SMOKING AND LUNG FUNCTIONS IN SPORTSMEN

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ABSTRACT

Ten smoker sportsmen and 17 non-smoker sportsmen and 41 smoker non-sportsmen were studied. Lung function was assessed by means of Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV_1), the ratio of FEV_1 to FVC ($FEV_1\%$) and Peak Expiratory Flow Rate (PEFR). For the smokers, all the tests were conducted before smoking (BS) and 30 min after smoking (AS) two cigarettes consecutively to observe the acute effect of smoking. In the smoker sportsmen there was no significant difference between BS and AS measures of lung function. Before smoking smoker sportsmen had lower values for FEV_1 , $FEV_1\%$ and PEFR than non-smoker sportsmen ($p < 0.05$). However, smoker sportsmen show higher BS values of FEV_1 ($p < 0.01$), $FEV_1\%$ ($p < 0.01$) and PEFR ($p < 0.05$) compared with those of smoker non-sportsmen who had similar smoking indices. These results indicated that the smoker sportsmen, despite exhibiting some degree of lung function impairment in relation to non-smoker sportsmen, still maintained rather better lung function status than the smoker non-sportsmen.

Key words: Smoking, Lung functions, Sportsmen

INTRODUCTION

Cigarette smoking is probably one of the most addictive and dependence-producing self-gratifications known to man (Roussel, 1974). A cigarette smoker has been defined as one who has smoked as much as one cigarette per day for as long as one year (Doll and Hill, 1950). A defensive lung reflex resulting in narrowing of the airways and a consequent rise in airway resistance has been reported (Sterling, 1967). Moreover, inhalation of smoke from even a single cigarette has been shown to cause brief bronchoconstriction in both smokers and non-smokers (Guyatt et al, 1970). Rees et al (1982) reported the reduction in specific conductance of the airways within 8 seconds after starting smoking. However, the maximum acute effect of smoking on lung functions has been reported to be around 30 minutes after smoking (Gosawi et al, 1980). Bronchioles of chronic cigarette smokers have a number of structural abnormalities including mucus plugs, accumulation of pigment laden macrophages (Niewoehner et al, 1974), goblet and squamous cells metaplasia, ulceration, inflammatory cell infiltrate, smooth muscle hypertrophy, fibrosis and excessive pigments (Cosio et al, 1978). Studies using a combination of tests have shown that, depending on smoking history, 70% of smokers have an abnormality in one or more tests (Buist et al, 1973).

The Indian sportsmen have been reported to possess higher values for a number of cardio-respiratory parameters than non-sportsmen (De, 1978, 1979; De et al, 1982; Malhotra et al, 1972). Sportsmen are also found to indulge in smoking despite the fact that it is known to impair their activity (Hutchinson et al, 1986). There is a popular belief in smoker sportsmen that by sports activity, impairment of pulmonary function due to smoking can be avoided. The purpose of this pilot study was to examine the acute effects of smoking on tests of lung function in sportsmen and controls, in addition, to compare the lung function of smoker sportsmen with that of comparable smokers who were not engaged in sports.

MATERIAL AND METHODS

Twenty-seven male sportsmen from a variety of sports 17 non-smokers and 10 smokers, and 41 smoker non-sportsmen volunteered for this pilot project. Their ages and heights are shown in Table I. Among the 27 sportsmen, 10 were habitual smokers and 17 never smoked. Smoker sportsmen were smoking around 8 to 10 cigarettes per day for approximately 4 to 8 years. Smoking indices were calculated on the basis of number of cigarettes consumed per day multiplied by the number of years smoked. For example, 5 cigarettes per day for one year, the smoking index was calculated to be 5 (Cosio et al, 1978). In the present study, the smoking indices were similar (31-90) in both smoker sportsmen and smoker non-sportsmen. Lung function tests mainly FVC, FEV_1 , and PEFR were recorded for each subject using Morgan's pocket spirometer (P. K. Morgan Ltd., Rainham, Kent). $FEV_1\%$ was also calculated for each effort. After demonstration, the tests were conducted in the standing posture without using nose clips (Saliman et al, 1981). Care was taken to avoid diurnal variation. Prior to all these tests subjects were asked not to smoke at least for two hours (Walter and Nancy, 1983) to obtain a clear effect of experimental smoking. Non-smokers performed the tests on one occasion only. Smokers performed all tests twice, i.e. before and 30 min after smoking two cigarettes in succession to assess the acute effect of smoking. The mean of the third, fourth and fifth of a series of technically satisfactory recordings (as recommended by Medical Research Council, 1965) was considered for each subject. All the values were expressed at BTPS. The values of FVC, $FEV_1\%$ and PEFR in Table III have been expressed per unit of height as height has a significant effect on lung volumes and capacities (Mathew et al, 1984).

TABLE I
Age and height of the subjects (mean $\pm$ SD)

Subjects	Age (yr)	Height (cm)
Non-smoker sportsmen (n = 17)	24.76 $\pm$ 4.62	167.74 $\pm$ 3.63
Smoker sportsmen (n = 10)	23.30 $\pm$ 5.73	168.00 $\pm$ 7.23
Smoker non-sportsmen (n = 41)	22.76 $\pm$ 9.43	168.93 $\pm$ 6.80

RESULTS AND DISCUSSION

Comparing the data of lung functions in smoker sportsmen after 30 min of smoking two cigarettes (AS values) with

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before smoking (BS values), numerical differences in values of FVC, FEV₁, FEV₁% and PEFR showing reduction varying between 2.06 to 7.30% were obtained (Table II). However, these differences were not statistically significant. The higher values of BS in non-smoker sportsmen than those of smoker sportsmen were significant for FEV₁, FEV₁% ($p < 0.05$) and PEFR ($p < 0.01$). The present study indicates that smoker sportsmen did not show significant impairment of pulmonary function after smoking as an acute effect indicated by BS and AS values.

The acute effect of smoking on smoker non-sportsmen was to reduce all the mean values of lung function tests significantly (Table III). This is in agreement with previous reports (Gosawi et al, 1980). On the other hand, BS values of pulmonary functions in smoker sportsmen were significantly lower than those of non-smoker sportsmen (Tables II and III).

PEFR has been in use to assess generalised airway obstruction (Crofton and Douglas, 1983). The difference ($p < 0.01$) in PEFR values between smoker and non-smoker sportsmen was suggestive of generalised airway obstruction due to chronic smoking in sportsmen. Further, the lower FEV₁ and FEV₁% ($p < 0.05$) values of the smoker sportsmen could be presumed due to involvement of smaller airways obstruction.

While comparing both BS and AS values between smoker sportsmen and smoker non-sportsmen who had similar smoking indices (Table III), it was observed that smoker sportsmen possessed significantly higher values of FEV₁ and FEV₁% ($p < 0.001$), PEFR ($p < 0.05$) whereas FVC did not show any significant difference between these

groups. The above data therefore are consistent with the suggestion that in smoker sportsmen mean pulmonary function values were probably at higher level before they started smoking and even after chronic smoking, though impairment of lung function occurred, functional capability was maintained at a higher level than in smoker non-sportsmen. One possibility is that this might be attributed to their sporting activities.

CONCLUSION

The present investigation revealed that the acute effects of smoking on sportsmen were negligible but that they could not avoid the effect on lung function. Further, sports and games cannot prevent the impairment of lung functions due to chronic smoking although they may reduce the deleterious effects of the habit.

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TABLE II

Before smoking (BS) and after smoking (AS) values of lung function measurements (mean $\pm$ SD) for non-smoker sportsmen (n = 17) and smoker sportsmen (n = 10)

Subjects of study	Height (cm)	FVC (l)		FEV (l)		FEV ₁ %		PEFR (l.min ⁻¹)	
		BS	AS	BS	AS	BS	AS	BS	AS
A. Non-smoker sportsmen	167.74 $\pm$ 3.63	4.29 $\pm$ 0.49	—	3.63 $\pm$ 0.36	—	84.90 $\pm$ 2.85	—	584.18 $\pm$ 47.92	—
B. Smoker sportsmen	168.00 $\pm$ 7.23	4.09 $\pm$ 0.66	3.87 $\pm$ 0.64	3.21* $\pm$ 0.44	2.97 $\pm$ 0.42	79.15* $\pm$ 8.05	77.52 $\pm$ 8.63	531.70** $\pm$ 42.69	504.50 $\pm$ 45.60

Significantly different between groups A and B, * $p < 0.05$, ** $p < 0.01$

TABLE III

Before smoking (BS) and after smoking (AS) values of lung function measurements related to height (mean $\pm$ SD) for non-smoker (n = 17) and smoker sportsmen (n = 10) as well as smoker non-sportsmen (n = 41), along with smoking indices

Subjects of study	FVC (ml.cm ⁻¹ Ht)		FEV (ml.cm ⁻¹ Ht)		FEV ₁ %		PEFR (l.cm ⁻¹ Ht.min ⁻¹)	
	BS	AS	BS	AS	BS	AS	BS	AS
A. Non-smoker sportsmen	25.60 $\pm$ 2.93		21.69* $\pm$ 2.16		84.90* $\pm$ 2.16		3.49** $\pm$ 0.29	
B. Smoker sportsmen (smoking index 32-80)	24.32 $\pm$ 3.90	23.04 $\pm$ 3.78	19.08 $\pm$ 2.60	17.69 $\pm$ 2.49	79.15 $\pm$ 8.05	77.52 $\pm$ 8.63	3.17 $\pm$ 0.25	3.00 $\pm$ 0.27
C. Smoker non-sportsmen (smoking index 31-90)	22.76 $\pm$ 0.30	21.03†† $\pm$ 0.33	14.97†† $\pm$ 3.33	12.81†† $\pm$ 0.30	65.41†† $\pm$ 9.05	60.64† $\pm$ 8.32	2.97‡ $\pm$ 0.31	2.85 $\pm$ 0.30

Significantly different between groups A and B, * $p < 0.05$, ** $p < 0.01$

Significantly different before smoking and after smoking, † $p < 0.05$, †† $p < 0.001$

Significantly different between groups B and C, ‡ $p < 0.05$, ‡‡ $p < 0.001$

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