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Original Research Article

Slow and Deep Breathing Exercise (*Pranayama*) For a Stress Free Life amongst Medical Students

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ABSTRACT

Stress is a condition which disrupts or destabilizes homeostasis, e.g., homeostasis of central nervous system (CNS), of blood pressure (BP), of skeletal muscular efficiency and so on. The cause of stress-related diseases is increasing day by day throughout the world. Stress-related disorder will be one of the causes of disability if proper measures are not taken to overcome it.

Pranayama, an important part of Yoga is breathing exercise, derived from two Sanskrit words: "*Prana*" and "*yama*", which means control over bodily functions and mind. Regular practice of breathing exercise (*Pranayama*) increases parasympathetic tone, decreases sympathetic activity and simultaneously improves cardiovascular and respiratory functions. It also decreases the effects of stress and strain on the body and improves the physical and mental health.

This study was done to find out the effect of simple slow and deep voluntary breathing on body and mind which was evaluated by recording blood pressure (BP) with the help of sphygmomanometer and stethoscope. The volunteers for the study included all medical students of age group 18-25 years, of Nepal Medical College and Teaching Hospital, Attarkhel, Jorpati, Kathmandu, Nepal.

Result was found to be decrease in both systolic and diastolic blood pressure after performing 5 minutes of this slow deep voluntary breathing exercise. The decrease of diastolic blood pressure and mean blood pressure were significant.

Keywords: Blood pressure, Diastolic blood pressure, Pranayama, Systolic blood pressure, Slow deep breathing exercise

INTRODUCTION

Stress is a condition which disrupts or destabilizes homeostasis, e.g., homeostasis of central nervous system, of blood pressure, of skeletal muscular efficiency and so on. Mental illness is a leading cause of disability worldwide, accounting for one-third of the years lost due to disability. [1] Global Burden of Disease Survey conducted by World Health Organization (WHO), estimates that mental disease, including stress-related illnesses, will be second leading cause of disability by the year 2020. [2]

The famous yoga guru, Patanjali, in his Yoga Sutra describes – *Yama*, *Niyaman Asana*, *Pranayama*, *Pratyahara*, *Dharana*, *Dhyana* and *Samadhi* as eight *angas* (parts) of yoga. [3]

In recent years, there has been considerable interest in scientific research on yoga. The focus of the scientific studies is mainly on the *asanas* and *pranayama*.

The effect of different *pranayamas* on healthy [4] and diseased people [5-7] has been well studied and they are known to affect the cardiopulmonary activities and autonomic functions.

Pranayama is derived from two Sanskrit words – *prana* (life) and *yama* (control). *Pranayama* or the control of *prana* or the life force yields control over bodily functions and the mind. [3]

It is known that the regular practice of breathing exercise (*pranayama*) while increasing parasympathetic tone decreases sympathetic activity and simultaneously improves cardiovascular and respiratory functions. It also decreases the effect of stress and strain on the body and improves physical and mental health. [8-10]

The present batch of medical students will grow up as standard and qualified doctors that will contribute to the development of society and the nation. The students are under immense stress with their studies and competition. So, it would be better if they could be properly equipped with techniques to overcome tremendous stress later in the life, especially through simple and effective exercise like slow and deep voluntary breathing.

Leaving the yoga-philosophy aside and being more confined to the modern medical physiology only, the present study was carried out to find out the effect of slow and deep voluntary breathing (without breath holding , maximum possible deep inspiration followed by maximum possible deep expiration) on body and mind.

The objective of this study was to assess effect of slow and deep voluntary breathing exercise on systolic and diastolic blood pressure (SBP and DBP).

MATERIALS AND METHODS

The study was conducted in Department of Physiology, NMCTH, Attarkhel, Jorpati, Kathmandu, Nepal. The volunteers were MBBS students of NMCTH who were healthy and non-smoker. Sample size of this study consisted of 100 male students. After explaining the objective of the study, consent was taken from volunteers, verbally.

Following 5 minutes of rest, a baseline blood pressure (BP) was recorded in sitting position. Mercury sphygmomanometer and stethoscope were used to measure blood pressure. [11]
The breathing technique was demonstrated to them and the same they practiced.

They were directed to sit in an easy and steady posture (*Sukhasan*) with head, neck and trunk erect and in straight line keeping the body still while practicing slow deep inspiration followed by slow deep expiration for 5 minutes (approximately 4 times per minute, i.e., 20 times in 5 minutes). They were told to take slow deep inspiration i.e., to inhale slowly up to maximum through both nostrils. This was followed by slow expiration i.e., to exhale slowly to the maximum through both nostrils.

The breathing exercise was conducted in cool, well-ventilated room (20-25°C). After 5 minutes of this breathing practice their blood pressure was recorded again in the aforesaid manner using the same instruments.

All the collected data were compiled and entered in Microsoft Excel and then analyzed by SPSS version 16 by using student t test.

Those respondents who were having problem of cardiovascular disease were referred to the concerned department for management.

RESULTS

Slow and deep voluntary breathing for 5 minutes caused decrease in blood pressure in most of the volunteers.

In volunteers the systolic blood pressure (SBP) decreased from 111.28 mm of Hg to 109.20 mm of Hg, and the diastolic blood pressure (DBP) decreased from 72.74 mm of Hg to 67.66 mm of Hg, after doing slow and deep voluntary breathing exercise for 5 minutes.

Mean blood pressure (MBP) in volunteers decreased from 84.30 mm of Hg to 80.12 mm of Hg, after slow and deep voluntary breathing exercise for 5 minutes.

The change in systolic blood pressure (SBP), diastolic blood pressure (DBP), Mean blood pressure (MBP) before

and after slow deep breathing exercise was found to be statistically significant.

Table: Change in systolic and diastolic blood pressure (SBP and DBP) and mean pressure after performing slow and deep voluntary breathing exercise for 5 minutes.

	Mean±SD	p value
SBP before slow deep breathing exercise	111.28±10.43	0.00
SBP after slow deep breathing exercise	109.20±9.75	
DBP before slow deep breathing exercise	72.74±6.37	0.00
DBP after slow deep breathing exercise	67.66±6.82	
MBP before slow deep breathing exercise	84.30±7.39	0.00
MBP after slow deep breathing exercise	80.12±7.38	

DISCUSSION

In Hering-Breuer inflation reflex, inflation of the lung to a volume greater than tidal volume stimulates stretch receptors of lungs and causes reflex expiration.

During inflation or inspiration above tidal volume, the slow adapting stretch receptors present in lungs get stimulated and produce inhibitory impulses.

In slow and deep voluntary breathing exercise, as in Hering-Breuer inflation reflex, the inflation is deep (above tidal volume). So stretch receptors of lungs are stimulated which increases frequency and duration of inhibitory neural impulses [12] which is shown by study of Jerath R, Edry JW, Barnes VA, Jerath V.

These inhibitory impulses control autonomic functions for example systemic vascular resistance [13] which is concluded by study done by Schelegle E, Green Schelegle J.

This inhibitory current regulates excitability of nervous tissue, [14] (as shown by Cuttle MF et al study), and is known to elicit synchronization of neural elements.

According to studies done by Siegelbaum R, Robinson S. and Roberts L, Greene J; inhibitory current synchronizes rhythmic cellular activity between the cardiorespiratory center [15] in brainstem and the central nervous system. [16]

Newberg A, Iversen J. and Lutz A, Greischar LL, Rawlings NB *et al* in their studies concluded that synchronization between the brainstem [17] and hypothalamus is responsible for inducing parasympathetic response [18] during slow and deep voluntary breathing exercise.

In a study done by Pramanik T, Sharma HO, Mishra S *et al* it was found that slow pace Bhastrika pranayama influences the blood pressure through enhanced activation of parasympathetic system. [19]

Hainsworth R's study found that inflation of lungs decreases systemic vascular resistance [20] and DBP depends upon peripheral vascular resistance. This response is initiated by pulmonary stretch receptors. When there is inflation of lungs, pulmonary stretch receptors decrease systemic vascular resistance. Study done by Daly M, De B, Robinson BH, states that the pulmonary stretch receptors cause withdrawal of sympathetic tone in skeletal muscle blood vessels which results in widespread vasodilatations and it leads to decrease in peripheral vascular resistance [21] and hence decrease in the DBP and mean blood pressure, which was also the result seen in volunteers of this study.

Bernardi L, Porta C, Spicuzza L. in their study found that slow breathing significantly increases sensitivity of baroreceptors. During slow breathing there is relative increase in vagal activity and reduction in both systolic blood pressure (SBP) and diastolic blood pressure (DBP). [22]

Thus, slow and deep voluntary breathing exercise for 5 minutes causes reduction in both systolic and diastolic blood pressure (BP) and hence mean blood pressure is also reduced.

Limitations:

Due to small sample size and time limitation, the finding could not be generalized in a large population.

CONCLUSION

Slow and deep voluntary breathing exercise for 5 minutes shows improvement in balancing autonomic nervous system

through increased activation of parasympathetic system.

Hence, slow and deep voluntary breathing exercise for 5 minutes, which involves respiratory rate approximately 4 times per minute, can be practiced for reducing stress and mental relaxation in daily life, which can help the medical students to study effectively.

A simple method for a stress free life is slow and deep voluntary breathing exercise daily for about 5 minutes.

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Conflict of interest: None

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