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Research Article

ASSESSMENT OF PEAK EXPIRATORY FLOW RATE IN SPRAY PAINTER

Priyanka Honkalas., Satish Pimpale., Mayuri Ghumatkar., Samina Hussain and Ajay Kumar

Runwal Estate, Behind Rmall, Godbandar Road, Manpada, Thane (West)

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ABSTRACT

Introduction: Individuals who paint often complain to doctors about respiratory problems. Car and furniture painters are exposed to isocynate, especially HDI and HDI-BT. Isocyanate are powerful irritants to mucous membranes of eyes and gastrointestinal and respiratory tracts. It can sensitize workers making them subject to severe asthma attacks and other small airway diseases if they are exposed again. Excessive short term isocyanate exposure during work may produce greater risk. One of the most largest group who are heavily exposed to isocynate are spray painters. Peak expiratory flow rate is a persons maximum speed of expiration which can be measured with a peak flow meter. It measures the airflow through the bronchi and thus the degree of obstruction in the airway.

Method: It is a type of observational study in which convenient sampling method was used. 200 subjects were taken according to the inclusion criteria. Subjects were assessed for height and peak expiratory flow rate of the subjects were taken in standing position. Three readings were taken and then best of three readings was noted down. These readings were compared with normal standard values.

Results: After 4 months of study, data was analyzed using the normal standard value which showed statistical significant difference in peak expiratory flow rate of spray painters.($P < .05$)

Conclusion: There is significant differerence in the peak expiratory flow rate of spray painters and standard normal values.

INTRODUCTION

Individuals who paint often complain to doctors about respiratory problems.

Car and furniture painters are exposed to isocyanates, especially hexamethylendiisocyanate (HDI), and biuret modified HDI (HDI-BT). Isocyanates are a family of highly reactive, low molecular weight chemicals. They are used in the manufacture of flexible and rigid foams, fibers, coatings such as paints and varnishes[1].

Isocyanates are powerful irritants to the mucous membranes of the eyes and gastrointestinal and respiratory tracts. It can sensitize workers, making them subject to severe asthma attacks and other small airway diseases if they are exposed again. Excessive short term isocyanate exposures during work may produce greater risk than continuous low dose exposures.[2]

One of the largest group who are heavily exposed to isocyanates are spray painters. Compressed air spray guns were identified as the major generator of paint aerosols. There is evidence that both respiratory and dermal exposures can lead to sensitization leading to death from severe asthma.[3]

Different pathophysiologic mechanisms are involved. Immunoglobulin E (IgE)-mediated sensitization and irritative effects have been clearly demonstrated in both exposed subjects and animals. Presumably, neural inflammation due to neuropeptide release of capsaicin-sensitive afferent nerves is crucial.

The peak expiratory flow (PEF), also called peak expiratory flowrate (PEFR) is a person's maximum speed of expiration, as measured with a peak flow meter, a small, hand-held device used to monitor a person's ability to breathe out air. It measures the airflow through the bronchi and thus the degree of obstruction in the airways.[2]

Funcition

Peak flow readings are higher when patients are well and lower when the airways are constricted. From changes in recorded values, patients and doctors may determine lung functionality, severity of asthma symptoms, and treatment.[6]

Corresponding author:* **Priyanka Honkalas
Runwal Estate, Behind Rmall, Godbandar Road, Manpada, Thane (West)

Measurement of PEFR requires training to correctly use a meter and the normal expected value depends on a patient's sex, age and height. It is classically reduced in obstructive lung disorders such as asthma

Due to the wide range of 'normal' values and high degree of variability, peak flow is not the recommended test to identify asthma. However, it can be useful in some circumstances.[12]

A small portion of people with asthma may benefit from regular peak flow monitoring. When monitoring is recommended, it is usually done in addition to reviewing asthma symptoms and frequency of reliever medication use.[4] When peak flow is being monitored regularly, the results may be recorded on a peak flow chart.

It is important to use the same peak flow meter every time.[6]

Need of Study

Frequency of spray painters complaining of cough, chest tightness, wheezing and difficulty in breathing is observed, which can be due to the constant exposure to isocyanate compounds. Excessive short term exposures during work may sensitize workers, making them subjects to asthma attacks and other small airway diseases is assumed. To our knowledge there is lack of studies in India that tells us about the pulmonary functions of spray painters.

Thus the present study is undertaken to assess the peak expiratory flow rate in spray painters.

Aims and Objectives

Aim

To assess the peak expiratory flow rate in spray painters using a peak flow meter.

Objectives

1. To assess the peak expiratory flow rate of spray painters exposed to isocyanate .
2. To measure the height of spray painters.
3. To compare the above findings with normal standard values of peak expiratory flow rate according to the height.

MATERIALS AND METHODOLOGY

Study Design:
Type of Study: Comparative study.
Duration of Study: 6 months.
Area of Study: Workshops.
Sample Design:
Sample Size: 200
Sample population: 35 - 45 year old spray painters.
Sampling: convenient.

Selection Criteria

Inclusion Criteria
Spray painters who are willing to participate.
Age group between 35 - 45 years.
Work experience of more than 2 years.
Involved in spray painting for atleast 6 hours of the day.
Asymptomatic individuals with no underlying disorder.

Exclusion Criteria

Acute cardiopulmonary condition.
Acute neurological problem.
Already on exercise program.
Non co-operative person.

Materials

Peak flow meter.
Disposable mouth piece.
Measuring tape.

Method

A proper consent was taken in the language best understood by the spray painters. A detailed verbal explanation and visual demonstration was given to the subject for better use of peak expiratory flow meter.

Subjects were selected according to the inclusion and exclusion criteria.

Height of the subjects were measured in meters using a measuring tape.

Peak expiratory flow rate was taken in standing position.

Instructions to the spray painters were as follows:

Take a deep breath through your nose filling your lungs completely.

Place your lips tightly around the mouthpiece.

Blow as hard and as fast as you can with a single breath.
The final position of the marker was noted. Following the above steps the test was performed three times with a micro pause of 10 seconds and the best of three value was used for data analysis.

Data analysis and interpretation

200 subjects were taken according to inclusion and exclusion criteria. Height was measured in meters and peak expiratory flow rate was performed .Three readings were taken and the best of these three readings were selected for data analysis.

The mean was calculated and data is analyzed using unpaired t test.

TABLES AND RESULT

Table 1 Comparison of peak expiratory flow rate of spray painters with normal standard values

Data	Mean Peak Flow Rate	P value	significance
Normative Data	474.735	0.001953	significant
Obtained Data	518.975		

Interference: By conventional criteria, the above pie diagram, shows there is significant difference in peak expiratory flow rate of spray painters when compared it to the normal standard value; (P value,<0.05) and thus is considered to be statistically significant.

CONCLUSION

There is significant difference in the peak expiratory flow rate of spray painters published normative data.

Clinical Implications

Awareness in the community about the use of face mask during work hours. Breathing exercises should be taught to the spray painters in order to improve their Pulmonary function. Awareness in the community about the use of less hazardous paints containing less or no isocyanate compounds. Encouraging chemical industries to produce paints solvent minimizing the use isocyanate compounds.

Limitations Ang Suggestions

Limitations

The study was performed over a small sample size. Advanced instruments were not used in order to assess the pulmonary function. Inspiratory affection is not focus paying attention to the affection caused only during expiration. Samples were collected only from Mumbai and its suburbs

Suggestions

Further study must be done to find the affection caused during both inspiration and expiration. More number of spray painters must be taken into consideration. Diverse areas should be selected for data collection.

DISCUSSION

200 subjects of age group 35 to 45 were selected who were spray painters with no known cardiopulmonary or neurological involvement. Their height was measured and peak expiratory flow rate of the spray painters taken using a peak flow meter. Best of three readings were taken. The data was collected and analyzed using the unpaired t test.

Table 1 shows statistical difference in the peak expiratory flow rate of spray painters when compared to the normal standard values. (p value=0.001953)

One of the largest group exposed to isocyanate and formaldehyde gas are spray painters which are known to be powerful irritants to the mucosal membrane of the respiratory tract. Moreover most of the inhaled formaldehyde is retained in the upper respiratory tract due to extraordinary solubility. In a study, painters in the furniture industries, particularly atopic subjects were found to be at high risk of asthma like symptoms. In these workers, asthma like symtoms were more sensitive than non specific bronchial hyper reactivity in detecting a negative effect of the occupational exposure.[1]

One of the study stated that excessive short term exposures during work may sensitize workers making them subjects to severe asthma attacks and other small airway diseases which was evident by its direct effect on FEV1 and these painters showed higher FVC values when compared with the controlled group.FEV1/FVC and FVC were found to be lower in the exposed workers who had been employed for ten years in spray painting. The incidence density of respiratory symptoms is higher in years 2 & 3after exposure.[4]

A working day of a spray painter consist of cycles of short task, and even exposure during spray painting is highly variable for all workers the pattern observed on pharmacologic challenge is associated with the etiologic agent and the immunologic mechanism. High molecular weight agents cause asthma induction of IgE antibodies. IgE dependent reactions can involve an early asthmatic reaction, between several minutes to and 2 hours after exposure, and IgE independent reaction can occur between 4 and 48 hours after exposure.

After analyzing 200 male spray painters with no known pulmonary problems with a work experience of more than two years and working for 6 hours of day the results were statistically significant stating that spray painters show evident affection in the peak expiratory flow rate when compared with normal standard values.

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