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Respiratory Morbidities And Associated Risk Factors Among Traffic Police Personnel: A Cross-Sectional Study

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ABSTRACT

Introduction: Air pollution, largely driven by transportation emissions, poses significant health risks, including respiratory diseases, for individuals worldwide. Traffic police officers, who face prolonged exposure to vehicular emissions, are particularly vulnerable to respiratory morbidity. However, limited research exists on this topic, especially in regions like Hyderabad, India, known for poor air quality. This cross-sectional study aimed to investigate the prevalence and associated factors of respiratory morbidity among traffic police personnel in Hyderabad.

Methods: A cross-sectional study was conducted from January 2021 to January 2023 among 258 traffic police personnel aged 25-58 years in Hyderabad. Data collection involved structured interviews using a questionnaire adapted from ATS DLD-78, lung function measurements via peak flow meter and spirometry, and assessment of environmental exposure using Air Quality Index data. Statistical analysis included descriptive statistics and logistic regression.

Results: The study revealed a high prevalence of respiratory symptoms among traffic police personnel, with 32.5% reporting frequent respiratory complaints and 29.8% reporting chronic complaints. Lung function assessments indicated obstructive patterns in 28.7% of participants. Factors such as age over 35 years and exposure to areas with poor Air Quality Index showed statistically significant associations with respiratory morbidity. However, educational level, duration of exposure to traffic, smoking, and mask usage did not exhibit significant differences in respiratory morbidity.

Conclusion: The study's findings underscore the increased risk of respiratory morbidity among traffic police officers due to prolonged exposure to vehicular emissions. Regular awareness sessions on personal protective equipment (PPE) and periodic health checkups are imperative to decrease health risks within this occupational group. Furthermore, rotating traffic police postings based on Air Quality Index rankings could help reduce exposure to pollutants and protect respiratory health. These interventions are crucial in addressing the significant burden of respiratory diseases among traffic police personnel in urban environments like Hyderabad.

KEYWORDS: Police, Traffic, Breathing problems, Air Pollution, Hyderabad, AQI, FEV1

INTRODUCTION

Air pollution is a major risk factor for many acute respiratory infections, cardiovascular diseases, stroke, chronic obstructive pulmonary disease (COPD), lung cancer etc. Approximately one-fifth of the world's carbon dioxide (CO2) emissions come from transportation. According to the Energy Technology Perspectives study by the International Energy Agency, the demand for passenger and freight aviation would triple, car ownership rates will rise by 60%, and passenger distance coverage in kilometres worldwide will double by 2070. [1]

Officers assigned to traffic enforcement frequently jeopardize their health for the benefit of the public and face increased risks in the line of duty. Because employment is a significant factor in determining one's health, traffic police officers deal with a variety of occupational risks, which has raised severe concerns about public health. Because of this, duty-bound employees, such as traffic police, are constantly exposed to risks and hazards related to their jobs which pre-

disposes them to respiratory morbidities such as Allergic rhinitis, Chest symptoms (cough, wheeze, breathing difficulty/chest tightness) and Allergic eye symptoms (redness and watering of eyes). [2–4] Air pollution in the last decade has risen to alarming levels especially in the metro cities of India (except during the COVID-19 lockdown period when there was a substantial decrease in PM2.5 and PM10 levels, mainly due to limited vehicular activity). [5]

The air quality in Hyderabad, India, often exceeds national ambient air quality standards, especially due to particulate matter (PM) contributions from vehicular emissions, which account for around 50% of the total emission load. The case study of Rao KV on Factor Analysis of Air Pollutants over Hyderabad showed the different components and their contribution to air pollution in different areas of the city. [6]

Nevertheless, a review of the literature found that there aren't many current studies that investigated respiratory health issues among traffic police officers in India, specifically in Hyderabad. To determine the prevalence and pattern of respiratory morbidity among traffic police officers as well as any association between respiratory morbidity and their background characteristics, we conducted this study in the twin cities of Hyderabad. The objective of the study was to estimate and assess the prevalence and factors of respiratory morbidity among the traffic police personnel of Hyderabad district, Telangana.

MATERIALS AND METHODS:

Study Population and Sampling:

We conducted a cross-sectional study from January 2021 to January 2023 among traffic police personnel aged 25-58 years in Hyderabad. Eligible participants were those who had been working in their current position for at least one year. We determined our sample size to be 270, accounting for a 15% non-response rate, using EpiInfo 7.2.2, based on an anticipated 31% prevalence of respiratory morbidities. Systematic random sampling was employed, with every third eligible individual from each station participating. The final study sample comprised 258 participants.

DATA COLLECTION:

Data was gathered via structured interviews utilizing a questionnaire based on the ATS DLD – 78, supplemented with additional queries regarding demographics, kitchen setup, and lifestyle habits. This questionnaire focused on identifying symptoms such as frequent and chronic cough, phlegm, and wheezing.

Lung Function Measurements: Participants' lung function was assessed using two methods:

1. Peak Flow Measurement: Conducted with a portable Air Zone Peak Flow Meter®, ensuring the use of a sterile mouthpiece for each subject. The best of three maximal efforts was recorded.
2. Spirometry: Performed using a Vitalograph copd-6^{TM} portable spirometer. The best of three efforts were noted, with measurements including FEV_1, FEV_1 percentage of predicted, FEV_1/FEV_6 ratio, percentage of predicted, Obstructive index and COPD (GOLD) classification.

We applied the European Respiratory Society (ERS) equations, adjusted for the Indian population with a correction factor of 0.7. An FEV1 and FEV1/FEV6 ratio of $\geq$ 80% and $\geq$ 0.7 respectively were considered normal.

Environmental Parameters: The Air Quality Index data for the year 2023 was obtained from the TS Pollution Control Board to assess environmental exposure.

Ethical considerations:

Study approval was taken from the Institutional Ethical Committee of Osmania Medical College, Telangana and written informed consent was taken from the participants.

RESULTS:

Sociodemographic details:

The mean age of the participants was 37.02 years with a standard deviation (SD) of 9.01 years (Table 1 **)**. None of them reported to be a widower or separated from their wives. Among the 258 study participants, 10.47% (27) reported residing in their houses which are located less than 300 meters from the main roads and 97.28% (251) did not have any major source of air pollution near their houses. All the study participants reported that they were using LPG for cooking and only one (0.39%) was found to be using solid fuel along with LPG. The presence of a separate kitchen was reported in all the population. Among all, 11.62% (30) were current smokers. The mean number of cigarettes smoked per day was 5.53$\pm$3.95 (Range 1 to 20). The mean number of years of smoking among the study participants was 10.43$\pm$8.19. Tobacco chewing was reported by 14.34% (37). **(Table 2)**

Occupational history:

The mean number of years of service in the police department was 13.96$\pm$8.27 years. The mean number of years of service in the study area among the study population for the current post in the traffic police department was 5.21$\pm$3.52 years. The average duration of working hours near the roadside per day for the study participants was 6 hours per day. Home guard (149) and police constable (78) cadres are the ones who are mostly involved in traffic duties on the road. Most of the participants used masks regularly but the type of mask used was a single-use disposable mask and not the respirator which is prescribed by the traffic police department.

Sociodemographic characteristic	Freq (%) N = 258
Age Range	
21-30	75 (29)
31-40	103 (40)
41-50	47 (18)
51-60	33 (13)
Educational Status	
Secondary School	75 (29)
Intermediate	98 (38)
Graduate	69 (26.7)
Postgraduate	14 (5.4)
Professional	2 (0.7)
Marital Status	
Married	235 (91)
Unmarried	23 (9)
Religion	
Hinduism	199 (77)
Islam	54 (20.9)
Christianity	5 (1.9)
Residence	
Urban	215 (83.3)
Rural	43 (16.7)
Type of Family	
Nuclear	225 (87.2)
Joint	27 (10.4)
Extended	6 (2.3)

Table 1: Socio-demographic characteristics of the study population

Personal Habit	No. (%)
Tobacco Smoking	30 (11.63)
Tobacco Chewing	37 (14.34)
Alcohol Consumption	117 (45.35)
Any form of Tobacco	66 (25.58)
Both Tobacco and Alcohol	14 (5.43)

Table 2: Distribution of the study population based on personal habits.

Respiratory Symptom	No. (%)
Frequent Phlegm	58 (22.5)
Frequent Cough	38 (14.7)
Frequent Wheeze	12 (4.65)
Any one of the above frequent complaints	84 (32.5)
Dyspnoea	9 (3.49)
Chronic Phlegm	49 (19)
Chronic Cough	34 (13)
Chronic Wheeze	9 (2.3)
Any one of the above chronic complaints	77 (29.8)

Table 3: Respiratory morbidity among traffic police personnel based on reported symptoms

Lung Function Test	No (%)
Obstructive PEFR pattern (PEFR <80% of Predicted)	
Obstructive pattern	73 (28.7)
50 - 80 % of Predicted	62 (24.4)
Less than 50% of Predicted	11 (4.3)
Obstructive Index	
Grade 0 (FEV1% Pred > 80%)	57 (22.4)
Grade 1 (FEV1% Pred 50% to 80%)	173 (68.1)
Grade 2 (FEV1% Pred 30 to 50%)	21 (8.3)
Grade 3 (FEV1% Pred <30%)	3 (1.2)
COPD Classification	
Normal (FEV1/FEV6 > 0.7)	226 (88.9)
Grade 1 (FEV1/FEV6 <0.7 & FEV1 > 80%)	2 (0.8)
Grade 2 (FEV1/FEV6 <0.7 & FEV1 50% to 80%)	10 (3.9)
Grade 3 (FEV1/FEV6 <0.7 & FEV1 30% to 50%)	16 (6.3)

Table 4: Distribution of study population according to Peak Expiratory Flow Rate (PEFR), Obstructive index and COPD classification

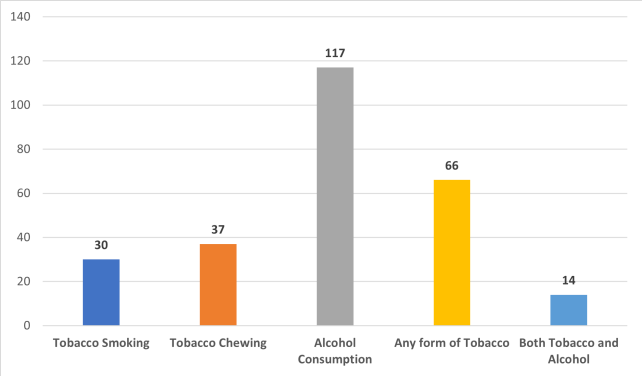

Figure 1: Distribution of the study population based on personal habits

The overall prevalence of chronic respiratory morbidity was 29.85%. The overall prevalence of peak expiratory flow obstruction among police personnel in this study was 28.7%. FEV_1 was less than Predicted FEV_1 values in 77% of subjects whereas FEV_1/FEV_6 ratio was found to be lowered in 10% of the study population. **(Table 3 and Table 4)**

A statistically significant association was found between age groups over 35 years and the obstructive index. Although lung function tests were compromised in participants who were educated below the 10th class, who had a duration of exposure to traffic for more than 10 years, smokers, tobacco users, and non-regular users of masks, the difference was not statistically significant. However, a statistically significant difference was observed in the respiratory morbidity of traffic police who were posted in areas with poor Air Quality Index (AQI) compared to those who were posted in areas with good AQI. **(Table 5)**

DISCUSSION:

The overall prevalence of chronic respiratory morbidity was 29.85%. Similar findings were observed by Gowda G (31.3%), Bandopadhyay A et al (29.6%) in Nashik, Haralkar SJ (28.9%) and Kumar PB et al (31%) in Vijayawada in similar studies conducted among Traffic Personnel. [2, 4, 7, 8] In a cross-sectional Study of the Respiratory Health Status of Traffic Police Personnel in the U.P. by Tayal BB et al., the traffic police study group was observed to have a significantly higher proportion of respiratory symptoms compared to the control group. [9]

The Obstructive peak flow pattern, Obstructive index and COPD were found to be higher among those whose service years were more than ten years in the city. A similar study conducted by Makhwana AH in Saurashtra, Naik M in Kashmir, India also showed traffic personnel with longer duration of exposure having significantly decreased pulmonary functions than those with lesser duration of exposure. [10, 11] The increased years of service could indicate higher total exposure for a longer duration of time and therefore adversely affecting the lung function.

In this study, police officers had a 24% overall prevalence of peak expiratory flow obstruction. The forced vital capacity and forced expiratory volume in 1 second (FEV 1) of traffic police officers in the Kashmir Valley had significantly decreased, according to a study by Naik M. In the research conducted by Sasikumar S, it was shown that traffic police personnel showed significantly ($P < 0.05$) decreased FEV1, FEV1/FVC ratio, and FEF 25–75% (L/s) in comparison to controls. Moreover, 5.8% of them displayed obstructive, 5.1% restrictive, and 0.7% mixed patterns on PFT. [12, 13]

There was a significant association between the reporting of respiratory morbidity and obstruction patterns observed in PEFR recordings. However, it is to be interpreted with caution since portable peak flow meter has limitations compared to more reliable measurements such as FEV_1 or forced vital capacity (FVC). [14, 15]

The present study showed a significant difference in the prevalence of respiratory morbidity among the different areas with varying air quality indices. However, there was no dose-response relationship observed for PM10, SO2 and NO2. A study conducted in Visakhapatnam reported a higher prevalence of respiratory morbidity and lower lung volumes for traffic police personnel compared to Law-and-order police who were not exposed to a more polluted atmosphere. [16]

CONCLUSIONS:

Owing to increasing vehicular exhaust day by day, traffic police constables can be considered a high-risk group for developing respiratory morbidity. There is a need for regular awareness sessions among traffic police men on the benefits of PPE and periodical health checkups. Traffic police could benefit by posting them at diverse locations each month based on the Air Quality Index ranking from high polluted to low polluted areas.

LIMITATIONS:

A definitive conclusion cannot be drawn from this study due to the absence of a control group. Without a comparison group, it is challenging to attribute observed respiratory morbidity solely to occupational exposure among traffic police personnel. Additionally, the study's cross-sectional design limits causal inference and the ability to assess temporal relationships between exposure and outcome variables. Furthermore, reliance on self-reported symptoms may introduce reporting bias, and the study's sample size may not fully represent the entire population of traffic police officers in Hyderabad.

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Variable	Any respiratory morbidity	Obstructive PEFR pattern (PEFR < 80% of predicted)	Obstructive index (FEV1 <80%)	COPD (FEV1/FEV6 <0.7)
Age	OR:1.7 (0.9-2.9)	OR:1.3 (0.77-2.3)	OR: 4.9 (2.6-9.6) *	OR: 0.62 (0.3-1.4)
> 35	35.4%	44%	8.7%	8.7%
< 35	24.4%	32%	14%	13.3%
Post groups	0.9 (0.4 – 2)	0.98 (0.4-2.2)	0.56 (0.2-1.3)	1.2 (0.3-4.1)
HG PC	29.5%	28.7%	21%	11.2%
Non HGPC	32.2%	29%	32%	9.68%
Education	1.4 (0.8-2.4)	1 (0.6-1.8)	1.13 (0.6-2.1	1.6 (0.7-3.6)
<10th	34.7%	29.3%	24%	14.7%
>10th	27.9%	28.4%	21.7%	9.5%
Duration of Exposure	1.4 (0.8-2.4)	1.36 (0.78-2.4)	1.24 (0.7-2.3)	1.28 (0.56 -2.9)
>10 years	32.7%	31.3%	24%	12.1%
<10 years	25.7%	25%	20.2%	9.6%
Smoking	1.2 (0.5-2.7)	0.88 (0.4-2.1)	1.56 (0.6-3.6)	1.28 (0.6-2.4)
Smokers	33.3%	26.7%	30%	20%
Non-smokers	29.4%	29%	21.4%	9.8%
Tobacco any form	0.8 (0.4-1.5)	1.2 (0.7-2)	1.3 (0.6-2.4)	1.7 (0.7-3.8)
Users	27.2%	31.8%	26%	15.1%
Non-Users	30.7%	27.6%	21%	9.6%
Alcohol	1.5 (0.8-2.4)	1.2 (0.69-2)	0.81 (0.44 -1.47)	0.86 (0.4 -1.9)
Users	34.2%	30.7%	20.15%	10.3%
Non-users	26.2%	27%	24%	11.68%
PPE	0.8 (0.4-1.6)	1.34 (0.8-2.1)	0.72 (0.35 -1.5)	0.7 (0.3-2)
Regular users	29.1%	36.3%	21.4%	10.48%
Non-regular users	33.3%	27.1%	27.2%	13.6%
AQI	1.92 (1.1-3.4) *			
>100	36.3%			
<100	22.8%			

Risk in exposed and risk in unexposed group are given in percentages. (n=258). *Statistically significant ($p < 0.05$)

Table 5: Distribution of study subjects according to socio-demographic and occupation related characteristics of study subjects and respiratory morbidity