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RISING AMBIENT AIR POLLUTION AND RISK OF RESPIRATORY IMPAIRMENT IN TRAFFIC POLICEMEN

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ABSTRACT

The particles emitted from vehicular exhaust usually include particles less than 10 micron diameter (PM10) which get accumulated in the lungs and produce respiratory impairments. This study was taken up to assess the effect of vehicular exhaust on their pulmonary functions readings. The spirometric analysis of traffic policemen revealed FEV1 2.35 L, FVC 3.19L and PEF 7.8 L/s when compared with those with controls in whom the values of FEV1, FVC and PEF were 4.20 L, 4.45 L and 8.47 L/s, respectively. The odd ratio for breathlessness, cough with expectoration, chest pain and irritation of therespiratory tract were 6.6, 3.7, 3.0 and 2.8 respectively. In the present study, we find rise of ambient air pollution as a result of vehicular pollution which may result in respiratory impairment of traffic policemen. It may be due to prolonged exposure of vehicular pollution, which causes a reduction in the lung function efficiency.

KEY WORDS:**Vehicular Pollution, RSPM, PM10, traffic policemen, Respiratory symptoms.**

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INTRODUCTION

Air pollution from automobile exhaust and vehicular traffic density has become a serious problem, particularly in metropolitan cities in India. Air quality crisis is mainly due to vehicular emission [1]. Automobile exhaust consists of oxides of nitrogen, carbon monoxide, particulate matter, and others which may cause injury to the terminal bronchioles and a decrease in the pulmonary compliance and vital capacity [2]. The particles emitted from the vehicular exhaust of more than 10 micron may held in upper respiratory tract and accumulates in the lung and produces airway respiratory abnormalities [3]. The occupational exposure to vehicular exhaust among traffic policemen is an important risk factor for the development of respiratory signs and symptoms. In urban areas vehicular pollution is predominant and significantly contributes to air quality problems. Respirable particles present in the atmosphere are responsible for the cardiovascular as well as respiratory diseases of human being because these particles can penetrate deep into the respiratory system, and studies indicate that smaller the particle, the more severe health impacts. Evidence suggests that long term exposure to air pollutants may contribute to the pathogenesis of airway disease and the urban levels of air pollution have adverse effects on respiratory tract [4]. These associations are stronger for those who were exposed occupationally to dust and fumes. Since many studies have been conducted throughout the world on particulate matter pollution and its effects on exposed subjects. But, there are limited studies in India concerning to pulmonary function test in traffic policemen. Particularly no organized study has been done in traffic policemen of Lucknow, India. Therefore, this study was conducted to assess the effect of RSPM/PM10 emitted from vehicular exhaust on respiratory health in traffic policemen at high density traffic sites.

MATERIALS & METHODS

The study was conducted from April 2012 to September 2012 in Lucknow with prior permission from the officials department of Lucknow city. Rapid increase of vehicular as well as human population is the major concern, because both are responsible for environment and human health especially in urban area. Human subjects' ethical approval was granted by the King George's Medical University, Lucknow. A questionnaire was used to collect the information on self-reported health problems in the traffic policemen. In both groups the subjects were selected on the basis of exposure.

Study Population

This study included 62 traffic policemen exposed to traffic exhaust at different sites of Lucknow city. Sixty two apparently healthy subjects living in a cleaner environment of rural area were taken as a control group. The controls were matched for age ± 5 years as that of traffic policemen. Subjects who are smokers or having family history of respiratory diseases were excluded from the study.

Workplace environment of traffic policemen

The exposed subjects came to us in small batches weekly. 124 people were examined in which 62 were traffic policemen exposed to traffic exhaust and remaining others were living in relatively clear environment i.e., attendants coming from rural area where traffic pollution is very less or negligible. The traffic policemen worked for about 8 hours per day between 9 am to 6 pm at various traffic sites of Lucknow city. The road traffic was very dense at most of the traffic junctions. The unexposed group includes the healthy attendants coming from rural areas where the traffic pollution was very less as compared to urban area with their patients in the hospital. They usually lived in rural areas where the traffic is very low.

Pulmonary Function Test

Pulmonary function test was done using Spirolab 3 portable spirometer in which force expiratory volume in 1 second (FEV1), Force Vital Capacity (FVC), and Peak Expiratory Flow (PEF) was measured. Before the test

age, height and weight were entered in the spirometer.

Statistical analysis

The datas were processed for odds ratio and p- values by using independent t- test. It included a recording of Force Vital Capacity, Force Expiratory Volume in 1 second (FEV1) and PEF (Peak Expiratory Flow). The data on the PFT parameter of the study group was collected by a questionnaire. The symptoms like breathlessness, cough with expectoration, pain in chest and irritation in respiratory tract were considered for odds ratio analysis. The risk was calculated between traffic policemen and control group having different exposure to risk factors. Odd ratio is defined as the cross product of the entries in the matrix [5]. The odd ratio above 1.0 suggests a causal relationship between exposure and risk.

RESULTS AND DISCUSSION

A total of 124 subjects (62 traffic policemen and 62 subjects living in relatively clear environment) were taken for the study. The data collected were expressed as mean±SE and analyzed by independent t test and odds ratio. Independent t- test was done for pulmonary function parameters and odds ratio was calculated for symptoms present in both the groups. The age, body weight and height between the control and study groups (Table 1).

Table 1
General characteristics and symptoms of respiratory diseases in the exposed group (n=62)

S.No.	Parameters	Results	
		Traffic Police (Mean±SE)	Control (Mean±SE)
1.	Age (years)	38.37±6.09	40.08±10.14
2.	Height (cm)	172.59±5.65	170.67±4.49
3.	Weight (kg)	68.08±9.88	57.35±8.16
4.	**Symptoms**		
	a.Breathlessness	68%	24%
	b. Cough with expectoration	52%	23%
	c. Chest pain	42%	19%
	d. Irritation in respiratory tract	45%	23%

The odds ratio for the symptoms includes (breathlessness, cough with expectoration, chest pain and irritation of respiratory tract) According to questionnaire 68% of the traffic policemen were suffering from breathlessness, 52% from cough with expectoration, 42% from chest pain and 45% from irritation in respiratory tract. Vehicular pollution exposure may be the reason for the respiratory symptoms among the traffic policemen. In control group only 24% reported breathlessness, 23% cough with expectoration, 19% chest pain and 23% irritation in respiratory tract. The odds ratio values for breathlessness, cough with expectoration, chest pain and irritation in respiratory tract were 6.6, 3.7, 3.0and 2.8 respectively at 95% confidence interval level (Table 2).

Table 2
Subjects with frequent symptoms

Symptoms	Study population	Presence of Symptoms		Odds ratio
		Yes	No	
Breathlessness	Traffic Police	42	20	6.6*
	Controls	15	47	
Cough with expectoration	Traffic Police	32	30	3.7*
	Controls	14	48	
Chest pain	Traffic Police	26	36	3.0*
	Controls	12	50	
Problem in respiratory tract	Traffic Police	28	34	2.8*
	Controls	14	48	

All values are statistically significant

The obtained values show the significant prevalence of the symptoms studied in traffic policemen than in the unexposed group. The tool for evaluating the respiratory status of the patient is a pulmonary function test. Table 4 shows the pulmonary function test of both the groups. The test was performed for comparison of the expected and observed values against their individual pulmonary function test. The data comparison in Table 3 shows a decrease in all spirometric parameters in traffic policemen. The traffic policemen showed a significant decrease in FEV1 (2.35 L), FVC (3.19L) and PEF (7.8 L/s) when compared with those with less exposed in whom the values of FEV1, FVC and PEF were 4.20 L, 4.45 L and 8.47 L/s respectively. PFT parameters were compared between traffic policemen and that of less exposed individuals. From this it was observed that there was significant difference in FEV1 (P<0.001), FEV (P<0.001) and PEF (<0.01) in the study group compared to control group (Table 3).

Table 3
Comparison of PFT parameters between traffic policemen (study group) and less exposed subjects (control group)

PFT	Traffic Policemen (n=62)		Control (n=62)		p- value
	Expected (Mean±SE)	Observed (Mean±SE)	Expected (Mean±SE)	Observed (Mean±SE)	
FVC (L)	4.32±0.056	3.19±0.089	4.45±0.060	4.55±0.659	<0.001
FEV1(L)	4.19±0.071	2.35±0.077	4.20±0.073	4.05±0.084	<0.001
PEF (L/s)	9.20±0.068	7.80±0.199	9.22±0.067	8.47±0.096	<0.01

p-value<0.05 (Significant)
p-value<0.001 (highly significant)

From this study (Table 3) it was observed that there was significant difference in study group [FEV1 (2.35±0.077L),FVC (3.19±0.089 L)PEF (7.8±0.199 L/s)] compared to control group [FEV1 (4.05±0.084L), FVC (4.55±0.659 L) PEF (8.47±0.096 L/s)]. The results of this study clearly indicate a reduction in respiratory functions of traffic policemen exposed to vehicular pollution. Similar observation hasbeen made in traffic police men by several studies conducted by different authors in India and around the world [3,7,8,9,10,11,12]. Wongsurakiat et al. observed a significant lowering of mean values of FEV1 and FVC of traffic policemen in Thornburi, Thailand, as compared to normal Thai population (3.29 ± 0.5 L vs 3.43 ± 0.5 L, P=0.01 for FEV1 and 3.86 ± 0.5 L vs 3.98 ± 0.6 L, p=0.047 for FVC). Another study reported a significant difference in FEV1 of nonsmoking subjects exposed to traffic-generated pollution and those not exposed. The FEV1 value in exposed subjects was 87.8% ± 9.5% of the expected value, whereas in non-exposed subjects, FEV1 was 95.3% ± 13.6% of the expected [13]. A large number of studies have shown that long-term exposure to particulates and vehicular exhausts is associated with adverse effects on health [14, 15, 16, 17, 18] .The literature reports a high prevalence of a respiratory symptoms associated with exposure to motor vehicle exhaust emissions[19]. Chronic occupational exposure to urban pollutants increases the risk of detrimental cardiovascular, respiratory and exercise performance [20]. Another study reports that continuous vehicular exhaust inhalation can lead in the symptoms of lower respiratory tract such as cough, shortness of breath and pain inspiration [21, 22]. Studies have shown reversible decrement in pulmonary function in the population exposed to traffic pollution [23]. Chronic exposure is associated with cough, sputum production, and lung function decrements [24]. Positive association was found between particulate matter less than 10 µm (PM10) and development of symptoms of chronic productive cough and increased severity of airway obstructive disease and asthma[25].

CONCLUSION

The above finding shows positive association between the exposure to vehicular pollution and respiratory impairment of traffic policemen which may be due to prolonged exposure to traffic exhaust. The same can be predicted for persons exposed to vehicular pollution like courier men, road side vendors and persons having residences at busy streets.

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CONFLICT OF INTEREST

Conflict of Interest declared none.

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