

Original article:

A study on effect of nadi-shodhana pranayama on respiratory parameters

¹Chethan K, ²Devaraju MR

¹ Assistant Professor, Physiology Department, KIMS, Mangalore, India

²Assistant Professor, Physiology Department, SIMS RH, Tumkur, India

Corresponding author: Chethan K

Abstract

Introduction: Yoga is an ancient discipline designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual. The essence of the pranayama practice is slow and deep breathing, which is economical as it reduces dead space ventilation. To study the effect of NadiShodhana pranayama(NSP) on respiratory parameters like Forced vital capacity in liters (FVC) Forced expiratory volume at the end of first second in liters (FEV1),FEV1/FVC, Peak expiratory flow rate in liters/sec(PEFR),Peak inspiratory flow rate in liters/sec (PIFR) after twelve weeks of twenty minutes daily practice.

Material and methods: This cross sectional study was conducted in department of physiology at AJIMS, Mangalore to evaluate the effect of twelve weeks NSP for twenty minutes daily on respiratory parameters on 100 students. Wherein 50 students practiced NSP for twelve weeks and another 50 students were control. Parameters like FVC, FEV1, FEV1/FVC, PEFR, and PIFR were measured on day one and after twelve weeks in both study group as well as control group. Results in study group were compared with controls.

Results: A significant improvement in PIFR, PEFR, FEV1, FVC (P<0.05) were observed when compared with control group.

Conclusion: It is evident from the present study that NSP produces a significant effect over respiratory system and produces improvement in lung function.

Key words-Nadi-shodhana pranayama, lung volume, vital capacity

Introduction:

Yoga is an ancient discipline designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual ⁽¹⁾. Human breath is a process controlled by both the brain and the consciousness. Breath is a bridge between our biological and spiritual nature ⁽²⁾. Nadi shodhana pranayama “purification of subtle energy paths” where inhalation and exhalation are done through alternative nostrils for successive respiratory cycles. Right nostril breathing (Surya Anuloma Viloma Pranayama) corresponds to activation of ‘Pingala’ subtle energy channel of yoga; related to sympathetic arousal and left nostril breathing (Chandra Anuloma

Viloma Pranayam) to ‘Ida’ svara with parasympathetic activation.

Nadi shodhana pranayama combines both of these into one cycle^(9,11). The ultimate goal of this pranayama is to have a slow and rhythmical breath, alternating inhalation (puraka) and exhalation (rechaka) between the left and right nostrils. These breathing techniques also causes strengthening of the respiratory muscles and improvement in the expiratory power and decrease in the resistance to the air flow in the lungs ⁽³⁾.Which can ultimately help in the improvement of lung volumes and capacities ^(4, 5).Hence it was decided to study the effect of

Pranayama on medical and dental students by comparing respiratory parameters.

Aims & objectives:

This study was undertaken to study the effect of NadiShodhana pranayama(NSP) on respiratory parameters like Forced vital capacity in liters (FVC) Forced expiratory volume at the end of first second in liters (FEV1),FEV1/FVC, Peak expiratory flow rate in liters/sec(PEFR),Peak inspiratory flow rate in liters/sec (PIFR) after twelve weeks of twenty minutes daily practice.

Materials & methods:

The present study was done on 100 healthy first year medical and dental students of age group between 17 and 21years of A J Institute of Medical Science, Mangalore. Study was conducted in department of physiology, A J Institute of Medical Science, Mangalore from December 2011 to December 2012 after obtaining written informed consent from subjects and clearance from Institutional Ethics Committee. Subjects were explained that cardiac parameters will be measured on day 1 and after 12 weeks of practicing NadiShodhana Pranayama (NSP).Then subjects were divided by lottery technique into study group, who will practice NSP 20

cycles daily for 20 minutes for about 3 months and control group, who will not practice any kind yoga or meditation during study period. Practice sessions were held between 5.30pm and 6pm, in a well-lighted and properly aerated, calm and quiet room. All the pulmonary functions parameters like FVC, FEV1, FEV1/FVC, PEFR, and PIFR were measured using RMS HELIOS (a self calibrating computerized Spiro meter that fulfils the criteria for standardized lung function tests) in the Department of Physiology, A J Institute of Medical Science, Mangalore. Subjects were asked to relax then take a deep breath and then to blow hard into the mouthpiece of the flow meter with a sharp blast and then again to take deep inspiration. Four recordings were taken at one-minute interval and the average of the three highest readings was noted down^(6, 7, 8).

Observations & results:

All data thus obtained were expressed in mean ± SD. Comparison of parameters were done by using students unpaired ' t 'test. Before and after NSP parameters were compared in study group by applying student's paired't 'test. SPSS software version-19 was used for statistical analysis. Results obtained were put up in graphs and tables.

Table 1: Age (in years) comparison between study group and control group

Group	N	Mean	Std. Deviation	
Study group	50	18.16	0.618	t = 0.9299 P = 0.3547
Control group	50	18.26	0.443	

Unpaired t test, p > 0.05

Table 2: Respiratory parameters before and after doing NSP in study group compared with control group

Variable	Control group		Study group		95% CI		P value
	Mean difference	SD	Mean difference	SD			
FEV1	0.05	0.33	-0.20	0.49	0.08	0.41	0.004*
FVC	0.15	0.40	-0.15	0.48	0.13	0.47	0.001*
FEV1/FVC	-2.18	13.90	-1.90	10.15	-5.11	4.55	0.910 #
PEFR	-0.63	1.01	-1.22	1.32	0.12	1.05	0.015*
PIFR	-0.82	1.01	0.79	1.52	-2.12	-1.09	<0.001**

Unpaired t test ** highly significant, * Significant, # Not significant

FEV1, FVC, PEFR showed a significant (P<0.05) difference between the two groups.

PIFR showed a highly significant (<0.001) difference between the two groups.

FEV1/FVC showed a non significant difference between the two groups.

Discussion:

Pranayama is a technique of breath control. Improvement observed in pulmonary function tests such as FVC, FEV1 in present study is consistent with earlier studies. Increase in PEFR and FEF25–75% in both males and females after practicing alternate nostril breathing for four months⁽⁹⁾. A significant increase in FVC, FEV1, PEFR, FEF25–75% and Breath holding time (BHT) after 6 weeks of pranayama training in 50 adult subjects⁽³⁾. Pranayam training improves ventilatory functions in the form of increase in FEV, FEV1 and PEFR⁽¹⁰⁾.

It is explained that, Nadishodhana pranayama is likely to influence pulmonary functions through these pathways.

1. Pranayama cleanses airway secretions⁽¹¹⁾,
2. Regular, slow and forceful inspiration and expiration for a longer duration during the

pranayama practice, leading to strengthening of the respiratory muscles⁽³⁾.

3. This maximum inflation and deflation is an important physiological stimulus for the release of surfactants and prostaglandins into the alveolar spaces, which thereby increase the lung compliance. The stretch receptors reflexly decrease the tracheobronchial smooth muscle tone activity, which leads to decreased air flow resistance and increased airway caliber, which causes the dynamic parameters of the lung function test to improve⁽¹²⁾
4. Yoga with its calming effect on the mind can reduce and release emotional stresses thereby withdrawing the bronchoconstrictor effect⁽¹²⁾.
5. The yogic processes of performing pranayama in fixed posture breathing through alternate nostrils promote vertical

breathing. By this vertical breathing all the alveoli of both the lungs open out evenly⁽¹³⁾.

Conclusions:

The essence of the pranayama practice is slow and deep breathing, which is economical as it reduces dead space ventilation. It also refreshes air throughout the lungs, in contrast with shallow breathing that refreshes air only at the base of the

lungs⁽¹⁴⁾. It is evident from the present study that NSP develops improvements in respiratory function. The daily practice could also be parts of physical fitness and life style modification programs in maintaining better physical and mental health to have a better future. Yoga not only has physiological effects but also improves the wellbeing of the subject.

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