Peak expiratory flow rate in printing press workers exposed to powder toner: An observational study

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Abstract

Aim: To check peak expiratory flow rate in printing press workers exposed to powder toner.

Procedure: An observational study done on 100 Printing Press Workers. Peak expiratory flow rate was taken and the predicted PEFR was calculated from given equation.

For Males: PEFR = -1.807(Age) + 3.206(Height)

Result: Out of 100 printing press workers, 32 workers are in Green zone, 68 workers are in Yellow zone and, 0 workers in red zone.

Conclusion: Data analysis shows that out of 100 subjects PEFR values are reduced in 68 workers.

Keywords: Printing press workers, respiratory disease, work related respiratory disorder

Introduction

The modern definition of occupational health is “the promotion and maintenance of highest degree of physical, mental and social well-being of workers in all occupation. It is observed that substantial economic losses are incurred by health and safety hazards at work and the reduction or loss of working capacity. Possible harmful effects of inhaled photo copier toner dust have been a matter of concern since the publication of several case reports suggested the existence of toner related pulmonary disorders. However, little evidence is available regarding the potential health risk associated with toner dust inhalation in occupational and general home environments where photocopier machines and laser printing devices are in use. The specific polymer used varies by manufacturer but can be a styrene acrylate copolymer, a polyester resin, a styrene butadiene copolymer, or a few other special polymer. Originally the particle size of toner averaged 14-16 micrometers or greater. To improve image resolution, particle size was reduced eventually reaching about 5-10 micrometers for 600 dots per inch resolution. Powder toner dust contain hazardous substances like respiratory irritants, systematic toxins, complex particulate matter. Exposure of substances like systemic toxins affects the parts of the body then the organs’. It has been observed that respiratory irritants contains the substances which is source for non-specific inflammation of the lung.” It has been observed that particles act as vehicles for absorption of toxicity into the respiratory tract. Respiratory tract contains nasopharyngeal region, trachea, bronchi, bronchioles and alveoli. Particles between 5-30 micron affected on the nasopharyngeal region. Particles between 1-5 micron affected on the large airways of the trachea, bronchi and bronchioles. Particles smaller than 1 micron affected the alveoli. The peak expiratory flow rate is measured with help of Standardized Peak Flow Meter. Peak flow meter device is designed to indicate the greatest expiratory flow rate. Peak expiratory flow rate is a person’s maximum speed of expiration. Peak expiratory flow has been correlated with age, height, and body surface area. Normal values in adults range from 400-1200 L/min. For lung functions peak expiratory flow rate (PEFR) is the simplest appraisal. Peak expiratory flow rate indicates severity of airflow limitation. ‘Peak expiratory flow meter (PEFM) is a device used to measure Peak expiratory flow rate (PEFR). Peak expiratory flow rate index (PEFR) is a simple, easy to handle and inexpensive device. It has diagnostic and prognostic value in patients with airway disease (Reliability 0.90).
NEED of study
The workers working in various printing press have exposure to toner dust and thus are at risk of compromised respiratory function. Exposure to toner dust has also been associated with a systemic inflammatory response further leads to airway inflammation. This study is done to analyze the effect of powder toner on respiratory health and spread awareness about the various pathological respiratory condition to the workers and improve the quality of life.

Previously there has been many researches done on various populations like chefs, fire fighters, singers. But there is no research done on printing press workers. Thus, there is need to evaluate Peak Expiratory Flow Rate in printing press workers.

AIM: To check peak expiratory flow rate in printing press workers exposed to powder toner.

Objective: To check peak expiratory flow rate in printing press workers exposed to powder toner using peak flow meter using Wright’s Peal Flow Meter

Methodology: Present study was an observational study. Subjects were selected by purposive sampling from printing press workers from Solapur. Subjects were enrolled in the study after their detailed evaluation of medical history. Subjects with known cardiovascular illness, allergic asthma and recent surgeries were excluded. Those with age 25-35 and minimum 5 years of experience were included in history.

Outcome measure: Peak expiratory flow rate by Wright’s Peak flow Meter.

Procedure
Ethical approval was taken from the ethical committee.

Subjects was chosen on the basis of the inclusion and exclusion criteria. The participants had explained about how the test will be performed. The test then be performed with 3 readings. The best of [3] for each of the subjects had considered and recorded [2]. Predicted PEFR was calculated from equation –

Equation- For Males- PEFR = -1.807(Age) + 3.206(Height)

Data was analyzed for results.

Data analysis and Result
PEFR in printing press workers:- The diagram shows that Out of 100 printing press workers 32 workers are in Green zone and 68 workers are in Yellow zone and 0 workers in red zone.

<table>
<thead>
<tr>
<th>PEFR</th>
<th>Subjects</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone</td>
<td>32</td>
<td>32%</td>
</tr>
<tr>
<td>Zone</td>
<td>68</td>
<td>68%</td>
</tr>
<tr>
<td>ZONE</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Discussion
The present study was designed to assess the PEFR in printing press workers exposed to powder toner dust in Solapur district. During this study we found that average actual value of subject is decreasing as compared to average predicted value. This study was conducted in 100 printing press workers and we found that 32 workers are in green zone, 68 workers are in yellow zone, and zero workers are in red zone of PEFR. According to personal best value there are three zones of PEFR.

Green Zone (Stable): Peak flow rate is between 80% to 100% of personal best. As long as no symptoms are present, the patient is considered at study state.

Yellow Zone (Caution): Peak flow rate is between 50% to 80% of personal best. Measurement in this zone are sign that your large airways are starting to narrow. Patient may start to have mild [18] symptoms.

Red Zone (Danger): Peak flow rate is less than 50% of your personal best. Patient may have severe symptoms [18]. PEFR is a person’s maximum speed and amount of expiration, as measured with peak flow meter. A peak flow meter is a small hand-held device used to monitor a person’s ability to breathe out air. PEFR measurement by peak flow meter is an easy way to access lung expiratory capacity and ventilatory functions of the subject [18, 14].

Printing press workers have average lung function due to exposure of respiratory irritants, systemic toxins, complex particulate matter. Printing press workers have more respiratory symptoms as the filtering mechanism of lung become overloaded and get damaged once they are damaged by various bacteria, viruses etc. [16]. With regards to the health effect of toner dust, in 1994 the first case was reported as a toner –induced health effect. This was followed by case reports on sarcoidosis, allergic rhinitis, and asthma. These reports raised concern about the health effects associated with toners and copy printers [9].

Conclusion
This study shows that out of 100 subjects PEFR values are reduced in 68 workers. 2) Hence we can conclude that PEFR values of workers are reduced due to inhaling the powder toner.

Limitation of study 1: It is not done comparing other occupations compromising respiratory symptoms. Working experience of printing press workers was not considered.

Recommendation and scope of study
1) PEFR should be assessed and monitored periodically in printing press workers.
2) PEFR monitoring along with Exercise protocol should be given to the printing press workers.
3) In future pulmonary function testing should be done.
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