# Respiratory Health Status Of Traffic Police Personnels In Ahmedabad, Gujarat

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**Abstract:** Background: To evaluate an association between vehicle exhaust and its effect on pulmonary functions of traffic police personnel and to assess the extent of impairment in the lung function of traffic police personnel compared to unexposed healthy control group. Material And Methods: In this comparative, observational study pulmonary function parameters were recorded in age- and BMI – matched 60 traffic police personnel (active in the field as study group) and 30 traffic police personnel (performing back office work as control group) of both genders. PFT parameters were compared between the study group and control group by using electronic (computerized) spirometer available in Department of Medicine, Smt.NHLMMC & VSGH. Blood oxygen saturation levels ($SpO_2$) and Perfusion Index (PI) were recorded using Dr.Trust Professional series Fingertip Pulse Oximeter. Result: No difference was found in case of Systolic Blood Pressure, Blood oxygen saturation levels ($SpO_2$) and Perfusion Index (PI) in both groups. Diastolic Blood Pressure was significantly ($P<0.05$) higher in study group (75.4 ± 8.03) in compare to control group (72.13 ± 6.02)**.** There was a significant decrease in FVC ($P<0.0001$), FEV1 ($P<0.00001$), $FEF_{25-75\%}$ ($P<0.0001$), PEF ($P<0.001$), $FEF_{0.2-1.2}$ ($P<0.001$), FEF25% ($P<0.001$), FEF50% ($P<0.0001$) and Inspiratory capacity ($P<0.05$) in study group compared to the control group. Conclusion: These changes suggest obstruction and narrowing of the airways in study group traffic police personnel compared to the control group. It may be due to exposure to vehicle emission for several hours in a day, which decreases their lung capacity. Abbreviations: BMI: Body Mass Index ($Kg/m^2$), PFT: Pulmonary function test, FVC: Forced Vital Capacity, FEV1: Forced Expiratory Volume in first second, $FEF_{25-75\%}$: Forced Expiratory Flow at 25-75% of FVC in litres per second, PEF: Peak Expiratory Flow in litres per second, $FEF_{0.2-1.2}$: Forced Expiratory Flow between 200 and 1200 ml of FVC, FEF25%: Forced Expiratory Flow at 25% of FVC in litres per second, FEF50%; Forced Expiratory Flow at 50% of FVC in litres per second, FEF75%: Forced Expiratory Flow at 75% of FVC in litres per second.[Shukla P Natl J Integr Res Med, 2020; 11(3):54-57]

**Key Words:** Pulmonary function parameters, traffic police personnel, blood oxygen saturation levels, perfusion index

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**Introduction:** Urban air pollution from road transport is a growing concern for a large number of developing country cities[3]. Ambient concentrations of fine particulate matter, which is one of the most damaging air pollutants, are several times higher in developing countries. The use of motorized transport is expected to increase in the coming years, potentially worsening the air quality. In Mega cities, Intensity of pollution is increasing day by day[6, 8].

Exposure to air pollutants has proven vulnerable for the lung health in humans[1, 3]. With increase in population and industrialization in Ahmedabad, there is an increase in usage of automobiles as a mode of transport[1,3]. Automobile exhaust consists of lead, suspended particulate matter, oxides of nitrogen, carbon monoxide, sulfur dioxide, nitrogen dioxide, benzene and polyaromatic hydrocarbons can cause injury to terminal bronchioles and decrease the vital capacity and pulmonary compliance[4,6]. Ultrafine particles of air pollution can easily enter in blood vessels and effect respiratory as well as cardiovascular systems[4]. Traffic police personals, due to nature of their job and continuous exposure to vehicle emission, are at a higher risk of deterioration in their lung functions. Hence, we have conducted the present study to assess the pulmonary function tests in traffic police personnel[7,8]. Pulmonary function tests using a computerized spirometer evaluate respiratory functions and give idea about the impairment in the respiratory health status of an individual[2].

Hence, this study aimed at evaluating respiratory health status of traffic policemen working in the field and in back office was carried out using spirometry.

**Material & Methods:** In this comparative, observational study pulmonary function parameters were recorded in age- and BMI – matched 60 traffic police personnel (active in the field as study group) and 30 traffic police personnel (back office work as control group) of both genders. Information about their age, gender, years in service, history of smoking,

alcohol consumption was acquired. Their personnel history of any respiratory symptoms along with family history of asthma and allergies were obtained.

Respiratory functions of the traffic police personnels were assessed by using a computerized spirometer. PFT parameters were compared between the study group (N=60) and control group (N=30) by using an electronic (computerized) spirometer (Helios 2) available in the Department of Medicine, Smt. NHLMMC & VSGH. Body Mass Index was calculated by Weight in Kg / Height in $m^2$. Blood pressures are taken in sitting, resting condition by Auscultatory method with the help of Sphygmomanometer. Blood oxygen saturation levels ($SpO_2$) and Perfusion Index (PI) were recorded using Dr.Trust Professional series Fingertip Pulse Oximeter.

Testing was performed in the sitting, relaxed position upon satisfactory demonstration of the procedure to perform the test and the results were obtained after adequate motivation and encouragement. The observed values were compared with the predicted values of the subjects.

The study was reviewed and approved by the Institutional Ethics Committee.
All the subjects were given an understanding of the research work and its risks and informed consent was obtained from all the subjects prior to the study.

Study Time: Study was conducted between the month and year of October 2018 to August 2019.

Statistical Analysis: Data were entered in Microsoft excel spreadsheet and analysis was done in SPSS. Observed values of PFT parameters like FVC, $FEV_1$, PEFR, $FEV_1$/FVC, $FEF_{25-75\%}$, $FEF_{0.2-1.2}$, FEF25%, FEF50% and MVV were compared with predicted values standardized for age, height and weight. Unpaired t-test was used to compare the difference of means between observed and predicted values of both the groups.

**Results:** A total of 90 traffic police personnels were included in the study,60 traffic police personnel (active in the field as study group) and 30 traffic police personnel (back office work as control group) of both genders.

TABLE -1 shows data of age, BMI matched study group and controls.

TABLE -2 significant difference was found in case of Pulse Rate ($P<0.05$) which was higher in study group (89.13 ± 11.23) in compare to control group (83.73 ± 11.12) and Diastolic Blood Pressure ($P<0.05$) higher in study group (75.4 ± 8.03) in compare to control group (72.13 ± 6.02).

TABLE-3 shows pulmonary function tests of traffic police personnels where almost all observed PFT parameters were less than their respective predicted values. Observed FVC in study group (2.00 ± 0.95 L) was less than control group (2.91 ± 0.63 L) with highly significant difference ($P<0.001$). There was statistically high significant difference ($P< 0.001$) between $FEV_1$ of study group (1.73 ± 0.81 L) and control group (2.57 ± 0.38 L).

Peak Expiratory Flow Rate which is considered as a better index to assess expiratory efforts was significantly lower in study group than control group ($P<0.001$) with values in study group of (3.44 ± 2.48 L) in compare to control group (5.53 ± 1.76 L). There was statistically high significant difference ($P<0.001$) found in $FEF_{25-75\%}$ of study group and control group, which is a better indicator of small airway obstruction with values in study group (2.23 ± 1.10 L) and control group showing (3.41 ± 0.89 L).

**Discussion:** The computerized spirometer was used in this study to assess the pulmonary functions of the lung. The additional parameters like BMI, Pulse rate; Systolic Blood Pressure and Diastolic Blood Pressure were also investigated. Pulse rate and blood pressure of the subjects were obtained after providing 5 minutes of rest.

Respiratory health is defined as the absence of obvious lung disease[10]. In recent years, environmental exposure has been identified as one of the severe risk factor for the development of lung disease.

Lung function is one of the most extensively recognized indicators of respiratory health. In current study, pulmonary function tests showed a reduction in lung function of traffic policemen.

$FEV_1$ was the fraction of the vital capacity expired during the first second of forced expiration.

**Table – 1 Anthropometric Data Of Study Group And Control Group**

| Parameters | Study Group (N=60) Mean ±SD | Control Group(N=30) Mean ±SD | T – Test (P Value) |
|---|---|---|---|
| Age(Years) | 29.76 ± 7.41 | 30.13 ± 7.83 | 0.874613 |
| Height(Cms) | 164.06 ± 7.95 | 161.8 ± 6.21 | 0.255158 |
| Weight (Kg) | 58.4 ± 13.28 | 60.3 ± 12.56 | 0.742338 |
| BMI (Kg/m2) | 21.54 ± 4.06 | 22.86 ± 3.52 | 0.355468 |

**Table – 2 Physical Activity, Pulse Rate And Blood Pressure In Study Group And Control Group**

| Parameters | Study Group (N=60) Mean ± SD | Control Group (N=30) Mean ± SD | T – Test (P Value) |
|---|---|---|---|
| Physical Activity (Min/Day) | 5.33 ± 9.90 | 5.33 ± 9.72 | 0.95 |
| Pulse Rate (/Min) | 89.13 ± 11.23 | 83.73 ± 11.12 | 0.09** |
| Systolic B.P (mm Hg) | 125.2 ± 12.48 | 122.4 ± 11.16 | 0.36 |
| Diastolic B.P (mm Hg) | 75.4 ± 8.03 | 72.13 ± 6.02 | 0.08** |

**Table – 3 Pulmonary Functions In Study Group And Control Group**

| Parameters | | Study Group (N=60) Mean ± SD | Control Group(N=30) Mean ± SD | T – Test (P Value) |
|---|---|---|---|---|
| FVC (L) | OBS | 2.00 ± 0.95 | 2.91 ± 0.63 | 0.0008*** |
| | % PRED | 2.97 ± 0.60 | 2.88 ± 0.50 | 0.55 |
| FEV1 (L/sec) | OBS | 1.73 ± 0.81 | 2.57 ± 0.38 | 0.00005*** |
| | %PRED | 2.45 ± 0.54 | 2.37 ± 0.44 | 0.58 |
| FEV1/FVC(%) | OBS | 88.18 ± 12.83 | 92.77 ± 6.18 | 0.13 |
| | %PRED | 82.27 ± 1.98 | 82.44 ± 1.94 | 0.74 |
| FEF25-75(L/sec) | OBS | 2.23 ± 1.10 | 3.41 ± 0.89 | 0.0007*** |
| | %PRED | 3.80 ± 0.47 | 3.69 ± 0.47 | 0.46 |
| PEFR(L/sec) | OBS | 3.44 ± 2.48 | 5.53 ± 1.76 | 0.002** |
| | %PRED | 7.70 ± 1.38 | 7.58 ± 1.21 | 0.71 |
| FIVC (L) | OBS | 0.42±1.04 | 1.038±1.29 | 0.79 |
| FEV0.5 | OBS | 1.36±0.65 | 2.044±0.34 | 0.00001*** |
| FEV3 | OBS | 1.96 ± 0.89 | 2.81 ± 0.50 | 0.0003*** |
| | %PRED | 2.88 ± 0.58 | 2.79 ± 0.48 | 0.56 |
| SVC | OBS | 3.33 ± 0.87 | 3.42 ± 0.68 | 0.94 |
| MVV(L/min) | OBS | 71.64 ± 27.99 | 86.62 ±22.52 | 0.10 |
| $SpO_2$ (%) | OBS | 97.86 ± 1.19 | 98 ± 0.65 | 0.38 |
| Perfusion Index (PI) (%) | OBS | 4.56 ± 2.28 | 4.62 ± 2.54 | 0.88 |

$FEV_1$ indicates strength of expiratory muscles. FVC shows the amount of air that a person can forcefully and quickly exhale after taking a deep breath. FVC helps to distinguish obstructive disease from restrictive disease.

Reduction in $FEF_{25-75\%}$ indicates small airway obstruction. Reduction in PEFR values indicates the risk of obstructive airway disease in the study group who are exposed to air pollutants every day. All the four parameters (FVC, $FEV_1$, PEFR and

$FEF_{25-75\%}$) were reduced in traffic police personnels working at traffic signals (study group) in comparison to traffic police personnels doing back office work (control group)[2]. Highly significant difference between observed and predicted PFT values points towards decline in lung function in traffic policemen working especially in crowded traffic signals. Reduction in above parameters suggests high level of obstructive airway disease in this occupational group which might coincide with higher density of air pollutants exposure. Identical observations have been observed in studies conducted in different cities of India and other countries as well.

**Conclusion:** Exposure to toxic pollutants present in the environment for long duration due to heavy traffic in Mega cities can lead to harmful effects to the lung functions. It is suggested that the traffic police personnel working near heavy traffic signals compulsory use personal protective devices (e.g. air filtering nose masks). Increasing strength of traffic policemen and reducing their duty hours could provide beneficial results. Traffic police personnel must under-go periodic health check-ups and spirometric assessment.

Awareness must be created amongst traffic police personnels and public regarding harmful effects of traffic pollution and its management procedures. It is necessary to switch off the engines in traffic queues. Extensive use of high quality gas fuels like CNG and establishing institutions which regulates vehicle emission standards and remove gross polluting vehicles from the road. Switch to the use of more battery operated vehicles.

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| Conflict of interest: None |
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| Funding: None |
| Cite this Article as: Shukla P, Mod H, Verma A. Respiratory Health Status Of In Traffic Police Personnels In Ahmedabad, Gujarat, India.Natl J Integr Res Med 2020; Vol.11(3): 54-57 |