IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 3 Ver. VI (Mar. 2015), PP 62-65
www.iosrjournals.org

Alternate Nostril Breathing and Autonomic Function in Healthy Young Adults

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Abstract: *Yoga balances Autonomic nervous system: Autonomic nervous system consists of two limbs; sympathetic nervous system and parasympathetic nervous system. Although individual asan and pranayam practices can selectively affect sympathetic or parasympathetic nervous system, the overall effect of yoga practice is to bring a state of parasympathetic dominance. In present study effect of alternate nostril breathing (Nadishuddhi pranayama) for 12-weeks were studied in 60 healthy volunteers (both males and females). Alternate Nostril Breathing had beneficial effect on autonomic functions. There was no change in parasympathetic reactivity indicated by non-significant change in Valsalva ratio. Change in sympathetic reactivity was observed due to change in blood pressure response to hand grip test. Overall there is tilt towards parasympathetic dominance after practice of alternate nostril breathing. Considering the facts, it can be suggested that regular practice of type alternate nostril breathing can be prescribed to hypertensive patients (with proper monitoring) along with the medical therapy.*

Keyword: *Valsalva ratio, Alternate nostril breathing, Hand grip test, Blood pressure.*

I. Introduction

Yogic breathing techniques are termed as `Pranayama'. Roughly `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. Many physicians now recommend yoga to patients at risk for heart diseases. Different types of Pranayama (breathing exercises) produce different physiological responses in normal young volunteers. Savitri Pranayama, Kapalbhati, Bhastrika Pranayama, Nadi Suddhi Pranayama (Alternate nostril breathing), are well known. The simplest form of pranayama is nadishodhanam (channel purification). These breathing exercises influence cardio-respiratory, autonomic functions and help in reducing the scores of anxiety and stress[1]. Nadishodhanam (channel purification)consists alternate nostril breathing, Prana, the vital energy pervades the whole body, flowing 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. Nadishodhana therefore means that practice which purifies the body. Practice of Nadishodhana enhances voluntary regulation of the breathing to make respiration rhythmic and to calm the mind. 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. It reduces stress, gives more relaxation, gives energy and vitality and improves overall health and well-being [2].

In the present study an attempt has been made to investigate the effect of alternate nostril breathing on Autonomic functions like Valsalva Ratio and sympathetic reactivity to Isometric hand grip test.

II. Material And Method

Equipment used: Automatic Sphygmomanometer (Omron), ECG Machine (BPL Cardiart 6108 T), Mercury Manometer, Hand Grip Dynamometer (Anand agencies, Pune).

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 (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 in 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.

Valsalva Ratio: - Quantitative Valsalva maneuver (i.e. forced expiration against resistance) is a simple test done to assess baroreceptor integrity. First, procedure was explained to subject to get maximum cooperation. The subject was made to sit comfortably in a stool with sphygmomanometer and ECG leads attached; nose was clipped with the help of a nose clip and a mouth piece is inserted between the teeth and lips. Subject was allowed to relax. Baseline HR and BP was measured. The other end of mouth piece was connected to a mercury manometer. The subject was asked to strain by blowing against closed glottis into the mouth piece attached to the manometer and maintaining a pressure of 40 mmHg for 10-15 sec. A continuous ECG was recorded for 1 minute before maneuver, during the maneuver and 45 seconds following strain release. Valsalva ratio was taken as ratio of maximum HR during the strain (phase II) to the minimum HR after the strain (phase IV). The maximum Valsalva ratio of three trials was taken for the autonomic activity. A ratio of greater than 1.45 was taken as normal; 1.20 to 1.45 is borderline; and less than 1.20 was abnormal (autonomic disturbances).

Hand Grip Test: - Blood pressure response to isometric exercise.Isometric exercise produces a significant rise in BP and HR, a detail of the procedure was explained to the subject and the baseline BP was recorded with the help of sphygmomanometer. The subject was asked to hold the dynamometer in dominant hand to have a full grip of it. Then He/she was instructed to compress the hands with maximum effort. The tension developed was measured. Then waiting for 1 minute, the whole procedure was repeated twice and 2^{nd} and 3^{rd} reading were taken. Mean of three readings was taken which is referred as maximal isometric tension. Now the subject was asked to maintain a pressure of 30% of Maximum Voluntary Contraction as long as possible. During the test procedure, the BP was recorded every 30 seconds with the help of sphygmomanometer on the non-exercising arm. The rise in diastolic BP at the point just before the release of hand grip is taken as the index of response to hand grip test.

Statistical Analysis: Data are expressed as mean ± 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 $p< 0.05$.

III. Result

Comparison of Pre and Post Valsalva ratio (VR):

The results are summarized in (Figure 2) with mean ± SD. In the entire individual either male or female, the Valsalva ratio was not any significant change observed after the practice of alternate nostril breathing, when compare to without practice of alternate nostril breathing.

Comparison of pre and post isometric hand grip test (IHG) test

The results are summarized in (Figure 3) with mean ± SD. In the entire individual either male or female, diastolic blood pressure response to isometric hand grip test was significant decreased after the practice of alternate nostril breathing, when compare to without practice of alternate nostril breathing.

IV. Discussion

Yoga balances Autonomic nervous system: Autonomic nervous system consists of two limbs; sympathetic nervous system and parasympathetic nervous system [3]. Although individual asan and pranayam practices can selectively affect sympathetic or parasympathetic nervous system, the overall effect of yoga practice is to bring a state of parasympathetic dominance [4]. Vempati and Telles [5] assessed the effect of yoga based guided relaxation on autonomic variables and found that power of the low frequency component of heart-rate variability spectrum reduced, whereas the power of high frequency component increased, suggesting a reduced sympathetic activity. Voluntary muscle activity is associated with sympathetic outflow to the cardiovascular system [6]. The accumulation of metabolites during the isometric contraction initiates the exercise reflex resulting in sustained sympathetic activity. Khannam et al [7] found the effect of yoga pulmonary and autonomic functions of asthma patients. In this study, they performed Sympathetic (hand grip test, cold pressure test) and parasympathetic (valsalva manouever, deep breathing test) autonomic function tests on asthma patients, the sympathetic reactivity was reduced following yoga training as indicated by significant reduction in DBP after HGT. There was no change in parasympathetic reactivity indicated by no significant change in valsalva ratio. Pal et al [8] observed the effect of slow type and fast type pranayama on autonomic functions in young healthy volunteers. In this study, they performed certain autonomic function test which included 40 mm Hg test (valsalva ratio). No significant change was observed in valsalva ratio in slow breathing (alternate nostril breathing) group. In our study, non-significant change in Valsalva Ratio may be attributed to the less duration of practice of breathing exercise, which was not adequate enough to cause changes in the sensitivity of baroreceptors and intrathoracic stretch receptors to affect Valsalva ratio. The results closely indicated the reduction in sympathetic reactivity. Vijayalakshmi et al[9] deliberate the effect of yoga on stress induced by hand grip test on blood pressure and found that yoga training optimises the sympathetic response to stressful stimuli like isometric handgrip test and restores the autonomic regulatory reflex mechanisms in hypertensive patients .In our study, reduced sympathetic reactivity can be attributed to decreased sympathetic activity because although vagal parasympathetic pathways are predominant for heart rate, sympathetic pathways play a major part in blood pressure[10]

V. 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 diastolic blood pressure (DBP). Therefore, this simple exercise can be prescribed to hypertensive patients (with proper monitoring) along with the medical therapy.

Acknowledgments

The authors gratefully acknowledge the Seth Gordhandas Sunderdas Medical College,King Edward Memorial Hospital, Mumbai and People's College of Medical Sciences and Research Centre, Bhopal for their constant support and help.

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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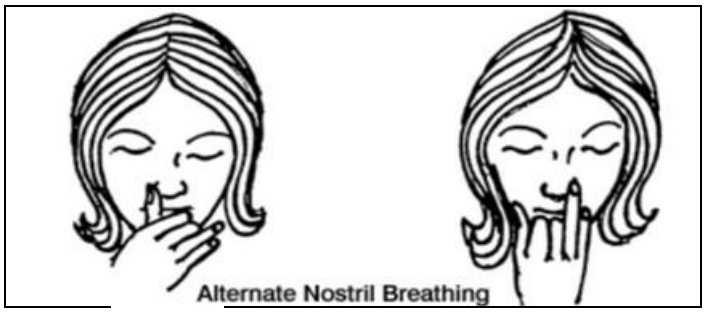

Figure 1: Steps in alternate nostril breathing.

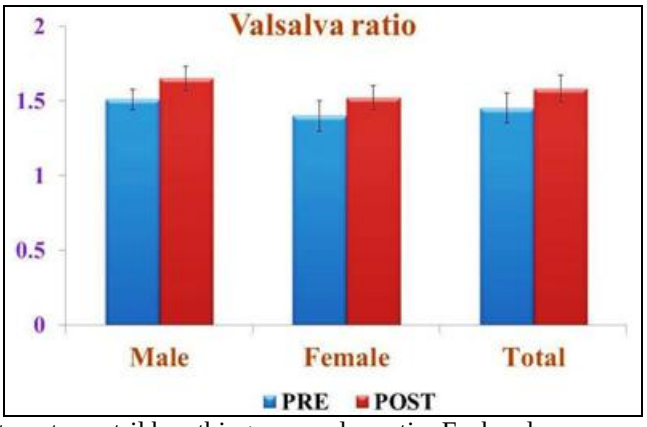

Figure 2: Effect of alternate nostril breathing on vasalva ratio. Each value represents mean ± SD. No significant changed was observed between pre and post alternate nostril breathing individuals

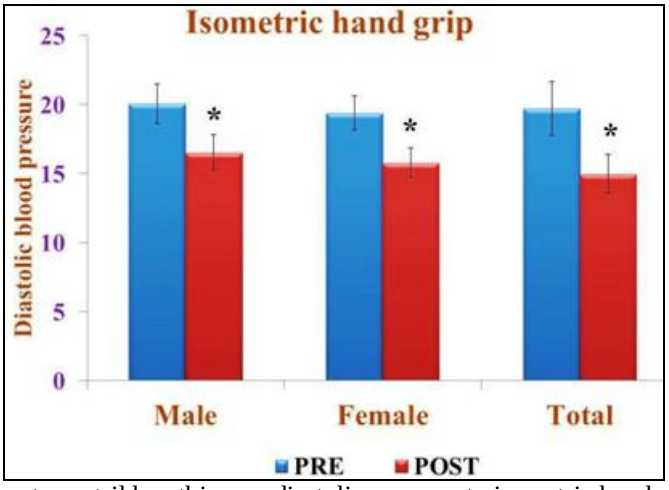

Figure 3: Effect of alternate nostril breathing on diastolic pressure to isometric hand grip test (IHG) test. Each value represents mean ± SD. * Showed significant changed among pre and post alternate nostril breathing individuals.