Research Article

Pulmonary function test in yoga practitioners in Chennai district

R. Jagadish Rajkumaar, A. Jothi Priya*, R. Gayatri Devi

ABSTRACT

Introduction: Yoga is considered as the mind and body practice having historical origin from ancient Indian civilization. Classical literature on yoga indicates its importance in day-to-day life and that it is of great value as a method of preservation of health and treatment of various diseases. Yoga practice consists of the five-principle including proper relaxation, proper exercise, proper breathing, proper diet, and positive thinking and meditation. In yoga, the respiration consists of very slow, deep breaths with sustained breath-hold after each inspiration. Practicing yoga contributes to the improvement of pulmonary ventilation and gas exchange. **Materials and Methods:** A total of 60 individuals of the age group of 20–40 years were included in the study. It comprised 30 control groups. The materials which were used in this study were a computerized RMS Med-spirometer. Pulmonary function test was performed in them the parameters measured include forced vital capacity (FVC), forced expiratory volume (FEV), FEV/FVC, and peak of expiratory flow. Data were analyzed statistically. **Results and Conclusion:** The study shows that there was a higher value of lung function of yoga practitioners compared to the control group and thus concluding that yoga practitioners have good lung function test. The knowledge so gained of the respiratory functions through spirometry can be utilized for the betterment of the population by bringing in a modification in their lifestyles.

KEY WORDS: Forced expiratory volume, Forced vital capacity, Lung capacity, Yoga practitioners

INTRODUCTION

Yoga is considered as the mind and body practice having historical origin from ancient Indian civilization.[1] Classical literature on yoga indicates its importance in day-to-day life and that it is of great value as a method of preservation of health and treatment of various diseases. Yoga practice consists of the five-principle including proper relaxation, proper exercise, proper breathing, proper diet, and positive thinking and meditation. In yoga, the respiration consists of very slow, deep breaths with sustained breath-hold after each inspiration. Practicing yoga contributes to the improvement of pulmonary ventilation and gas exchange. It also has immense role in the prevention, cure, and rehabilitation of patients with respiratory illnesses by improving ventilatory functions.[2-4] It is a popular form of exercise in India since ancient times and yoga's effects on pulmonary function have been investigated previously.

Spirometry helps in the screening, diagnosis, and monitoring of respiratory diseases and is increasingly advocated in primary care practice.[4] Hence, pulmonary functions are generally determined by the strength of respiratory muscles, compliance of the thoracic cavity, airway resistance, and elastic recoil of the lungs.[5] Lung function tests provide qualitative and quantitative evaluation of pulmonary function in patients with obstructive and restrictive lung diseases. It is well known that pulmonary functions may vary according to the physical characteristics including age, height, body weight, and altitude.[6] Regular exercise produces a positive effect on the lung by increasing pulmonary capacity and thereby improving the lung functioning. There are several studies which have shown improved pulmonary function in athletes. [7-10] The present study was carried to find out the lung function in yoga practitioner using spirometer and to determine the effects of yoga on pulmonary function test (PFT) comparing the control group.

Access this article online	
Website: jprsolutions.info	ISSN: 0975-7619

Department of Physiology, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

***Corresponding author:** A. Jothi Priya, Department of Physiology, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road, Chennai - 600 077, Tamil Nadu, India. E-mail: a.jothipriya88@gmail.com

Received on: 25-04-2019; Revised on: 26-06-2019; Accepted on: 29-07-2019

MATERIALS AND METHODS

A total of 60 individuals of the age group of 20-40 years were included in the study. It comprised 30 control groups. The materials which were used in this study were a computerized RMS Med-spirometer. PFT was performed in them the parameters measured include forced vital capacity (FVC), forced expiratory volume (FEV), FEV/FVC, and peak of expiratory flow (PEF). Data were analyzed statistically. The materials which were used in this study were an electronic spirometer, a weighing machine, and a measuring tape. Lung function parameters (FVC; FEV in 1st s [FEV1]; and PEF rate [PEFR]) were recorded on electronic spirometer. Measuring scale stand was used for measuring height in centimeters. Electronic weighing machine was standardized and used for measuring weight in kilograms. The informed consent was obtained and procedure was explained to each subject during test. The study subjects undergoing the tests were well informed about the instrument and the technique of the test by demonstration of the procedure. For evaluating the respiratory functions, the subjects were asked to sit comfortably on a chair. The complete procedure was explained and the subjects were instructed to breathe in fully by deep inspiration with their nostrils, to seal their lips around the sterile mouthpiece of the spirometer, and to forcefully expire air out. The best three readings were recorded and interpreted. Mean values were compared between the two groups, using unpaired *t*-test for the difference in the mean scores. The results were considered statistically significant at $P > 0.05$.

Inclusion Criteria

Healthy yoga practitioners and control group of age group between 20 and 40 years.

Exclusion Criteria

Yoga practitioners without the habit of smoking alcoholism, lung disorder, and acute and chronic respiratory disorders were excluded from the study.

RESULTS

The study population consist of a total of 60 members included in two different categories, namely, control group (30 members) and yoga practitioners (30 members). The mean age and mean demographic measurements of both groups are tabulated in Table 1.

Table 1: Demographic details of participants (*n*=60)

Variables	Yoga practitioners	Control group
Age	20.0	23.8
Weight (kg)	51.3	53.2
Height (cm)	163.4	162.5

The following five parameters such as FVC, FEV1, FEV1/FVC, and PEF were taken into consideration and the values obtained were recorded. The parameters chosen were (1) FVC, (2) FEV1, (3) PEFR, and (4) FEV1/FVC ratio which were analyzed for both yoga practitioners group and control group. Values for all measurements are expressed as mean liters. The results are shown in Table 2.

Mean percentage of predicted FVC of yoga practitioners was higher compared to the control group and the difference was found statistically significant. The result is shown in Figure 1. Similarly, it was found that the mean of FEV1 of yoga practitioners (4.6) was significantly higher than that of the control group (3.2) as shown in Figure 2. Statistically significant difference was observed in the mean percentage of predicted FEV1 values of both yoga practitioners and control group. The mean value of PEF among yoga practitioners (9.2) and (6.8) among control group was comparatively higher. The higher mean of PEF observed among yoga practitioners compared to the control group was statistically significant which is also shown graphically in Figure 3. The mean FEV1/FVC ratio also showed a significant difference with higher value in yoga practitioners than the control group. These findings are shown by a bar diagram in Figure 4. Lung function results from the present study showed a significant difference between yoga practitioners and control subjects.

DISCUSSION

The results discussed above clearly indicate that yoga practitioners had higher values of lung functions compared to the control group, thereby confirming that regular yoga practice has a facilitating effect on the lungs. Similar results have been obtained by other workers in this field.[11,12] The results of the present study support the idea that yoga has a facilitative effect on ventilatory function and physically active persons have greater lung function values in comparison to the control group.[13,14]

It has been observed that the mean value of FVC for the control group subjects was 3.5 and for yoga practitioners 4.9, clearly showing that the yoga practitioner subjects had better FVC values than the control group.

Table 2: Test values obtained

Column 1	Yoga practitioners	Control group	*P* value
FVC	4.9	3.5	<0.01
FEV1	4.6	3.2	<0.01
PEF	9.2	6.8	<0.01
FEV1/FVC	98.8	91.4	<0.01

FVC: Forced vital capacity, FEV: Forced expiratory volume, PEF: Peak of expiratory flow, FEV1: Forced expiratory volume in 1st s

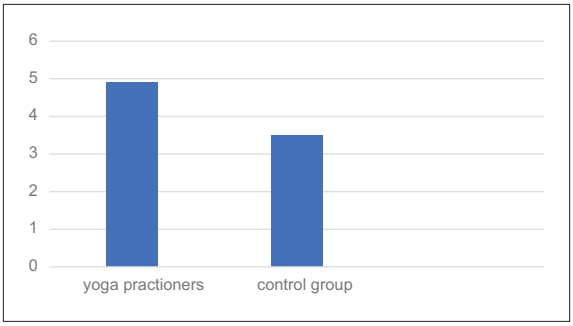

Figure 1: Forced vital capacity between yoga practitioners and control group

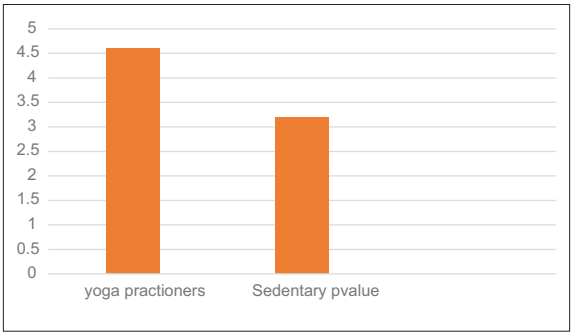

Figure 2: Forced expiratory volume in 1st s between yoga practitioners and control group

With reference to FEV1, the second parameter studied the mean value of FEV1, for the control group was 3.2 and for yoga practitioners, it was 4.6. The values reflect that the FEV1 values of yoga practitioners were much better when compared to the control group. When the control group and yoga practitioners groups are compared, results showed higher FEV1 in physically active as reported by other studies.[15-17]

In the present study, the mean value of FEV1/FVC for the control group was lower (91.4) than yoga practitioners (98.8). Some previous studies have observed no significant differences in vital capacity in physically active or yogic people when compared with control subjects.

Vital capacity is determined by the lung dimensions, compliance, and respiratory muscle power, whereas FEV1/FVC is determined mainly by airway caliber, alveolar elastic recoil, and respiratory muscle effort.[18,19] The possible explanation is that regular forceful inspiration and expiration during exercise leads to strengthening of the respiratory muscles which, in turn, help the lungs to inflate and deflate maximally. This maximum inflation and deflation is an important physiological stimulus for the release of surfactant as stated by Hildebran *et al*.[20]

The findings of the present study can also be explained on the basis of better functions of respiratory muscle strength, improved thoracic mobility, and the

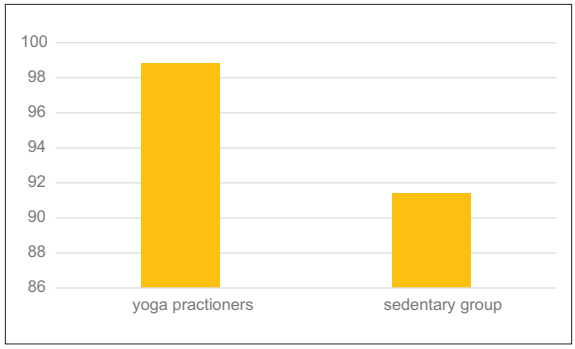

Figure 3: Forced vital capacity between yoga practitioners and control group

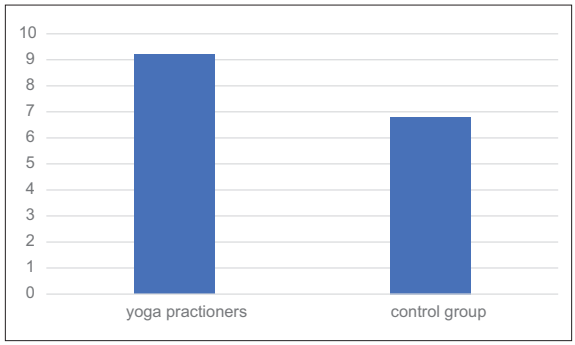

Figure 4: Forced expiratory volume in 1st s/forced vital capacity between yoga practitioners and control

balance between lung and chest elasticity which the yoga practitioners may have gained from regular involvement in breathing exercises. Hence, regular physical activity causes many desirable physiological, psychological, and physical changes in the individual.

CONCLUSION

The study revealed that the lung function of yoga practitioners was significantly better than the control group. The present study suggests that regular yoga practice has an important role to play in determining and improving lung volumes.

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Source of support: Nil; Conflict of interest: None Declared