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***Research Article***

# A COMPARATIVE STUDY OF PEAK EXPIRATORY FLOW RATES OF RURAL AND URBAN MALES

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## ABSTRACT
Peak Expiratory Flow Rate is a widely used Lung function test and is an effective measure of effort dependent airflow. It is relatively a simple procedure, and may be carried out in the field using portable instrument. The Peak Expiratory Flow Rate shows a diurnal variation in normal healthy individuals. For males its value is 450-550 Liters per minute and for females 320-470 Liters per minute. The PEFR is more in young adults and decreases in old age. This study was undertaken to compare the peak expiratory flow rates of rural adult males with that of urban adult males of Punjab. The peak expiratory flow rate was measured using Mini Wright's Portable peak flow meter. Peak expiratory flow rates of 50 healthy non-smoking adults from urban population were compared with control group from rural population who were matched for age, height and B.S.A.. The values were noted and statistical analysis was done which showed a significantly higher value of peak expiratory flow rate in rural population.

***Key Words:*** *Peak Expiratory Flow Rate (Pefr), Rural and Urban Population, Air Pollution.*

## INTRODUCTION
Peak expiratory flow rate has been defined by Wright and Mc Kerrow (1959) as the highest flow rate sustained by a subject for at least ten seconds. Peak expiratory flow rate as a measurement of ventilatory function was introduced by Hadorn in 1942 and was accepted in 1949 as an index of spirometry (Jain SK et al, 1983). A number of factors like age, height, B.S.A. and high altitude effect PEFR. Peak expiratory flow rates have been reported earlier in different groups but no such study has taken place so far to compare the PEFR of urban with the rural population. In a subject whose lungs have not been effected by any pathological condition the factors effecting PEFR are the dimensions of the large intra and extrathoracic airways (Mellissinos CG et al, 1977), the force generated by the expiratory muscles, the speed with which maximal alveolar pressure is reached (Potter et al, 1971) and how the lung was stretched prior to the PEFR manoeuvre. PEFR has been well correlated to maximum expiratory pressure which is a representation of respiratory muscle strength (Black LF and Hyatt RE 1969, Smyth RJ et al, 1984). Exercise training increases the PEFR because of an increase in respiratory muscle strength. Peak flow rate is higher in fitter, healthier population such as Armed forces personnels and Athletes (Goyle et al, 1984).Factors which have an adverse influence on PEFR are low socioeconomic status, overcrowding of residence and smoking (Jain et al,1983). Airway diseases such as Asthma and chronic obstructive pulmonary diseases have a high prevalence and a profound effect on the health of millions of people worldwide (Lopez AD et al 2006, and Hogg JC 2004). Airflow limitation, a decrease in maximal achievable expiratory flow characterizes this class of diseases and is due to loss of lung elasticity and/or increased airway resistance.

## MATERIALS AND METHODS
The study was conducted on 50 healthy subjects, selected randomly between the age group of 15-40 years from the inner walled city of Amritsar and 50 healthy adults from a village situated approximately 20 kilometers from the city. Nature of the study was explained and informed consent was obtained from each participant prior to participation in the study. The protocol of the study was approved by the institutional ethics committee. All subjects were matched for age, height and B.S.A. Proper history regarding smoking, history of chest trauma, history of Asthma or any other history of chronic obstructive pulmonary disease was taken. Any subject giving history of anyone of the above factors was excluded from the study. A

complete physical examination was done and subjects having any cardiac or respiratory disease were excluded. Peak expiratory flow rate was detected by Wright's Peak Flow meter which is an accurate rugged and portable instrument. The procedure was fully explained to the subjects. The subjects were asked to breathe out maximally into the peak flow meter after taking a maximum inspiration. The subjects were trained to inspire in maximally and used their full force during expiration. The readings were taken in the standing position. Best of three readings was recorded. All readings were noted and statistical analysis was done.

## RESULTS

Table number 1 shows the anthropometric parameters of rural and urban subjects selected for study. There was no significant difference in the anthropometric measurements of the rural from urban subjects. Mean height of the rural population was 167±6.22 cm and of urban population was 166.35±6.46, the difference between the two groups being statistically non-significant. Table number 2 shows the mean and S.D. of peak expiratory flow rates of rural and urban subjects. Higher PEFR is seen in the rural population in all the three age groups. The difference is non-significant in the age group of 15-20 years, becomes significant in the age group of 21-30 years and a highly significant decline in PEFR is seen in urban population as compared to rural population in the age group of 30-40 years of age group. It is clear from the above statements that peak expiratory flow rates in urban population is less in all age groups as compared to rural population. Chronic bronchitis, exposure to air pollutants, over crowding of houses may be the reason for decreased PEFR in the urban population. Whereas more physical activity and healthy environmental conditions might be the reason for high PEFR in rural population. It is also clear in Table number 2 that peak expiratory flow rate is more in 21-30 years of age groups both in rural (449.75±29.82) as well as urban (428.32±31.56) population.

**Table 1: Anthropometric Measurement Of The Subjects:**

| PARAMETER | RURAL ADULT MALES | URBAN ADULT MALES |
|---|---|---|
| AGE (years) | 30.44±8.96 | 29.56±13.54 |
| HEIGHT (cm) | 167.44±6.22 | 166.35±6.46 |
| WEIGHT (kg) | 66.48±8.36 | 66.09±4.56 |
| B.S.A. ($m^2$) | 1.68±0.22 | 1.64±0.36 |

**VALUES OF PEAK EXPIRATORY FLOW RATES OF RURAL AND URBAN SUBJECTS**

| AGE GROUP | RURAL ADULTS | | URBAN ADULTS | | t value | P value | Significance |
|---|---|---|---|---|---|---|---|
| | MEAN (L/min) | S.D | MEAN (L/min) | S.D | | | |
| 15-20 years (n=10) | 400.20 | ±41.66 | 396.65 | ±24.73 | 0.21 | >0.05 | NS |
| 21-30 years (n=20) | 449.75 | ±29.82 | 428.32 | ±31.56 | 2.1 | <0.05 | S |
| 30-40 years (n=20) | 392.76 | ±31.56 | 360.49 | ±38.83 | 2.8 | <0.001 | HS |

*n = number of subjects*
*HS: Highly Significant* *p<0.01, <0.001*
*S: Significant* *p<0.05*
*NS: Non-significant* *p>0.05*

## DISCUSSION

In this study we noted the peak expiratory flow rates of healthy rural and urban adult males. Our results suggest that peak expiratory flow rate in rural population is more as compared to urban population. This study has shown a statistically significant relationship between outdoor air pollution and adults poor lung function. The elevated air levels of some air pollutants like Nitric oxide (Brunekref B et al, 1997) which combines with oxygen in the atmosphere to form nitrogen dioxide which causes damage to the mechanism that protects the human respiratory tract and can increase a person's susceptibility to respiratory infection (Gilliland FD et al, 2001).In particular populations living near busy roads are more susceptible (Singh V et al, 2003). In our study also we took persons living near busy roads. Short term exposure to air pollutants can increase respiratory allergic reactions. That is why there is non significant decrease in peak expiratory flow rate in urban subjects in 15-20 years of age group. As the duration of exposure increases, the decrease in peak expiratory flow rate in urban subjects becomes highly significant statistically. Some previous studies have also reported such results that there is a strong association between the duration of exposure to air pollutants and lung function changes or air way obstruction (Neuberger M et al, 2004). Short term acute effects of air pollutants like sulphur dioxide include pulmonary function decrements, increased airway responsiveness and airway inflammation and aggravation of pre existing respiratory diseases like asthma (Schwela D, 2000). Chronic exposure may lead to chronic obstructive pulmonary diseases and decreased lung functions including decreased PEFR.
Another important finding of our study is that peak expiratory flow rate is higher in 21-30 years of age group of subjects both in rural as well as urban males. These findings are consistent with some previous studies (Kamat SR et al 1967,Malik et al 1975). The males achieve a peak at about 20 years, maintain this level upto 30 years and thereafter their peak expiratory flow rate starts to decline.So to conclude, our study adds the effect and positive association of air pollution on peak expiratory flow rate.

### *Conclusion*

Peak expiratory flow rate is higher in rural males as compared to their urban counterparts. Maximum peak expiratory flow rate is seen in age group of 21-30 years.

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