Study of Pulmonary Function Tests in Traffic Police

Medical Science

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ABSTRACT

Environmental Health Hazards include air pollution, noise pollution etc. The explosive growth of population in the developing countries and the rapid industrialization of the developed and developing countries are the great causes of atmospheric pollution. Duration of exposure, aging, smoking together complicate pulmonary functions. Prolonged exposure to different air pollutants even at low concentrations may cause a variety of adverse effects on health.

Study of Pulmonary function tests in Traffic police who are exposed to dusty and smoky environment and in control group who are not routinely exposed to dusty and smoky environment.

a)   To study the Respiratory function tests among two study groups.
i)   General population who are not routinely exposed to air pollution.
ii)   Traffic police.
b)   To assess the effects of pollutants on respiratory functions in traffic police.
c)   To compare the study results of pulmonary functions among control group and traffic police.

The study revealed that the lung parameter like FVC, FEV1, FEV1 / FVC ratio, FEF25-75 and PEFR were gradually declining more with increase in period of exposure in traffic police

Introduction

The principles underlying pulmonary function in health and disease were understood in detail during the past three hundred years. Expiratory volume of lung was the first aspect of the function to be tested and even today stands as simple and informative test in cases of pulmonary disorders.

2000: Pulmonary functions in fertilizers and chemicals industry workers of Kerala were performed by B.Geetha, R. Harikumaran Nair, C. Kesavachandran, Susan Chandy and S. Shahidhar.

2002: Maximal Expiratory Flow Volume (MEFV) curves were recorded with medspiror in querry workers by Arcot Sadagopa Subhashini and Natesa dam, and observed that all the functional values were lowered in querry workers than control group.

2003: Lung function tests in Electroplaters of East Delhi were conducted by Sujatha Natrajan, Pratiba Gupta, Savita Singh.

2004 : Pulmonary function test in saw mill factory workers were studied by Dudhmal V.B., Sayeda Afrozm Jadhav S.S. and Karadkhedkar S.S. and it was observed that FVC was not altered significantly while FEV1 PEFR were significantly reduced.

The prime function of lungs is exchange of gases between the inspired air and the venous blood. This is called external respiration. The lung function depends on CNS, skeletal musculature, the circulation, the organs and the tissues which influence the composition of blood.

the importance of ongoing maintenance of standards[35,36]. Hence, effective training and quality assurance are vital prerequisites for successful spirometry[4]. Becklake MR and Crapo RO in their studies stated that, specific diagnosis cannot be made with siprometry

Materials and methods

Study area: The study was conducted at Kurnool Medical College and Aswini Hospital, Kurnool.

Study population: A total of 90 subjects belonging to traffic police stations of Rayalaseema Urban areas including Kurnool and Anantapur districts were studied.

30 members of control group who are not routinely exposed to smoky and dusty environment, having 20-55 years of age.

Both the study groups were compared.

Subjects:

The subjects were selected from traffic police station and the control group consisted of those who were not exposed to air pollution and were aged between 20-55 years. They were willing to participate in the study and gave written consent or informed consent.

The study population was grouped into

Group A   -   Controls
Group B   -   Traffic police between 20-30 years of age.
Group C   -   Traffic police between 31-40 years of age.
Group D   -   Traffic police more than 40 years of age.

Time frame : The study was conducted from March 2009 to August 2010.

RESULTS

FVC values of all the four groups were shown in Table No-1
TABLE No.-1:
FVC values in all the four study groups

S.No.	Group	No. of subjects	Mean ± S.D.	P-Value
1	A	30	2.61 ± 0.92	0.050
2	B	30	2.81 ± 0.57	0.06
3	C	30	2.18 ± 0.42	0.001
4	D	30	2.13 ± 0.63	0.0001

All values were expressed as mean ± S.D.

Mean value of FVC in group A was 2.61 ± 0.92 and p-value 0.050.

Mean value of FVC in group B was 2.81 ± 0.57 and p-value 0.06

and it was statistically not significant.

Mean value of FVC in group C was 2.18 ± 0.42 and p-value 0.001 and it was statistically more significant.

Mean value of FVC in group D was 2.13 ± 0.63 and p-value 0.0001 and it was highly significant.

The FEV1/FVC ratio in all the four groups were shown in Table -2
Table no. -2:
FEV1/FVC ratio in all the four study groups

S.No.	Group	No. of subjects	Mean ± S.D.	P-Value
1	A	30	87.02 ± 6.91	0.025
2	B	30	84.26 ± 6.72	0.015
3	C	30	79.35 ± 7.37	0.005
4	D	30	72.23 ± 1.77	0.001

All values are expressed as mean ± S.D.

Mean value of FEV1 / FVC in group A was 87.02 ± 6.91 and p-value 0.025.

Mean value of FEV1 / FVC in group B was 84.26 ± 6.72 and p-value 0.015 and it was significant than group A.

Mean value of FEV1 / FVC in group C was 79.35. ± 7.37 and p-value 0.005 and it was showing more significance.

Mean value of FEV1 / FVC in group D was 72.23 ± 1.77 and p-value 0.001 and it was showing high significance.

PEFR values different study groups were shown in Table No-3
Table no. -3:
PEFR values in different study groups

S.No.	Group	No. of subjects	Mean ± S.D.	P-Value
1	A	30	7.55 ± 2.10	0.047
2	B	30	6.80 ± 1.90	0.020
3	C	30	5.12 ± 0.62	0.002
4	D	30	4.92 ± 0.32	0.001

All values are expressed as mean ± S.D.

Mean value of PEFR in group A was 7.55 ± 2.10 and p-value 0.047.

Mean value of PEFR in group B was 6.80 ± 1.90 and p-value 0.020 and it was showing significance than group A.

Mean value of PEFR in group C was 5.12. ± 0.62 and p-value 0.002 and it was showing more significance than group A.

Mean value of PEFR in group D was 4.92 ± 0.32 and p-value 0.001 and it was showing highly significant than group A..

Discussion
Environment has a direct impact on the physical, mental and social well being of those living in it. Increased industrialization, rapidly multiplying number of automobiles in most towns and cities is the main cause for occupationally induced respiratory problems. Polluted air is considered to be the main problem affecting the lungs[70].

In this context a comparison is made between control group and traffic police regarding pulmonary function tests which will show variations.

By using spirowin, various pulmonary function tests were conducted and observations were recorded. An attempt is made to compare the observations of present study with the literature available.

Among various parameters recorded by the spirowin, only the following cardinal parameters were considered for this study.

They are :- 1) FVC
2) FEV1
3) FEV1 / FVC ratio
4) FEF 25-75
5) PEFR
The mean values of each parameter for the 4 groups (A,B,C & D) were considered for analysis.

Automobile exhaust is a complex mixture of different gases and particulate matter. These include oxides of nitrogen, carbonmonoxide, sulphurdioxide (SO_2) hydrocarbons and particulate matter[10]. Particulate matter of the size of 2.5 μm and 10μm ($PM_{2.5}$, PM_{10},) and NO_2 have been found to be significantly associated with reduced FVC[1,2]. Particles below 10μm (PM_{10}) of aerodynamic diameter were most likely to reach and be deposited in the lung acini[23].

FEV1:
The mean value of FEV1 in group A was 2.42 ± 0.65 and p – value 0.04. The mean value of FEV1 in group B was 2.14 ± 0.58 and p-value 0.05.

The mean value of group C was 1.99 ± 0.42 and p-value 0.003.

The mean value of group D was 1.91 ± 0.72 and p-value is 0.001.

The mean value of FEV1 in group B, C and D were showing gradual decrease and p-value of group C and D were highly significant.

Airway pollutants like inhaled dust and gases causes bronchoconstriction through stimulation of receptors present in trachea and large bronchi[33].

FEF_{25-75}:
The fourth parameter in our study was FEF 25-75.

The mean value of FEF25-75 in group A was 3.51 ± 0.05 and p-value 0.05..

The mean value of FEF25-75 in group B is 3.14 ± 0.95 and p-value 0.02.

The mean value of FEF25-75 in group C is 2.44 ± 0.32 and p-value 0.007.

The mean value of FEF25-75 in group D is 2.37 ± 0.42 and p-value 0.001.

The mean values of group B, C and D were showing gradual decrease when compared to group A. p-values also showing increased significance from group B to D when compared to group A.

FEF25-75 is considered as a fairly good test to identify early small airway disease. Findings of present study indicates that small airways probably bear the brunt of the air pollution and fuel va-

pour relating lung injury. These findings in agreement with most of studies on pollution inflicted changes in lung function.

In conclusion any significant decline in the lung function with time, merits attention. Since they indicate likely morbidity in the event of continuing exposure to an offending agent. Most of the individuals are likely to remain asymptomatic till significant pulmonary damage results.

SUMMARY AND CONCLUSION

The study revealed that the lung parameter like FVC, FEV1, FEV1 / FVC ratio, FEF_{25-75} and PEFR were gradually declining more with increase in period of exposure in traffic police. This is due to exposure to smoky and dusty environment. Increasing age also appears to have contributed individually in lowering lung functions. In this study obstructive type of pathology was more prevalent than the restrictive type of abnormality.

This study emphasizes the need to adapt precautionary and protective measures to prevent air pollution. Those measures are

1) Analyzing the air sample at work place to monitor exposure level and suggesting to wear nose masks at work place.
2) Screening PFT to know small airway obstruction before the subject become symptomatic.
3) Introducing emission control like catalysis converters on petrol cars and filtration systems on diesel cars and regulations should be enforced to reduce exhaust emission.
4) Control of air pollution need to be audited by appropriate air monitoring.
5) Transfer of heavy transport from road to rail.
6) Control of air pollution is a matter for government policy.

Ultimately the control of air pollution depends on sufficient public concern. In every country a comprehensive transport policy should be made a part of government programme.

REFERENCE

1) Abramson M, Voigt T Ambient air pollution and respiratory disease. Medical Journal of Australia 1991:154(8):543-53. | | 2) "Air quality criteria for particulate matter". National Air pollution control Administration Publ. No. AP – 49, Superintendent of documents. Washington, D.C., Jan.1969. | | 3) American Thoracic Society Lung Function Testing: Section of reference values and interpretative strategies, Am. Rev. Respir. Dis. 1991; 144: 1202-1218. | | 4) American thoracic society, standardization of spirometry, 1994, update. Am.J. Resp. Crit. Care Med. 1995, 152: 1107-1136. | | 5) Anuj Chawla and A.K. Lavania, Air pollution and fuel vapour changes in lung functions. Are Fuel Hondlers Safe 7, Indian J. Physiol. Pharmacol. 2008. 52(3):255-261. | | 6) Arcot Sadagapa Subhashini and Natesa Satchidha Nandam, Indian J. Physiol Pharmacol 2002; 46(1); 78-84. | | 7) Ashkar A.L. and Colleagues: Interpreting Pulmonary function tests: Recognize the Pattern and Diagnosis will follow. Cleveland Clinic Journal of Medicine, Vol. 70; Number 10,October 2003, 872. | | 8) Baser ME, Tockman MS, Kennedy TP. Pulmonary function and respiratory symptom in poly chloride fabrication workers. Am Rev Respir 1985; 131(2): 203-208. | | 9) Bates D. Air pollution and the human lung. Am.J.Resp. Disease 1972; 105:1. | | 10) Battigelli, M.C., Sulfur dioxide and acute effects of air pollution.J. Occup. Med 10.1968:500(Including discussions by J.A. Zapp and R. Frank).