A COMPARATIVE STUDY ON PULMONARY FUNCTION TEST BETWEEN SMOKERS AND NON-SMOKERS

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ABSTRACT

BACKGROUND
Smokers are prone to develop Chronic Obstructive Pulmonary Diseases (COPD) than non-smokers. Chronic Obstructive Pulmonary Diseases (COPD) includes chronic bronchitis, bronchial Asthma, and emphysema. Pulmonary function test is a routine procedure for assessment and monitoring diseases.

OBJECTIVE
To estimate the Pulmonary function test like Forced Vital Capacity(FVC), Forced Expiratory Volume in one second(FEV_1), FEV_1/FVC ratio and Peak Expiratory Flow Rate (PEFR)among smokers and non-smokers. Also, to study the effect of age and body mass index (BMI) on the pulmonary function of these groups of people.

MATERIAL AND METHOD
It is a cross sectional study. The study was conducted among students and staff of Silchar Medical College and Hospital 121 subjects were selected, among them 60 were smokers and 61 non-smokers. Spirometric tests were carried out to assess pulmonary function.

EXCLUSIONS CRITERIA
Subjects having cardio pulmonary diseases.

RESULT
Mean FVC, FEV_1 and PEFR were found to be of lower value in smokers than non-smokers. There were significant differences between mean spirometric values among smokers and non-smokers.

CONCLUSION
Pulmonary function declines in smokers.

KEYWORDS
Smokers, Non-Smokers, Pulmonary Function Test, Spirometer, Body Mass Index (BMI).

INTRODUCTION: Tobacco is the most important predisposing factors for cardiovascular and respiratory diseases. Chronic obstructive pulmonary disease is one of the most important causes of morbidity and mortality in chronic tobacco smoker's worldwide. COPD cause chronic obstruction to airflow in small airways less than 2 mm in diameter. Pulmonary function testing is a routine procedure for the assessment and monitoring of respiratory disease.[1] This obstruction in airways invariably affects the parameter of pulmonary function e.g., FVC, FEV_1, FEV_1/FVC and PEFR.

Spirometric values vary according to age, height and body size.[2,3,4] Continued surveillance and educational interventions emphasizing the harm and addictiveness of tobacco smoking may be valuable for smoking subjects.[5]

MATERIAL & METHOD: A cross sectional study was conducted in the department of Physiology at Silchar medical college. Approval was obtained from the institutional ethical committee. 121 individuals voluntarily agreed to participate in the study and gave informed written consent. Subjects were selected among students, staff and were screened through a questionnaire for smokers and nonsmokers. 60 were smokers and 61 were nonsmokers.

Structured questionnaire included personal data related to age, gender, occupation and questions related to Smoking habits, onset, duration, number of cigarette per day. Anthropometric measurements as Weight was

measured by using a standard weighing machine, Height was measured by using a stadiometer and body Mass Index (BMI) were calculated by using Quetelet index. According to guideline stated by National Institute of Health, weight status is classified into four groups: underweight (BMI 18.5), Normal weight (BMI between 18.5 -24.9), Overweight (BMI between 25-29.9) and Obese (BMI ≥ 30).[6]

Spirometric tests were done by using digital computerized spirometer (Medspiror), to assess the pulmonary function of the subjects which include Forced Vital Capacity (FVC), Forced expiratory volume in first second(FEV_1), FEV_1/FVC, FVC% and Peak expiratory flow rate(PEFR).

Procedure: Before performing the spirometry, the procedure was explained and demonstrated to the subjects. Each subject's standing height measured by using a stadiometer and weight were obtained in light clothing and without shoes by standard weighing machine. The study was conducted in the department of Physiology, Silchar Medical College, Silchar, between 10 am to 11am after a light breakfast. The subject breathed in as deeply as possible and then blew out as hard and fast as possible to assess and estimate the pulmonary parameters. Each individual made three attempts and the largest value of each parameter was recorded.[7]

RESULTS: All data were analyzed statistically.

Variable		No	%
Age (years)	<20	12	9.91
	20-29	27	22.31
	30-39	29	23-96
	40-60	53	43.8
Smokers		60	49.58%
Non-smokers		61	50.41%
Table 1: Characters of study subjects (121) (Mean values±SD)			

In table-1 the finding includes 60 smokers with mean age 34.85±12.84 years and Non-smokers with mean age 36.21±9.40. Most of them were male. Smokers (49.58%) and Non-smokers (50.41%),

Concerning of the mean height, weight in Table-3 and BMI for smokers & non-smokers were 159.68±6.87, 54.13±7.93, 21.25±2.82 & 163.52±7.50, 57.14± 7.50 and 21.29± 2.43 respectively.

Also mean spirometric values of FVC, FEV_1, FEV_1/FVC and PEFR for smokers & non-smokers were 1.8±0.44, 1.66±0.46, 89.35±10.63 and4.48±1.71&2.93±0.56, 2.60±0.48, 84.98±7.58 and 7.06±1.67 respectively.

				FVC	FEV_1	FEV_1/FVC	PEFR
BMI	Under weight <18.5	22	18.18%	2.37±0.72	2.37±0.64	94.35±6.06	6.00±1.86
	Normal - 18.5-24.9	90	74.38%	2.39±0.76	2.07±0.68	88.63±9.10	5.58±2.11
	Overweight -25-29.9	9	7.43%	2.11±0.16	2.36±0.44	88.72±6.24	6.40±2.44
	Obesity ≥30	0					

Table 2

Table 2 Shows BMI concerning underweight, normal weight and overweight and their numbers, percentage and & spirometric variables of smokers and non-smokers group.

Variables	Smokers (Mean±SD)	Non-Smokers (Mean±SD)	P-value
FVC(L)	1.8±0.44	2.93±0.56	<0.05
FEV_1(L)	1.66±0.46	2.60±0.48	<0.05
FEV_1/FVC %	84.98±7.58	89.35±10.63	<0.05
PEFR(L)	4.48±1.71	7.06±1.67	<0.05
BMI	21.25±2.82	21.29±2.43	
Height	159.68±6.87	163.52±7.50	
Weight	54.13±7.93	57.14±7.50	
Age	34.85±12.84	36.21±9.40	
Table 3			

Table 3 Shows that there is statistical difference between mean spirometric values FVC, FEV_1, FEV_1/FVC and PEFR between smokers and non-smokers & that Mean spirometric parameter like FVC, FEV_1 and PEFR are higher value in Non-Smokers than Smokers. The result of spirometric analysis is significant at P<0.05.

BMI - Body Mass Index.
FVC - Forced Vital Capacity.
FEV_1- Forced Expiratory Volume in one Second FEV_1/FVC%.
PEFR - Peak Expiratory Flow Rate.
SD - Standard Deviation.
L – Liter.

DISCUSSION: Spirometry is performed to assess pulmonary function which is an important diagnostic tool for assessing pulmonary diseases. The interpretation of pulmonary function depends on the comparison to reference values derived from healthy subjects.

Although the values of spirometric variables were found to be higher in males in all age groups, the difference in FVC was significantly higher in younger age group. This finding is similar with other international studies.[8,9] Again, in some studies, age was found to be independent variable for spirometric values.[10]

Studies have found that body weight and fat inversely related to spirometric variables. Adiposity caused restriction of chest and (diaphragm) abdominal movements.[10] But in our study, BMI was not significantly associated with most of the spirometric values.

CONCLUSION: We conclude that mean FVC, FEV_1 and PEFR were higher in non-smokers than smokers. Pulmonary function changes from adolescence to old age group. BMI was not significantly associated with most of the spirometric values. In order to generalize these reference values, a larger study, following the criteria set by the American Thoracic society is needed as demographic and anthropometric character changes with passage of time.

RECOMMENDATIONS: As previous studies recommended that university curriculum must include information about smoking cessation.[11]

The current study indicates that cigarette smoking is mainly a problem of male students; the smoking cessation support for youths in this country is urgently needed. The smoking epidemic is so huge that every effort is needed to launch an effective campaigning to protect our people so that they can maintain a good quality healthy life.

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