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A Study of Effect of Air Pollution on Peak Expiratory Flow Rate in Traffic Police Men with and without Breathing Masks.

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ABSTRACT

Peak expiratory flow rate (PEFR) is a reliable indicator of the lung function. PEFR depends on the force of contraction of expiratory muscles, elastic recoil of lungs and resistance of the bronchial tree. Reduction in PEFR values may indicate the risk of obstructive airway disease in the occupational group like the Traffic policemen who work in the busy traffic signal areas for years together and are exposed to air pollutants everyday. To evaluate and compare PEFR in the traffic police men with and without breathing mask. The study group comprised of 100 healthy traffic police men aged about 25 – 50 years. The study subjects were divided into two groups, group 1 comprised of 50 traffic police men who were not using breathing masks and group 2 comprised of 50 traffic police men who were using breathing masks. The wrights peak flow meter was used the dial range is 0-1000 lpm. Each participant blow 5 times into the flow meter and three maximum readings were recorded. Each study subject was encouraged to make a maximal effort and was closely watched to ensure that an air tight seal between lips and mouth piece is maintained. The Data analysis was performed using one way ANOVA to find the significance of study parameter between the two groups. The p value less than 0.05 or less was considered statistically significant. There was a significant reduction in the actual PEFR values in both the study groups when compared to predicted values ($p < 0.001$**). Secondly there was no statistically significant change in the actual PEFR values between the two study groups ($p \rangle 0.001$).

Keywords: PEFR, Traffic policemen, breathing mask, air pollutants

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INTRODUCTION

Air pollution is a major environment related health threat and a risk factor for both acute & chronic respiratory disease. Epidemiological studies have demonstrated an association between air pollution as it occurs in various places around the world and lung function. [1]

In urban areas vehicular pollution is predominant and significantly contributes to air quality problems. Road traffic produce volatile organic compounds, suspended particulate matter (SPM), oxides of sulphur (SOx), oxides of nitrogen (NOx), and carbon monoxide (CO), which makes adverse health effects on the exposed population. The particles emitted from the vehicular exhaust of more than 10-micron size are held in upper respiratory tract and particles less than 10-micron size (PM10) accumulates in the lung and produces respiratory abnormalities. The effects of air pollution include breathing and respiratory problems, aggravation of existing disease and alterations in the body defense systems against foreign materials, damage to lung tissue, carcinogenesis and premature death [2, 3].

Traffic related sources of air pollution are drawing increasing concerns from interested exposure assessors, epidemiologists, as well as toxicologists. Traffic policemen who work in the busy traffic signal areas for years together are exposed to the risk of air traffic pollution. In the long run, the pollutants may produce diseases like asthma and bronchitis in the exposed individuals with changes in normal lung functions [4]. The wrights peak flow meter is accurate, rugged a portable equipment and thus can be used in field studies to measure Peak expiratory flow rate (PEFR) [5]. Therefore the present work was undertaken to evaluate and compare PEFR in the traffic police men with and without breathing mask.

METHODS AND MATERIALS

The study group comprised of 100 healthy traffic police men aged about 25 – 50 years. The study subjects were divided into two groups, group 1 comprised of 50 traffic police men who were not using breathing masks and group 2 comprised of 50 traffic police men who were using breathing masks. The present study was conducted in Kalasipalyam and K.R Market area. Ethical clearance for the study protocol was obtained from institutional ethical committee. For the study of traffic constables official permission was granted by deputy commissioner of police (traffic). The police stations included were Kalasipalyam police station, New Tharagupet police station, K.R. Market police station. Subject's clinical history and details were taken according to the standard proforma. Informed written consent was taken from all subjects in the study. Subjects with history of smoking, recurrent or persistant expectoration, wheezing, episode of bronchitis, asthma, any serious respiratory disease and those on regular medications affecting cardiovascular and respiratory system were excluded from the study. The data regarding number of years of service as traffic constables i.e., exposure exhaust of vehicular fumes in target area was collected.

Experimental design

Each person was weighed with normal light clothing and height measured without shoes and body mass index was calculated. The experimental protocol was fully explained to the participants to allay apprehension and method of blowing into the instrument was demonstrated. The wrights peak flow meter was used the dial range is 0-1000lpm. Each subject then held the instrument and had several trials blows, until it was clear that he was using the meter properly and comfortably. Each was encouraged to make a maximal effort and was closely watched to ensure that an air tight seal between lips and mouth piece is maintained. Each participant blow 5 times into the flow meter and three maximum readings were recorded [6].

Statistical analysis

The data profile of subjects including name, age, height, weight, body mass index, with their mean and standard deviation are shown in table 1. The results were given in mean± standard deviation. Data analysis was performed using one way ANOVA to find the significance of study parameter between the two groups. The p value less than 0.05 or less was considered statistically significant.

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RESULTS

This comparative study consisted of 50 traffic police men who were not using breathing masks 50 age and BMI matched traffic police men who were using breathing masks 25 – 50 years [Table 1]. The PEFR values were determined and compared between two groups. There was a significant reduction in the actual PEFR values in both the study groups when compared to predicted values ($p < 0.001$**). Secondly there was no statistically significant change in the actual PEFR values between the two study groups ($p \rightarrow 0.001$) [Table 2].

Table 1: Profile of the study group.

Variable	Group 1: Traffic constables Without breathing mask	Group 2: Traffic constables With breathing mask
Age (yrs)	36±6.6	34±3.7
Height (cms)	162.9±5.80	161.2±6.50
Weight(kg)	60±13.0	63.8±10.10
BMI(kg/m2)	22.2±4.00	24.5±3.60

Table 2: comparision of the PEFR between Traffic constables with and without breathing mask

PEFR	n	Mean±SD PEFR Actual (l/min)	Mean±SD PEFR Predicted (l/min)	P value
Traffic constables Without breathing mask	50	427±102	497±48	<0.001**
Traffic constables With breathing mask	50	436±160	494±35	<0.001**

**-- Highly significant

DISCUSSION

This study was done to evaluate and compare PEFR in the traffic police men with and without breathing mask. PEFR was evaluated in 100 traffic police men, 50 of them used breathing mask and remaining 50 did not used the breathing mask. The two groups were similar in terms of age, sex and BMI.

PEFR is a reliable indicator of the lung function. It depends on the force of contraction of expiratory muscles, elastic recoil of lungs and resistance of the bronchial tree and thus testing the function of all these. Reduction in PEFR values may indicate the risk of obstructive airway disease in the occupational group who are exposed to air pollutants everyday [7]. In the present study there was a significant reduction in the actual PEFR values in both the study groups when compared to predicted values ($p < 0.001$**). This shows that the traffic police men are probably at high risk of developing obstructive pulmonary disease. Secondly there was no statistically significant change in the actual PEFR values between the two study groups ($p \rightarrow 0.001$) [Table 2] irrespective of whether they use breathing mask or not. This tells us that usage of Protective gears such as masks did not had any beneficial effect on PEFR values which is a marker of lung function. This is contradictory to the findings of Pajanivel ranganadin et al who says that PEFR is more in traffic policemen who use breathing masks [8]. The probable reasons for not getting significant change between the two groups may be due to the following reasons:

- As the traffic police men have to use whistle every now and then, they were not able to wear the mask continuously and regularly.
- Even if they wear continuously masks will prevent only the suspended particles but not the poisonous gases such as CO, SO2, and Oxides of nitrates.
- If similar study is undertaken in larger population, we might get statistically significant increase in the PEFR values between the two groups.

With this we conclude that the clean air act should be established which should identify all pollutants that may reasonably be anticipated to endanger the public health and to issue air quality criteria documents for such pollutants that reflect “the latest scientific knowledge useful to indicate the kind and extent of all identifiable effects on public health and welfare which may be expected from the presence of such pollutants in the ambient air”.

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