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Influence of Cigarette Smoking on Spirometric Indices after 3 Months of Intermittent Training

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ABSTRACT

Background: The present study was conducted to assess effect of cigarette smoking on spirometric indices after 3 months of intermittent training. **Methods:** 60 subjects were classified into group I (smokers) and group II (non- smokers). All subjects performed 30 min of interval exercise (2 min of work followed by 1 min of rest) three times a week for 3 months at an intensity estimated at 70% of the subject's maximum aerobic capacity (V O2max). **Results:** The mean FVC in group I was 95.2% and in group II was 101.2%, FEV1 was 94.1% and 104.7% in group I and II respectively, PEF was 88.5% and 96.4% respectively, Tiffeneau index was 0.92% and 1.4% respectively, FEF 25- 75% was 95.3% and 104.5% respectively and FEF 50% was 94.8% and 98.2% respectively. There was improvement of 4.2% in FVC in group I and 1.8% in group II, FEV1 was 5.6% and 0.6% in group I and II respectively, PEF was 3.8% and 1.6% respectively, Tiffeneau index was 1.33% and 0.33% respectively, FEF 25- 75% was 1.6% and 2.3% respectively and FEF 50% was 0.7% and 0.6% respectively. The difference was significant for FVC in both groups and FEV1 for group I ($P< 0.05$). **Conclusion:** With 3 months intermittent training there was improvement in FVC and FEV1 in smokers.

Keywords: Cigarette Smoking, Spirometry.

INTRODUCTION

Examining the relationship of smoking habits, respiratory symptoms and lung function to mortality in men from the general population aged 50-60 years. Cigarette smoking is an important worldwide health problem.[1] This problem is compounded by the fact that the rate of cigarette smoking in young people continues to steadily increase. Cigarette smoking carries major health risks with the most cause-specific mortalities being those of respiratory and cardiovascular diseases. Therefore, smoking habits may affect the respiratory function of youths.[2]

The respiratory function test may indicate deterioration of respiratory function prior to clinical symptoms, and its results can be used to prevent or reduce the incidence of respiratory diseases.[3] Also, the respiratory function test can be conducted in a number of ways, such as measurement of chest expansion, lung volume or flow with spirometry and respiratory muscle strength. Chest expansion as measured by circumference and diameter is simple and inexpensive.[4] Maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP) are simple, convenient, and non-invasive indices of respiratory muscle strength measured at the mouth.

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Respiratory muscle strength depends on the maximal effort of the muscles used in chest expansion during breathing.[5]

The benefit of training programs appears to be important in the general healthy population for increasing cardiorespiratory performance. The practice of physical activity is associated with an increase in V O2max regardless of age. Moreover, several studies examining the effects of physical training on BP, HR, and V O2 max in healthy adults have yielded convincing result.[6] The present study was conducted to assess effect of cigarette smoking on spirometric indices after 3 months of intermittent training.

MATERIALS AND METHODS

The present study was conducted in the department of Physiology. It comprised of 30 smokers and 30 non-smokers who agreed to participate in the study after their written consent was obtained. Ethical clearance of the study was obtained before starting the study.

Demographic profile such as name, age, gender etc. was recorded. They were classified into group I (smokers) and group II (non- smokers). All subjects performed 30 min of interval exercise (2 min of work followed by 1 min of rest) three times a week for 3 months at an intensity estimated at 70% of the subject's maximum aerobic capacity (V O2max). Pulmonary function was measured using spirometry based on standards described by the American Thoracic Society. Pulmonary function variables such

as FVC, FEV1, and FEV1/FVC ratio were recorded. Maximum aerobic capacity was assessed by maximal exercise testing on a treadmill before the beginning and at the end of the exercise training program. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table 1: Distribution of subjects

Groups	Group I	Group II
Status	Smokers	Non- smokers
Number	30	30

[Table 1] shows that group I had smokers and group II had non- smokers. Each group had 30 subjects.

Table 2: Spirometric assessment before the training

Spirometric	Group I	Group II	P value
FVC (%)	95.2	101.2	0.04
FEV1 (%)	94.1	10.4.7	0.01
PEF (%)	88.5	96.4	0.03
Tiffeneau index (%)	0.92	1.4	0.01
FEF 25-75% (%)	95.3	104.5	0.02
FEF 50% (%)	94.8	98.2	0.05

[Table 2, Figure] shows that mean FVC in group I was 95.2 and in group II was 101.2, FEV1 was 94.1 and 104.7 in group I and II respectively, PEF was 88.5% and 96.4% respectively, Tiffeneau index was 0.92% and 1.4% respectively, FEF 25- 75% was 95.3% and 104.5% respectively and FEF 50% was 94.8% and 98.2% respectively. The difference was significant (P< 0.05).

Table 3: Improvement rate in spirometric parameters after 3 months of training

Spirometric	Group I	Group II	P value
FVC (%)	4.2	1.8	0.06
FEV1 (%)	5.6	0.6	0.02
PEF (%)	3.8	1.6	0.01
Tiffeneau index (%)	1.33	0.33	0.02
FEF 25- 75% (%)	1.6	2.3	0.07
FEF 50% (%)	0.7	0.6	0.91

[Table 3] shows that there was improvement of 4.2% in FVC in group I and 1.8% in group II, FEV1 was 5.6% and 0.6 %in group I and II respectively, PEF was 3.8% and 1.6% respectively, Tiffeneau index was 1.33% and 0.33% respectively, FEF 25- 75% was 1.6% and 2.3% respectively and FEF 50% was 0.7% and 0.6% respectively. The difference was significant for FVC in both groups and FEV1 for group I (P< 0.05).

DISCUSSION

Some previous studies have demonstrated the effect of smoking on the pulmonary function of adults. They showed that smoking decreased pulmonary function including forced vital capacity (FVC), forced expiratory volume in one second (FEV1), FEV1/FVC, and forced expiratory flow at 25–75% (FEF 25–75%). Cigarette smoking causes deficits in both FEV1/FVC and FEF 25–75 which indicate airway obstruction and small airway disease in adult smokers.[7,8] A previous study reported that older symptomatic smokers with histories of large numbers of pack-years had lower FVC levels than non-smokers, while young adult smokers had FVC levels equivalent to or higher than equivalent non-smokers.[9] The intensity and duration of smoking by elderly smokers, including the degenerative effect, are likely to have powerful respiratory health effects. However, there is no clear evidence indicating that smoking affects the lung function of youths as severely as in the elderly.[10] The present study was conducted to assess effect of cigarette smoking on spirometric indices after 3 months of intermittent training.

In present study, group I had smokers and group II had non- smokers. Each group had 30 subjects. The mean FVC in group I was 95.2% and in group II was 101.2%, FEV1 was 94.1% and 104.7% in group I and II respectively, PEF was 88.5% and 96.4% respectively, Tiffeneau index was 0.92% and 1.4% respectively, FEF 25- 75% was 95.3% and 104.5% respectively and FEF 50% was 94.8% and 98.2% respectively.

Koubaa et al,[11] conducted a study on 12 cigarette smokers, 10 hookah smokers, and 11 non-smokers in exercise program. All subjects performed 30 min of interval exercise. As expected, prior to the exercise intervention, the cigarette and hookah smokers had significantly lower pulmonary function than the non-smokers. The 12-week exercise training program did not significantly affect lung function as assessed by spirometry in the non-smoker group. However, it significantly increased both forced expiratory volume in 1 second and peak expiratory flow (PEF) in the cigarette smoker group, and PEF in the hookah smoker group. Our training program had its most notable impact on the cardiopulmonary system of smokers. In the non-smoker and cigarette smoker groups, the training program significantly improved V O2 max (4.4 and 4.7%, respectively), V O2 max (6.7 and 5.6%, respectively), and the recovery index (7.9 and 10.5%, respectively).

In present study we found that there was improvement of 4.2% in FVC in group I and 1.8% in group II, FEV1 was 5.6% and 0.6% in group I and II respectively, PEF was 3.8% and 1.6% respectively, Tiffeneau index was 1.33% and 0.33% respectively, FEF 25- 75% was 1.6% and 2.3% respectively and FEF 50% was 0.7% and 0.6% respectively. Tantisuwat et al,[12] compared the respiratory function of smoking and non-smoking youths. Smoking and non-smoking male participants aged between 15 to 18 years were recruited (n=34 per group). Participants were asked to complete a

questionnaire relating to smoking habits and the Fagerström test for nicotine dependence questionnaire, and their respiratory function was tested (measurement of chest expansion, lung function test with a spirometer, and assessment of respiratory muscle strength). All respiratory function tests demonstrated significant differences between the smoking and non-smoking groups. Smokers initiated cigarette smoking between the ages of 15 to 18 years. The most common duration of cigarette smoking was 1-3 years and the degree of nicotine dependence among the youths was at a low level.
The shortcoming of the study is small sample size.

CONCLUSION

Authors found that with 3 months intermittent training there was improvement in FVC and FEV1 in smokers.

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