Original Research Article

Comparison of pulmonary function between smokers and non-smokers among out patients of Raja Muthaiah Medical College and Hospital, Cuddalore District

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Abstract

Introduction: In India smoking is a common habit prevalent in both urban and rural areas. Cigarette smoking has extensive effects on respiratory function and is clearly implicated in the etiology of a number of respiratory diseases, particularly chronic bronchitis, emphysema, and bronchogenic carcinoma. An attempt has been made to study the pulmonary function among smoker and non-smoker population in a rural area. Nicotine present in tobacco is the most dangerous of all psychoactive substances which is harmful to human race. Approximately 40% of cigarette smokers will die prematurely due to cigarette smoking unless they are able to quit.

Aim and objectives: To compare the pulmonary function in smokers and non-smokers attending the medicine OPD of Raja Muthaiah Medical College and Hospital.

Materials and methods: This present study was a case-control study conducted among 50 smokers (subjects) and 50 non-smokers (control) aged 25-55. PFT measurements were carried out three times in each subject and highest level for forced vital capacity (FVC), forced expiratory volume in first second (FEV1) and peak expiratory flow rate (PEFR) were recorded. Data was analysed using unpaired students t- test and ANOVA.

Results: Smoking had a negative impact on lung function, as compared to non-smokers. There was significant decrease in all pulmonary function ($p < 0.05$).

Conclusion: Almost all the pulmonary function parameters were significantly reduced in smokers and obstructive pulmonary impairment was commonest. Thus by spirometry a spectrum of lung disorders may be detected at an early stage and subsequent morbidity can be minimized.

Key words

Smoker, Spirometry, Pulmonary function, Rural area.

Introduction

In India, smoking is a common habit prevalent in both urban and rural areas irrespective of the mode of smoking i.e. cigarettes, bidis, pipes, cigar, hookah etc. The cigarette/ bidis smoke is a heterogeneous aerosol produced by the incomplete combustion of the tobacco leaf. Besides the direct consequences of smoking on smokers, passive smoking by non-smokers, who are exposed to tobacco smoke also has shown an increased risk of respiratory and cardio vascular problems [1]. After inhalation of cigarette smoke, nicotine is quickly distributed to the brain, and it can affect the central nervous system instantaneously [2]. Tobacco smoke contains 4000 chemicals, out of which 60 are known carcinogens, which can lead to lung cancer [3]. Nicotine affects the cardiovascular system first by stimulating and then paralyzing all the autonomic ganglia and so, at first, there is cardiac slowing, followed by the acceleration of the heart rate [4]. Cigarette smoking has extensive effects on respiratory function and is clearly implicated in the etiology of a number of respiratory diseases, particularly chronic bronchitis, emphysema, and bronchial carcinoma .Pulmonary function testing has come into widespread use since the 1970s [5]. This has been facilitated by several developments because of advances in computer technology. It is a valuable tool for evaluating the respiratory system, representing an important adjuvant to the patient history, various lung imaging studies, and invasive testing such as bronchoscopy and open-lung biopsy [6].

Materials and methods

The study was carried out in Raja Muthaiah Medical College and Hospital in the year 2004 from February to August. The subjects included are 50 male smokers and 50 non-smokers. Cigarette consumption was classified according to the criteria of Rastogi, et al.: mild, 1–10 cigarettes/day; moderate, 11–20 cigarettes/day; heavy consumption, 120 cigarettes/day.

Inclusion criteria

Healthy adult male with no past or present history of smoking between the age group of 25-55 years (Control group). Individuals with a history of cigarette smoking, daily for at least one year, were considered as smokers and they were selected for study.

Exclusion criteria

Refusal for participation in study, Female subjects, and Male subjects with a history of smoking less than one year, Male subjects suffering from diseases which directly or indirectly affect the lung functions.

Demographic data was taken which included age, gender, history of smoking, weight, height. All patients were explained in detail about aim, objectives of study and written consent was taken. A detailed history was taken including age, duration of smoking in years and the number of cigarette smoked per day to see the dose response relationship. A thorough general physical examination of patient including height, weight, body mass index, pallor, vital data and thorough systemic examination were done to exclude medical problems so as to prevent confounding result. Pulmonary function test machine (Med-spirometer version 8.91), nose clip, mouthpiece. 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 closed with nose clip, and asked to seal their lips around the sterile mouthpiece of the spirometer and then to forcefully expire air out. They were given 1-2 trials, so that they understood the procedure. The best three reading was recorded and interpreted

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Various pulmonary function test included in the assessment are

- Vital Capacity (forced vital capacity-FVC): the person was asked to take deep inspiration from outside and then to expire in the spirometer as forcefully and as fast as possible. The graph was recorded and value obtained.
- Peak expiratory flow rate (PEFR): The person was asked to take deep breath and exhale as forcefully as possible in to the mouthpiece in a single blow.
- Forced expiratory flow (FEF25-75%): This is the average rate of air flow between 25% and 75% of total air flow.
- FEV1 (forced expiratory volume in first second): It is the fraction of FVC expired during the first second of the forced expiration. Normally at least 80-83% of the forced vital capacity can be expired in first second.
- FEV1/FVC ratio: forced expiratory volume in first second expressed as a percentage of FVC [7].

Classification criteria as suggested by WHO (1998)

- 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 this study a detailed record of smoking with reference to duration of smoking (in years) and number of cigarettes / bidis smoked per day was taken. None of

individuals smoked tobacco in any form other than bidis or cigarettes.

Results

This present study was a case-control study conducted among 50 smokers (subjects) and 50 non-smokers (control) aged 25-55. PFT measurements were carried out three times in each subject and highest level for forced vital capacity (FVC), forced expiratory volume in first second (FEV1) and peak expiratory flow rate (PEFR) was recorded. Similarly there was no significant difference in the means of other physical parameters like height, weight, body mass index and body surface area in smokers and non-smokers (**Table – 1**).

The mean values of all the pulmonary function tests are significantly reduced in smokers compared to non-smokers. The association of impaired PFT in smokers was found to be statistically highly significant by applying unpaired t test of significance. In the present study obstructive pulmonary changes were most common in smokers (36.0%), followed by mixed (4.0%) and restrictive (2.0%) changes (**Table - 2**). Most of the non-smokers (96.0%) had normal PFT results [8].

Discussion

In the present study it was observed that there was no significant difference in the mean physical parameters like age, height, weight, body mass index and body surface area thereby showing proper matching of smokers and non-smokers. In present study there was a statistically significant decrease in FVC in smokers compared to non-smokers. It is also shown that FVC level decreases more with both increase in duration of smoking and number of cigarettes smoked per day [9]. In present study there was a statistically significant decrease in FEV1 in smokers compared to non-smokers. It was observed that FEV1 decreases more with both increase in duration of smoking and increase in number of cigarettes smoked per day [10]. Most of the cigarette smokers usually smoked non-

filter cigarettes because they were easily available and cheap in the rural areas, the smokers belonged to the rural background and were of a low socio-economic status. In our study, almost all the smokers were deep inhalers. Deep inhaler means that they drew in the cigarettes with prolonged inspiration and exhaled through the mouth or the nose [11]. Others are considered as 'Puffers'. In present study there was a significant decrease in FEV1/FVC ratio. Also this ratio was more decreased with increase in duration of smoking and also with increase in number of cigarettes per day [12]. In present study the level of forced expiratory flow between 25% and 75% of FVC or average forced expiratory flow was reduced in smokers compared to non-smokers which were statistically significant. It was also observed that level of FEF25-75% decreased more with increase in duration of smoking as well as with increase in number of cigarette smoked per day. Present study has shown a significant decrease in the level of PEFR. As with other parameters, it also decreases more with increase in duration of

smoking and increase in number of cigarettes smoked per day [13]. In the present study out of total 100 study subjects 77 (77.0%) had normal lung functions, whereas 23 (23.0%) had impaired lung functions, out of which 21 (91.3 %) were smokers and only 2 (8.7%) were non- smokers. The association between smoking and impaired PFT was statistically highly significant. The smokers had 17.3 times more risk of having impaired pulmonary function as compared to non-smokers [14]. The fall in FEV, PEFR and other flow rates indicate obstructive lung changes and fall in FVC indicates restrictive lung changes. In the present study, obstructive lung dysfunction was commonest among those with impaired pulmonary functions in both smokers (18 out of 21 i.e. in 85.71%) and non-smokers group (2 out of 2 subjects i.e. in 100.0%). The obstructive lung changes were most common and were observed predominantly in only bidi smokers (72.22%), followed by in both cigarette and bidi smokers (22.22%) and only cigarette smokers (5.55%) [15].

Table – 1: Values of demographic data variation between smokers and non-smokers.

Variables	Smokers (Mean±2S.D.)*	Non-smokers (Mean±2S.D.)*
Age (years)	43.26±8.03	43.10±9.34
Height (m)	1.46±0.9	1.55±0.23
Weight (Kg)	75.4±6.8	69.4±11.5
Body Mass Index (BMI)	25.52 ±3.20	20.80±3.37
Body surface area (m^2)	1.80±0.06	1.63±0.14

Table – 2: Pulmonary function tests parameters value among smokers and non-smokers.

Pulmonary Function Tests (PFTs)	Smokers (Mean±2S.D.)	Non-smokers (Mean±2S.D.)	Significance p value
FVC	2.34±1.56	3.67±0.33	0.04352(S)
FEV1	2.68±1.32	2.81±0.86	0.000784(HS)
FEV1/FVC	79.33±21.98	87.49±9.54	0.004808(HS)
PEFR	4.30±3.89	6.80±5.22	0.000139(HS)
FEF 25-75%	2.80±2.03	5.59±1.74	0.00133(HS)

Conclusion

It was shown, that the effect was also dependent on the extent of exposure, both in the form of duration and number of cigarettes. Possible

mechanism for this could be accumulation of inflammatory exudates, excess mucus secretion, altered surface tension or altered smooth muscle tone. Also mediators released from cells present

in or brought to the airway could contribute to these changes. The progressive nature of these changes with continued smoking indicates that at least a proportion of these smokers develop chronic obstructive airways diseases. Human body has tremendous reserve to cope with adversities. Disability develops only when impairment has progressed up to a certain level.

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