Research Article

A study done using pulmonary function test as a tool in health assessment among individuals with different lifestyle

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Abstract

Background: Pulmonary function tests are of significance in assessing the functional status of lungs in different individuals exposed to varied conditions and to predict the clinical outcome. **Aims**: The study has been conducted to evaluate and explain the effects of different lifestyle conditions including the sedentary life style, smoking and yoga exercises on the functioning of the lungs and to signify the importance of regular exercise and to quit smoking to improve the health. **Settings and Design:** This study was conducted in clinical lab of physiology department on 30 healthy male sedentary non-smoker subjects, 30 healthy male sedentary smoker subjects and30 healthy male ex-smoker Yogis in the age range of 21 to 30 years. **Materials and Methods:** Five spirometricparameters were used to evaluate the pulmonary function and differences between groups. Lung Function Test was performed using– computerized spirometer"Medspiror". All the values were recorded and comparison tables were derived after statistical analysis using SPSS statistical software version 20.0 and the results were analyzed. **Results and Conclusion:** The Pulmonary Function values derived were compared between the study groups. In the present study the ex-smoker Yogis group was having higher mean value of FVC, FEV1, FEV1/FVC, PEFR, and MVV as compared to sedentary smoker and sedentary non-smoker group. Smoker group has significantly less mean values for the lung function variables compared to other two groups. The ex-smoker yogis has higher mean values than sedentary groups suggesting that regular Yoga exercises has improved lung function after cessation of smoking.

Key Word: pulmonary function test, lifestyle.

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INTRODUCTION

Health has been always related not only to physical exercise but also to abstain from unhealthy lifestyle. The changing lifestyle with unhealthy food and sedentary habit has decreased the working capacity and also productive lifespan. In present urban living habitat with limited play areas for physical activity, the life of urban habitants is rendered sedentary. Sedentary lifestyle is an important cause of obesity and thus an important modifiable cause of many diseases. Unhealthy habits such as smoking adds to the morbidity burden and further decreases the productive lifespan. Studies have shown that physically active individuals are less addicted to smoking and participation in sports and other physical activities has been used in smoking cessation programmes.[1] It is also found that smokers more often quits physical activity than non-smokers.[18] Some studies reported a positive correlation between physical activity and physical fitness and lung capacity[5, 10, 16], while others do not.[4] Pranayama and yoga breathing and stretching postures are used to increase respiratory stamina, relax the chest muscles, expand the lungs, raise energy levels,

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and calm the body.[15] Pranayama, a well regulated breathing exercise increases the depth of breathing and expands lungs more than normal and recruits previously closed alveoli. Moreover, endurance power of the lung muscle also improves after adopting yoga.[7] Many studies have shown Yoga to have a positive significant correlation with lung capacities and also on general health condition. This could be because of reduction of sympathetic reactivity attained with yogic training which may allow broncho-dilatation by correcting the abnormal breathing patterns and reducing the muscle tone of inspiratory and expiratory muscles. Due to improved breathing patterns, respiratory bronchioles may be widened and perfusion of a large number of alveoli can be carried out efficiently.[14] Yogic practice covers the entire field of our existence from physical, sensory, emotional, mental and spiritual to the highest self-realization. One of the hallmarks of yoga is balance - which is of both body and mind. The benefits of smoking cessation have been well demonstrated. Smoking cessation reduces health risks and improves quality of life. The cumulative risk of dying of cardiovascular and lungdiseases can be drastically reduced (up to 90%) if smokers quit smoking, even late in life.[3, 13] In this study we evaluated the lung function using computerized spirometer among individuals with different lifestyle to explain the deleterious effects of sedentary lifestyle and smoking habit on lungs and therefore on general health condition and to signify the benefits of yogic exercises that improves lung function.

MATERIALS AND METHODS

This study was conducted on 90 male healthy individuals, 30 healthy male sedentary smokers, 30 healthy male sedentary nan-smokers and 30 healthy male ex-smoker yogis. All the subjects were in the age range of 21 to 30 years of age. After obtaining informed written consent, the procedure was explained to all the subjects.Detail history, physical examination and anthropometric measurements were done in all subjects.

The study subjects were divided into mainly three groups:

A) Sedentary smokers B) Sedentary Non-smokers and B) Ex-Smoker Yoga practitioners.

Classification Criteria As Suggested By WHO (1998)[19].

- Smoker: Someone who, at the time of the study, smokes any tobacco product either daily or occasionally.
- Non-smoker: Someone who, at the time of the study, does not smoke at all.
- Ex-smoker: Someone who was formerly a daily or occasional smoker but currently does not smoke at all.

In the present study, sedentary individuals were defined as individuals who have less than 20 minutes of physical activity in a day. The habitual smokers (nicotine dependent, daily cigarette smokers) were defined as those who reported smoking 15 – 20 cigarettes per day from the last one year and Yogis were defined as subjects who practiced yoga daily for one hour from the past one year. The yogis who are ex-smokers were included in the study.

Subjects having respiratory or other systemic diseases, on medication, on diet restriction, alcoholics and tobacco chewers were excluded.

METHOD

The lung function tests were carried on all the subjects as per the standards mentioned by M.R Miller *et al.*[11].

The tests were carried out using computerized spirometer "Med-Spiror". It records the amount of air and the rate of air that is breathed in and out over a specified period of time. Spirometryprocedures were quite simple, non-invasive and harmless to the patient. The subjects were familiarized with the instrument and the technique used. During this time period the laboratory was staffed by a technologist and a trained medical officer. The chief technologist of the laboratory is a registered pulmonary function technologist.Each pulmonary function test was examined in detail by the chief technologist to confirm the accuracy of computer grading.

The readings were taken in standing position. Age, height and body weight were recorded. Each subject was given two trials and three tests runs for each test and best of the three test readings was taken.

The parameters studied from the records were Forced Vital Capacity(FVC), Forced Expiratory Volume in 1second (FEV1), FEV1/FVC% and Peak expiratory flow rate (PEFR) and Maximum voluntary ventilation (MVV).

Statistical Analysis

Commercially available software was used for statistical computations. Data analysis was done using IBM SPSS statistics version 20.0

Data are reported as mean, standard deviation and standard error of mean. Mean values were compared between two different groups using unpaired t test for the difference in the mean scores. A 2-tailed P value of less than0.05 was considered significant and less than 0.001 as highly significant.

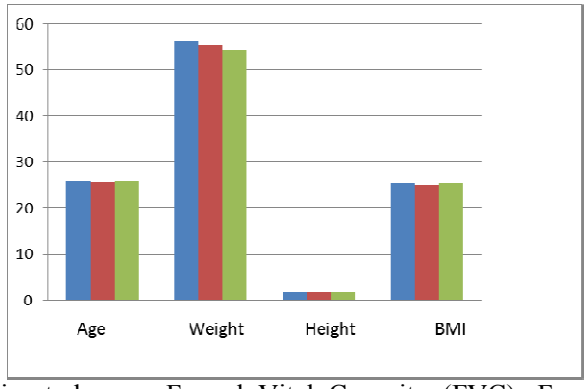
RESULTS

The mean age and mean anthropometric measurements of the groups is summarized in table 1 which suggests that the three groups did not differ significantly and are comparable.

Table 1

Variables	Study groups			P value
	Sedentary smoker	Sedentary non-smoker	Ex-smoker Yogis	
Age (years)	26.0 (5.0)	25.8 (5.2)	26.0 (4.5)	NS
Weight (kg)	56.2 (8.6)	55.3 (8.3)	54.2 (8.5)	NS
Height (m)	1.63 (7.2)	1.64 (6.8)	1.62 (7.0)	NS
BMI	25.58 (1.8)	24.96 (2.2)	25.15 (1.6)	NS

Anthropometric measurements of participants



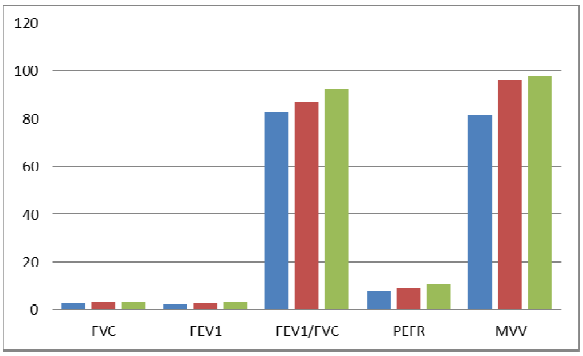
The parameters considered in this study are: Forced Vital Capacity (FVC), Forced Expiratory Volume1 (FEV1), FEV1/FVC%, PEFR and MVV.

Descriptive results of spirometric pulmonary functions (mean± SD)are summarized in Table 2.

Table 2

PARAMETER Predicted %	Sedentary smoker N= 30	Sedentary Non-smoker N= 30	Ex-smoker Yogis N= 30	Comparison between groups (p-value)		
				SS-SNS	SS-ESY	SNS-ESY
FVC	2.98 ± 0.311	3.3703 ± 0.325	3.3821± 0.297	HS	HS	S
FEV1	2.45± 0.302	2.926 ± 0.342	3.113± 0.299	HS	HS	HS
FEV1/FVC	82.621 ± 25.94	86.7 ± 16.45	92.438 ± 10.42	HS	HS	HS
PEFR	7.763 ± 0.461	9.097 ± 1.107	10.528 ± 0.211	HS	HS	HS
MVV	81.2 ± 42.12	96.28 ± 35.71	97.65 ± 16.19	HS	HS	HS

SS= sedentary smoker, SNS= sedentary non-smoker, ESY=ex-smoker yogi,
HS= highly significant(P <0.001), S=significant (P<0.05)



Mean values of these spirometric measures were higher in sedentary non-smokers than in sedentary smokers and highest in yoga practitioners. The student t test compared different groups and a statistically highly significant difference was obtained in FVC, FEV1, FEV1/FVC, PEFR and MVV among the three groups except between sedentary non-smokers and ex-smoker Yogis as given in the descriptive table of comparative analysis between the groups. The comparison shows just significant result for FVC between sedentary non-smokers and ex-smoker Yogis.

DISCUSSION

The results of the present study conducted with an aim to evaluate and explain the effects of different lifestyle conditions including the sedentary life style, smoking and regular exercise on the functioning of the lungs and to signify the importance of regular exercise and to quit smoking to improve the health. The study shows that the individuals who smoke and have sedentary lifestyle has lung function values significantly lesser than the yoga practitioners. The study also shows that sedentary smokers have decreased mean lung function values compared to sedentary non-smokers. From this study, the evidence of changes in lung function in smokers is also in accordance with current available data. Pranayama practice showed significant improvement in vital capacity and maximal ventilatory ventilation and Peak expiratory flow rate. The findings were supported by the study conducted by Mauch AD *et al.*[9], Upadhyay *et al.*[17], Joshi LN, *et al.*[8], Murthy *et al.*[12] in their study reported a statistically significant increase in PEFR. In adults, smoking is a primary cause of deteriorating forced expiratory volume in 1 second (FEV1) and strongly contributes to the progression towards chronic obstructive pulmonary disease (COPD).[6] In the present study also FEV1 and FVC declines and therefore the risk for COPD were higher in active versus nonsmokers. The present study shows that regular yoga training is associated with significantly higher lung function values in ex-smoker Yogis and therefore there can be a lower lung function decline and risk of COPD in active smokers after quitting smoking habit and regularly practicing yoga. Assessment of health by pulmonary function tests by simple spirometry if used routinely, permit early identification of abnormalities associated with many respiratory diseases. These tests would also provide valuable information in monitoring disease progression, response to treatment and rating disability due to occupational hazards. These tests are user friendly, non-invasive and with a minimal fluctuation of reliability for use by a General Practitioner in community and also in working environment like industries. Pulmonary function tests have become an accepted part of respiratory system studies and screening programmes. Preoperative evaluation of Lung Function Tests has become an integral part of preparing patients with lung disorders who are at increased risk for the interventions. In general, lung function tests in combination with other Radiological and Clinical data, suggest specific diagnosis. Hutchinson, a London Surgeon in 1846 in his classic treatise “On the capacity of lungs and Respiratory Function” introduced the concept of spirometry. The results of this study agree with this fact that sedentary lifestyle is accompanied by significantly lesser lung function values compared to regular yoga practitioners. There is much evidence that sedentary lifestyle is associated with indulging in smoking habit and also that regular physical activity prevents individuals from smoking. Smoking is one of the important reason for quitting the physical activities and participation in sports. The current study has shown that simple lifestyle modification by actively participating in physical activity such as yoga and also abstinence from smoking habit can improve lung function and therefore improve general health condition. In counseling patients who smoke, health professionals can provide abundant information on the improvement in lung function and general health condition following smoking cessation and starting regular physical activity. Since the risk of pulmonary and cardiovascular disease is reduced significantly in even elderly smokers after cessation, the clear public health message is that it is never too late to quit. In summary, the present study shows significant lung function changes in smokers and sedentary individuals compared to the values in regular yoga practitioners. Starting the yoga exercises in early ages in childhood prevents not only the deleterious effects of sedentary lifestyle but also prevents them from indulging in smoking habit that can itself further deteriorate the health condition. Yoga can provide essential physical activity in limited time period and space that not only improve lung function but also provide benefit in general health status in all ages. This study therefore suggests the necessity of Yoga in daily life for all the age groups to improve health and also recommends for counseling the smokers to quit smoking and make Yoga a routine.

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