speculated that this may occur through a neural reflex mechanism in the superior nasal meatus [42]. The physiological changes in cardiorespiratory profile with respect to *Chandra Anuloma Viloma Pranayama* may be due to the physiology of nostril breathing exercises having the probable relation with nostril and cerebral dominance as explained by Upadhyay- Dhungel K et al. [5, 6, 19]

CONCLUSION

Based on the analysis of the results obtained, this study concluded that the effect of CAV on different physiological parameters among Naïve group are drop in all parameters but significant drop was only seen in systolic blood pressure. Similarly, the significant fall in pulse rate, systolic blood pressure and diastolic blood pressure and insignificant fall in respiratory rate was found among Yoga practitioners. The result of the *Pranayama* in

this study is more eminent in the yoga practitioners than in the naïve group. The modification of the autonomic activity might occur due to their regular habit of practicing asanas and *Pranayama* among yoga practitioners. *Pranayama* are non-invasive therapy that has several benefits in the treatment of various diseases. Further investigations are essential to recognize the exact mechanism responsible for these changes possibly by quantifying the neural circuits involved.

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