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ATHLETES, YOGIS AND INDIVIDUALS WITH SEDENTARY LIFESTYLES; DO THEIR LUNG FUNCTIONS DIFFER ?

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Abstract : Buffalo health study concluded that pulmonary function is a long-term predictor for overall survival rates. It is essential to be involved in physical activity or sports which help in achieving better lung function. Cross sectional observation study was conducted to determine if yoga and athletic activity (running) are associated with better lung functions as compared to subjects with sedentary lifestyles and how does athletes and yogis differ in lung function. Spirometric parameters were assessed in randomly selected 60 healthy male, non-smoking, non-obese subjects- athletes, yogis and sedentary workers. The groups differed significantly in FEV_1 and PEFR. The highest mean FEV_1 and PEFR were observed in yogis. Both yogis and athletes had significantly better FEV_1 as compared to sedentary workers. Yogis also had significantly better PEFR as compared to sedentary workers and athletes. Yogis and athletes had similar lung functions except for better PEFR amongst yogis. Involvement in daily physical activity or sport preferably yoga can help in achieving better pulmonary function.

Key words : yogis athletes sedentary lung function

INTRODUCTION

Persson et al (1) pointed out that there is an urgency to reach a better understanding of the relationship of impaired pulmonary function to disease in order to undertake preventive measures. Buffalo health study concluded that pulmonary function is a long-term predictor for overall survival rates in both genders and could be used as a tool in general health assessment (2). Pulmonary function was assessed based on Forced Expiratory Volume in 1 second (FEV_1) expressed as per cent predicted for the age, sex, height, weight and race. Hence it becomes essential to achieve more efficient lung function as a preventive measure. Sedentary lifestyles could be associated with less efficient pulmonary function. Involvement in certain physical activities or sports could help in respiratory muscle strengthening and improvement in pulmonary function. In this study we have compared pulmonary function of people with

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sedentary life styles, athletes and yogis (performing pranayam daily) to see if athletes and yogis have better pulmonary function than people with sedentary life styles; and if so, how they differ amongst themselves with respect to various spirometric parameters. There are several studies which have shown improved pulmonary function in athletes and yogis. However there is no study which has compared them with each other and with sedentary workers.

MATERIALS AND METHODS

Definitions :

Sedentary lifestyle was defined as per center for disease control and prevention, as no leisure-time physical activity, or activities done for less than 20 minutes or fewer than 3 times per week. Athletes were defined as marathon runners running atleast 2 km daily for at least 6 months. Yogis were defined as subjects practicing Pranayama and other yogic exercises for at least 1 hour daily for atleast 6 months. Pranayama was done for about half an hour early morning, sitting on the floor, in Padmasana and included steps namely Bhastrika, Kapalbhati, Anulom-vilom, Mahabandha and others like Bhramri, Ujjai & Shetalee. Bhastrika done for about 5 minutes involved forced breathing through nostrils across the vital capacity. In kapalbhati, maximum pressure was applied on exhaling the breath through the nostrils to residual volume with a passive inhalation to function residual capacity at a frequency of about 30–35 breaths per minute. Anuloma-vilom done for about 5 minutes involved breathing from one nostril slowly across the vital capacity with the order of breathing through the nostrils for inhalation and exhalation being reversed every time. Mahabandha pranayama involved end expiratory and end inspiratory breath holds. “Smoker” was defined as per center for disease control and prevention as those who have smoked more than 100 cigarettes in their lifetime and currently smoke.

Inclusion criteria :

1. Males aged between 20 to 40 years. This was done to remove the confounding factor of impact of aging on lung function (3).

2. Non obese individuals, as in non-obese men there is no much effect of body weight on FVC values (4).

3. Consent to participate in the study

Exclusion criteria :

1. Smokers

2. American Thoracic Society (ATS) questionnaire suggestive of any active respiratory disorder

Spirometry was conducted on athletes from a police training institute; yogis from a yogabhyasi mandal in Nagpur city and sedentary life style subjects were selected from the medical students at Government Medical College, Nagpur. Spirometry was conducted on 20 randomly selected subjects from those fulfilling the inclusion criteria in each category. Those failing to perform the test successfully were rejected and replaced by another randomly selected subject. Random selection was facilitated by random

number table. The readings were taken in standing position using COSMED microquark spirometer based on ATS recommendations. Time of testing was 6:30 am to 9:30 am; mean temperature was 24°C, relative humidity 95%. Athletes in the study were aged 20 to 27 years, mean age was 23 years, mean height was 172.78 (± 5.20) cm, mean weight was 65.33 (± 4.87) kg. Yogis were aged 20 to 40 years, mean age was 30 years, mean height was 170 (± 5.33) cm, mean body weight was 68.6 (± 6.45) kg. Sedentary subjects were aged 20 to 25 years, mean age was 22 years mean height was 169.6 (± 4.17) cm, mean weight was 67.2 (± 5.58) kg. Statistical analysis was done using SPSS version 11. Parameters analyzed were in the form of percentage of the predicted for the age, sex, height and weight – Forced Expiratory Volume in 1 second (FEV_1), Forced Vital Capacity (FVC), Peak Expiratory Flow Rate (PEFR), FEV_1/FVC and Forced mid Expiratory Flow rate (FEF 25–75%). One way analysis of variance was used to see if the groups differ in any of the parameters and independent sample t test was used for between groups comparison. P value was derived from two-tailed analysis. P-p plot and levene's test for equality of variance were used to assess normality.

RESULTS

Comparison of lung function parameters across activities is shown in Fig. 1. The groups differed significantly in FEV_1 (P=0.047) and PEFR (P=0.022). The highest mean FEV_1 (96.25%) and PEFR (116.77%) was observed in yogis. Lowest FEV_1 and PEFR values were observed amongst sedentary workers and athletes respectively. Comparison of athletes with sedentary

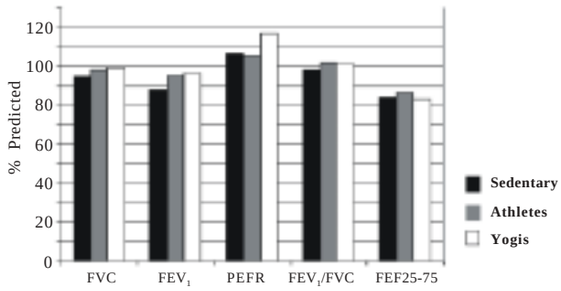

Fig. 1 : Lung function parameters in athletes, yogis and sedentary workers.

workers revealed significantly higher FEV_1 (P=0.038, 95% CI; 14.6; 4.2) And FEV_1/FVC (P=0.02, 95% CI; 7.5; 0.6) parameters amongst the athletes. Comparison of yogis with sedentary workers revealed significantly higher FEV_1 (P=0.036, 95% CI: 16.15; 0.60) and PEFR (P=0.037, 95% CI: 19.0; 0.6) amongst yogis. There were no significant differences in the other parameters measured. Lung functions of yogis and athletes were similar except for PEFR which was significantly higher amongst yogis (P=0.019, 95% CI: 20.5; 1.98).

DISCUSSION

Buffalo health study revealed FEV1 as an independent predictor of overall long term survival rates and could be used as a tool in general health assessment (2). Pursuing a physical activity or sport which could help in achieving efficient lung function especially FEV_1 is an essential preventive strategy in this busy age when prevalence of sedentary life style is increasing and so are the associated lifestyle disorders.

The results of the present story showed that those performing yoga regularly had higher lung function parameters as compared

to athletes and those with sedentary life styles. Significantly higher values were observed for FEV_1 and PEFR. This is in confirmation with previous studies which analyzed the impact of yoga on lung function (5–7). It has been shown in previous studies that beneficial effects of yoga become established between 6 to 12 weeks (8). The subjects in our study were professional yogis with more than 24 weeks of daily yoga practice. Pranayam, a yogic practice has beneficial effects on respiratory efficiency. It includes various exercises like bhastrika, kapal bharti etc. which involve forceful inspiration to Total Lung Capacity (TLC) and forceful exhalation to residual volume, and all maneuvers are done through nostrils, which offer resistance by means of decreased cross sectional area and turbulence. Breathing through one nostril in Anulom-vilom pranayama further increases the resistance. The effects of resistance training on skeletal muscle are well documented (9). Higher peak expiratory flow rates and FEV1 could be explained due to better strengthening of respiratory muscles in yogis. Skeletal muscle 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 (10).

Running does not improve respiratory muscle strength. Endurance athletes like marathon runners are not exposed to resistance training of the respiratory muscles and repeated inspiration and expiration to TLC and residual volume respectively (11). Though athletes had lower mean functions than the yogis this was not statistically significant. Yogis had significantly higher peak expiratory flow rates presumably due to respiratory muscle conditioning. Both athletes and yogis had significantly better lung functions as compared to sedentary workers. There is also some concern of exercise induced asthma and prevalence of bronchospasm in endurance athletes especially due to chronic hyperventilation of cold dry air mediated bronchial dysfunction (12).

People with sedentary lifestyles had lowest pulmonary function parameters. Sedentary life style is also associated with higher incidence of obesity, and development of restrictive lung function and cardio-vascular morbidity. In this busy age people should try to be involved in such physical activities or sports with better health yield for the time spent. We recommend that sedentary workers should adopt yogic exercises for improving their health. Apart from the preventive value of yoga there is emerging realization of its benefit as a complementary therapy in therapeutic and rehabilitative medicine (13, 14).

Our study was a cross sectional study. A follow up study with larger sample size is needed. Lung function in yogis should also be compared to other activities like swimming, classical singers and instruments players like wind pipe blowers. Clinical significance of such differences in pulmonary function needs to be determined, however the significant differences observed in the present story guide us in selecting appropriate exercise for improving pulmonary function.

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