**RESEARCH PAPER**

# Assessment On Respiratory Parameters And Pulmonary Function Among Traffic Policemen In Satara District..

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**ABSTRACT**
Background: Traffic policemen often spend long hours working in environments filled with vehicle exhaust, dust, and pollution. Constant exposure to such air contaminants can gradually affect their lung function and increase the chances of developing respiratory problems. A simple and effective way to check their lung performance is by using a Peak Flow Meter, which helps in measuring how well air moves out of the lungs. This research aims to evaluate the lung health of traffic policemen in the Satara district by using this tool and identifying those who may be at risk of developing breathing-related conditions. Objective: To determine the prevalence of respiratory impairment related to exposure to vehicular air pollution and to assess the relationship between duration of exposure and pulmonary function decline in traffic police. Methods: A cross-sectional survey was conducted among 81 traffic policemen in Satara district using a data collection and peak flow meter device. Inclusion criteria included both male and female traffic policemen having one year of continuous traffic duty and working for at least 6 hours per day. Exclusion criteria involved any comorbid respiratory condition, recent illness or person with current smoking history. Results: Based on the statistical analysis it was found that the prevalence of respiratory impairment among traffic policemen of Satara district is 71.60% with the majority of individuals falling into the Yellow Zone, indicating moderate respiratory function impairment. Only 28.39% of participants demonstrated normal pulmonary function, as indicated by their placement in the Green Zone. Conclusion: The results of this study reveal that more than 70% of traffic police personnel in Satara district demonstrate reduced lung function, as reflected by their placement in the Yellow Zone of PEFR classification. Although no cases were observed in the Red Zone, the predominance of Yellow Zone values indicates a notable public health issue. These outcomes are consistent with previous national and international research, emphasizing vehicular pollution as a major occupational risk factor for this workforce. These observations advocate for the urgent need to implement targeted preventive healthcare measures, conduct routine respiratory screenings, and introduce environmental interventions to protect and promote the long-term respiratory health of traffic police personnel..

**Keywords:** Pulmonary Function, PEFR, Traffic Policemen, Respiratory Health, Peak Flow Meter, Occupational Exposure, Lung Function, Respiratory Impairment, Public Health
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## INTRODUCTION

The issue of air pollution has emerged as one of the most significant environmental and public health concerns in the modern era. As urbanization continues to rise, especially in developing countries like India, emissions from vehicles have become a major contributor to deteriorating air quality. Among those most vulnerable to these emissions are traffic police personnel, who spend a substantial part of their working hours stationed at busy road junctions. Due to this prolonged exposure, they are at heightened risk for respiratory conditions and diminished pulmonary function. (7)

Automobile emissions consist of harmful pollutants such as carbon monoxide, nitrogen oxides, sulphur dioxide, volatile organic compounds, and fine particulate matter (PM10 and PM2.5). Inhalation of these substances over long durations can damage lung tissue, reduce lung compliance, and impair gas exchange efficiency, thereby increasing the likelihood of respiratory ailments. (9) Such conditions not only affect lung function but also contribute to systemic health problems over time.

Numerous studies conducted worldwide have linked air pollution to adverse health effects. A well-known epidemiological study across six major U.S. cities confirmed that prolonged exposure to polluted air was associated with higher rates of cardiopulmonary-related

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deaths. [6] These findings underscore the significant impact air pollutants can have on human health, even in countries with relatively stringent air quality regulations.

In India, where vehicular density is high and environmental regulations are often less enforced, the impact is even more pronounced. Several regional studies have indicated that traffic police personnel working in polluted urban environments experience significant reductions in lung function when compared to unexposed populations. For instance, a study from Patiala demonstrated that individuals exposed to vehicle exhaust had lower scores in pulmonary function tests (PFTs) such as forced vital capacity (FVC), forced expiratory volume in the first second ($FEV_1$), and peak expiratory flow rate (PEFR). [8]

A similar investigation carried out in Latur, Maharashtra revealed comparable findings. Traffic police who had been working in high-traffic areas for at least five years displayed notably lower values in critical respiratory metrics including FVC and PEF, compared to office workers of the same age and health status. [7] The controlled conditions of these studies—such as exclusion of smokers and proper calibration of spirometers—further confirm the direct correlation between vehicular pollution exposure and reduced respiratory performance.

On a cellular level, pollutants present in vehicle emissions initiate inflammatory responses and oxidative stress within the lungs. This biochemical imbalance can cause damage to alveolar structures, increase mucus secretion, and result in narrowing of the airways. Over time, these physiological alterations may evolve into chronic respiratory conditions such as asthma, bronchitis, and in severe cases, chronic obstructive pulmonary disease (COPD). [7][9]

Research from Jaipur has shown that even after excluding smoking as a variable, there remains a statistically significant difference in pulmonary function between exposed and non-exposed groups. The findings showed that non-smoking traffic police had significantly lower $FEV_1$ values than their counterparts working in low-pollution environments. [2] This emphasizes the need to consider occupational exposure as a key determinant of respiratory health in urban and semi-urban populations. [2]

The respiratory symptoms commonly reported by traffic police include persistent coughing, breathlessness, wheezing, and throat irritation. A study based in Patiala found that the incidence of these symptoms was significantly higher in the exposed group than in controls. The odds ratios for frequent coughing, shortness of breath, and respiratory irritation were substantially elevated in traffic police personnel. [8] Such clinical manifestations often precede measurable lung function decline, making early symptom reporting and monitoring vital.

Despite this well-established link, the use of personal protective equipment (PPE) like N95 masks remains limited among traffic police in India. Research has suggested that those who consistently use such protective aids show less decline in respiratory parameters. Comparative studies conducted in Thailand and other parts of Asia affirm that basic interventions like face masks can provide meaningful protection against inhaled pollutants. [8]

In semi-urban areas like Satara district in Maharashtra, traffic police are exposed to similar environmental risks as their counterparts in metropolitan cities, yet there is a noticeable absence of empirical research on their respiratory health.[7] This creates a significant knowledge gap, especially given the increasing vehicular population in such regions.[2] By investigating pulmonary function in this demographic, the current study aims to generate localized evidence that could inform public health strategies and occupational safety protocols.[7]

Spirometry remains the preferred method for non-invasive evaluation of lung function. It measures key respiratory parameters such as VC (vital capacity), FVC, $FEV_1$, PEFR, and tidal volume (TV). Deviations in these values from predicted norms are often indicative of early-stage pulmonary disease, even in individuals who are otherwise asymptomatic. [8] Implementing routine spirometry for high-risk occupational groups can aid in early detection and prevention of severe respiratory conditions. [7]

Furthermore, while national environmental agencies such as the Central Pollution Control Board (CPCB) in India provide general air quality data, they do not usually measure pollutant exposure at the microenvironmental level.[2] This makes it difficult to understand the exact extent of exposure experienced by individuals working directly on roads.[8] Studies that gather real-time exposure data at breathing height and correlate it with clinical outcomes are essential for drafting accurate occupational health policies.[2]

The present study aims to bridge this gap by conducting a comprehensive assessment of respiratory health among traffic police personnel in Satara district. [7] Using a cross-sectional design, the study will involve pulmonary function tests, demographic data collection, a d analysis of symptom prevalence. The goal is to evaluate the relationship between long-term vehicular pollution exposure and deterioration in lung function while accounting for confounding factors such as age, BMI, and medical history. [2]

Findings from this research are expected to provide actionable insights for health policymakers.[2] Evidence-based recommendations may include mandatory use of

PPE, rotational duty assignments to limit exposure duration, regular medical check-ups, and public awareness campaigns on the health risks of air pollution.[7] These interventions are particularly important in safeguarding the respiratory health of traffic personnel, who are an essential part of urban infrastructure and public safety.[7]

In summary, vehicular pollution presents a serious occupational hazard for traffic police in India. [8] Numerous studies across different regions have consistently shown that long-term exposure to vehicular exhaust leads to a measurable decline in lung function, even in healthy, non-smoking individuals. [2] Despite this, there is a scarcity of localized research data for smaller districts like Satara. [7]

| GENDER | COUNT | PERCENTAGE |
|---|---|---|
| Male | 49 | 60.49% |
| Female | 32 | 39.50% |

The proposed study intends to fill this gap by systematically assessing respiratory parameters in the traffic police of this region, using robust scientific tools and methodologies. The outcomes will not only contribute to scientific literature but also potentially influence regional public health policy and occupational safety standards. [8]

## 2. Materials and Method:

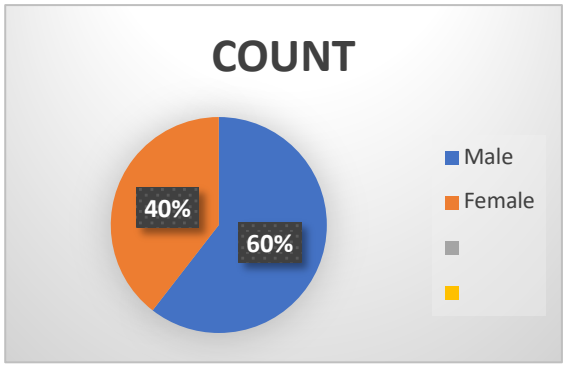
The study was approved by the Ethical Committee and Protocol Committee (protocol no.603/2022-2023). Eighty-one participants were chosen using the formula of $n=Z^2pq/L^2$ for the cross-sectional study using a survey approach via data collection sheet and peak flow meter device. This study aims to understand how working in traffic-heavy, polluted environments may be affecting the lung health of traffic policemen. Since these individuals spend long hours on the roads breathing in dust and vehicle fumes, they may be more vulnerable to breathing problems over time. By using a Peak Flow Meter to measure how well their lungs are functioning, the study hopes to spot early signs of respiratory issues. The goal is to identify those who may be at risk and highlight the importance of regular check-ups and preventive care for people in such high-exposure jobs. For documentation purpose a data collection sheet was made which includes names, age, gender, height, weight, BMI, respiratory rate, coughing during test, peak flow meter readings and predicted PEFR values. A simple random sampling method was used in Satara district. The inclusion criteria included both males and females of age group 25-55 years with working hours of 6 hours per day for continuously 1 year or more. People with recent illness, comorbid respiratory condition and having a current smoking history were excluded.

## 3. Result:

The study involved 81 traffic policemen from the Satara district and focused on understanding how long-term exposure to polluted air and heavy traffic might affect their lung function and overall respiratory health. A structured data collection sheet was designed to identify individuals at potential risk of developing respiratory complications due to occupational environmental exposure. The data collection sheet included information such as names, age, gender, height, weight, BMI, respiratory rate, coughing during test, peak flow meter readings and predicted PEFR values. The collected data was analysed by statistician using an instat application. Table 1 depict gender distribution among the 81 traffic policemen in Satara district who participated in this study. The data was analysed and calculated in which the frequency and percentage of male participants were 48(60.49%) and female were 32(39.50%).

**Gender distribution table**

**Table 1. Percentage distribution of participants according to gender.**




In table 2 participants were categorized according to the zones as per their peak expiratory flow rate interpretations:

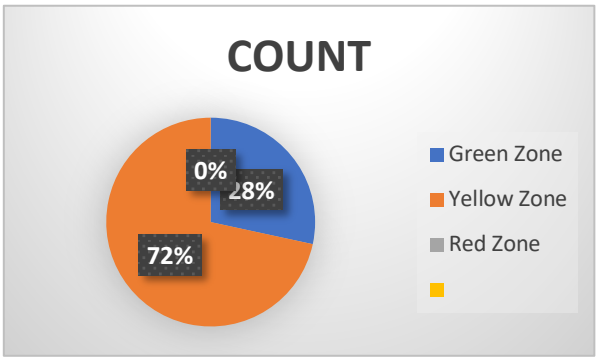
- Green Zone: 80–100% of predicted PEFR – indicates normal lung function
- Yellow Zone: 50–79% of predicted PEFR – indicates moderate obstruction or caution zone
- Red Zone: Below 50% of predicted PEFR – indicates severe obstruction or medical alert zone

Statistical analysis was done to classify the pulmonary function of the traffic policemen based on their peak expiratory flow rate which was done using the peak flow meter.

**Zone distribution table:**

Table 2. Shows the distribution of participants across PEFR zones.

| ZONE | COUNT | PERCENTAGE |
|---|---|---|
| Green Zone | 23 | 28.39% |
| Yellow Zone | 58 | 71.60% |
| Red Zone | 0 | 0% |




The frequency (count) and percentage of participants falling into each PEFR zone were calculated.

58 individuals (71.60%) fell into the Yellow Zone, indicating moderate respiratory function impairment.

23 individuals (28.39%) were in the Green Zone, indicating normal pulmonary function.

No participants (0%) fell into the Red Zone, suggesting that no severe airway limitation was recorded during data collection.

**4. Discussion:**

Traffic policemen, by the nature of their duties, are exposed daily to harmful air pollutants, particularly in high-traffic zones. This long-term exposure is recognized as a potential occupational hazard that can impair pulmonary function. The present study assessed respiratory health among traffic police in Satara district using Peak Expiratory Flow Rate (PEFR) to identify early signs of airway obstruction and evaluated the influence of gender and PEFR zone classification on respiratory performance. [9]

In this study peak flow meter device is used to assess the peak expiratory force rate (PEFR) among traffic policemen. PEFR is a simple and reliable indicator of airway obstruction and overall lung function. In this study, PEFR values were interpreted using standardized zones:

- Green Zone (80–100%): Normal lung function
- Yellow Zone (50–79%): Mild-to-moderate obstruction
- Red Zone (<50%): Severe obstruction

Out of 81 participants, only 28.39% were in the Green Zone, while 71.60% fell into the Yellow Zone, suggesting early signs of pulmonary compromise in the majority. Notably, no participants were found in the Red Zone, indicating absence of severe obstruction, but the high Yellow Zone prevalence is a matter of concern, as it may reflect subclinical or early airway damage. [9]

Prolonged exposure to vehicular pollutants, including carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulphur dioxide ($SO_2$), and particulate matter (PM2.5 and PM10), is known to impair respiratory function. In the current study, most participants worked for extended hours in heavily polluted environments without consistent use of protective masks. This direct exposure likely contributed to the impaired PEFR values recorded.

Studies in other Indian cities report similar results. For instance, Shelke et al. found that traffic police exposed to urban vehicular emissions had significantly lower vital capacity (VC), $FEV_1$, and PEFR compared to controls (7.21 ± 1.30 L/s in traffic police vs. 8.06 ± 1.59 L/s in controls). These reductions are clinically relevant and reflect the damage caused by sustained inhalation of airborne pollutants. [7]

Moreover, Gupta et al. observed that the duration of exposure played a key role: traffic policemen with more than 8 years of exposure had lower PEFR (7.5 L/s) than those with less than 8 years (7.7 L/s), demonstrating a dose-dependent effect of pollution on respiratory health. [9]

The sample consisted of 49 males (60.49%) and 32 females (39.50%). Both groups showed high Yellow Zone prevalence, indicating compromised lung function regardless of gender. While males generally have higher absolute PEFR due to larger lung volumes, no significant difference in PEFR zone distribution was observed between genders in this study, echoing findings by Gupta et al., where gender did not alter the relative risk when occupational exposure levels were high.

This suggests that environmental exposure is a stronger determinant of pulmonary decline than biological sex in this occupational group.

Participants in the Yellow Zone are at risk for developing:

- Early-stage obstructive airway disease
- Occupational asthma
- Decreased work endurance and exertional breathlessness

Gupta et al. linked reduced PEFR to early symptoms such as frequent coughing, breathlessness, and irritation in the respiratory tract. In fact, their data showed that traffic police were 6.37 times more likely to report frequent coughing than unexposed controls. [9]

**5. Conclusion:**

The results of this study reveal that more than 70% of traffic police personnel in Satara district demonstrate reduced lung function, as reflected by their placement in the Yellow Zone of PEFR classification. Although no cases were observed in the Red Zone, the predominance of Yellow Zone values indicates a notable public health issue. These outcomes are consistent with previous national and international research, emphasizing vehicular pollution as a major occupational risk factor for this workforce.

These observations advocate for the urgent need to implement targeted preventive healthcare measures, conduct routine respiratory screenings, and introduce environmental interventions to protect and promote the long-term respiratory health of traffic police personnel..

**REFERENCE**

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