ORIGINAL RESEARCH PAPER

Physiology

KEY WORDS: PEFR, respiratory functions, automobile mechanics , Mini Wright's Peak Flow Meter

EFFECT OF OCCUPATIONAL EXPOSURE TO POLLUTANTS ON PEAK EXPIRATORY FLOW RATE OF HEALTHY NON-SMOKING AUTOMOBILE MECHANICS IN THE AGE GROUP OF 18-45 YEARS

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ABSTRACT

The present study was undertaken to establish the effect of pollutants on the respiratory airways of healthy, non-smoking auto mobile mechanics. Two hundred healthy, non-smoking automobile mechanics(18 to 45 years) were selected randomly from various automobile shops and garages of this region. PEFR test was performed by using Mini Wright's Peak Flow Meter. PEFR values of auto mobile mechanics were found to be less when compared with healthy non smoking persons engaged in works other than mechanics. All the data was analyzed statistically. The results were found to be statistically highly significant ($p<0.005$). It was also seen that with increase in duration of exposure to occupational pollutants there is a decline in mean PEFR.

INTRODUCTION

Due to increase in vehicle usage in India , there is an increase in the number of organic and inorganic pollutants which are potential hazards for respiratory health of people at work, especially automobile mechanics who are continuously exposed to them. One of such important disease is occupational asthma [1]. The gas portion of automobile exhaust consist of oxides of nitrogen, suspended particulate matter, carbon monoxide, lead, carbon dioxide, sulphur dioxide etc. Apart from autoexhaust, mechanics are also exposed to other pollutants such as welding fumes, dust, paints, asbestos used in petrochemical industries. It is necessary to detect the presence of any ill effect at an early stage. The screening test which is used to detect the effects on respiratory health are pulmonary function tests [2]. Peak expiratory flow rate (PEFR) is one such parameter that can be easily measured[3]. According to Wright and Mckerrow (1959), PEFR is the maximum expiratory flow rate sustained by a subject for at least 10 mille seconds expressed in litres /minute[4].The present study was undertaken to establish the effect of pollutants on the respiratory airways of healthy, non-smoking auto mobile mechanics (18-45 years) by measuring the peak expiratory flow rate (PEFR) values.

MATERIALS AND METHODS

200 healthy, non-smoking automobile mechanics (18 to 45 years) were selected randomly from various automobile shops and garages of this region. It is important to take non smokers as smoking can overshadow any effect attributable to pollution[5].As PEFR is influenced by subject's age, height, weight ,so for interpretations of observed values of PEFR it is required that they may be compared with values of normal subjects with the same anthropometric characteristics. So, 200 healthy, non-smoking persons (18 to 45 years) engaged in works other than automobile mechanics where they are not exposed to pollutants were taken as control subjects. Study subjects were divided in three groups depending on duration of exposure i.e ≤10 years, 11-20 years, ≥21 years exposure. Persons who were excluded from study are smokers , who gave history of cardiovascular or respiratory problems and taking any drug affecting respiratory system.

Age was calculated in years. Height was recorded in centimeter(cm) by making the subject to stand bare footed on the floor against the wall, the heels slightly separated, buttocks , back in contact with the wall. Body weight was measured in kilograms (kgs) with the subject standing on a portable weighing machine, without wearing shoes. Body surface area was calculated in square metres using Dubois formula [6] $B.S.A\ (m^2) = 0.007184 \times W^{0.425} \times H^{0.725}$ where W is weight in kgs and H is height in cms.

MINI WRIGHT PEAK FLOW METER was used to measure PEFR . Written consent was taken from all the subjects before the test and subjects filled out a performa which included brief past and personal history and general physical examination of all systems were done to exclude any medical problem. The subject was instructed to stand and take a maximal inspiration and blow into the instrument rapidly and forcefully. The test was repeated three times and the highest of these readings was recorded for analysis in lts./min. All the data was analyzed statistically.

RESULTS

Table 1 shows that no statistically significant difference is seen on comparing mean and SD of age, height, weight and body surface area of study and control subjects respectively which means they were age, height, weight and body surface area matched. Mean PEFR of the automobile mechanics (479.04 ± 63.19) was found to be less than that of the control subjects (621.62±57.66) as shown inTable2 and this difference is statistically highly significant ($p<0.001$). Table 3 shows the comparison of mean and SD of PEFR in the study subjects according to three duration of exposure groups and it is seen that PEFR decreases with the increase in duration of exposure. Table 4 shows the statistical comparison of mean PEFR of study subjects according to three duration of exposure groups and the statistical comparison of mean PEFR of control subjects with study subjects divided according to three duration of exposure groups using student's 't' test. Statistically highly significant difference is seen on comparing group I with group II ($p<0.01$), group I with group III ($p<0.001$), and group II with group III ($p<0.01$). Highly significant difference is seen on comparing mean PEFR of controls with group I,II,III of study subjects.

Table 1 Mean And Sd Of Age, Height, Weight And Body Surface Area And Its Comparison In Study And Control Subjects

		Study subjects	Control subjects
Age (years)	Range	18 to 45	18 to 45
	Mean±SD	30.09 ± 8.54	30.46 ± 8.27
	't','p'value, Significance	't' value 0.43 and 'p'> 0.05*	
Height (cms.)	Range	148 – 177	148 – 177
	Mean±SD	167.82 ± 5.64	166.90 ± 5.94
	't','p'value, Significance	't' value 1.67 and 'p'> 0.05*	

Weight(kgs)	Range	35 – 76	35 – 76
	Mean±SD	63.07 ± 7.18	63.78 ± 6.80
	't','p'value, Significance	't' value 1.08 and 'p'> 0.05*	
BSA(m2)	Range	1.21 -1.90	1.42 -1.90
	Mean±SD	1.71 ± 0.10	1.71 ± 0.10
	't','p'value, Significance	't' value 0.30 and 'p'> 0.05*	

Significance:* Not Significant

Table2 Comparison Of Mean And Sd Of Pefr In Study And Control Subjects

Subjects	Range of PEFR (in lts. / min.)	Mean±SD of PEFR (in lts. / min.)	't' value	'p' value
Study	350-625	479.04 ±63.19	23.62	<0.001**
Control	480-715	621.62 ±57.66		

Significance: **Highly significant

Table 3 Comparison Of Mean And Sd Of Pefr In Study Subjects According To Duration Of Exposure Groups

Group no.	DOE (in years)	No. of subjects	Range of PEFR (in lts./min.)	Mean±SD of PEFR (in lts. / min.)
I	≤10	155	350-625	493.22 ± 60.78
II	11-20	30	390-526	443.4 ± 38.97
III	≥21	15	360-486	399.73 ± 35.85

Table 4 Comparison Of Mean Pefr Of Study Subjects According To Duration Of Exposure Groups And Comparison Of Mean Pefr Of Control Subjects With Study Subjects Divided According To Duration Of Exposure Groups

Comparison	't'	'p'
I and II	4.31	<0.01**
I and III	5.84	<0.001**
II and III	3.63	<0.01**
Control and I	21.67	<0.001**
Control and II	36.22	<0.001**
Control and III	46.22	<0.001**

Significance: **Highly significant

DISCUSSION:

The present study has been undertaken to establish the effect of pollutants on respiratory airways of automobile mechanics by measuring PEFR values. Statistically highly significant($p<0.001$) decrease in mean PEFR of the automobile mechanics(479.04 l/min) was found than control subjects(621.62 l/min) as seen in Table 2 . This observation is consistent with other studies [7,8,9,10]. This decrease is PEFR in automobile mechanics is due to their continuous exposure to dust, fumes, auto exhaust and other pollutants at their workplace. Wolf et al [14] did a study to analyze pulmonary function among welders and controls and concluded that the significantly reduced flow values among the welders than controls indicates the presence of small airways disease[14]. The present study also revealed that mean PEFR decreased with increase in duration of exposure as seen in Table 3 and the results are statistically highly significant. This observation is consistent with other studies [7,8,11,12,13]. Ajay et al [15] did a study to find the lung function of autorikshaw drivers by measuring Peak Expiratory Flow Rate (PEFR) and compared it with the residents of Urban Davangere . He concluded that respiratory functions of auto rickshaw drivers were significantly reduced as compared to controls and drivers who had worked for > 10 years were more affected than those who had worked for <10 years[15]. Statistically highly significant difference is seen on comparing group I with group II ($p<0.01$), group I with group III $p<0.001$), and group II with group ($p<0.01$) divided according to duration of exposure as shown in Table 4. Highly significant difference is seen on comparing mean PEFR of controls with group I,II,III of study subjects as shown in Table 4. In Ajay et al [15]study, significant difference is seen when controls were compared with group I and III and highly significant difference is seen when controls were compared with group IIof study subjects[15] .

CONCLUSION:

Mean PEFR of automobile mechanics was found to be less than control . Mostly all the automobile garage workers are working in confined spaces with poor ventilation and without protective devices. There are many ways to reduce the effects of pollutants like working in an area with good ventilation, personal protective equipment, regular respiratory checkups etc. All these measures can help reduce the ill effects of pollutants on the respiratory health of workers .

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