Original Research Article

Effect of simple yogic exercises on pulmonary function tests in healthy adults - A case control study

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Abstract

Background: Study was carried out to find the effects of simple yogic exercises on Pulmonary Function Tests in elderly individuals between 60 to 80 years of both sexes. The study was conducted at Department of Physiology, Govt. Medical College, Aurangabad. Parameters like FVC and MVV were recorded once before and again after completion of six weeks of Yoga training. The results indicate that there is definite improvement in Pulmonary functions after completion of six week training, revealed by significant increase in FVC and MVV. The present study concluded that there is a significant increase in pulmonary functions and physical domain.This suggest that regular yoga exercise has improved pulmonary functions.

Key Wsords : FVC, MVV, Elderly individuals, Simple Yogic Exercises.

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INTRODUCTION

Exercises in different forms, if performed regularly, have a beneficial effect on the various systems of the body. The modality of exercise that is most beneficial and economic for all has now become a topic of research[1] The conventional exercises (endurance exercises like walking, jogging, running, swimming, cycling etc) which give stress on cardiovascular and respiratory systems are well known. On the other hand, ancient yogic exercises which have been claimed to benefit human body on multiple fronts are also getting popularity all over the world.[2]

Yoga is practiced in India over thousands of years. Yoga has scientific basis and it produces consistent physiological changes by aiming at perfection of body and mind[3]. It is said to help in increasing longevity and also to have a therapeutic and rehabilitative effect. The efficiency of respiratory system and ventilation declines as age advances due to various factors. Pranayam, the well known yogic practice has beneficial effects on respiratory system as a whole. These exercises help to empty and fill the respiratory apparatus more efficiently and completely, leading to increased development of respiratory musculature. So, in the present study, the focus is on the effect of yoga (Asans and Pranayam) on the lungs in terms of pulmonary functions which have been identified as a long term predictor for overall survival rates as well as a tool in general health assessment.[4] Yoga has been reported to improve the pulmonary functions to a great extent as it involves physical activity as well as breathing exercises.[5-6] Similar ventilatory training, even in elderly individuals (between 60 and 75 years) has been shown to improve lung volumes and capacities.[7] A study performed on a group of elderly people (aged 41-50 years) indicated that, a short

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term yoga practice (posture and pranayam) was beneficial and prevented development of primary respiratory problems by increasing the efficacy of respiratory muscles.[8] Joshi *et al.*[9], Makwana *et al.*[10]Bijlani and others have also reported similar observations.[11] The aim of the present study was therefore to assess the beneficial effects of yoga and to compare the improvements in pulmonary functions, by performing them in healthy adults of Aurangabad city.

MATERIALS AND METHODS

Study Design: Case control study

Present study was conducted in the Pulmonary Function Test (PFT) Laboratory, Department of Physiology, Govt. Medical College, Aurangabad. Informed (written) consent was taken from each subject before the study.

Cases:60 elderly subjects, including both male and female of age group of 60 to 80 years, with no respiratory, cardiovascular or other medical aliments, were selected for the study.

Controls: Same subjects who acted as cases were examined after 6 weeks of Yoga training were controls.

Subject with past history of major respiratory illness like Tuberculosis, pleural effusion, COPD, Asthama and Smokers were excluded from the study.

- PFT were recorded on whole Body Plethysmograph (Elite DX Model), (Medgraphics USA make)
- Spirometry parameters like Forced Vital Capacity (FVC) and Maximum Voluntary Ventilation (MVV) were recorded in sitting position outside the body box of machine.
- The standard protocol and precautions for the spirometry procedure were followed as per American Thoracic Society guidelines.
- Three recordings were taken and the best effort was included in the results
- All the recordings were done between 9 am to 11 am to eliminate any effect of diurnal variations.
- Percent (%) predicted values for all the parameters were taken into consideration for statistical analysis to eliminate the effect of confounding factors like Age, Sex, Height and Weight on different lung parameters.
- Paired 't' test was applied for comparison between the two groups.

The Yogic exercises allotted to the participants were[12]

1. Bhastika Pranayam – duration 3 minutes
2. KapalBhati Pranayam – duration 1 min to 5 mins
3. Anulom Vilom Pranayam – duration at least 10 mins.

RESULTS

Table I: Baseline Characteristics

Parameter	Cases
Age (Years)	68.27 ± 5.26
Weight (Kilogram)	71.50 ± 12.42
Height (Centimeters)	164.76 ± 7.36

Table II - Comparison of percent (%) predicted values of Pulmonary functions

Pulmonary Parameters	Test group Mean ± SD	Control Group Mean ± SD	'p' value
FVC % Predicted	54 ± 9.7	78.9 ± 6.4	0.0001**
MVV % Predicted	70.6 ± 16.8	89.9 ± 14.3	0.0001**

**Highly Significant

DISCUSSION

Sixty subjects of both sexes between the age group 60 to 80 years with no active respiratory, cardiovascular and other medical illness were assessed during the study. Pre-exercise and Post-exercise (6 weeks Yoga training) readings of pulmonary function parameters like FVC and MVV were recorded. Significant increase in both the parameters was obtained after statistical analysis of data (shown in table II).As age advances the efficiency of ventilation and respiratory system as a whole declines[3]. This may be due to decreased elasticity of the lung tissue, reduced muscular power and stiffness of the thoracic cage. Alveolar ventilation also decreases due to reduced mechanical efficiency. Less oxygenation of the tissues is also seen in older ages than in healthy young individuals. During expiration, closure of respiratory bronchioles is prevented by loss of elastic recoiling. In old age above 70 years the capacity of respiratory system becomes very low. A compromised respiratory efficiency reduces the individuals stress tolerance which affects the quality of life in total. Yoga, specially Pranayam has beneficial effects on respiratory efficiency. It includes various respiratory exercises which involve forceful inspiration to total lung capacity (TLC) and forceful exhalation to residual volume (RV) and all manoeuvres are done through nostrils, which offer resistance by means of decreased cross sectional area and turbulences. Breathing through one nostril in Anulom – Vilom Pranayam further increases the resistance. The respiratory apparatus is emptied and filled more completely and efficiently by Yoga practice, which is recorded in terms of increased forced vital capacity (FVC)[13,14].Yogic breathing creates more negative pressures in both abdominal and thoracic cavity during inspiration and moves the diaphragm more than its normal excursions and helps in efficient movement of diaphragm, intercostals and abdominal muscles. Thus, the improvement in vital capacity is due in part to increased development of respiratory musculature incidental to regular practice of Yoga[15].Removal of undue tension from the skeletal muscles in yogasanas helps the

thorax to relax better them before. All these practices seem to increase expiratory reserve volume (ERV) thereby increasing the vital capacity[16].Skeletal muscles control many crucial elements of aerobic, conditioning including lung ventilation. Repeated inspirations to TLC and breath holdings as done during pranayam can lead to increase in the maximal shortening of the inspiratory muscles which has been shown to improve the lung function parameters.[17]Yoga postures involve isometric contraction which is known to increase the skeletal muscle strength.[18]Yoga, also with its calming effect on the mind can reduce and release emotional stresses, hereby withdrawing the bronchoconstrictor effect.[13,16,19]Lung inflation near to total lung capacity is a major physiological stimulus for the release of lung surfactant and prostaglandins into alveolar space, which increases lung compliance and decreases bronchiolar smooth muscle tone, respectively.[9,17,19]Increase in maximum voluntary ventilation (MVV) may be due to improvement in the respiratory mechanism and strengthening of respiratory muscles due to regular practice of yogasanas and yogic breathing exercises. Thus, even in elderly age group the respiratory efficacy greatly improves after exercise, which go a long way in healthy living. Hence elderly people must be trained in systematic physical activity under suitable guidance to improve their quality of life.[20]

Limitations

The present study has important limitation of not comparing the effects of these modalities of exercise on other body functions. One more limitation of the present study is small sample size. More lung function parameters must also be studied for detailed effect of Yoga on respiratory system as a whole.

CONCLUSION

The study revealed that after undergoing six weeks of regular yoga training in elderly individuals (60-80 years), definite improvement in pulmonary function parameters like FVC and MVV is seen. This may be due to regular slow and forceful inspiration and expiration during yogasanas leading to strengthening of respiratory muscles and increased release of surfactant too.

Recommendations

In developing and poor countries the facilities for recreational exercise and sports are not easily available and many low socio-economic group people cannot afford to utilize the available resources. Some individuals with physical constraints and for other reasons like lack of training may not be able to perform any other sports activity (outdoor/indoor) though they can undergo some yoga training.In light of these facts, Yoga exercise can become the most convenient and important way of lifestyle intervention and physical activity for prevention of many diseases as prescribed by World Health Organization(WHO), specially for the elderly individuals where rigorous physical exercise in not always advisable.

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