

Is Passive Smoking Affect on Pulmonary Functions?

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Abstract: Background: Passive smoking is a world health problem and part of the tobacco epidemic which victimizes mostly adolescents. Epidemiological studies have, essentially, addressed the association between passive smoke exposure and respiratory health in adult population, and increased risk of chronic obstructive pulmonary disease (COPD) & lung cancer among adult nonsmokers. Relatively few studies have been reported on lung function in relation to effects of passive smoking among nonsmoking individuals. **Objective:** To investigate the effects of passive smoking on lung functions among individuals in urban region. **Materials and Method:** The present study was composed of smokers, passive smokers (control), aged between 17 and 25 years. Sixty healthy individuals were placed in two different groups on the basis of questionnaire (Group A: active smoker, Group B: passive smoker). Study was done with the help of computerized spirometry (spiroexcel). **Results:** FVC, FEV1, PEFR, FEF_{25-75%}, FEV1/FVC% values were significantly decreased in passive smokers as compared to smokers individuals (P<0.001, P<0.05). **Conclusions:** The present study suggests a significant reduction of lung functions in individuals exposed to passive smoke.

Keywords: Passive Smoking, Active Smoking, Lung Functions, FEF_{25-75%}, VC, FEV1/FVC%.

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INTRODUCTION

Cigarette smoking has been identified as the single most important source of premature mortality [1]. Tobacco smoke contains over 4000 chemicals in the forms of particles and gases [2]. When burned, cigarettes create more than 7,000 chemicals. At least 69 of these chemicals are known to cause cancer, and many are toxic.

Passive smoking or environmental tobacco smoke (ETS) exposure has been variously described as 'second-hand smoke' or 'involuntary smoking'. ETS comprises the amount of tobacco smoke which is not inhaled by the smoker (sidestream smoke-SS), as well as the portion of inhaled smoke (mainstream smoke) which is not retained in the smoker's lung, and is exhaled into the environment. In enclosed spaces, smoke accumulates, and the concentration varies with the number of smokers, with the type of smoking, and with the characteristics of the room, especially the ventilation. Although the exposures to active smoke and ETS are not

identical, the latter appears to include most tobacco combustion byproducts, including irritants, and carcinogens [3].

The most popular Indian smoking product is "bidi" (also spelled as beedi). Bidis are made of crude sun-dried tobacco wrapped in a dried Tendu (*Diospyros melanoxylon*) leaf. Another smoking product used in different parts of India is "chillum" or "hooka", which resembles a pipe made of clay. Tobacco is burnt along with molasses and coal, and smoked either directly or through a long pipe with smoke passing through a water container. The amount of nicotine and tobacco alkaloids present in the mainstream smoke (MS) of these vernacular tobacco products is likely to be different from those present in the MS of standard cigarettes because of the differences in their design (e.g. water acts as a filter in hooka and no filter exists in most bidis) [4]. Smoke causes an increase in the number of pulmonary alveolar macrophages (PAM). Macrophages release a chemical substance that attracts leucocytes in lung. Leucocytes in turn release proteases including elastase which attack

elastic tissue in lung [5]. Normally alpha-1antitrypsin inactivates elastase and other proteases. Alpha-1 antitrypsin is inactivated by oxygen radicals which are released by the leucocytes leading to protease antiprotease imbalance with increased destruction of lung tissue. Exposure to passive smoking is associated with diverse health effects in nonsmokers. These adverse health outcomes include heart disease, lung cancer, asthma, chronic obstructive pulmonary disease (COPD), and upper airway problems [6]. Few studies have been conducted to study the effect of ETS on pulmonary function in developing countries like India, Environmental conditions like overcrowding, poor ventilation in homes and cramped living conditions, the health effects of ETS exposure may be even more pronounced [7]. Moreover, the effects of ETS exposure on children important aspects, as their respiratory and immune systems are still in developmental stages, possibly putting them at high risk of being affected by passive smoke. Such environment is more common in developing countries like India, because of its large population. In this study we evaluated the effects of exposure to passive smoking among young adults.

MATERIALS AND METHODS

The study was carried out at department of physiology, Nootan Medical College Visnagar. It was a cross sectional study. The present study was composed of smokers and passive smokers (control), aged between 17 and 25 years. Only healthy male subjects were included in the present study. No female subjects were included. The subjects selected for present study were recruited from our institution. Sixty healthy individuals were placed in three different groups on the basis of questionnaire (Group A active smoker and Group B passive smoker control). The study was approved by the Institutional ethics committee Visnagar and an informed consent was taken from all the subjects after explaining the test procedures and the goal of the study.

Study Group

- Group A (Active smokers-male); individuals with history of cigarette smoking more than three years were considered as active smokers.
- Group B (Passive smokers-male); Non-smoking male subjects those who lived with at least one smoker or interacted with a smoker at work for at least three years prior to the study.

Inclusion, Exclusion Criteria

- **Inclusion Criteria:** Healthy individuals in the age group of 17 – 25 years.
- **Exclusion Criteria:** Subjects on medication for Respiratory (RS), Cardiovascular (CVS) and Central nervous system (CNS) disorders.

Subjects with past and present history of CVS disorders, diabetes, psychiatric illness. Subjects with H/O drug abusing.

Test Parameters Chosen for This Study Are:

- PEFR (L/S) (Peak expiratory flow rate)
- FEV1 (L) (Forced expiratory volume in first second of FVC)
- FVC (L) (Forced vital capacity)
- FEV1/FVC (%)
- FEF_{25-75%} (Forced expiratory flow)

STUDY PROCEDURE

A detailed clinical history of these subjects are to be taken such as Relevant past history, family history, any drug history, personal history like smoking, alcoholism etc. Study was done with the help of spirometer (Spiro Excel). The whole procedure was explained to the subject thoroughly. Anthropometric measurements (height, weight, BMI, BSA) were recorded for each subject. Relevant data (name, age, sex, height, weight) was entered into computer program. The subjects were given proper instructions prior to each parameter. All the pulmonary function tests were performed with the subjects in standing position and wearing nose clips [8].

The subjects were asked to take deep inspiration from outside and then to expire as forcefully and as fast as he can inside the mouthpiece. A nose clip was applied during the entire procedure. Tests were repeated three times and the best matching results were considered for analysis.

Statistical Analysis: The two groups were compared by student's unpaired t test with 5% level of significance.

RESULTS

Sixty healthy individuals were included in the present study. Table 1 shows mean age, height, weight, body mass index and body surface area of active smokers, passive smokers & control individuals. There was no significant difference in the mean physical parameters like age, height, weight, body mass index and body surface area among active smokers and passive smokers individuals. Table 2 shows lung functions (FVC, PEFR, FEV1, FEV1/FVC ratio, FEF 25-75%) of active smokers and passive smokers subjects. The values of all Pulmonary functions were decreased in active smokers as compared to passive smokers. Values of FVC (vital capacity) were decreased significantly in active smokers ($P=0.010$) however there were significant changes in FVC, PEFR, and FEV1 values among active smokers and passive smokers as compared to each others.

Table 1: Physical characters of Active smokers and Passive smokers subjects

Variables	Active Smokers Mean $\pm$ S.D. (N=30)	Passive Smokers Mean $\pm$ S.D. (N=30)	P Value	Significance
Age (yrs)	24.10 $\pm$ 10.11	23.19 $\pm$ 12.09	0.75	NS
Height (m)	1.70 $\pm$ 0.19	1.71 $\pm$ 0.22	0.85	NS
Weight (kg)	59.5 $\pm$ 9.20	61.4 $\pm$ 12.06	0.49	NS
Body mass index	21.7 $\pm$ 2.21	21 $\pm$ 3.02	0.30	NS
Body surface area (m ²)	1.70 $\pm$ 0.09	1.72 $\pm$ 0.02	0.23	NS

NS -- Not significant

Table 2: Pulmonary functions of Active smokers, and Passive smokers subjects

Variables	Active Smokers Mean $\pm$ S.D.* (N=30)	Passive Smokers Mean $\pm$ S.D.* (N=30)	P-Value	Significance
FVC	2.89 $\pm$.54	3.12 $\pm$.53	0.1013	S
FEV1	2.34 $\pm$.41	2.73 $\pm$.41	0.005	S
FEV1/FVC	82 $\pm$ 8.60	87.5 $\pm$ 6.80	0.008	S
FEF25-75	3.39 $\pm$.62	3.84 $\pm$.63	0.007	S
PEFR	6.16 $\pm$ 0.99	5.45 $\pm$ 0.68	0.002	S

* P< 0.1 consider significant

DISCUSSION

Nowadays, smoking is considered to be one of the unhealthiest of human behaviors and the most hazardous of addictions. Recently, considerable attention has been focused on the harmful effect of “passive” smoking, confirming ETS as a serious and substantial public health problem, with particular impact on respiratory health of children [9]. Some studies have also demonstrated this effect in adults [10]. Exposure to passive smoke, contributes to the occurrence of diseases of the lower and higher airways, asthma, wheeze, lung lesions detectable in computer tomography, as well as lung function impairment [11]. In the case of passive smokers, the risk of the occurrence of chronic obstructive pulmonary disease is significantly higher. Worldwide, 40% children, 33% male non-smokers and 35% female nonsmokers were exposed to ETS in 2004. This exposure was estimated to have caused 603,000 deaths, which was about 1% of worldwide mortality by 2020, this disease is probably going to be the top third cause of mortality [12].

FEF₂₅₋₇₅ indicates flow rates in small airways, i.e. airways with internal diameters less than 2 mm, which is reduced in both restrictive and obstructive diseases. The present study showed significant reduction of FEF₂₅₋₇₅ values in passive smokers (P=0.001). It is in agreement with previous studies [13], showing that FEF₂₅₋₇₅ values were significantly decreased in passive smokers. White *et al.*, [14], reported small airways dysfunction with a 14% reduction in FEF₂₅₋₇₅ in non-smokers exposed to environmental tobacco smoke; Kauffman *et al.*, [15], studied the effect of exposure to cigarette smoke at home on lung function in French men and showed a 6% fall in FEF₂₅₋₇₅; Masi *et al.*, [16], found adverse effects of passive smoking on FEF₂₅₋₇₅ in young men (aged 15- 35). Our results were in agreement the findings of White *et al.*, Kauffman *et al.*, Masi *et al.*,

Another study done by Casale *et al.*, [17], who investigated the effects of passive smoking on lung function of children aged 6-11 years old, and found the FEF₂₅₋₇₅ to be significantly reduced in study group. FEV1 is an important part of evaluating chronic obstructive pulmonary disease (COPD) and monitoring progression of the condition. Some studies shows that the FEV1 values of children were significantly reduced by parental smoking. more recent findings reported by Merghani and Saeed [18], who studied 135 young male students (9–14 years old) in Khartoum, Sudan, and found the FEV1 and FVC to be significantly lower in the passive smoke exposed group than the nonsmoker control group. Our study does not show significant difference in FEV1 & FVC values. Kentner *et al.*, [19], carried out an investigation involving 1,351 white collar workers. He couldn't able to find out significance difference in FVC. Our findings were in agreement with Kentner *et al.*, Another study from Mohammad-Reza Masjedi *et al.*, [20], shows significant reduction of FEV1 and FVC values in male passive smoker. Results of previous studies regarding FEV1 are more consistent, with a majority showing a lower FEV in children exposed to parental smoking. In the present study we find significant changes in FEV1 & FVC parameters in passive smokers but it shows lower values in passive smokers however it did not show statistical significance. It might be due to nature of exposure of passive smoking, many individuals in our study were exposed by passive smoking in open air. It needs further detailed analysis.

CONCLUSION

The present study suggests a significant reduction of lung functions in individuals exposed to passive smoke. Passive smoke exposure is an independent risk factor for developing COPD and passive smokers are at similar risk like active smokers.

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