Original Research Article

Peak expiratory flow rates in age matched smokers and non-smokers in a tertiary care hospital

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Abstract

Introduction: Tobacco smoking is a major risk factor for various respiratory diseases in humans. PEFR is a useful parameter to monitor airway obstruction, its severity, variation and evaluation of treatment.

Aim of the study: The aim of this study was to assess the PEFR in age-matched asymptomatic smokers and non-smokers.

Materials and methods: Study was conducted in 50 asymptomatic smokers and 50 healthy nonsmokers. PEFR recording was done using Wright's peak flow meter.

Results: On comparing the anthropometric indices, mean weight of the smokers was 61.23 whereas it was 66.88 in nonsmokers which was statistically significant. Mean PEFR of smokers was 354.16 and that of nonsmokers was 409.60 which were significant. Smokers smoking for less than 10 years had a mean PEFR of 368 as against the PEFR of 308 in those with smoking history for more than 10 years. Beedi smokers had the lowest mean PEFR of 256.5 when compared to cigarette smokers mean PEFR of 352.60.

Conclusions: Smoking had a significant impact on the lung function of smokers even though they are asymptomatic. Smokers had a significant reduction in their weight too. Smoking for a longer duration of years affects both cigarette and beedi smokers but the worst was with the Beedi smokers. PEFR is an easy and effective method of detecting deterioration in lung function in OPD setting thus helping to create awareness among smokers to quit smoking as early as possible.

Key words

PEFR, Peak Expiratory Flow Rate, Smokers, Non-smokers.

Introduction

The scope of the burden of disease and death that cigarette smoking imposes on the public's health in extensive [1]. Tobacco use leads most commonly to diseases affecting the heart, liver, and lungs. Smoking is a major risk factor for heart attacks, strokes, COPD, Peripheral Arterial disease, High blood pressure and several cancers [2]. Around 80% of 1.1 billion smokers worldwide live in low and middle-income countries, where the burden of tobacco-related illness and death is heaviest [3]. Indians are the second largest consumer of the tobacco products and the third largest producer of tobacco in the world. The adult population smokers in India is about 84.8million and the death toll from tobacco use is projected to rise from 5.4 million in 2004 to 8.3 million in 2030 [4]. The chronic obstructive pulmonary disease is a major and growing cause of morbidity and mortality in countries at all levels of economic development with smoking being recognized as its most important causative factor. According to WHO estimates, 80 million people in the world have moderate to severe COPD. It is the third leading cause of death worldwide [5]. PEFR is a simple index of the pulmonary function used in both research and clinical practice [6]. It is effort dependent and reflects the status of the large airways [7]. PEFR provides a good objective index to confirm the diagnosis, control medication and monitor response to treatment [8]. Earlier detection of decrements in lung function using this simple test helps to identify obstructive lung disease related to smoking early and hence treatment can be started earlier. Hence, this study is proposed to calculate PEFR in smokers and nonsmokers and to derive the association between a number of pack-years of smoking, type of smoking, with PEFR.

Materials and methods

The subjects of the study were 50 healthy male smokers and 50 healthy male nonsmokers, who accompanied the patients attending OPD of Karpaga Vinayaga Institute of Medical Sciences, Kancheepuram district. The study was conducted from June 2018 to August 2018. Ethical clearance was obtained from the Institutional ethical committee.

Inclusion criteria

Cases: Asymptomatic male smokers with a history of smoking for more than 5 years and those who smoke more than 5 cigarettes/beedis or both per day.

Controls: Healthy male subjects with no past or present history of smoking.

Exclusion criteria

- Female subjects.
- Male subjects with acute/ chronic illness or any respiratory illness or those who work in places where lungs are affected by dust or fumes.
- Male subjects with musculoskeletal, neuromuscular, allergic or endocrine disorders.

Informed consent was obtained after explaining the procedure. Information about age, duration, and type of smoking was taken. Anthropometric measurements were recorded. The PEFR recording was done in the morning hours between 11 am to 1 pm with Wrights Peak flow meter. The readings were taken in all the subjects in standing position. Each subject was told to take a deep breath and then blow into the peak flow meter as forcibly and as fast as he can. Three recordings were taken from each subject and the best value was recorded.

Statistical analysis was done using unpaired T-test and ANOVA. P value < 0.05 was taken as statistically significant and <0.001 as statistically highly significant.

Results

Table - 1 showed the age and anthropometry indices of the study subjects. The mean age of smokers was 42.68±13.32 and the mean age of nonsmokers was 42.24±14.15. There was no significant difference (P>0.05) regarding the age of both smokers and nonsmokers thus proving that the study was age-matched. The mean weight of the smokers was 61.23± 9.804 and the mean weight of nonsmokers was 66.88±12.909. There was a significant (P<0.05) reduction in weight among smokers when compared to nonsmokers. The mean height of smokers was 161.82± 6.623 and that of nonsmokers was 170.98±2.814. It was not statistically significant (P>0.05).

Table - 1: Age and anthropometry of the study subjects.

	Smoking status	N	Mean	Std. Deviation	T value	P value
Age	Smoker	50	42.68	13.32	0.16	0.873
	Non smoker	50	42.24	14.15		
Weight	Smoker	50	61.23	9.804	2.7	**0.016***
	Non smoker	50	66.88	12.909		
Height	Smoker	50	161.82	6.623	1.28	0.148
	Non smoker	50	170.98	42.814		

***P-Value <0.05 was significant**

Table - 2: Pulmonary function tests of smokers vs non-smokers.

	Smoking status	N	Mean	Std. Deviation	T value	P value
Best PFR	Smoker	50	354.16	85.265	2.974	**0.002***
	Non smoker	50	409.60	100.549		

*** P-Value <0.05 was significant**

Table - 3: Pulmonary function test based on duration and number of smoking among smokers.

	Duration of smoking	N	Mean	Std. Deviation	T value	P value
Best PFR	<10 years of smoking	38	368	86.15	24.1	**.005***
	>10 years of smoking	12	309	65.55		
	Number of cigarettes/day	**N**	**Mean**	**Std. Deviation**	**T value**	**P value**
	<10 Cig/day	46	350.61	83.03	0.76	0.49
	>10 Cig/day	4	395	113.55		

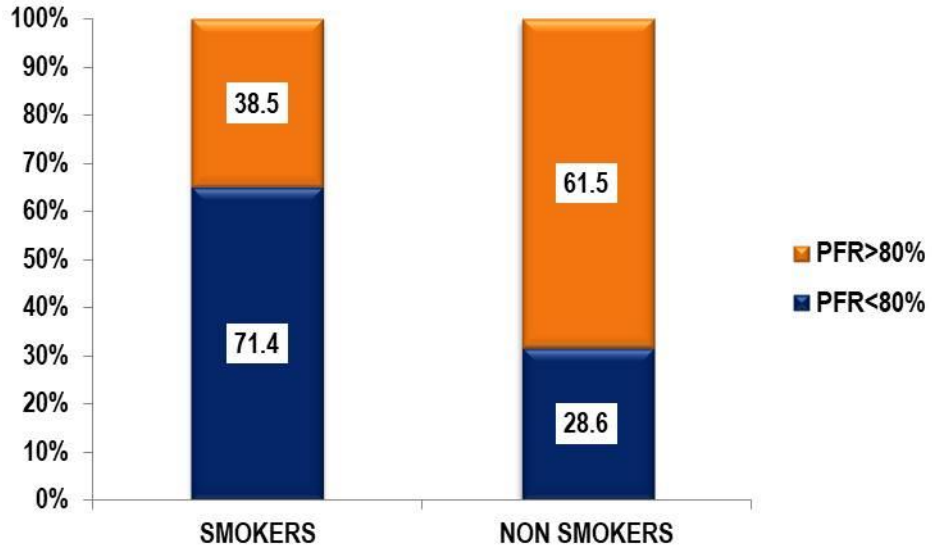
*** P Value <0.05 was significant**

Table - 4: Pulmonary function test based on type of smoking among smokers.

Type of smoking	N	Mean	Std. Deviation	F value	P value
Cigarette	30	374.2	73.4	11.619	**.000***
Beedi	11	256.5	56.9		
Cigarette (filter)	4	352.6	51.3		
Cigarette/Beedi	5	438	38.8		

Table - 2 showed the PEFRs of smokers and nonsmokers. The mean PEFR of smokers was 354.16±85.265 and that of nonsmokers was 409.60 ± 100.549. Unpaired T-test showed that the mean values of PEFR were significantly lower in smokers than nonsmokers.

Figure – 1: PFR values among smokers vs non-smokers.



Unpaired T-test was used in **Table - 3** to know the PEFR based on duration and number of smoking among smokers. Subjects who smoked for >10 years had a significant reduction (P<0.05) in PEFR than who smoked for less than 10 years. In this study there was no statistically significant reduction in PEFR when comparing the number of smokings per day.

Table - 4 showed the differences in PEFR among smokers based on the type of smoking using ANOVA test. The mean PEFR of beedi smokers was 256.5± 56.9 compared to that of cigarette smokers those mean PEFR was 374.2±73.4. There was a statistically significant decrement in (P<0.05) PEFR among beedi smokers. The PEFR was < 80% in 71.4% of smokers and 28.6% of nonsmokers. This was depicted in the **Figure - 1** which again was statistically highly significant.

Discussion

Cigarette combustion produces a smoke with more than 4000 noxious components, including gas and particulate substances – among them, we have acrolein, cotinine, acetaldehyde, phenol, and potassium cyanide 8, and many of these components are provenly toxic to the respiratory epithelium [9]. Smoking tobacco in any form causes irritation of respiratory tract which in turn causes hypertrophy of mucosal cells resulting in increased secretion of mucus and formation of mucosal plugs [10]. Other factors involved in narrowing of the respiratory tract in smokers are bronchoconstriction, activation of inflammatory cells, loss of elastic recoil of lungs, slowing of movement of cilia thus making mucociliary clearance difficult and angiogenesis in the respiratory tract [11, 12]. In our present study, when comparing the anthropometry indices among smokers and nonsmokers, the weight of the smokers was significantly reduced when compared to nonsmokers whereas there were no differences in age and height. Contrary to this statement, a study by Parvez et al revealed that there was no significant difference between mean age, weight, height and BMI of smokers and nonsmokers [13]. A study by Demetrius, et al. have concluded that cigarette smokers weighed less and were leaner than nonsmokers controlling for age and sex [14]. PEFR was significantly lower among smokers when compared with age-matched nonsmokers in this study. The same results were derived in many studies [15-18]. Smokers even if they are symptom-free, have lower values of PEFR than nonsmokers. Early detection of airflow obstruction and smoking cessation may result in significant health gain [15]. Higgins M W, et al. conducted a study titled smoking and lung function in elderly men and women and they found lung function was

related inversely to pack-years of smoking [19]. In our present study, PEFR of smokers who have a history of smoking for more than 10 years has a significant reduction. But the number of cigarettes per day doesn't seem to affect PEFR. This may be probably due to small numbers of subjects who smoked more than 10 cigarettes per day. (Only 4 subjects had H/o smoking > 10 cigarettes per day). PEFR was also significantly lower in beedi smokers than a cigarette and both cigarette + beedi smokers. This can be accounted on the basis of the excess amount of carbon monoxide, tar and other toxic constituents present in the smoke of the beedi [20]. Similar findings are reported by studies done by Padmavathy, et al. [21]; Rubeena Bano, et al. [22]; and Jain SK, et al. [23].

Conclusion

The inferences from the present study revealed that smokers even though asymptomatic have a significant reduction in PEFR compared to their age-matched nonsmokers. Smoking affects the weight of the person making it as an important risk factor in deteriorating PEFR. Smoking in any form cigarette/beedi/cigarette and beedi both will affect the lung function and especially the beedi smokers are affected the most. PEFR measurement is a simple outpatient test done with a handheld user friendly apparatus. It must be present in all health care centers to assess the lung function and alarm the patient to quit smoking.

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