Original Research Article

Respiratory effects of air pollutants among non-smoking traffic policemen: An analytical cross sectional study

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Abstract

Background: Automobile exhaust related air pollution have become a major health hazard. Traffic police personnel, due to their continuous and prolonged exposure are likely to be the worst affected group in this regard. Many studies in the past have documented impaired respiratory function among traffic policemen. Studies from India, exploring the relationship between duration of exposure and respiratory function is necessary.

Objective: To compare the pulmonary function parameters between controls and traffic police exposed to air pollutants for variable duration

Materials and methods: The study was a community based analytical cross sectional study in Telangana state from August 2012 to November 2013. A total of 120 study participants, including 30 controls and 90 traffic police (30 in each of decadal age groups from 21 to 50 years) were studied. Lung functions were measured by Spirowin. FVC (L), FEV1 (L), FEV1 / FVC ratio, FEF 25 - 75 (L/Sec) and PEFR (L/Sec) were measured and compared.

Results: The absolute and percentage predicted values of FEV1 were higher in control group, compared to traffic police and they have shown gradually decreasing trend with increasing age band which was statistically significant. The mean FVC value and percentage predicted was highest in 21 to 30 age group traffic police and showed gradually declining trend with increasing age band. The other pulmonary function parameters like FEV1/FVC, FEF 25-75 and PEFR have also shown gradually declining trend with increasing age group among traffic police.

Conclusion: The traffic police had poor respiratory function, compared to general population, which declined with increasing age of the individual and increasing duration of exposure.

Key words

Traffic police, Automobile exhaust, Respiratory function.

Introduction

With unprecedented increasing the density of automobile vehicles all over the globe, automobile exhaust related air pollution have become a major health hazard. Inhalation of fuel vapor along with dust may lead to significant impairment of lung and other body functions. Traffic police personnel, due to their continuous and prolonged exposure are likely to be the worst affected group in this regard. Duration of exposure, aging, concurrent smoking may influence the pulmonary function in these populations.

Many studies in the past have documented impaired respiratory function among traffic policemen, attributable to their long term exposure for vehicular emissions like fumes, chemical traces [1, 2]. Respiratory morbidity was more common in people who are working in traffic than the others [3-5]. When compared with traffic police men using protective masks, who are not using masks have more risks of abnormal FEV1 and FVC [5]. Along with respiratory diseases cardio vascular and nervous disorders are more common health issues in long term air pollution exposures [6-8]. Air pollution induced respiratory impairment was also documented as a strong predictor of cardio-respiratory morbidity and mortality [9-11]. Few studies in the past also have documented cytogenetic abnormalities, increased frequency and severity of asthma exacerbations and COPD in people with prolonged exposure to automobile derived air pollution [12-14].

Even though so many studies available to understand the adverse effects of air pollutants on health of traffic policemen, only few are focusing on the aspect of respiratory health and their relation with duration of exposure [15]. In this study, we aimed to compare the pulmonary function parameters between controls and traffic police exposed to air pollutants for variable duration

Objective

To compare the pulmonary function parameters between controls and traffic police exposed to air pollutants for variable duration.

Materials and methods

Study design and study site

The study was a community based analytical cross sectional study, conducted in the field practice area of SVS Medical College, Mahaboobnagar, Telangana state from August 2012 to November 2013. Traffic police working across various stations in field practice area and general population controls were the study participants.

Study population

A total of 120 study participants, including 30 controls and 90 traffic police (30 in each of decadal age groups from 21 to 30 years, 31 to 40 years and 41 to 50 years) were recruited into the study. The traffic police personnel were recruited into the study by stratified random sampling. After acquiring the complete list of traffic personnel, they were divided into strata basing on their age group. Required number of subjects was recruited from each age group by simple random sampling. 30 gender matched controls were selected from healthy attendants of OPD patients, who were not exposed to smoky or dusty environment at their work place.

Inclusion and exclusion criteria

The inclusion criteria for the study were, males aged between 20 – 55 years. People with any severe acute respiratory disorder on screening, known case of pulmonary Tuberculosis, people with central or peripheral nervous system disorders, epileptic disorders and heart diseases not related to occupational hazards were excluded from the study.

Study procedure

After obtaining informed written consent, each subject was interviewed using a modified ATS-DLD -78 questionnaire (A respiratory disease questionnaire for use in adult for epidemiological research study recommended by the American Thoracic Society – National Heart and Lung Institute, Division of Lung diseases-1978) [16]. General physical and systemic examinations were conducted on each subject. Anthropometrical measurements were also carried out. (Height, weight) Lung functions were measured by Spirowin. Before recording of lung functions, satisfactory demonstrations were made to the subjects.

The test was carried out in a well-ventilated spacious room with ambient temperature ranging from 28 – 35^0C. The test should be performed by well-trained Doctor who is thoroughly familiar with the instrument (Spirowin) and the technique of testing. The study subjects undergoing the tests were well informed about the instrument and the technique of the test by demonstrating the procedure.

Computerized versions of 1.0 Windows 2000 XP based, serial communication spirometer with deskjet printer was used for the study. Using Spirowin, FVC (L), FEV1 (L), FEV1 / FVC ratio, FEF 25-75 (L/Sec) and PEFR (L/Sec) were measured and compared among different study groups.

Information was gathered regarding the personal history, about smoking, recent respiratory illness, medications used etc., and also elicited about the family history of any bronchial asthma.

Ethical approval

Approval of institute Human Ethics Committee was obtained. Informed written consent was obtained from all the participants, after explaining the objectives of the study, risks and benefits involved. The personal details of the patients were kept confidential throughout the study.

Statistical analysis

Various pulmonary function parameters were considered as primary outcome variables. Presence or absence of exposure to air pollution and duration of air pollution was the primary explanatory variable. Descriptive analysis of the data was done by using frequency and percentage for categorical variables, mean and standard deviation for quantitative variables. The mean values of the pulmonary function parameters were compared among various study groups. Analysis of variance (ANOVA) was used to assess the statistical significance of the association. P value 0.05 was considered as statistically significant. IBM SPSS version 21 was used for statistical analysis.

Results

A total of 120 participants were included in the final analysis, out of which 30 were controls and the remaining 90 were traffic police, with 30 subjects in each of the age bands i.e. 21 to 30 years, 31 to 40 years and > 40 years. (**Table - 1**)

Table - 1: Description of the study groups (N=120).

Group	Number	Percentage
Group A	30	25.0%
Group B	30	25.0%
Group C	30	25.0%
Group D	30	25.0%
Total	**120**	**100**

There were minor differences among the study groups in mean weight, height and BMI values. Even though those differences were statistically significant, they appeared to be not very relevant clinically. There was no increasing or decreasing pattern observed with increasing age group in anthropometric parameter, as they varied randomly among the study groups. (**Table - 2**)

The absolute and percentage predicted values of FEV1 were higher in control group, compared to traffic police and they have shown gradually decreasing trend with increasing age band which was statistically significant. The mean FVC value and percentage predicted was highest in 21 to 30 age group traffic police and showed gradually declining trend with increasing age band. The other pulmonary function parameters like FEV1/FVC, FEF 25-75 and PEFR have also shown gradually declining trend with increasing age group among traffic police. The pulmonary function parameters of the control group was comparable to the 21 to 30 year age group traffic personnel and were significantly higher compared to other two higher age bands. (**Table - 3**)

Table - 2: Sociodemographic and anthropometric profile study population (N=120).

Parameter	**Group A (N=30)**	**Group B (N=30)**	**Group C (N=30)**	**Group D (N=30)**	**P-value**
Age (Mean±SD)	36.17±11.31	25.30±1.68	35.27±2.81	47.17±4.41	<0.001
Weight (Mean±SD)	73.13±4.58	74.03±2.76	72.10±3.44	70.13±4.71	0.008
Height (Mean±SD)	169.80±2.67	171.93±2.19	171.60±2.54	171.03±2.66	0.002
BMI (Mean±SD)	25.38±1.74	25.05±1.05	24.50±1.46	23.98±1.69	0.003

Table - 3: Comparison of pulmonary function parameters among study groups (N=120).

Parameter	**Group A (N=30)**	**Group B (N=30)**	**Group C (N=30)**	**Group D (N=30)**	**P-value**
FEV1					
Actual value (Mean±SD)	2.58±0.49	2.55±0.70	1.99±0.46	1.91±0.72	<0.001
% predicted	82.83±10.58	79.33±20.87	73.43±15.14	55.73±13.38	<0.001
FVC					
Actual value (Mean±SD)	2.68±0.43	2.94±0.67	2.18±0.42	2.13±0.64	<0.001
% predicted	77.30±12.11	79.33±11.7	70.00±9.11	56.30±12.75	<0.001
FEV1/FVC					
Actual value (Mean±SD)	87.07±5.69	84.72±13.3	79.35±7.34	77.23±12.58	0.001
% predicted	98.57±5.35	93.77±14.57	92.90±5.94	91.33±13.79	0.063
FEF 25 - 75					
Actual value (Mean±SD)	3.05±0.48	3.18±0.69	2.37±0.43	2.44±0.33	<0.001
% predicted	85.13±11.20	77.03±20.94	50.20±8.18	56.56±8.31	<0.001
PEFR (L/Sec)					
Actual value (Mean±SD)	7.69±1.20	6.84±.083	5.12±0.70	4.49±1.07	<0.001
% predicted	84.60±9.95	86.83±8.46	70.23±5.90	58.00±11.72	<0.001

Discussion

Existing study on adverse effects on respiratory health of Traffic policemen was similar to few studies [1, 2]. Respiratory morbidity and risk of abnormal FEV1 and FVC was more common in people who are working in traffic than the others [3-5]. Along with respiratory diseases cardio vascular and nervous disorders are also common health issues in long term air pollution exposures [6-8].

Current study has focused on to compare the various pulmonary function parameters, sociodemographic and anthropometric parameters among the four study groups. In the current study there were minor differences among the study groups in mean weight, height and BMI values. Even though those differences were statistically significant, they appeared to be not very relevant clinically.

In this study, the absolute and percentage predicted values of FEV1 were higher in control group, compared to traffic police and they have shown gradually decreasing trend with increasing age band which was statistically significant. The mean FVC value and percentage predicted was highest in 21 to 30 age group traffic police and showed gradually declining trend with increasing age band. Like the present study Makwana A. H., et al. [8] and Ingle S.T., et al. [17] have documented low FEV1 and FVC values among traffic police men than the control groups.

The other pulmonary function parameters like FEV1/FVC, FEF 25-75 and PEFR have also shown gradually declining trend with increasing age group among traffic police. The pulmonary function parameters of the control group was comparable to the 21 to 30 year age group traffic personnel and were significantly higher compared to other two higher age bands. This further emphasizes the strong impact of age and duration of exposure on lung function. Studies by Makwana, A. H., et al. [8] and Ingle S.T., et al. [17] have also documented significantly low PEFR values in traffic police men than the controls.

In Gupta S., et al. [15] FVC, FEV1 and PEFR are significantly decline in traffic police men, (such as forced vital capacity (FVC), forced expiratory volume in one second (FEV(1)), and peak expiratory flow rate (PEFR)) when compared with controls, and is because of long term exposure to air pollutants. .Traffic policemen of >8 years of exposure, the values of FVC (2.7 L), FEV(1) (1.8 L), and PEFR (7.5 L/s) were significantly lower than those obtained in traffic policemen with <8 years of exposure, in whom the values were 2.9 L, 2.3 L, and 7.7 L/s for FVC, FEV(1), and PEFR, respectively.

The role of chance was quantified in the study using appropriate statistical test. Use of standardized equipment and study tools and random sampling, have minimized the role of any selection or interviewer bias in the study. Random sampling would have minimized the effect of known and unknown confounders.

Not documenting the role of major confounders like smoking, known lung disease etc can be considered as a major limitation of the study.

Conclusion

The traffic police had poor respiratory function as assessed by various parameters, compared to general population. The respiratory function declined with increasing age of the individual and increasing duration of exposure to automobile exhaust.

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