

Original research article

## Immediate Effect of Short-Term Alternate Nostril Breathing on Autonomic Function Test Among Medical Students

Priyanka Singh<sup>1</sup>, Nishitha L Mendonca<sup>2</sup>, Jamuna BL<sup>3</sup>, Yogesh MK<sup>4\*</sup>

<sup>1</sup> Associate Professor, Department of Physiology, Rajarajeswari Medical College & Hospital, Bengaluru - 560074, India.

<sup>2</sup> Assistant Professor, Department of Physiology, Rajarajeswari Medical College & Hospital, Bengaluru - 560074, India.

<sup>3</sup> Professor & HOD, Department of Physiology, Rajarajeswari Medical College & Hospital, Bengaluru - 560074, India.

<sup>4\*</sup> Associate Professor, Department of Physiology, Rajarajeswari Medical College & Hospital, Bengaluru – 560074, India.

Corresponding Author: Dr. Yogesh MK

### Abstract

**Background:** Medical education in present times has become very stressful. The stress predominantly decreases the performance of students and lessens their self-esteem. It is now becoming imperative to have some tools or techniques which can help the students to cope with this immense stressful situation. One such technique which is practiced in yoga is alternate nostril breathing (ANB). It brings about a balance in the activity of the two nostrils and simultaneously reduces stress related conditions by shifting the sympatho-vagal balance toward parasympathetic dominance

**Aim:** To evaluate effects of short-term alternate nostril breathing (ANB), on autonomic functions in young healthy medical students.

**Materials & Methods:** The study was conducted on 25 healthy first year medical students aged 16-22yrs. The subjects were then asked to perform the ANB for 15 mins. The autonomic function test [galvanic skin response (GSR), heart rate (HR), Heart rate variability (HRV) parameters - VLF, LF, HF and LF/HF, finger-tip temperature (FTT)] parameters were recorded before and after the procedure.

**Result:** GSR, HR, VLF, LF, LF/HF showed a significant reduction and FTT, HF showed a significant increase post short-term ANB.

**Conclusion:** Short term ANB shows a significant tilt towards parasympathetic dominance. Considering this fact, it is suggested that regular practice of ANB can help to reduce stress.

**Keywords:** Alternate nostril breathing (ANB), yoga, autonomic function test

### Introduction

Medical education is considered to be the toughest and also the most noble profession in the present times. A student needs to acquire a vast quantum of knowledge and develop unique skills within a limited amount of time. He also must develop a professional attitude and character. The pressure to perform in academic, professional, and even social life is immensely stressful. Due to these factors, stress levels have increased leaps and bounds in today's modern world. There are multiple studies which show that there is a negative correlation between stress and academic performance<sup>(1)</sup>

Stress leads to lessening of students' self-esteem, affecting their academic achievements. A high level of stress may reduce the cognitive functioning and learning of students in medical school. <sup>(1)</sup> There are a lot of incidents where the student has not been able to perform up to the mark due to stress.

It is now becoming imperative to have some tools or techniques which can help the students to cope with this immense stressful situation. One such technique which is practiced in yoga is alternate nostril breathing (ANB).

In yogic sciences, Alternate nostril breathing is referred to as Nadi shodhan pranayama. It brings about a balance in the activity of the two nostrils and simultaneously reduces stress related conditions by shifting the sympatho-vagal balance toward parasympathetic dominance.<sup>(2)</sup>

The ANB exercise has been reported to influence cardio-respiratory and autonomic functions<sup>(3,4)</sup> and also help in reducing the scores of anxiety<sup>(5)</sup> and stress.<sup>(6)</sup> But, many studies have presented conflicting results. Since there is a dearth of research which shows the effect of ANB on autonomic functions and there are still fewer studies which focus on short term effects of ANB. Hence, the present research focuses to evaluate effects of short term ANB, on autonomic functions in young healthy medical students.

### **Materials and methods**

The study was conducted in the department of Physiology of a medical college in Karnataka, after obtaining ethical clearance from the institutional ethics committee.

Selection of subjects: The research included 25 healthy first year medical students of both genders. The age group selected was between 16-22 years. The subjects who were practising yoga or athletic activities were excluded from the study. Also the subjects who had undergone any major surgery, had any chronic disease, respiratory diseases, smoker, alcoholic, on anti-depression medications or did not give consent for the study were excluded from the research. The volunteers were explained the study protocol and their right to quit study at any point, after which an informed written consent was taken from the subjects before the start of study.

Experiment protocol: The subjects were told to refrain from ingestion of caffeine 2 hours prior to study. The procedure was explained to the subjects and then they were made to relax for 10 mins in a temperature-controlled environment. The recording was done in the evening at 4:00pm, on different days as per their convenience. Basal recording of parameters was taken. The parameters recorded were galvanic skin response (GSR), finger-tip temperature (FTT), heart rate (HR), heart rate variability (HRV) by using computerized polygraph, which is a windows-based machine using software Physiopac (Medicade). This was followed by a trial session to make them familiar with the breathing technique. The subjects were then asked to perform the ANB for 15 mins. Immediately after the procedure all the parameters were recorded again.

Description of breathing techniques: The subjects were instructed to inhale through the left nostril, then hold the breath for a moment while keeping both nostrils closed, followed by exhalation from the right nostril keeping the left nostril closed. The procedure was repeated for three cycles and then was reversed (inhalation through the right nostril and exhalation through left nostril) for next three cycles. The subjects repeated this cycle at a rate of 5 breaths/min for 15 min.

### Statistical analysis

All the values obtained before and after performing ANB were expressed as Mean  $\pm$  SD. Data was analyzed by a statistical package for social science (SPSS version 17). All the parameters were compared by using paired 't' test.  $P < 0.05$  was considered as statistically significant.

### Results

The parameters obtained for assessing the autonomic functions of the subject before and after intervention of ANB are shown in Table-1. It shows that mean GSR, HR, VLF, LF and LF/HF post ANB are significantly reduced while FTT and HF were significantly higher post intervention.

**Table 1: Comparison of basal and post ANB parameters**

Parameters	Basal Mean $\pm$ SD	Post ANB Mean $\pm$ SD
GSR (Kmph)	1268.9 $\pm$ 430.16	1237.8 $\pm$ 410.19**
FTT ( $^{\circ}$ F)	83.06 $\pm$ 1.38	85.02 $\pm$ 1.34**
HR (beats/min)	99.08 $\pm$ 11.61	93.82 $\pm$ 11.08**
VLF (Hz)	0.028 $\pm$ 0.01	0.025 $\pm$ 0.001 **
LF(Hz)	0.074 $\pm$ 0.04	0.059 $\pm$ 0.022***
HF(Hz)	0.19 $\pm$ 0.03	0.218 $\pm$ 0.04 **
LF/HF	0.402 $\pm$ 0.21	0.281 $\pm$ 0.12***

p value : \* $<0.05$ (significant); \*\* $<0.01$ (highly significant); \*\*\* $<0.001$ (very highly significant); by paired 't' test

### Discussion

Autonomic nervous system is divided into two divisions - 1) parasympathetic nervous system and 2) sympathetic nervous system. Any type of prolonged stress results in sympathetic dominance. The medical students must deal with tremendous stress in the path to become a competent doctor of global standards. Over activation of the sympathetic system might lead to development of many chronic diseases and affect day to day performance. Yoga is said to balance the Autonomic nervous system.

In our study we found that short-term ANB has significant results in shifting the autonomic parameters towards parasympathetic dominance. The parameters used for assessing autonomic functions were GSR, FTT, HR, VLF, LF, HF and LF/HF. All the parameters except FTT and HF decreased significantly after performing ANB for 15 mins. FTT and HF increased significantly after the intervention.

K Upadhyay Dhungel et al., studied the effect of ANB on cardio-respiratory functions. They found a significant increment in Peak expiratory flow rate and Pulse pressure. Systolic blood pressure was insignificantly decreased but the pulse rate, respiratory rate, diastolic blood pressure decreased significantly. They hypothesised that regular practice of ANB increases parasympathetic activity, which is similar to the results obtained by our study<sup>(6)</sup>.

Dhanvijay AD et al., studied the effect of ANB for 12 weeks on 60 subjects and found a tilt towards parasympathetic dominance; which is also in accordance with our study<sup>(7)</sup>.

GK Pal et al., observed an increase in parasympathetic activity and decrease in sympathetic activity after practicing slow breathing exercise, but no such changes were observed in the fast-breathing exercise group. The study suggested that regular practice of slow breathing exercise improves autonomic functions which are similar to the results of our study<sup>(8)</sup>.

Sinha AN et al., assessed the effect of ANB on the parasympathetic nervous system in young adults. They found that ANB enhances the autonomic control of the heart by increasing the parasympathetic modulation<sup>(9)</sup>.

Dhanvijay AD et al., studied the effect of ANB on cardio-respiratory variables in healthy adults and found a reduction in pulse rate, respiratory rate, systolic and diastolic blood pressure and increase in Peak Expiratory Flow Rate<sup>(10)</sup>. Therefore, it demonstrates the effect of ANB in controlling the autonomic nervous system, which is similar to our study.

Srivastava RD et al., studied the effect of 8 weeks alternate nostril breathing on various cardio-respiratory and autonomic parameters in young healthy adults. They found a tilt towards parasympathetic dominance. The results were similar to our study.<sup>(11)</sup>

Raghuraj P et al., studied the effect of kapalabhati and nadisuddhi breathing techniques on heart rate variability. The results showed a significant increase in low frequency (LF) and LF/HF ratio while high frequency (HF) was significantly lower following kapalabhati while no significant change was seen following nadisuddhi. Hence they suggested that kapalabhati modifies the autonomic status by increasing sympathetic activity with reduced vagal activity<sup>(12)</sup>.

Shreya Ghiya and C Matthew Lee., found that ANB results in enhanced autonomic modulation of the heart without a shift in autonomic balance. They suggested that autonomic changes occurring in response to ANB are primarily mediated by breathing rate in individuals without prior experience with yogic breathing.<sup>(2)</sup> These results are not in accordance with our study.

It is observed that in the human body the left and right nostril do not function at the same time. One of the nostrils is always more congested than the other. The congestion alternates between both the nostrils throughout the day which is called the nasal cycle. This rhythmic and alternating shift of nasal activity has been shown to correspond to the activity in the autonomic nervous system and cerebral cortex.<sup>(13,14)</sup> Slow breathing facilitates an enhancement in baroreceptor sensitivity & shifts the balance of the autonomic nervous system towards parasympathetic dominance<sup>(15)</sup>.

The alternate nostril breathing through the nervous system might alter the autonomic and metabolic functions<sup>(16)</sup>. During inhalation, the stretch of lung could produce inhibitory signals by slow adapting stretch receptors & hyperpolarization potentials by fibroblasts. Both these inhibitory signals and hyperpolarization potential cause synchronization of neural networks and may cause a shift towards parasympathetic dominance.

The limitations of our study are that it had a smaller sample size which prevented us from generalizing the results of our finding. We were also unable to study the effect of ANB among the different genders.

## Conclusion

The results of various studies show a tilt to parasympathetic dominance following ANB. Since stress is a major determinant for our day-to-day performance and long-term health, this simple procedure which does not require much time and instruments can help to maintain our autonomic balance. There is a dearth of research on the short-term effect of ANB on various functions of our body and can be considered for future research. Further studies are required to validate the findings of the present study and compare the results with other types of yogic techniques.

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