National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Influence of smoking on forced expiratory volume in first second: A case–control study

Gurunath Andappa Birajdar[1], Neelam Bala Prasad[2]

[1]Department of Physiology, B. K. L. Walawalkar Rural Medical College and Hospital, Sawarde, Ratnagiri, Maharashtra, India, [2]Department of Physiology, Dr. D. Y. Patil Medical College, Hospital and Research Centre, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

Correspondence to: Gurunath Andappa Birajdar, E-mail: drgurubirajdar@gmail.com

Received: March 27, 2020; **Accepted:** April 06, 2020

ABSTRACT

Background: Smoking is one of the significant contributing risk factors for chronic obstructive pulmonary disease (COPD) and increases risk of death in cardiovascular and respiratory disorders. **Aims and Objectives:** This study was planned to see the influence of cigarette smoking on forced expiratory volume in first second (FEV1). **Materials and Methods:** FEV1 of 50 male moderate smokers (asymptomatic) and 50 healthy male non-smokers of age and height matched was recorded using RMS Helios 401 Spirometer. **Results:** The reduction of FEV1 in smokers was statistically significant. **Conclusion:** Smoking is preventable cause of COPD. Reduced FEV1 value in smokers is an indicator of risk factor for the development of COPD which can be prevented by early identification and proper counseling in asymptomatic smokers. This is important to prevent future complications.

KEY WORDS: Forced Expiratory Volume in First Second; Males; Moderate Smokers

INTRODUCTION

Tobacco addiction leads to high morbidity and mortality which has been ascribed to the pharmacological properties of nicotine.[1-3] Smoking decreases lifespan amounting significantly to premature deaths.[4,5]

By forced expiratory volume, it has been shown that there is a subdivision among smokers which is highly susceptible to irreversible obstructive changes, leading to speedy deterioration in lung function.[6] It has also been shown that there is deleterious impact on the central and peripheral airways due to smoking of a cigarette.[7]

Access this article online	
Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2020.10.03079202006042020	

Spirometry is extensively used as non-invasive test of ventilatory functions. Ventilatory assessment is done systematically both in the clinics and in patients self-monitoring of FEV1. It offers scope to improve patient understanding, self-management, and quality of life for those with lung disease.[8] Being relatively simple, affordable, and non-invasive, it can be used on a large scale by primary care providers to facilitate early intervention.[9] For the assessment of airflow obstruction, FEV1 is the quite essential variable derived from spirometry.[10] The procedure for measuring FEV1 is very time efficient, safe and causes minor discomfort to the patient.[11]

Taking into view the above scenario, the present case–control study was planned to assess the influence of cigarette smoking on forced expiratory volume in first second (FEV1) in moderate smokers.

MATERIALS AND METHODS

The present study was undertaken after approval of the Institutional Ethical Committee.

Inclusion Criteria for Study Group

a. 50 male subjects
b. Age 20–50 years
c. Asymptomatic moderate cigarette smokers.

Inclusion Criteria for Control Group

a. 50 male subjects
b. Age 20–50 years
c. Non-smokers of any type.

Moderate smokers were defined as cigarette smoking of 8–10 pack-years.[11]

Pack-year was calculated using the following formula.

Pack-years= cigarette smoked per day X years smoked/20

Exclusion Criteria

The following criteria were excluded from the study:

- Subjects with respiratory, cardiovascular diseases and cerebrovascular diseases, endocrinological disorders, or any systemic disease
- Passive smokers and hookah smokers
- Obese and underweight subjects were excluded
- Family history of asthma, bronchitis, or respiratory illness.

Personal details as name, age, sex, occupation, and contact number were obtained. The anthropometrical data measured were height in cm and weight in kg.

Pulmonary function test was carried out using RMS Helios 401 Computerized Spirometer (manufactured by Recorder and Medicare system, Chandigarh-160002) with built in computer program. Test was done on the subject comfortably seating in posture. All subjects were made familiar with the instrument and procedure for performing pulmonary function tests.[12,13]

The subject was asked to take deep full inspiration, which was followed as much rapid and forceful expiration in mouthpiece of spirometer. Three consecutive readings were taken and best among three was taken for the study. Rest for 10 min was given between each effort. Percentage predicted values of %FEV1 were selected for the study.

Statistical Analysis

Data statistically analyzed by calculating mean and standard deviation. Statistical difference was evaluated by Chi-square test and $P \leq 0.05$ was considered as statistically significant.

RESULTS

Table 1 shows that there was no significant difference in age, height, and weight between the study group and control. Age and height matched. Furthermore, it shows that percentage predicted value of FEV1 is significantly decreased in the study group. Table 2 shows that signs of mild airflow obstruction were seen in 13 subjects in the study group and 6 subjects in the control group.

DISCUSSION

In the present study, 50 male asymptomatic moderate smokers 20–50 years aged were compared with 50 male nonsmokers. Mild airway obstruction was seen in 13 subjects in the study group and 6 subjects in the control group.[14] Further, our results also indicated that airway obstruction has direct relations with number of pack-years of smoking.[15]

The mean value of FEV1 in non-smokers was higher as compared to that in asymptomatic moderate smokers with significant *P*-value. Similar results were found by Fletcher and Peto,[6] Tager *et al*.,[16], and Omar Farouk Helal.[17] There is a rapid deterioration in pulmonary function tests such as FEV1 which indicates diameter of airways due to smoking.[18]

The reduction in FEV1 may be due to airway smooth muscle contraction which, in turn, increases resistance.[19] Damage of airway epithelia causing changes in permeability and other epithelial function, chronic airway inflammation, changes in the structure of airway wall, and depletion of alveolar attachments are all the suggested pathological changes that may lead to airway narrowing in smokers.[20]

FEV1 screening should be used to identify the high-risk group of susceptible smokers. Targeted approach for smoking cessation can then be taken in these susceptible smokers.[21]

Table 1: Age, anthropometric parameters, and % FEV1 in both groups

Parameters	Cases	Controls	*P*-value
	Mean±SD (*n*=50)	Mean±SD (*n*=50)	
Age	35.86±8.17	33.28±8.11	0.11
Height (cm)	174.14±3.52	174.4±3.47	0.71
Weight (kg)	70.46±4.80	71.94±7.06	0.22
%FEV1	90.5±10.20	100.64±11.83	0.00**

%FEV1: Percentage predicted value of forced expiratory volume in first second

Table 2: Number of subjects with "Mild Airflow Obstruction" in both groups

Airflow obstruction	Cases	Controls
Normal	37	44
Mild obstruction	13	6
Total	50	50

Strengths

Earlier detection of respiratory damage in asymptomatic smokers will prevent future complications.

Limitations

1) Small sample size
2) Only males were included
3) Should be done on both males and females with large sample size.

CONCLUSION

Smoking is preventable cause of chronic obstructive pulmonary disease (COPD). Reduced FEV1 value in smokers is an indicator of risk factor for the development of COPD which can be prevented by early identification and proper counseling in asymptomatic smokers. This is important to prevent future complications.

REFERENCES

1. Bajentri AL, Veeranna N, Dixit PD, Kulkarni SB. Effect of 2-5 years of tobacco smoking on ventilatory function tests. J Indian Med Assoc 2003;101:96-7, 108.
2. Ray R, Schnoll RA, Lerman C. Nicotine dependence: Biology, behavior, and treatment. Annu Rev Med 2009;60:247-60.
3. Martin LM, Sayette MA. A review of the effects of nicotine on social functioning. Exp Clin Psychopharmacol 2018;26:425-39.
4. Boyle P. Cancer, cigarette smoking and premature death in Europe: A review including the recommendations of European cancer experts consensus meeting, Helsinki, October 1996. Lung Cancer 1997;17:1-60.
5. Hole DJ, Watt GC, Davey-Smith G, Hart CL, Gillis CR, Hawthorne VM. Impaired lung function and mortality risk in men and women: Findings from the renfrew and paisley prospective population study. BMJ 1996;313:711-5.
6. Fletcher C, Peto R. The natural history of chronic airflow obstruction. Br Med J 1977;1:1645-8.
7. Roth MD, Arora A, Barsky SH, Kleerup EC, Simmons M, Tashkin DP. Airway inflammation in young marijuana and tobacco smokers. Am J Respir Crit Care Med 1998;157:928-37.
8. Pierce R. Spirometry: An essential clinical measurement. Aust Fam Physician 2005;34:535-9.
9. Ferguson GT, Enright PL, Buist AS, Higgins MW. Office spirometry for lung health assessment in adults: A consensus statement from the national lung health education program. Chest 2000;117:1146-61.
10. Lung function testing: Selection of reference values and interpretative strategies. American thoracic society. Am Rev Respir Dis 1991;144:1202-18.
11. Khan A, Shabbir K, Ansari JK, Zia N. Comparison of forced expiratory volume in one second (FEV1) among asymptomatic smokers and non-smokers. J Pak Med Assoc 2010;60:209-13.
12. Pherwani AV, Desai AG, Solepure AB. A study of pulmonary function of competitive swimmers. Indian J Physiol Pharmacol 1989;33:228-32.
13. Nerkar N, Ashok P, Purandare VR. Comparative study of forced expiratory flow and peak expiratory flow in males with and without Type-2 diabetes mellitus. Natl J Physiol Pharm Pharmacol 2019;9:917-9.
14. Longmore M, Ian B, Wilkinson IB, Rajagoplan S. Chest medicine. In: Oxford Handbook of Clinical Medicine. 6th ed. New York: Oxford University Press; 2004. p. 189.
15. Parkhad SB, Palve SB. Pulmonary function tests and their reversibility in Saudi Arabian smokers. Natl J Physiol Pharm Pharmacol 2014;4:29-33.
16. Tager IB, Munoz A, Rosner B, Wiess ST, Carey V, Spiezer FE. Effect of cigarette smoking on the pulmonary function of children and adolescents. Am Rev Respir Dis 1985;131:752-9.
17. Helal OF. Impact of smoking on adults lung age and ventilator function. Int J Physiother Res 2014;2:453-59.
18. Burrows B, Knudson RJ, Cline MG, Lebowitz MD. Quantitative relationships between cigarette smoking and ventilatory function. Am Rev Respir Dis 1977;115:195-205.
19. Macklem PT. A theoretical analysis of the effect of airway smooth muscle load on airway narrowing. Am J Respir Crit Care Med 1996;153:83-9.
20. Saetta M, Finkelstein R, Cosio MG. Morphological and cellular basis for airflow limitation in smokers. Eur Respir J 1994;7:1505-15.
21. Young RP, Hopkins R, Eaton TE. Forced expiratory volume in one second: Not just a lung function test but a marker of premature death from all causes. Eur Respir J 2007;30:616-22.

How to cite this article: Birajdar GA, Prasad NB. Influence of smoking on forced expiratory volume in first second: A case–control study. Natl J Physiol Pharm Pharmacol 2020;10(05):434-436.

Source of Support: Nil, **Conflicts of Interest:** None declared.