

A Study on Respiratory Morbidities and Pulmonary Functions among Traffic Policemen in Bengaluru City

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Abstract

Context: Air pollution is a major public health problem in the present Indian cities, due to unplanned urbanization and increased use of vehicles. Traffic policemen, due to the nature of their job and working atmosphere, are more prone to develop respiratory problems such as asthma, chronic obstructive pulmonary disease, rhinitis, recurrent respiratory tract infections, and others. **Objectives:** The objective was to find out the respiratory morbidities and to assess their pulmonary function using computerized spirometry among traffic policemen in Bengaluru city. **Settings and Design:** A cross-sectional study was conducted for a period of 6 months (from January 2018 to June 2018) in randomly selected traffic police stations in South Bengaluru, Karnataka. **Subjects and Methods:** A pretested, semi-structured questionnaire was used to collect information on the demographic profile, duration of exposure, smoking history, allergy/asthma history, and the use of personal protective measures. Pulmonary function test (PFT) was done to assess the lung function using computerized spirometry. **Statistical Analysis Used:** Data were entered and analyzed using Microsoft Excel 2016 version. **Results:** A total of 217 traffic policemen were included in the study. The mean duration of working in the traffic department was 5.9 ± 6.6 years (mean \pm standard deviation). Among them, 101 (46.5%) used personal protective measures. Allergic rhinitis was reported by 38 (17.5%) individuals, and 28 (12.9%) individuals had chest symptoms (cough and breathing difficulty). Among them, 44 (20.3%) experienced exacerbation of these symptoms at the workplace. Observed mean values of all parameters in the PFT were less than their predicted (expected) values. **Conclusions:** There was increased burden of respiratory problems and lower lung volumes and flows among traffic policemen.

Keywords: Pulmonary function test, respiratory illness, traffic policemen

INTRODUCTION

Air pollution is a major public health problem in India in the past few decades. Most of the metropolitan cities such as Delhi, Mumbai, Chennai, Bengaluru, and other cities have the highest effect of air pollution on health.^[1] The impact of air pollution includes respiratory diseases, cardiovascular diseases, increased risk of malignancy, and premature death.^[2,3] Acute effects include irritation of the eyes and nose, cough, headache, and fatigue. Long-term exposure causes diseases such as asthma, chronic obstructive airway disease, and malignancy in exposed individuals.^[4]

Automobile exhaust-related air pollution is increasing over the years due to the increasing number of vehicles and unplanned urbanization.^[5] The presence of various particles and gases such as carbon dioxide, carbon monoxide, sulfur, benzene, lead, nitrogen dioxide, and nitric oxide from vehicular emission plays a vital role in the pathogenesis of respiratory diseases.^[6]

According to the World Health Organization (WHO) statistics published in 2018, 91% of the global population was exposed to outdoor air pollution which was at least 2.5 times above the safety standard set by the WHO. There were 7 million deaths due to outdoor and indoor air pollution in the year 2016.^[7]

Bengaluru is a metropolitan city with a rapid increase in population, migratory influx from other parts of the country, and uncontrolled urbanization; increased number of vehicles and prolonged traffic jams contribute to increase air pollution levels. The data from the Regional Transport Office, Bengaluru, stated that about 75 lakh registered vehicles on road which

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can contribute to air pollution.^[5] Data on ambient air quality from the Karnataka State Pollution Board claim that the air quality in Bengaluru is moderate to satisfactory. However, as per the WHO standards, PM10 and PM2.5 levels are on the higher side.^[8]

Traffic police personnel, due to the nature of their job and working atmosphere, are continuously exposed to vehicular exhaust fumes and their toxic effects. Pulmonary function test (PFT) using a computerized spirometer accurately assesses the lung volumes and flow, and hence aids in the early identification of impaired lung function. There are very few studies available on the respiratory morbidities among traffic policemen. Hence, this study was conducted with the following objectives: to identify the magnitude and types of respiratory morbidities and to assess the pulmonary function using computerized spirometry.

SUBJECTS AND METHODS

A cross-sectional study was conducted in Bengaluru city, over a period of 6 months from January to June 2018. The study was reviewed and approved by the Institutional Ethical Committee. Permission was obtained from the Additional Commissioner of Police (Traffic Management Centre), Bengaluru, after explaining the objectives and purpose of the study. All the traffic police stations in South Bengaluru were listed, and five were selected by simple random sampling. After visiting each traffic police station, the traffic policemen with ≥ 1 -year working experience in traffic management and consenting to participate were included for the study. Informed written consent was taken.

A pretested, semi-structured pro forma was used to collect the information on age, duration of service, history of smoking, and use of protective measures. History of respiratory symptoms and family history of allergy and asthma were also noted. Initial screening examination and anthropometric measurements such as height and weight were recorded. Those with gross pulmonary disease, acute infection, and infective lung diseases such as tuberculosis, those with central and peripheral nervous system disorders, seizures disorder, heart disease, and any contraindication for spirometry were excluded for PFT using computerized spirometer. A total of 217 traffic policemen were interviewed, and PFT was done for 199 individuals.

Pulmonary function was assessed using computerized spirometry, which is a noninvasive and accurate method for assessing the pulmonary function, especially the ventilatory function of the lung. The test was performed in a relaxed, seated individual after adequate motivation and demonstration. Individuals were asked to place a mouthpiece attached to the spirometer with the lips tightly closed. Individuals were instructed to inhale maximally from and exhale maximally, and rapidly into the disposable mouthpiece. This maneuver was repeated thrice, and the best of three readings was taken.^[9] The following parameters were measured using computerized spirometer:^[10]

- Forced vital capacity (FVC) – This measures the amount of air exhaled after the complete inhalation
- Forced expiratory volume in 1 s (FEV1) – This measures the amount of air exhaled in the first second of a full forced expiration. This is often expressed as a percentage of FVC and is the measure of airway obstruction or limitation. In normal individuals, the value is approximately 70%. Postbronchodilator testing was done for those with a FVC/FEV1 ratio < 0.7
- Forced expiratory flow (25%–75%) – This measures the airflow halfway through exhalation. It is often reduced in small airway diseases
- Peak expiratory flow – It measures the speed of exhalation.

Observed values were then compared with predetermined predicted values.

Data were tabulated and analyzed using Microsoft Excel 2016 version. Independent *t*-test was used to compare the difference of means between the observed and predicted values.

RESULTS

A total of 217 traffic policemen were included in the study. Among them, 203 (93.5%) were male and 14 (6.5%) were female. The mean age was 39 ± 11.2 years (Mean \pm standard deviation [SD]). Most of them, 101 (46.6%) had a bachelor's degree. Majority of the study individuals, that is, 97 (44.7%) were constables followed by 85 (39.2%) head constables. One hundred and sixty-six (76.5%) of them had been working in the traffic department for ≥ 3 years. The mean duration of active service was 5.9 ± 6.6 years (mean \pm SD). Out of the total respondents, 54 (24.9%) were current smokers. With respect to personal protective equipment, 101 (46.5%) respondents used a mask. Of these, only 7 (6.9%) used respirator mask, whereas 94 (93.1%) used disposable tissue mask [Table 1].

Among 217 traffic policemen, 68 (31.3%) had suffered from either one or more respiratory morbidities. Allergic rhinitis was reported in 38 (17.5%) individuals, and 28 (12.9%) had suffered from chest symptoms such as cough, wheeze, and breathing difficulty/chest tightness. Allergic eye symptoms such as redness and watering of eyes were reported in 33 (15.2%) study individuals. It was observed that 44 (20.3%) had an exacerbation of the symptoms at their workplace [Figure 1].

PFT using computerized spirometer was done on 199 study individuals to assess the lung volumes and flows. All the observed values of PFT parameters were less than their predicted (expected) values. The observed mean FVC was 3.6 L, which was less than the expected mean FVC, that is, 4.3 L. Similarly, the observed mean FEV1 was 2.9 L which was less than the expected mean FEV1, that is, 3.5 L. Mid maximal expiratory flow 25–75 which reflects the condition of the small airways also showed values less than those expected. On applying independent *t*-test, there was statistically significant association found between the observed and expected values indicating a reduction in lung functions [Table 2]. Traffic policemen diagnosed with respiratory problems and abnormal

lung functions were referred to a pulmonologist at our institute for further evaluation and treatment. Health education regarding the use of personal protective measures and regular screening for health problems was given.

DISCUSSION

Increasing air pollution in India is a major public health hazard, especially among those who live and work in cities. The growing number of vehicles is one of the contributing factors for worsening of air quality. Traffic policemen who are continuously exposed to air pollutants are at high risk.

Tables 1: Distribution of study individuals based on the sociodemographic profile (n=217)

Variables	Values (*)
Age (mean±SD)	39.34±11.20
Sex	
Male	203 (93.5)
Female	14 (6.5)
Education	
Up to primary school	35 (16.1)
Up to high school	66 (30.4)
Graduation	101 (46.6)
Postgraduation	15 (6.9)
Designation	
Constable	97 (44.7)
Head constable	85 (39.2)
Assistant sub-inspector	21 (9.7)
Sub-inspector	12 (5.5)
Inspector	2 (0.9)
Number of years of service in the traffic department	
<3	51 (23.5)
>3	166 (76.5)
PPD	
Use of PPD (mask)	101 (46.5)
Respiratory mask	7 (6.9)
Disposable mask	94 (93.1)
Current smoker	54 (24.9)
Anthropometric measurements (mean±SD)	
Height	173.07±5.18
Weight	76.03±10.50
BMI	25.39±3.33

*Figures in parenthesis indicate percentages. BMI: Body mass index, SD: Standard deviation, PPD: Personal protective devices

Table 2: Distribution of study participants based on the observed and predicted pulmonary function test parameters (n=199)

PFT	Observed values	Expected values	P*
FVC (L)	3.57±0.68	4.27±0.56	<0.0001
FEV ₁ (L)	2.91±0.52	3.53±0.48	<0.0001
MEF25-75	3.15±1.09	4.13±0.58	<0.0001

*Independent *t*-test. Observed and expected values were expressed as mean±SD. FVC: Forced vital capacity, FEV₁: Forced expiratory volume in 1 s, MMEF: Maximal mid-expiratory flow, SD: Standard deviation, PFT: Pulmonary function test

In the present study, 17.5% had reported rhinitis, and 12.9% had chest symptoms such as cough, wheeze, and breathing difficulty/chest tightness. A cross-sectional study conducted at Puducherry to assess the respiratory health status among traffic policemen showed that among 94 traffic policemen, 52.1% reported cough and 40% reported rhinitis; and another similar study at Patiala reported 68% of frequent cough and 22% of shortness of breath in traffic police.^[4,11] A study done to assess the impacts of vehicular exhaust on traffic police working at Batticaloa town, Sri Lanka, reported 25% shortness of breath and 8.3% frequent cough.^[12]

As per OSHA guidelines, mask or respirator is recommended among those exposed to airborne particulate matter in their work environment and those who are exposed to toxic pollutants emitted from automobiles.^[13] In the present study, of 217 traffic policemen, only 6.9% reported the use of a respiratory mask. A study on knowledge and practice for the prevention of respiratory problems among traffic policemen in Kathmandu valley, stated that 71.5% had used protective devices during their duty hours.^[14]

The current study found that all the PFT parameters were less among traffic policemen which was similar to many studies conducted across India and other countries. The study conducted at Puducherry by Ranganadin *et al.* and Makwana *et al.* in Gujarat showed a reduction in all PFT parameters, which was similar to the present study, indicating a reduction in the lung function among the study individuals.^[4,15] A study by Ingle *et al.* at Jalgaon city, on the effects of exposure to vehicular pollution and respiratory impairment observed that all the PFT parameters were adversely affected in traffic policemen when compared with the control group.^[16] A comparative study on pulmonary function among traffic policemen versus general policemen was conducted in Puducherry by Pal *et al.*, who observed that there was a significant decrease in pulmonary function among traffic policemen when compared to the control group, inferring that traffic air pollution has a detrimental effect on the pulmonary function of traffic policemen.^[6] An analytical cross-sectional study carried out in Telangana by Maddur *et al.*, among nonsmoking traffic policemen and healthy control groups found that traffic police had poor respiratory function as

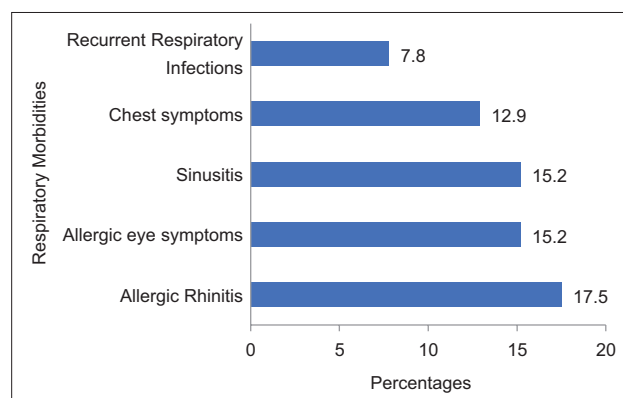


Figure 1: Distribution of study subjects based on morbidities (n = 217)

compared to controls and also showed that respiratory function decreases with increase in age and duration of exposure.^[3]

CONCLUSION

There was considerably increased burden of respiratory morbidities and lower lung function volumes and flows compared to the expected values among traffic policemen in Bengaluru city. It is recommended to conduct periodic medical surveillance along with spirometry to assess pulmonary function which helps in early diagnosis and management. Regular health education regarding the importance of the use of respiratory masks, and medical examination is very much essential. Promotion of electrical and hybrid vehicles by the Government, frequent vehicle emission tests for vehicles, and carpool methods are some of the ways to reduce vehicular pollution.

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Conflicts of interest

There are no conflicts of interest.

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