

Peak Expiratory Flow Rate (PEFR) Changes in Residents Surrounding Puffed Rice Industries

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Abstract

Background - A delicate balance exists between man and his environment. The race for development, coupled with the greed of man, has led to pollution of the environment in several ways, threatening the precarious equilibrium between all objects on the planet, living and non-living. The environmental pollution from puffed rice units is a result of usage of low-grade hazardous fuels in primitive furnaces. The immediate health effects of air pollution are borne by respiratory system resulting in acute bronchitis. Hence the present study is taken up.

Objectives - Compare the effects on PEFR with relation to the distance of residence from the puffed rice industries.

Methods - 61 healthy subjects of residents surrounding puffed rice industries within a radius of 500mts were selected randomly. The PEFR of all the subject will be done in the morning session (Between 11 am to 1 pm) using WRIGHT'S PEAK FLOW METER and the results were analyzed.

Results - The mean difference of actual PEFR among the 2 groups is 50.4 l/min. The percentage of predicted PEFR among those residing within 100m of the industries have a mean of 78.3% and those residing beyond 100m have the mean value of 93.5%. There is a statistically significant decrease in PEFR of those residing within 100m of the clusters.

Conclusion - smoking causes inflammation and narrowing of airways which results in increase in resistance to airflow and a decrease in elastic recoil pressure of the lungs

Key Words: Peak Expiratory flow rate & Puffed rice.

INTRODUCTION

A delicate balance exists between man and his environment. The impact of changes in the surrounding atmosphere on human health was first reported by Plinius, the Younger, in 73 AD. The race for development, coupled with the greed of man, has led to pollution of the environment in several ways, threatening the precarious equilibrium between all objects on the planet, living and non-living¹. In the last few years, several studies have reported significant associations between industrial pollution and various markers for acute respiratory morbidity². About 1.3 billion urban residents worldwide are exposed to air pollution level above recommended limits. In many developing countries air quality has deteriorated because of rising industrial activity³.

Inhalable particulates (particulates less than 10 micron) present in ambient air find passage into the respiratory system due to their small size and impair the health. Surveillance of inhalable particulates is, therefore, essential for assessing an inhalation health hazard. The activity also provides guidance for appropriate protection against the ill effects.⁴

Puffed rice is produced in cluster of small units. Many such clusters are present in Davangere. The environmental pollution from puffed rice units is a result of usage of low-grade hazardous fuels in primitive furnaces. Fuels used in the ovens are mainly rice husk, wood shavings, used automobile tyre, groundnut shell, and agricultural residues. Each furnace is loosely fitted with chimney, which is just 3-4 mts high. Thus the dispersion of pollutants is not high and as a result

visible black clouds hover on the cluster and also neighboring areas. Thus, air pollution is the most serious problem in the Puffed Rice units in the form of particulate matter, carbon monoxide and other harmful airborne pollutants from tyre burning.⁵

Peak Expiratory Flow Rate (PEFR) is a sensitive indicator for predicting the magnitude of airway obstruction⁶. The immediate health effects of air pollution are borne by respiratory system resulting in acute bronchitis. The delayed effects are chronic bronchitis, lung cancer, bronchial asthma, emphysema and respiratory allergies⁶. Hence the present study is taken up. The present study objective is to compare the effects on PEFR with relation to the distance of residence from the puffed rice industries.

MATERIALS AND METHODOLOGY

61(30 males ± 31 females) healthy subjects of residents surrounding puffed rice industries within a radius of 500mts were selected randomly from the population of Davangere. And They were divided into 2 groups people living within a radius of 100mts & the second group people living between 200 to 500mts from the puffed rice industries. The average distance of the stay from the puffed rice industries is considered to see the dose response relationship.

The inclusion criteria for this study, in the control group is

- Healthy adult subjects in the age group between 20-40 yrs with no past history or present history of smoking.

- Healthy adult subjects with a history of residing within in the radius of 500mts of the puffed rice industries.

The exclusion criteria for this study were

- Children
- Subjects of less than 20 years or above 40 years
- Subjects between 20-40 years of age who are smokers, suffering from any diseases which directly or indirectly affects the lung functions of the subject.

Informed consent will be taken from all the subjects after detailed procedure of the non-invasive technique was explained to them. A brief personal history, smoking history and a clinical examination of all the systems will be done to exclude medical problems and to prevent confounding of result.

The PEFR of all the subject will be done in the morning session (Between 11 am to 1 pm) using WRIGHT'S PEAK FLOW METER. The physical characters such as height in centimeters and weight in kilograms of all the subjects will be recorded. All there personal information like Age, Sex and a brief history will be entered in the patient information chart giving a separate ID for each subject.

Statistical analysis

The results were given as Mean \pm Standard Deviation and range values. Comparisons were performed using students t-test for 2 group comparisons. The p value of 0.05 or less was considered as statistical significance.

RESULTS

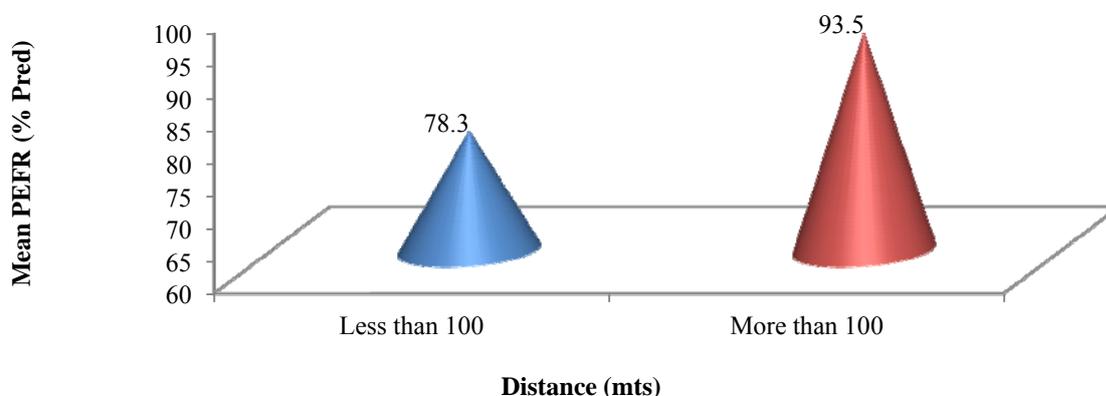
Among the residents surrounding the puffed rice industries, 31 were residing within the distance of 100m from the units. The mean of the actual PEFR for this group was 394.6l/min. 30 individuals residing beyond the distance of 100m from the units showed the mean actual PEFR of 445.0 l/min (Table 1). The mean difference actual PEFR among the 2 groups is 50.4 l/min. There is a stastically significant decrease in the actual PEFR of those residing within 100m of the clusters.

The percentage of predicted PEFR among those residing within 100m of the industries have a mean of 78.3% and those residing beyond 100m have the mean value of 93.5%. There is 15.2% decrease in the mean of individuals residing in proximity to the cluster. The decrease is statistically significant (Table 1, Graph 1).

Table 1: PEFR in relations to distance from puffed rice industries.

Distance (mts)	No.	Actual PEFR(l/min)	Pred(%) PEFR
		Mean \pm SD	Mean \pm SD
Group -1(Less than 100)	31	394.6 \pm 52.5	78.3 \pm 7.7
Group -2 (Bet 100 to 500)	30	445.0 \pm 55.0	93.5 \pm 6.2
Mean difference		50.4	15.2%
Significance	t-value	3.46	7.64
	p-level	0.001, S	<0.001 HS

Graph no 1: Comparison of PEFR (% Pred) in relation to Distance from puffed rice industries



DISCUSSION:

The study has shown that PEFr has decreased more if the subjects are staying close to the puffed rice industries compared to the cases staying away, showing a dose response relationship. These findings were similar to those reported by O A Ileperuma⁷, A sagar et al⁸, Jafary Z A et al⁹, and A. S. Agarwal et al.¹⁰

This results because, smoking causes inflammation and narrowing of airways which results in increase in resistance to airflow and a decrease in elastic recoil pressure of the lungs. Woodsmoke-emitted respirable particulates (<3.5 µm), composed of a relatively equal mixture of ultrafine/fine (0.02–2.5 µm) and coarse (2.5–3.5µm) particles can penetrate into the deep lung, producing a variety of morphological and biochemical changes¹¹.

CONCLUSION

The following conclusion can be drawn from the results of the present study.

- The actual values of PEFr are more decreased if they are staying close to puffed rice industries compared to cases staying away from industries. Thus showing a dose response relationship.
- Health education on hazards of pollutants of industries, preventive measures, legislation on Banning of tyre burning and increase in the height of chimney in these places to be encouraged.

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