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Research Article

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Effect of smoking on PEFR: a comparative study among smokers and non smokers in an urban slum community of Hyderabad, India

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ABSTRACT

Background: Smoking is hazardous for health. The first impact of smoking is on lungs where it starts decreasing the lung capacity of the smokers. Hence if we can identify this decrease in lung capacity, at an early stage among the smokers, we can try to prevent the further effects of smoking on all body systems. The objective of the study was to study the effect of smoking on PEFR among smokers and compare with age, sex and other facts matched controls (non smokers) in an urban slum community of Hyderabad, India.

Methods: A community based cross sectional comparative study was carried out among 50 smokers and 50 age, sex and other factor matched non smokers. Detailed history was taken. Lung capacity was measured by Wright's peak flow meter as per the standard guidelines. Statistical tests like odds ratio and chi square were used wherever applicable.

Results: The mean age and BMI of smokers and non smokers were comparable. PEFR in smokers was significantly low compared to non smokers. Smoking is strongly associated with the abnormal PEFR. The prevalence of abnormal PEFR was 84% among smokers as compared to 60% among non smokers. The smokers were found to be 3.33 times more at risk of having abnormal PEFR than non smokers. This association was statistically significant. (p < 0.05).

Conclusions: The smokers were found to have reduced lung capacity compared to non smokers. Smoking is known to reduce the lung capacity. This study has proved that smoking adversely affects the normal functioning of lungs which leads to increased morbidity and mortality among smokers. Thus smoking was found to be directly related to reduced lung capacity measured in terms PEFR.

Keywords: Smoking, PEFR, Lung capacity

INTRODUCTION

The UN Health Agency reports that about 4.9 million people die each year across the globe due to cigarette smoking. The death toll is steadily increasing and unless current smoking trends are reversed, this figure is expected to rise to 10 million deaths per year by the 2020 or early 2030, with 70% of those deaths occurring in the developing countries. Cigarette is the leading known risk factor for the development of chronic obstructive

pulmonary disease and 50% of smokers develop clinically significant airflow obstruction.³

India is the second largest consumer of tobacco products and third largest producer of tobacco in the world. The adult population of smokers in India is about 84.8 million and is almost equal to the population of Vietnam or Germany. The death toll from tobacco use is projected to rise from 5.4 million in 2004 to 8.3 million in 2030. The prevalence of tobacco smoking in Indian males is much

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higher (24%) than females (3%) according to Global Adult Tobacco Survey (GATS) India 2009-10 report.⁵

However, the prevalence of cigarette smoking in Andhra Pradesh is high in males (18.5%) compared to bidi smoking (13.6%) and cigars, cheroots or cigarillos (4%). It is noteworthy that the overall prevalence of cigar in India is less than 1% (0.6%) but its prevalence is very high in Andhra Pradesh.⁵

It is difficult to establish national norms in India for healthy men and women as the lung function varies with socio-economic, geographical, climatic, environmental and nutritional conditions. Various authors have used multiple regression analysis to explore the relationship between PEFR and age, height, and weight.⁶ The obstruction to airflow that develops in 15 to 20% of heavy smokers is thought to be due to abnormalities in airways with less than 2 mm internal diameter.⁷

It is estimated that around 13% of cardiovascular disease death are due to tobacco smoking. ⁸ Paradoxically several epidemiological studies have found that blood pressure levels among cigarette smokers were the same as or lower than those of non smokers. ^{9,10}

With the above background, it is clear that smoking is hazardous for health. The first impact of smoking is on lungs where it starts decreasing the lung capacity of the smokers. Hence if we can identify this decrease in lung capacity, at an early stage among the smokers, we can try to prevent the further effects of smoking on all body systems. And as mentioned above, this can be simply and easily measured by PEFR.

Hence present study has been planned to study the effect of smoking on the lung capacity (as measured by PEFR) among smokers and compare with age, sex and other facts matched controls (non smokers) in an urban slum community.

METHODS

Present study was a community based cross sectional comparative study carried out in an urban slum area of Hyderabad which is a field practice area of Department of Community Medicine, Malla Reddy institute of Medical Sciences, Hyderabad during December 2013 to March 2014.

Ethical considerations

Institutional Ethics Committee permission was obtained to conduct the study. Informed consent was obtained from every person. At the end of history taking and examination, every subject was imparted health education on hazardous effects of smoking. We tried to motivate them to quit smoking. Those who were found to have any health problems were referred to Urban Health Training Centre.

Sample size

It was decided to cove 50 smokers and 50 age, sex and other factor matched non smokers.

Sampling technique

Convenient sampling technique was used to select smokers and non smokers.

Cases and controls

Smokers were termed as cases and non smokers were termed as controls for the present study purpose.

Matching

Cass and control were matched for age group interval of five years, sex, occupation and other parameters as listed in the inclusion and exclusion criteria.

Eligibility criteria for cases and controls:

Inclusion criteria

- 1. Age 25 50 years.
- 2. For cases minimum duration of smoking of 5 years.
- 3. Willing to participate in the study.

Exclusion criteria

- 1. Industrial workers.
- 2. History of tuberculosis, COPD, Asthma, any other cardiopulmonary diseases, lung cancer, any thoracic/spinal/muscular deformity, history of ARI preceding 6 weeks.
- 3. Body mass index (BMI) less than 18.5 and more than 25.
- 4. Passive smokers.

Data collection procedure

Baseline socio demographic information was collected in the pre designed study questionnaire from smokers initially. Measurements like PEFR, anthropometry, blood pressure were recorded.

Height, weight, waist circumference and hip circumference were measured as per standard guidelines laid down by World Health Organization (WHO). ¹¹ A cut off point of BMI more than or equal to 25 kg/m² was taken as risk factor. ¹² Blood pressure was measured and classified as suggested by WHO. ¹³

PEFR is a simple method of measuring airway obstruction and it will detect moderate or severe disease. The simplicity of the method is its main advantage. It is measured using a standard Wright Peak Flow meter or mini Wright Meter. The needle was always reset to zero before PEFR is measured.

Table 1: Normal values of PEFR are related to the patients' height.

Height (cm)	PEFR (L/min)
120	215
130	160
140	300
150	350
160	400
170	450
180	500

Mean = 2; SD = ± 100

RESULTS

A community based cross sectional comparative study was carried out in an urban slum area among 50 smokers and 50 age, sex matched non smokers to study the effect of smoking on PEFR.

Table 2: Distribution of study subjects as per their age.

Age (years)	Smokers	Non smokers	Total
25-29	13 (26)	13 (26)	26 (26)
30-34	07 (14)	09 (18)	16 (16)
35-39	14 (28)	12 (24)	26 (26)
40-44	10 (20)	08 (16)	18 (18)
45-50	06 (12)	08 (16)	14 (14)
Total	50 (100)	50 (100)	100 (100)

^{*}Figures in the parentheses indicate percentages

Table 2 shows age distribution of the study subjects. Both the groups of smokers and non smokers are comparable in their age distribution as they were matched for age groups. Among smokers, maximum study subjects were found in the age group of 35-39 years (28%) followed by 25-29 years i.e. 26%. Among non smokers, 26% were in the age group of 25-29 years.

Table 3: Comparison of smokers and non smokers for few specified attributes (values are given in mean+SD).

Characteristics	Smokers	Non smokers	T value	P value
Age	36.2 <u>+</u> 7.13	35.98 <u>+</u> 7.3	0.152	0.879
BMI	22.9 <u>+</u> 4,25	24.07 <u>+</u> 3.55	1.502	0.136
PEFR	311.6 <u>+</u> 105.99	365.4 <u>+</u> 91.65	2.716	0.007
SBP	123.97 <u>+</u> 16.52	125.1 <u>+</u> 15.61	0.351	0.725
DBP	85.24 <u>+</u> 11.82	84.96 <u>+</u> 8.25	0.137	0.891

The mean age and BMI of smokers and non smokers were comparable and there was no statistical significant difference in the mean values of them. This is because they were matched for age and BMI.

It can be observed from the above table that the mean PEFR in smokers was significantly low compared to non smokers.

Table 4: Association between smoking and PEFR.

	Abnormal PEFR	Normal PEFR	Total
Smokers	42 (84%)	08 (16%)	50 (100%)
Non smokers	30 (60%)	20 (40%)	50 (100%)
Total	72 (72%)	28 (28%)	100 (100%)

 $OR = 3.33 (95\% CI = 1.3613-8.999); X^2 = 7.143; P = 0.00752$

It can seen from the above table that smoking is strongly associated with the abnormal PEFR. The prevalence of abnormal PEFR was 84% among smokers as compared to 60% among non smokers. The smokers were found to be 3.33 times more at risk of having abnormal PEFR than non smokers. This association was statistically significant. (p < 0.05).

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DISCUSSION

Peak expiratory flow rate (PEFR) value can be used as an indicator of a person's health and it is a clinical tool in diagnosis, management and follow up for respiratory diseases. It has been shown that as a person ages, their PEFR decreases. Peak flow measurements can be used to measure the strength of muscles of respiration and thus ca be used to monitor respiratory impairment. Diurnal variation of PEFR is used to diagnose and in the management of bronchial asthma. 14

PEFR is measured by peak expiratory flow meter which is a simple and relatively cheap device. It has a great diagnostic and prognostic value in patients with hyperactive air way disease. ¹⁴⁻¹⁶

Many factors can affect the reading of PEFR. The age, sex and height are important variables upon which PEFR depends. ¹⁷ Other factors include the diurnal variations ¹⁸ and ethnic differences. ¹⁹

One possible reason for the decrease in PEFR could be inflammation which is common and constant pathological finding in cigarette smokers. ²⁰ Earlier studies have reported that airway flow limitation occurs due to bronchial constriction caused by mediators of inflammation. ²¹ Inflammation either directly or by increasing smooth muscle tone, indirectly, may cause airway fibrosis. ²⁵ All these changes promote wall thickness leading to airway narrowing and flow limitation. ^{22,23}

The prevalence of abnormal PEFR was 84% among smokers as compared to 60% among non smokers. The smokers were found to be 3.33 times more at risk of having abnormal PEFR than non smokers. This association was statistically significant (p < 0.05).

Bajentril AL, Veeranna N studied that 2-5 years of tobacco smoking tends to a definite tendency to narrowing of both the large and small airways and significantly lowering lung function. Ferris and Cotes showed a decrease in diffusing capacity in cigarette smokers and this was probably related to a lower pulmonary capillary blood value in smokers compared with non smokers. Chatterji S et al found that value of MVV and PEFR is significantly lower in smokers than non smokers.

Padmavathi KM et al reported that MVV showed significant reduction (p <0.0001) in smokers than non smokers possible due to reduction in respiratory muscle strength.²⁷ Mead et al showed that with increasing resistance at the mouth there was a decline in PEFR.²⁸ Thus, within an individual subject, PEFR may be influenced by the instrument used for measuring it; however, such an interaction between subject and instrument may not be the same for all subjects. Read et al ²⁹ had assessed ventilator capacity in relation to smoking habits and respiratory symptoms and concluded that among males, smoking in the absence of symptoms even leads to some reduction of ventilator capacity.

CONCLUSION

The smokers were found to have reduced lung capacity compared to non smokers. Smoking is known to reduce the lung capacity. This study has proved that smoking adversely affects the normal functioning of lungs which leads to increased morbidity and mortality among smokers. Thus smoking was found to be directly related to reduced lung capacity measured in terms PEFR. Thus smoking was found to be directly related to reduced lung capacity measured in terms PEFR.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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