



EFFECTS OF AIR POLLUTANTS ON LUNG FUNCTIONS OF TRAFFIC POLICEMEN OF UJJAIN, MADHYA PRADESH, INDIA

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ABSTRACT

Background- Maximum Air pollution is at road side. It can cause acute and chronic respiratory diseases. Traffic policemen are continuously exposed to pollutants. Study was done for lung function assessment of traffic policemen of Ujjain city.

Methodology- Detailed history and clinical examination were done. Spirometry was done before and after duty with Spirolab III machine.

Results- 100 traffic policemen 98% were male and 2% female. Duty place- roadside-90% and office -10%. Daily exposure- 63% were 6 hours or less and 37% were more than 6 hours. Service length- 79% had 10 years or more period. Spirometry results were pre duty 60% normal, 33% restrictive, 4% obstructive and 3% mixed. Air quality index of Ujjain was good and satisfactory.

Conclusion- Spirometry is a good tool for lung function assessment and diseases (asthma, COPD) detection. Regular health check-ups, spirometry, facemask use and quit smoking are essential for healthy lungs.

KEYWORDS : Spirometry, Traffic policemen, Air pollution

Introduction-

Air pollution can cause serious health effects. According to World Health Organization (WHO) air pollution defined as contamination of outdoor or indoor environment by any of physical, chemical, or biological agent, which changes the characteristics of air atmosphere (1). These substances become a big threat to human, plant and animal life because they interfere with the comfort and enjoyment of life (2). In modern era air pollution became a burning problem. Vehicular exhausts are polluting the atmosphere and produce deleterious effect on respiratory system (3). Air borne dust plays a major role in air pollution. Motor vehicle emissions constitute the most significant source of this air dust (4). Road traffic and vehicles produce volatile organic compounds, suspended particulate matter, oxides of sulfur, oxides of nitrogen, and carbon monoxide which can adversely affect the respiratory system in exposed population (5).

Traffic related air pollution is an occupational health hazard to individuals who work close to traffic (6). Traffic police personnel are more prone to develop health hazards of respiratory system. When air pollutants are inhaled, they can damage the airways and lungs. The major effects include individuals with chronic obstructive pulmonary disease (COPD), cardiovascular disease, and asthmatics (7).

The prevalence of the obstructive, restrictive and mixed type of functional impairment of the lung has been found to have direct relationship with the dust concentration and duration of exposure (8). Prolonged exposure to dust can result in chronic bronchial problems (9). Investigations are necessary to rule out the respiratory health effects due to vehicular pollution in order to predict the risk factors that may cause an asthmatic response (10).

Several studies have indicated that air borne pollutants can cause changes in the pulmonary function tests (PFT). Air pollutants can cause injury to airways and lung parenchyma. (11). Air pollution decreases body defense mechanism against foreign material. This lung tissue insult causes chronic cough, chest tightness, wheezing, breathlessness, and lastly carcinogenesis. (12,13)

Air pollutants put a great burden on lungs. Their oxidative stress contributes to the genesis of fibrotic lung diseases, chronic bronchitis, emphysema and lung cancer (14). Toxic chemicals and gases of vehicular emission produce irritation and allergy in lungs and airway of subjects (15). Several research works reveal there is a link between exposure to vehicular exhaust and pulmonary function impairment (16). Pulmonary function tests (PFT) by computerized spirometer can assess the respiratory function and give a fair idea about the respiratory health of an exposed population. Therefore, these changes can be observed in early stage.

Various PFT studies have been done in India (Bangalore, Kochi, Jammu, Hyderabad, Pondicherry etc.) in traffic police. This study was carried out to assess the lung function of traffic policemen of Ujjain city Madhya Pradesh. Ujjain is a city of pilgrims. Ujjain is a tourist place and famous for Mahakal temple. The result of the study will help to plan preventive measure to decrease the effect of air pollutant on traffic policemen respiratory function.

Methods-

After ethical clearance, study was done at Ujjain city of Madhya Pradesh in 2016-2017. All positive consent cases (100, Male-98% and Female-2%) aged 18 - 60 years were included. Active tubercular and negative consent cases were excluded. All preliminary details were recorded. Structured interview and detailed clinical examination was done in small groups. Information about their duty hours, duty place and service length were recorded. Symptomatology, addiction pattern and their medical illness information were recorded. Spirometry testing was done with the help of Spirolab III machine. All data were collected and analyzed with the help of SPSS version 23 software. Interpretation was done.

Results-

Mean values were age - 48 years, weight-75.34 kg, height-169.96 cm, BMI 26.09, pulse-92 per minute, systolic BP-130 mm Hg, diastolic BP-91 mm Hg, Spo2-97%, respiration rate-19 per minute. 90% traffic policemen worked at road side and 10% worked in office. Mean of daily exposure hours was 6.75 hours and mean service length 20.33 years. In daily exposure, 63% six hours or less and 37% more than six hours. 79% traffic policemen were completed ten years and more service period. Recurrent cough and sore throat was the most common clinical presentation (36%). Cough (25%), eye itching (22%), chest tightness (17%), skin itching (15%), sneezing (14%), breathlessness (7%). (Table-1) and throat congestion in 25%. Associated comorbidities hypertension (48%), diabetes (11%), asthma (2%) and old treated Pulmonary TB (1%). Smoking was the most common addiction (42%), alcohol (38%) and tobacco chewing in 32%.

Table-1 (Common symptomatology of traffic policemen)

Percentage	Recurrent cold (Sore throat)	Cough	Chest tightness	Breathlessness	Sneezing	Eye itching	Skin itching
Present	36%	25%	17%	7%	14%	22%	15%
Absent	64%	75%	83%	93%	86%	78%	85%

Spirometry was done in all traffic policemen, PFT results revealed 60% normal pattern, 33% restrictive pattern, 4% obstructive pattern and

3% mixed pattern. All abnormal (Mostly restrictive) pattern of PFT are mild grade.

Table-2- PFT Result

Mean	FVC	FEV1	FEV1/ FVC	PEF	FEF25 -75	MVV	PIF
Predicted	3.89	3.19	78.72	8.48	2.61	123.81	8.50
PFT result	3.26	2.70	83.27	6.97	1.81	93.60	4.72

Data from pollution control board Ujjain city showed air quality index (AQI) during study period was good 6 at one place (Regional office) and satisfactory (Nagar nigam-80 and Industrial area-90).

Table-3 AQI (Air quality index) category

Severe	Very-poor	Poor	Moderate	Satisfactory	Good
401-500	301-400	201-300	101-200	51-100	0-50

Discussion-

Spirometry results revealed 60% normal pattern, 33% restrictive pattern, 4% obstructive pattern and 3% mixed pattern. All abnormal (Mostly restrictive) pattern of PFT are mild grade. **In Emad A-H Salem et al** study showed "PFT results 55.2%- normal, 32.8%-restrictive, 9%-mixed & 3%-obstructive. **Amit H Makwana et al** study revealed computerized spirometry-based evaluation of pulmonary functions of traffic policemen in two groups. Results revealed declined lung function. (17)

In present study, mean value of various PFT parameters (FVC, FEV1, FEV1/FVC, PEF, FEF 25%-75%, MVV and PIF) are relatively normal except low PIF which might be due to muscle weakness. Good AQI in Ujjain is due to use of CNG based public transport (City buses and autos), good sanitation and good quality roads maintenance by Ujjain municipal corporation (UMC). Restrictive pattern PFT results are due to continuously exposure of lung to air pollutants. This causes constant inflammation of airways and lung parenchyma which leads to excessive secretion and some degree of pulmonary fibrosis. Smoking also has some additive effect to pulmonary fibrosis. This all can cause naso-bronchial allergy, asthma and COPD etc. **R Sayyad et al** study showed decrease in FVC, FEV1, value in traffic policemen due to small airway obstruction which was confirmed by FEF25-75% and PEF (18). **Pramila T. et al** study at Bangalore city in Traffic policemen's showed a significant reduction in FEV1, PEF and FEV / FVC ratio reflected an obstructive pattern (19). **In Pal et al** study at Pondicherry showed a significant decrease in VC, FEV1, FEF-25 and PIF in study group compared to the control group. (20)

Conclusion-

Present study was done at Ujjain city of Madhya Pradesh among the traffic policemen to assess the lung function with the help of computerized spirometry. Air pollutants can cause deleterious effect on lung function. Spirometry is a good tool to assess lung function. It is also helpful to detect various diseases like asthma, COPD in early stage. Results of this study showed, over all lung function of Ujjain city traffic policemen are relatively good. This all might be due to good AQI of Ujjain city. Various recommendations were suggested to further improve the lung function. These include use of face masks, eye goggles and glass cabins use. Regular health check-ups and spirometry, decrease the duty hours in most polluted areas and quit smoking, all these suggestions are further helpful to increase the lung age of traffic policemen of Ujjain city.

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