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Comparative Study of PEFR between Auto Drivers with the Residents of Urban Davangere

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Abstract

Background: Vehicle pollution has been a major factor causing the degradation of the environment around us, the air we breathe, and the soil we live on. Exposure to air pollutants is known to be harmful to health, in general, and to the lungs, in particular. In this respect, auto rickshaw drivers are at a risk, since they are continuously exposed to emissions from vehicles, due to the nature of their job.

Objectives- To study the lung function of autorikshaw drivers in terms Peak Expiratory Flow Rate (PEFR) and compare with the residents of Urban Davangere.

Methods - 50healthy adult subjects of urban residential areas of Davangere (control) and 50 healthy non smoking auto rikshaw drivers were selected randomly from the population of Davangere. WRIGHTS Peak flow meter which is a portable device for measuring ventilator functions. Comparisons were performed using students t-test for 2 group comparisons and one way ANOVA (Analysis Of Variance) for multiple groups.

Results - There has been a statistically significant decrease both in actual PEFR and percentage of predicted PEFR among the individual groups classified on basis of duration of driving **Conclusion**- From the present study it was concluded that respiratory functions of auto rickshaw drivers who are continuously exposed to emissions from vehicles were significantly reduced. Long term exposure to the air pollutants leads to deleterious effects on the respiratory functions of automobile drivers.

Key words: PEFR, AutoRikshaw drivers

INTRODUCTION:

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[1]. Vehicle pollution has been a major factor causing the degradation of the environment around us, the air we breathe, and the soil we live on. In the last few years, several studies have reported significant associations between industrial pollution and various markers for acute respiratory morbidity.[2] Numerous epidemiological studies have documented decrements in pulmonary function and various other health problems associated with long-term air pollution exposure.[3]
The rapidly multiplying number of automobiles in most cities is causing a corresponding increase in air pollution, which is a cause of grave concern. Long term exposure to the air pollutants leads to deleterious effects on the respiratory functions of automobile drivers. Also, the
failure to use personal protective equipment poses a great risk for the automobile drivers like auto rickshaw drivers. Exposure to air pollutants is known to be harmful to health, in general, and to the lungs, in particular. In this respect, auto rickshaw drivers are at a risk, since they are continuously exposed to emissions from vehicles, due to the nature of their job[4].
Peak Expiratory Flow Rate (PEFR) is a sensitive indicator for predicting the magnitude of airway obstruction[5]. 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 allergies[6]. So far very little data is available on extent and severity of the pollution that is caused by these vehicles.

AIMS &OBJECTIVES:

1. To study the lung function of autorikshaw drivers in terms Peak Expiratory Flow Rate (PEFR).
2. To study the similar lung function parameter of appropriately matched controls in urban Davangere .
3. To compare the results of the above two groups and hence study the effect of pollutants of automobiles on the respiratory system of autorikshaw drivers.

MATERIAL AND METHODS:

The study was undertaken to observe the effects of vehicle pollutents on the lung functions in terms of PEFR in auto rikshaw drivers. This is done by comparing the lung functions in terms of PEFR in the autorikshaw drivers with the lung function of residents of urban Davangere.
50healthy adult subjects of urban residential areas of Davangere (control) and 50 healthy non smoking auto rikshaw drivers were selected randomly from the population of Davangere. The duration of starting his driving is also considered to see the dose response relationship.
The inclusion criteria for this study, in the control group is

- Healthy adult male subjects in the age group between 20- 40 yrs with no past history or present history of smoking.
- Healthy adult auto rikshaw drivers with no past or present history of smoking 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 lung functions of all the subject will be done in the morning session (Between 11 am to 1 pm). 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.

We use WRIGHTS Peak flow meter which is a portable device for measuring ventilator functions. It has mouth piece, which is connected to a body piece that contain a calibrated scale with marker. The readings are in litres per minute.

Subjects were motivated prior to the start of maneuver. The subjects were made to sit on a stool, we would attach a nose clip and ask the subject to take a maximum inspiration and then place the mouth piece firmly in mouth and ask him to blow out as fast as possible.

The test was performed over 3 maneuvers. The tests with the best maneuver was selected.

The results obtained were expressed as Mean ± SD .The results were compared between the autorikshaw drivers with the residents of urban Davangere statistically analysed. The results were given as Mean ± Standard Deviation and range values. Comparisons were performed using students t-test for 2 group comparisons and one way ANOVA (Analysis Of Variance) for multiple groups.

RESULTS

The actual values of PEFR in residents of Davangere ranges from 370 to 600 l/min with mean of 480.5 l/min. the same parameter in the autorikshaw drivers ranged between 300-540 l/min with the mean of 410.1 l/min. The percentage of the predicted PEFR values in the residents of Davangere exhibited variations in the range of 80.0 to 110.8% with a mean of 93.1% while the percentage of predicted PEFR values among the auto rikshaw drivers ranges from 62.8 to 100.7% with the mean of 80.3%.It was seen that the both the actual PEFR values and the percentage of predicted PEFR among the autorikshaw drivers indicated a decrease in the mean values. There was a statistically highly significant decrease in both the parameters. (Table 1)

On basis of the duration of the driving , auto rikshaw drivers were divided into 3 groups and the data compared separately with that of the residents of urban Davangere. Out of the 50 individuals, 20 had been driving for less than 10 years, 20 of them have driving for more than 10 years but less than 20 years , while 10 of them have been living in the area for more than 20 years. The mean actual PEFR of those who have been driving the last ten years is 425.3 l/min . The mean actual PEFR for those who have been driving for more than 10 years and less than 20 years is 408.3 l/min and for those living for more than 20 years is 401.0 l/min. The mean percentage of predicted PEFR for the above three groups classified on basis of duration of driving is 86.1%, 83.6% and 81.% respectively. There has been a statistically significant decrease both in actual PEFR and percentage of predicted PEFR among the individual groups classified on basis of duration of driving with those of Davangere taken separately (Table 2)

TABLE 1 : COMPARISON OF PEFR PUFFED RICE INDUSTRIES AND RESIDENTS OF URBAN DAVANGERE

Groups	*N*	*Actual value (*l/min)*		*% predicted*	
		Range	***Mean ±SD***	***Range***	***Mean ±SD***
	50	370-600	469.50±65.4	80.0-110.8%	93.1±8.4
	50	300-540	410.1±58.0	62.8-100.7%	80.3±10.2
Mean diff			58.4		9.7
Significance	T	t=5.29		t=5.89	
	P	<0.001	HS	p<0.001	HS

TABLE 2: PEFR IN RELATION TO DURATION OF EXPOSURE AMONG RESIDENTS SURROUNDING PUFFED RICE INDUSTRIES.

	No.	**Actual PEFR Mean ± SD**	**Pred (%) Mean ±SD**
Residents of Davangere (control)	50	469.5 ± 65.4	93.1± 8.4
<10 year	20	425.3 ±53.3	86.1 ± 8.2
10-20 year	20	408.3 ± 58.1	83.6± 11.6
>20 years	10	401.0 ± 61.0	81.2 ± 9.0
Control v/s 10 years		t=2.69, p<0.05, (s)	t=3.44, p<0.01, s
Control v/s 10-20 years		t=4.39 , p<0.001 HS	t=5.00 ,p<0.001 HS
Control v/s 20 years		t=3.25 , p <0.01 S	t=4.46 ,p<0.001 HS

DISCUSSION:

Long term exposure to the air pollutants leads to deleterious effects on the respiratory functions of automobile drivers. Zhou et al investigated the health effects of occupational exposures to vehicle emissions in 745 bus drivers, conductors, and taxi drivers, compared with 532 unexposed controls in Shanghai, and the results showed that the prevalence of some respiratory symptoms and chronic respiratory diseases were significantly higher ($p < 0.05$) in the exposed group than in the controls[7].

Among the motor vehicle-generated air pollutants, diesel exhaust particles account for a highly significant percentage of the particles emitted in many towns and cities. Acute effects of diesel exhaust exposure include irritation of eyes and nose, lung function changes, headache, fatigue, and nausea. Chronic exposure is associated with cough, sputum production, and lung function decrements.

Zuskin et al studied acute and chronic respiratory symptoms as well as ventilatory capacity in 116 bus drivers and 119 mechanics. Bus drivers and mechanics demonstrated a significantly higher prevalence of most chronic respiratory symptoms when compared to control workers.[8]

This is probably due to the continuous occupational exposure to pollutants, which causes adverse effect on their respiratory functions. Similar observations have been made in reduction in respiratory functions of auto mobile drivers on exposure to air pollutants by several studies conducted by different authors in India and around the world. Chattopadhyay et al conducted a study on garage workers, drivers and conductors of Kolkata city to assess the pulmonary function status of these workers and found that FEV1, FEV1% and flow rates, FEF 02-121, FEF25%-75% values showed gradual decrement as age and duration of exposure increased[9]. Jones et al conducted a cross sectional study to evaluate the lung function respiratory symptoms of Hong Kong bus and tram drivers exposed to air pollutants and observed that forced vital capacity, forced expiratory volume in one second and maximal voluntary ventilation were lower in the Non Air conditioned bus drivers compared with Air conditioned bus drivers[10]. Vehicle pollutants causes inflammation and narrowing of airways which results in increase in resistance to airflow and a decrease in elastic recoil pressure of the lungs[11]. Many studies have shown similar results. [9,10,11,& 12]

CONCLUSION:

From the present study it was concluded that respiratory functions of auto rickshaw drivers who are continuously exposed to emissions from vehicles were significantly reduced as compared to respiratory functions of age, weight and height matched control groups. Also it was observed that respiratory function tests of auto rickshaw drivers who had worked for more than 10 years were more affected than those who had worked for less than 10 years. There are many ways to reduce and prevent the ill effects of pollutant exposure that are likely to occur at workplaces like:

1. Regular respiratory checkups of auto rickshaw drivers.
2. Compulsory use of LPG fitted or electric auto rickshaws.
3. Personal protective equipment for auto rickshaw drivers.
4. Imparting health education to auto rickshaw drivers.

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