EFFECT OF "DEEP BREATHING" ON PULMONARY FUNCTIONS IN HEALTHY YOUNG INDIVIDUALS

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ABSTRACT: CONTEXT: Breathing is the most vital function for maintenance of life. Studies have showed that yogic type of breathing exercises reduces the dead space ventilation & renews air throughout the lungs. However, there are no conclusive studies on the effects of deep breathing exercise for short term duration on the pulmonary functions. The present study was planned to know the effect of deep breathing on the pulmonary functions. **AIM:** This study was conducted to determine the effect of Deep breathing (Db) on Pulmonary functions (Peak Expiratory Flow Rate-PEFR & Breath Holding Time-BHT) in healthy young individuals. **SETTINGS AND DESIGN:** The present study was a case-control study consisting of 30 healthy individuals in the age group of 18-24 years. **MATERIALS AND METHODS:** This study was conducted in the Department of Physiology, Adichunchanagiri institute of medical sciences, B.G. Nagara, Nagamangala Taluk, Mandya district, after the institutional ethical clearance and written consent from each participant. .pulmonary parameters were recorded before & after practicing deep breathing exercise daily for three months. **RESULTS:** The parameters thus recorded were analyzed for statistical significance using Students't' test and $p<0.05$ was considered the level of significance. Both PEFR and BHT were significantly increased at ($p = 0.002^{**}$ and $p < 0.001^{**}$ respectively) after practicing deep breathing. **CONCLUSIONS:** The results of this study indicate that a simple maneuver of practicing deep breathing daily as indicated in the method, improves the pulmonary functions significantly even in the absence of any other form of physical exercise.

KEYWORDS: PEFR-Peak expiratory flow rate, BHT-Breath holding time, Db-deep breathing.

INTRODUCTION: The deepest breath that the human beings take is the first cry after birth. First cry is the maximum inspiratory effort to expand the collapsed lung permanently at the time of birth, during which the intra-pleural pressure becomes -70mm of Hg.

"Life is breathing & breathing is life" is the words said by Sir Arabindo Ghosh. Breathing is a function that we all do naturally and with little awareness.

Bizarre as it might seem, breathing is something most people do poorly, Dennis LEWIS writes in "Free your Breath and free your life." Improving the way you breathe may be the most basic way to tackle stress and boost your immune system. Proponents claim anyone can breathe properly by practicing deep breathing techniques.

Benefits of practicing deep breathing have been found in Hindu Sanskrit texts from as early as the fifth century. However, the fact that it is such a vital component in Eastern meditation systems, such as Taoist qi gong, tai chi and pranayama yoga, suggests that the practice of deep breathing in the pursuit of health and enlightenment is probably much older.

Deep breathing is called "diaphragmatic" because it emphasizes the use of the diaphragm, the muscular sheet underlying the rib cage. When the diaphragm contracts, it pushes down on the internal organs of the abdomen, enlarging the space allotted to the thoracic cavity and causing the lungs to expand. The stronger is the contraction, the more air will be inhaled.

Normally the tidal volume is around 500ml, but in the deep breathing exercise it increases & rate is 12-18 cycles per minute but in the deep breathing it decreases.

Deep breathing relaxes the mind/body and relieves tension, emotional problems & elevates mood. It strengthen the lungs, makes the heart stronger & improves cellular regeneration In spite of all these benefits in this modern era, fresh air has been decreased due to increased pollution, overcrowding & sedentary life style of the people . These factors gradually decrease the ventilator functions of the lungs. Considering all these factors the cardio-respiratory system gains utmost importance for the normal & healthy functioning of the body. Any exercise or activity which improves the lung function parameters therefore needs to be adopted for a healthy living. Studies relating the effects of various exercises on the respiratory functions are being conducted world-wide, with varying results. Slow and deep breathing is economical because it reduces dead space ventilation as well decreases the workload on the heart. It also renews air throughout the lungs in contrast with shallow breathing which renews air only at the base of the lungs[1].It is also suggested that the practice of deep breathing without breath holding phase, can also strengthen the respiratory muscles and increase the elastic properties of lungs and chest and thereby improve some of the ventilator functions of lungs[2].

Improvement in respiratory parameters such as FVC, MVV and PEFR after practice of pranayama which involves slow and deep breathing is documented[3] .In bronchial asthma patients also deep breathing is shown to significantly improve the respiratory parameters[4]. Deep breathing also enhances the performance efficiency among athletes by improving the functional capacity of the lungs [5]. Among hypertensive patients, deep breathing exercise has been found to reduce the heart rate variability [6]. Resistance to air flow is found to be reduced following deep breathing [7]. Deep breathing has also been documented to increase the alveolar ventilation[8]. Studies also shows that yogic type of breathing exercises reduces the dead space ventilation & renews air throughout the lungs. The present study is designed to know if deep breathing for a short duration regularly among apparently healthy young adults, benefits the respiratory system

MATERIALS & METHODS: Subjects were healthy volunteers in the age group of 18 – 24 years studying 1st year MBBS in AIMS B.G NAGAR, With BMI of 19 to 25 kg/m2 .All the subjects were non-smokers and were not on any medications. Those already performing some form of yoga or breathing exercises were excluded from the study. Those with Diabetes, cardiovascular & respiratory diseases were also excluded from the study. The study was prior reviewed and approved by the Institutional ethical committee. Each subject gave a written consent before participating in the study.

A s**a**mple size of 30 subjects was calculated based on the results of a pilot study done on similar subjects.

The selected groups of subjects were made to practice the deep breathing daily for 10 minutes between 4pm-5pm, for a period of 3 months. Subjects were instructed to sit erect while performing this exercise concentrating on breathing. Subjects were asked to take slow & maximal

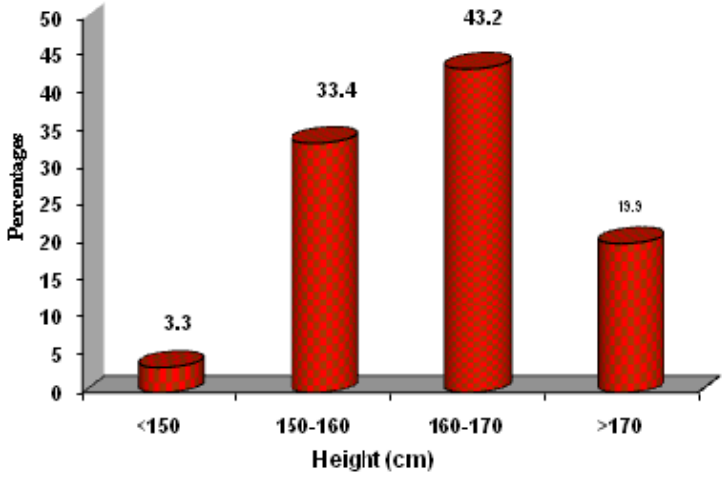
inspiration lasting for five seconds, followed by maximal expiration which also lasts for five seconds at a rate of 6 breaths per minute during each practice. They were then given an audio CD with the recorded commands, prompting the timed inhalation and exhalation. Pulmonary function parameter (PEFR) was recorded using a computerized spirometer – BPL ARPEMIS version 3.1and & BHT was recorded using stop watch between 8 - 9AM on both the occasions

Statistical analysis of the data obtained was done using Student-'t' test, and other relevant statistical tools.Both PEFR and BHT were significantly increased (p=0.002** and p=< 0.001** respectively) after practicing deep breathing daily for ten minutes

RESULTS: The parameters thus recorded were analyzed for statistical significance using Student't' test and p<0.05 was considered the level of significance. . Both PEFR and BHT were significantly increased at (p = 0.002** and p < 0.001** respectively) after practicing deep breathing.

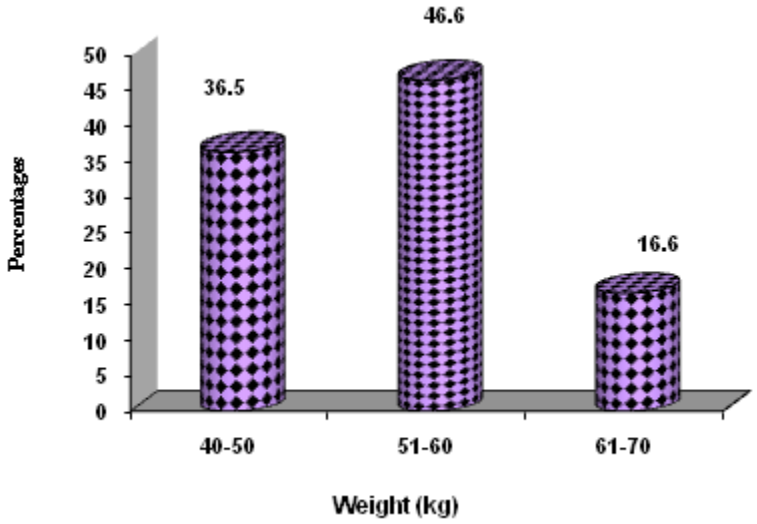
Distribution of Height (cms) of subjects studied

Height (cm)	Number of subjects	%
<150	1	3.3
150-160	10	33.4
160-170	13	43.2
>170	6	19.9
Total	30	100.0



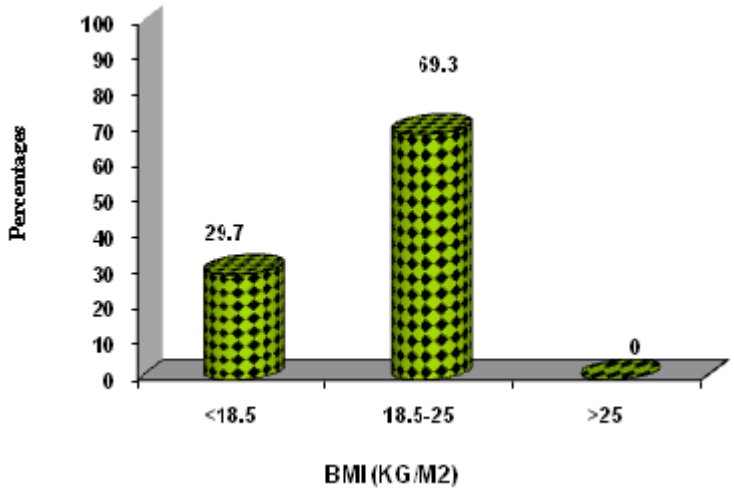
Distribution of Weight (kg) of subjects studied

Weight (kg)	Number of patients	%
40-50	11	36.5
51-60	14	46.6
61-70	5	16.6
Total	30	100.0

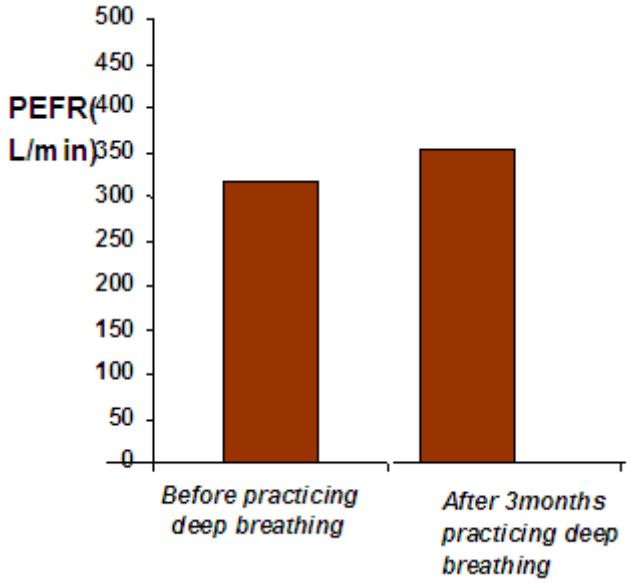


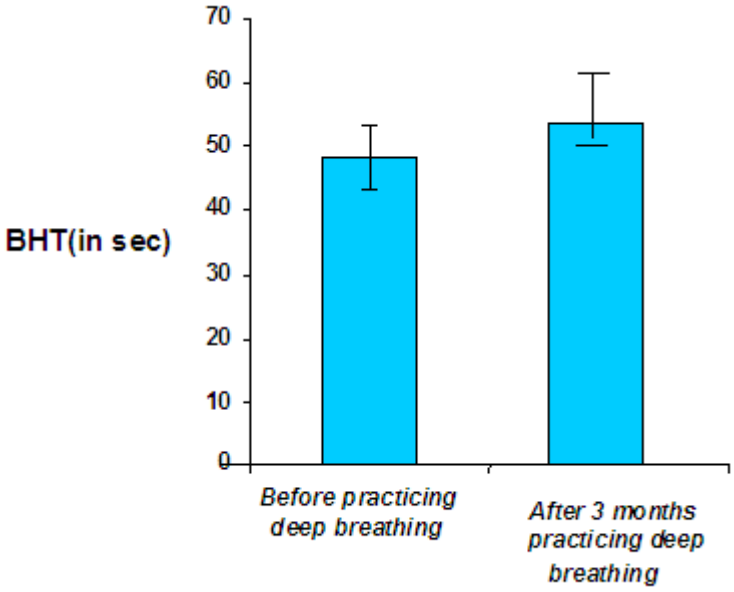
Distribution of BMI (KG/M²) of subjects studied

BMI (KG/M²)	Number of patients	%
<18.5	9	29.7
18.5-25	21	69.3
>25	-	-
Total	30	100.0



Pulmonary function parameters	Before practicing deep breathing	After practicing deep breathing for 3 months	Significance
PEFR(L/min)	317.50±87.80	354.86±78.88	0.002**
BHT(in sec)	48.3±4.92	53.57±5.7	<0.001**





DISCUSSION: This study was done to see the effect of deep breathing, daily for ten minutes for three months. In our present study both PEFR & BHT were increased significantly because stimulation of the pulmonary stretch receptors due to maximum inflation of the lung during deep breathing reflexly relaxes the smooth muscles of tracheo bronchial tree. The stretch receptors are thus trained to withstand more and more stretching this helps us to hold the breath for a long period(1). Surfactant which is secreted by the type II pneumocytes is increased after deep breathing and this surfactant increases the compliance of the lung as shown in the increased compliance during the deflation phase of the pressure volume curve of a lung. This phenomenon as been well studied in isolated animal lungs, in-situ lungs and also in the cultured pulmonary epithelial cells with the possible mechanism of exocytosis (9, 10, 11). The practicing of deep breathing also helps in

reducing the sympathetic activity and increasing the parasympathetic activity, which also has been demonstrated for pranayama (13).

By regular practice of deep breathing respiratory Centre in medulla oblongata is brought under volition. In deep breathing the individual continues the phase of Inhalation with his strong voluntary control so that lungs are expanded considerably and the walls of the alveoli are stretched to the maximum extent, thus increasing the compliance of the chest wall. The duration of inspiration is gradually increased so that respiratory centre is gradually acclimatized to withstand higher Pco2 and lower Po2. The CO2 stimulates the chemoreceptors located in the medulla oblongata that are sensitive to the amount of CO2 concentration in blood, which in turn send the Impulses to the respiratory centre. The respiratory centre which could have otherwise started exhalation is now helpless against the strong voluntary control from the cortex. In addition increased development of respiratory musculature and endurance due to regular practice of deep breathing delays the onset of fatigue. (14). The review on deep breathing showed that it has beneficial on Blood Pressure. The Practice of deep breathing was associated with significant decrease in systolic (SBP), diastolic (DBP) & mean blood pressure (MBP) in hypertensive subjects (15, 16) & also heart rate variability of hypertensive patients. (17, 18, 19)

Thus this practice of deep breathing exercise can be advised to COPD & asthmatics patients as it reduces the airway resistance & improve their ventilation.

CONCLUSION: By this we can conclude that practicing deep breathing even for short duration daily can improve our lung functions by increasing respiratory muscle strength, the elastic properties of lungs and chest, thereby improves the ventilatory functions of the lungs.

LIMITATIONS OF THE STUDY: The limitations of the present study were less number of the subjects.

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