Open Access

Pak J Med Res
Vol. 64, No. 3, 2025

Original Article

Spirometric Evaluation of Respiratory Health in Traffic Policemen Deployed on Roads of Lahore

Abdul Wahab Gureja[1], Bilal Mushtaq[2], Asif Hanif[3], Affaf Javaid[3], Muhammad Nusrullah[3], Faiza Khalid[3]

[1]Ali Fatima Hospital/Abu Umara Medical & Dental College, Lahore, [2]THQ Hospital, Wazirabad, [1,3]King Edward Medical University/ Mayo Hospital, Lahore.

Abstract

Background: Health risks associated with breathing in polluted air caused by motor vehicles have increased significantly. The worst impacted population is anticipated to be traffic enforcement officers because of their constant and extended exposure on the busy roads.
Objective: To measure the lung function parameters i.e. mean FEV1, FVC, ratio of FEV1 to FVC and PEFR in traffic policemen performing their duties on roads of Lahore by using spirometer.
Methods: This cross-sectional study was conducted at Institute of TB & Chest Medicine, Mayo Hospital, Lahore from July 2024 to January 2025. A total of 100 wardens visiting outpatients were consecutively included and underwent lung function evaluation on Spirodoc© spirometer. They were asked to blow air through spirometer and FEV1 (L), FVC (L) and FEV1/FVC ratios (%) and PEFR (L/s) were recorded. All the data was stored using 'WinspiroPRO' software version 62 and recorded on the attached proforma.
Results: Mean age of wardens was 30.44±6.32 years & mean job duration was 7.57±5.58 years. Spirometric evaluation showed that mean FEV1 and FVC was 73.74±9.31(%) and 74.49±8.34(%). However mean FEV1/FVC ratio and PEFR was 100.16±16.36(%) and 74.22±9.21L/srespectively. No statistically significant difference was seen for lung function parameters (FEV1, FVC, FEV1/FVC & PEFR) in relation to age, duration of job [*p*-value >0.05] however BMI showed significantly reduced FEV1/FVC; [*p*-value 0.024]) among underweight wardens.
Conclusion: A decreased level of lung function has been observed among traffic wardens. With age and prolonged duration of exposure to traffic pollution, a declining trend in lung functioning has been observed based on spirometric evaluation.
Key words: FEV1/FVC ratio, PEFR, traffic policemen, warden, Lahore, spirometer.

Introduction

Lahore is amongst the fastest growing cities of Pakistan. There is rapid urbanization which is leading to higher number of vehicles emitting harmful air pollutants. These air pollutants include Carbon mono oxide (CO), Carbon dioxide (CO_2), Lead, Nitrogen oxide (NO_2) and particulate matter. The solid particles, also known as Diesel Exhaust Particulate (DEP) makes up a major part of the particulate matter.[1,2] The CO is the most common widely distributed pollutant produced from vehicle exhaust systems. Moreover, there are suspended solid & liquid droplets floating in the air. Exposure to these air pollutants leads to increased health hazards particularly when exposure is prolonged as is the case with traffic police personnel. When traffic officers are stationed at busy intersections, they put their own health at risk, particularly that of their lungs.[3,4] Air pollution is harmful to the respiratory system when breathed in over time. The incidence of obstructive, restrictive, and mixed forms of lung dysfunction is rising.[5,6]

A study conducted on traffic policemen found that Forced Expiratory Volume in first, second (FEV1) and Forced Vital Capacity (FVC) were reduced by 0.21L/min and 0.32L and FEV1/FVC was higher by 6.8%.[7] In another study on traffic policemen conducted by Ranganadin et al. all observed Pulmonary Function Test (PFT)

Corresponding Author:
Abdul Wahab Gureja
Ali Fatima Hospital/Abu Umara Medical & Dental College, King Edward Medical University/ Mayo Hospital, Lahore.
Email: awgureja@gmail.com
Received: 01 July 2025, **Accepted:** 24 September 2025
Published: 30 September 2025

Authors Contribution

AWG conceptualized the project. BM & FK did the data collection. AWG & AH performed the statistical analysis AWG & AH, HIM & AJ did the literature search. Drafting, revision & writing of manuscript were done by BM, AJ & MN.

parameters were less than their respective predicted (expected) values i.e. FVC=3.7L (expected 4.0 L), Peak Expiratory Flow Rate (PEFR)=8.1 L/s (expected 8.5 L/s), FEV1=2.9L (expected 3.3L).[8] Pal et al. also showed that in traffic policemen, mean FVC was 3.56±0.11L, mean FEV1 was 2.79±0.10L, mean FEV1/FVC was 78.40±2.12L and mean PEFR was 362.47±25.91L.[9]

According to a Pakistani study, conducted in Lahore, it was reported that there were 23.4% wardens who had problem of breathlessness. Based on the symptoms, they concluded that most traffic wardens had a moderately impacted respiratory profile at the clinical to subclinical level. Lahore's air quality index fell into the unhealthy to very unhealthy range.[10]

Assessment of the pulmonary function capacity of traffic policemen / controller working on roads of Lahore is of most importance to see the long-term effects of working environment on lung functions. There are no or few studies conducted to evaluate the pulmonary function test parameters in traffic policemen of Lahore and to measure the changes in lung functions resulting from long term exposure to vehicular pollution. In addition, this will aid in the identification of high-risk groups of traffic police, allowing for the provision of appropriate recommendations pertaining to the safety of police personnel while on traffic duty. Thus, this will supplement local data and aid in the preparation of safety measures for subjects carrying out their responsibilities in severely contaminated areas. Therefore, the objective of this study is to measure the lung function parameters i.e. mean FEV1, FVC, ratio of FEV1 and FVC and Peak Expiratory Flow Rate (PEFR) in traffic policemen performing their duties on road of Lahore by using spirometer

Methods

This cross-sectional study was conducted at Institute of TB & Chest Medicine, Mayo Hospital, Lahore from July 2024 to January 2025. A sample size of 100 traffic wardens is statistically calculated taking expected magnitude of FEV1/FVC i.e. 78.40±2.12L[9] among traffic controller working in Lahore. Non probability, consecutive sampling technique was used to collect the data from males Traffic policemen of age 18 years and above working for more than 8 hours a day having experience of three years and above in Lahore. Traffic policemen who are: smokers, tobacco users, history of abdominal or chest surgery, chronic respiratory illness or morbidly obese BMI>35Kg/m^2 were excluded from the sample

The informed consent was taken from all 100 participants visiting outpatients of Institute of TB & Chest Medicine, Mayo Hospital. Demographic details of subjects including name, age, BMI and duration of job as traffic controller was recorded. Then all the subjects undergone lung function evaluation on Spirodoc© spirometer. They were asked to blow air through spirometer and FEV1 (L), FVC (L) and FEV1/FVC ratio (%) and PEFR was recorded. All the data was stored using 'WinspiroPRO' software version 62 and recorded on the attached proforma.

Data was entered and analyzed using SPSS version 20. Quantitative variables like age, FEV1, FVC and FEV1/FVC ratio and PEFR was presented as mean and standard deviation. Qualitative variables like BMI (Normal, underweight, overweight and obese), was presented as frequency and percentage.

Results

Mean age of wardens was 30.44±6.32 years. Mean height and weight of wardens was 1.79±0.05 meters and 69.21±6.11 Kg respectively. However mean BMI of wardens was 21.51±2.35 kg/m^2.As per BMI criteria 85 (85%) wardens BMI was normal; 6 (6%) were under weight and 9 (9%) were overweight. Mean job duration of wardens was 7.57±5.58 years. Mean FEV1 and FVC was 73.74±9.31% predicted and 74.49±8.34% predicted. However mean FEV1/FVC ratio and PEFR was 100.16±16.36% and 74.22±9.21 L/s, respectively as presented in Table-1.

Table 1: Demographic characteristics and clinical examination of participants. (n = 100)

Characteristics		*Descriptive Outcomes*
Age (years)		30.44±6.32
Height (m)		1.80±0.05
Weight (kg)		69.21±6.11
BMI	Mean (kg/m^2)	21.51±2.35
	Normal	85 (85%)
	Overweight	6 (6%)
	Obese	9 (9%)
Job duration (years)		7.57±5.58
FEV1 (%)		73.74±9.31
FVC (%)		74.49±8.34
FEV1/FVC		100.16±16.36
PEFR (L/s)		74.22±9.21

No statistically significant difference was seen for FEV1, FVC, FEV1/FVC and PEFR in the age group 20-30 and 31-40 years. However, FEV1, FVC and FEV1/FVC were higher in the age group 31-40 years but this difference was insignificant (*p*-value (FEV1) = 0.302, (FVC) = 0.460, (FEV1/FVC) =

Table 2: Comparison of clinical examination with respect to age, duration of job and BMI. (n = 100)

Factor		*FEV1*	*FVC*	*FEV1/FVC*	*PEFR*
Age (Years)	≤30	72.76±9.00	73.86±8.3	99.69±16.25	74.76±9.77
	>30	74.69±9.60	75.10±8.36	100.60±16.62	73.71±8.71
p-value		0.302	0.46	0.782	0.572
Job Duration (Years)	≤5	72.15±8.84	75.00±9.42	97.67±17.35	76.04±9.71
	>5	72.93±9.22	74.05±8.21	99.51±15.56	74.17±9.6
p-value		0.734	0.662	0.65	0.44
BMI	Underweight	64.67±8.59	78.67±8.56	82.69±8.16	69.50±7.71
	Normal	74.47±90.4	74.47±8.59	101.18±15.99	75.04±9.32
	Overweight	72.89±11.84	71.89±6.27	102.07±18.50	69.67±7.26
p-value		0.41	0.308	0.024	0.108

0.782 & (PEFR) = 0.572). Except FEV1/FVC all other lung function parameters i.e. FEV1, FVC and PEFR values were insignificantly across different BMI. However, FEV1/FVC was very much reduced in underweight subjects (*p*-value =0.024). FEV1, FVC, FEV1/FVC and PEFR insignificantly differ in job duration categories i.e. 1-5 years [FEV1=72.15, FVC=75.00, FEV1/FVC=97.67 & PEFR=76.04] and 6-10 years [FEV1=72.93, FVC=74.05, FEV1/FVC=99.51 & PEFR=74.17] as presented in Table-2.

Discussion

Air pollution caused by automotive exhaust has emerged as a serious health risk due to the remarkable growth in vehicle density across the world. Breathing in dust and gasoline vapor together may seriously damage your lungs and other organs. Because of their constant and extended exposure, traffic police officers are likely to suffer the most severe consequences. In these groups, lung function may be affected by factors including length of exposure, age, and co-occurring smoking. Long-term exposure to vehicle emissions (such as fumes or chemical residues) has been linked to reduced lung function in several studies of traffic officers.[11,12]

Long-term exposure to vehicle-generated air pollution has been linked to a variety of health problems, including cytogenetic abnormalities, asthma exacerbations, and chronic obstructive pulmonary disease.[13] In this study mean age of wardens was 30.44±6.32 years. Mean job duration of wardens was 7.57±5.58. Spiro-metric evaluation showed that mean FEV1 and FVC was 73.74±9.31 and 74.49±8.34. However mean FEV1/FVC ratio and PEFR was 100.16±16.36 and 74.22±9.21 respectively. No statistically significant difference was seen for lung function parameters (FEV1, FVC, FEV1/FVC & PEFR) in relation to age, BMI (except underweight wardens had significantly reduced FEV1/FVC) and duration of job.

People who work in motor vehicle traffic areas have a higher incidence of respiratory illness.[12,14] There is a higher probability of abnormal FEV1 and FVC among non-mask-wearing traffic police officers compared to their mask-wearing counterparts. In addition to respiratory ailments, long-term exposure to air pollution is associated with an increased risk of cardiovascular disease and nervous system problems.[15,16] Researchers found that impaired lung function due to air pollution was a significant predictor of cardiorespiratory illness and death.[17]

Most of the studies in literature have compared the lung function tests of traffic wardens with controls (taken from some other police department or normal people).[18,19] However in this study we just evaluated the lung function test of wardens and did not compared their lung function test it with any control. Patil found that the traffic cops he studied had significantly reduced lung function metrics. Values for FVC, FEV1, PEFR, and MMV among traffic officers were significantly (p <0.01) below their predicted values. The wardens, on the other hand, had poorer FVC (0.32L), FEV1 (0.21L/min), and a greater FEV1/FVC ratio (6.8%). There was a decrease of 7.3% in the FEV1/FVC ratio and a decrease of 11.8% in FVC as compared to the expected value. In traffic wardens, 30.8% had a modest decrease in forced vital capacity (FVC), whereas 17.3% had a moderate decrease[7]. These findings were also similar to the findings were observed in this study, showing reduced lung functioning of traffic wardens. This may be because of Pakistan and India have been sharing similar traffic and atmospheric parameters.

Long-term exposure to air pollution is responsible for the considerable reduction in FVC, FEV1, and PEFR shown in the research by Gupta S., et al. compared with controls. Values for forced vital capacity (FVC) (2.7L), forced expiratory volume in one second (FEV1) (1.8L), and peak expiratory flow rate (PEFR) (7.5L/s) were significantly lower in traffic police officers with >8 years of exposure

compared to those obtained in traffic police officers with 8 years of exposure.[20] Pal et al., conducted another study in India and showed that in traffic policemen, mean FVC was 73.56±0.11L, mean FEV1 was 72.79±0.10L, mean FEV1/FVC was 78.40±2.12L and mean PEFR was 362.47±25.91L/min.[9] Results of this study are also comparable with findings of current study.

Patil, Gupta and Pal et al showed decreasing trend in lung function test parameters of traffic wardens and results of this study are consistent with the findings of these authors however in this study we did not compare the lung function test parameters with controls. A latest study from Multan Pakistan also showed that among traffic wardens mean FVC was 4.54±0.12, mean FEV1 was 3.97±0.11, mean FEV1/FVC was 86.30±3.11 and mean PEFR was 483.56±26.81.[21]

In another study on traffic policemen conducted by Ranganadin et al., all observed PFT parameters were less than their respective predicted (expected) values i.e. FVC=3.7L (expected 4.0 L), PEFR=8.1 L/s (expected 8.5 L/s), FEV1=2.9L (expected 3.3L).[8] Sayyad from Nepal also reported a significant decrease in FVC (p <0.01), FEV1 (p <0.01), FEV1/FVC and PEF in traffic wardens.[22]

In addition, Gupta and his colleagues demonstrated that traffic cops saw a noticeable reduction in all Spiro-metric indicators as the length of their exposure to different pollutants increased. When comparing traffic officers with and without 8 years of exposure, individuals with 8 years or more of exposure had significantly lower values for FVC (2.7 L), FEV1 (1.8 L), and PEFR (7.5 L/s).[20]

Participants in this study i.e. traffic officers, were exposed to toxic compounds and gases from vehicle emissions for extended periods of time, causing irritation and allergies in their lungs and airways. Particulate matter in the lungs causes reactive oxygen species to be produced in macrophages and bronchial epithelial cells via vehicle exhaust, especially organic extracts of diesel exhaust.[23, 24]

In this study, only spiro-metric examinations were performed while level of lung diseases i.e. chronic or acute were not evaluated. Moreover, due to recent wave of corona virus, most of the wardens were using masks. The effect of heat was also not assessed. Moreover, their cardiac functioning was also not assessed, that could be associated with lung functioning. These limitations are the future prospects of this study.

Conclusion

The study demonstrates a decline in spiro-metric parameters among traffic wardens in Lahore, particularly FEV1 and FVC. Although the results were not significant across most subgroups, underweight participants showed significantly lower FEV1/FVC ratios, indicating a possible restrictive pattern. These findings highlight the need for regular lung function monitoring and preventive measures, including use of protective masks.

Funding: None.

Availability of Data: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval: The Institutional Review Board of King Edward Medical University, Lahore approved the study via letter no. 469/RC/KEMU.

Conflict of Interest: None declared.

References

1. Lorensia A, Suryadinata RV, Diputra I. Risk Factors and Early Symptoms Related to Respiratory Disease in Pedicab Drivers in Surabaya. KEMAS 2019; 15(2): 224-34.
2. Ojukwu CP, Okemuo AJ, Madu CV, Ativie RN, Caesar CS, Moris AE. Pulmonary functions of commercial tricyclists (Keke Napep riders) in Enugu State, Nigeria. Afr Health Sci 2020; 20(2): 798-805.
3. Fahim TA. Factors and respiratory complications among traffic polices in Dhaka City: Bangladesh Health Professions Institute; 2023. (Accessed on 26th July 2025) Available from URL:http://dspace.crp-bangladesh.org:8080/xmlui/handle/123456789/1007]
4. Khaliq F, Vaney N, Indora V. Event-related potentials in traffic policemen. Indian J Physiol Pharmacol 2022; 65(4): 217-21.
5. Yadav OP, Pun M, Mahotra NB, Rana BS. Spirometric Evaluation of Effect of Air Pollution on Pulmonary Functions of Traffic Police in Kathmandu Valley. Janaki Med Col J Med Sci 2022; 10(2): 4-10.
6. Holthof K, Bridevaux PO, Frésard I. Underlying lung disease and exposure to terrestrial moderate and high altitude: personalised risk assessment. BMC Pulmo Med 2022; 22(1): 187.
7. Patil P, Thakare G, Patil S. Comparative Study of Lung Function Test of Policemen in Traffic Control with those in General Duty. Nat J Physiol Pharm Pharmacol 2013; 3(2): 162-6.
8. Ranganadin P, Chinnakali P, Vasudevan K, Rajaram M. Respiratory health status of traffic policemen in puducherry, South India. Int J Cur Res Rev 2013; 5(7):88-91.

9. Dutta T, Pal G. Pulmonary function test in traffic police personnel in Pondicherry. Indian J Physiol Pharmacol 2010; 54(4): 329-6.
10. Tahir M, Tariq F, Saeed HW, Nauman M, Usman M, Ali S. Impact of Air Pollution on Respiratory Health of Traffic Wardens in Lahore: Air Pollution and Respiratory Health. Healer J Physiother Rehab Sci 2023; 3(7): 703-9.
11. Ahmed P, Eaty M, Alam N, Yasmin N. Respiratory Symptoms in Urban Traffic Policemen: A Cross-Sectional Study in Bangladesh. J Environ Sci Public Health 2022; 6(2): 158-68.
12. Dey A, Mishra T, Sahu S, Saha A. Evaluation of impact of ambient air pollution on respiratory health of traffic police in Kolkata. BLDE Uni J Health Sci 2021; 6(1): 35-42.
13. Patil R, Chetlapally S, Bagavandas M. Global review of studies on traffic police with special focus on environmental health effects. Int J Occupat Med Environ Health 2014; 27(4): 523-35.
14. Boogaard H, Patton A, Atkinson R, Brook J, Chang H, Crouse D, et al. Long-term exposure to traffic-related air pollution and selected health outcomes: A systematic review and meta-analysis. Environment Int 2022;164: 107262.
15. Santos UdP, Arbex MA, Braga ALF, Mizutani RF, Cançado JED, Terra-Filho M, et al. Environmental air pollution: respiratory effects. J Brasil Pneumol 2021; 47: e20200267.
16. Khreis H. Traffic, air pollution, and health. Advances in transportation and health: Elsevier; 2020: 59-104.
17. Park J, Kim HJ, Lee CH, Lee CH, Lee HW. Impact of long-term exposure to ambient air pollution on the incidence of chronic obstructive pulmonary disease: a systematic review and meta-analysis. Environ Res 2021; 194: 110703.
18. Sasikumar S, Kuppusamy M, Dilara K, Ramaswamy P. Assessment of pulmonary functions among traffic police personnel in Chennai city - A comparative cross-sectional study. J Fam Med Prim Care 2020; 9: 3356.
19. Jamil P, Karuppiah K, Rasdi I, How V, Tamrin SBM, Mani KKC, et al. Associations of Occupational, Socio-Demographic and Lifestyle Factors with Lung Functions in Malaysian Traffic Policemen. Ann Global Health 2020; 86(1): 84.
20. Gupta S, Mittal S, Kumar A, Singh KD. Respiratory effects of air pollutants among nonsmoking traffic policemen of Patiala, India. Lung India 2011; 28(4): 253.
21. Muhammad Zafar* AaMKAK. Exposure of vehicular pollution in altering the pulmonary functions in traffic policemen in Multan city. Punjab Univ J Zool 2015; 30(1): 1-5.
22. Bhairahawa N. Evaluation of pulmonary function tests on non smoking traffic police men at Tirupati, AP, India. Int J Physiother Res 2013; 1(5): 279-82.
23. Gowda G, Thenambigai R. A study on respiratory morbidities and pulmonary functions among traffic policemen in Bengaluru city. Ind J Community Med 2020; 45(1): 23-6.
24. Sasikumar S, Maheshkumar K, Dilara K, Padmavathi R. Assessment of pulmonary functions among traffic police personnel in Chennai city-A comparative cross-sectional study. J Fam Med Prim Care 2020; 9(7): 3356-60.