

RESPIRATORY IMPAIRMENTS IN OCCUPATIONAL WORKERS

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Abstract:-

Background: Exposure to dust due to occupational in developing countries is well known phenomenon. Risk of inhalation particulate materials that may lead to adverse respiratory effect such as chronic bronchitis, emphysema, acute and chronic silicosis, lung cancer, are found in individuals working in dusty environment.

Aims: To find out the incidence of respiratory impairment in occupational worker.

Methodology: The objective of the

study was to compare Peak Expiratory Flow Rate (PEFR) of occupational workers such as painters, teachers, flour mill workers, street sweepers and construction site workers exposed to various dust. The comparative study was conducted in total 100 participants; 20 subjects from each occupation.

Results: The PEFR showed 13 participants from teachers, 7 participants from painters, 6 participants from flour mill workers, 16 participants from sweepers and 15 participants from construction site workers were having PEFR less

than 50 %. 5 participants from teachers, 12 participants from painters, 11 participants from flour mill workers, 4 participants from sweepers and 5 participants from construction site workers were having PEFR between 50-79% and 2 participants from teachers, 1 participant from painters, 3 participants from flour mill workers, but there were no participants from sweepers and construction site workers were having PEFR between 80-100% and from this it was concluded that there is high respiratory impairments in occupational workers.

Conclusion: There was high incidence of respiratory impairment in sweepers and construction site workers as compared to painters, teachers and flour mill workers.

Keywords: PEFR, Respiratory surveillance questionnaire, Respiratory impairments.

Introduction:-

Exposure to dust due to occupational in developing countries is well known phenomenon. Risk of inhalation particulate materials that may lead to adverse respiratory effect such as chronic bronchitis, emphysema, acute and chronic silicosis, lung cancer, are found in individuals working in dusty environment.^{1, 9} Occupational diseases are not much widespread and disabling than any other occupational pulmonary diseases. Proliferation and fibrotic changes in lungs are caused due to inhalation of dust over a period of time. ²

Particles which are penetrate the bronchial tree but usually deposited before they reach the respiratory bron-

chioles and are removed by ciliary action within 12-24 hours are of 3-10 micrometres of diameter. The particles which penetrate to the periphery of the lungs and enter the alveoli have less than 3 micrometers of diameter.³

Teachers are mostly commonly exposed to chalk dust. In classrooms fine particle of chalk dust are present in major quantity. These chalks are actually less dust producing than dusty chalks but have high percentage of respirable dust (<4.5 micrometers) and are less harmful compared to dusty chalks. ^{4, 5} Street sweepers are workers which are exposed dust while cleaning streets and roads and the dust consists of a complex mixture of soil, sand particles, motor vehicle wear and tear particles, bioaerosols, plant particles etc.⁶ There was high incidence of sneezing, cough, eye irritation; throat infection in workers exposed to dust was reported in some studies.^{7,8} Increase in alveolar swelling is due to airborne contaminants like nitric oxide, carbon dioxide, carbon monoxide, sulphur dioxide, hydrocarbon and suspended particulate matters which are also responsible for injury of airways and lung parenchyma.⁹

In paint solvents are most important components. Their purpose of application is to dilute paint and for suitable handling consistency or viscosity for easier manufacturing and application.¹⁰ Xylene is used for paints and varnishes as thinner. The use of xylene and other volatile organic components used in paints have effects in a number of organs such as lungs, skin, eyes, neurological system, heart, gastro-intestinal

system, kidney and reproductive system. Irritation of skin, eyes, nose and throat is associated with exposure of high level of xylene for shorter periods.¹¹ Respiratory illness and chronic obstructive pulmonary diseases can cause in paint industry workers are exposed to inhalation of solvents and other volatile paint components.¹² In flour mill workers Hazardous substance like flour dust with respiratory sensitizing properties which may give rise to respiratory, nasal and eye symptoms.¹³,¹⁵ In 2009 by the American conference of governmental industrial hygienists (ACGIH) proposed a threshold limit value of 0.5 mg/m³ of flour dust as the occupational exposure level (OEL) in breathing zone for workers in flour mill.¹⁴ From many industries, cement industry is largest manufacturing industries and its workers are exposed to dust at various manufacturing and production processes. Air will be polluted by cement and sand mixture in areas where construction sites are present.¹⁶ Workers with such occupation have high exposure to total dust (59-95mg/m³) and respirable dust (20-23mg/m³). In the cement production process the aerodynamic diameter range is 0.05-5.0µm, which is produced by hearing ground cement rock or other limestone-bearing materials into a fused clinker that, is then ground into a fine powder was reported by Kalacic (1973).^{17,18} Respiratory hazards vary among construction workers more recently caused by exposure to isocyanates and epoxy compounds.¹⁹ In present study we wanted to explore the hypothesis that injection workers

may be at increased risk of developing respiratory impairment due to exposure to dust of various occupations, hence out of all the pulmonary function tests PEFr was selected for study because it can be easily measured with small portable instrument which can be carried to the field for testing. it gives an idea about the airway narrowing.²⁰

Methodology:-

The present study was conducted in 100 participants out of whom 20 were teachers, 20 were painters, 20 were street sweepers, 20 were flour mill workers and 20 were construction site workers. Various schools, construction site, flour mill site, etc were selected and permission was taken from head of institutes to conduct a study in their premises. Permission from institutional ethical committee was obtained before starting the study. The aims and objectives were cleared to the participants and consent forms were filled by them. The detail history was taken by using Respiratory surveillance questionnaire with age, height and PEFr were determined using IN 108B Peak Flow Meter. Inclusion criteria were males and females, age 20-60years, working more than 1 year. And Exclusion criteria were 1 any known case of respiratory condition and not willing to cooperate. In present study only one smoker was found. Each participant was given trial of instrument before taking readings. The three readings were taken for each participants in standing position and best was considered as PEFr. The data was analysed according to the zones or levels of Peak Flow Meter.

Result:-

From the graph no.1, its show that There were 100 participants out of which 13 participants from teachers, 7 participants from painters, 6 participants from flour mill workers, 16 participants from sweepers and 15 participants from construction site workers were having PEFR less than 50 %. 5 participants from teachers, 12 participants from painters, 11 participants from flour mill workers, 4 participants from sweepers and 5 participants from construction site workers were having PEFR between 50-79% and 2 participants from teachers, 1 participants from painters, 3 participants from flour mill workers, but there were no participants from sweepers and construction site workers were having PEFR between 80-100% and from this it was concluded that there is high respiratory impairments in occupational workers.

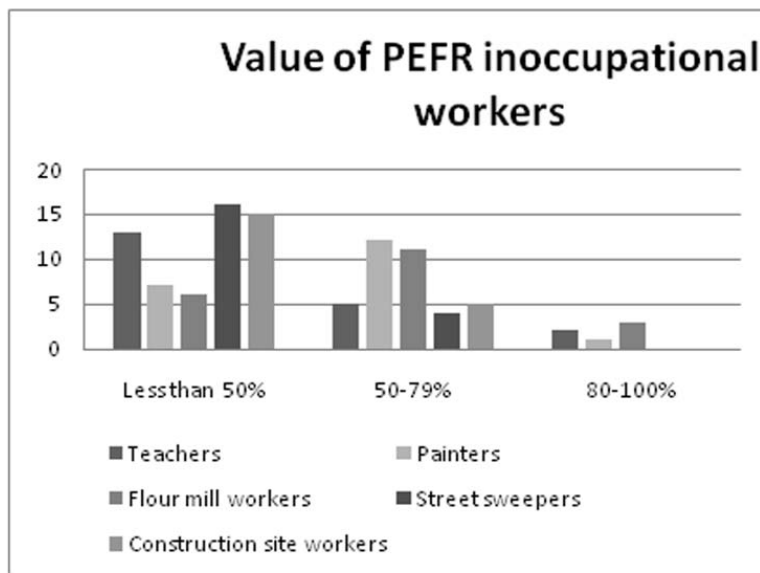
Graph No. 1

Discussion: -

This study was conducted to find respiratory impairments various occupational workers such as painters, teachers, street sweepers, flour mill workers and construction site workers. As they all are associated with various types of dust particles which may enter their respiratory tract and causes respiratory disorders. These dust particles have various diameters and according to their diameter the particles penetrate in respiratory tract which cause respiratory symptoms resulting in cough, breathlessness, skin irritants etc.

Hence to find out the impairments peak flow meter was used. As the peak flow meter helps to assess the airflow through the airways and thus help in determining the degree of obstruction. It was founded that PEFR was significantly reduce in all participants with lowest in construction site worker and street sweeper. There are zones/levels

in peak flow meter for the asthmatic patient who can managed better by themselves and according to the degree the level is decided. If the peak flows meter reading is between 80-100% of patients personal best than he/she is in all-clear zone. If the peak flows meter reading is between 50-79% of patient's personal best than



he/she is in caution zone. If the peak flows meter reading is less than 50% of patient's personal best than this is an emergency warning.

In this study as construction site workers have 15 participating and sweeper have 16 participants having PEFr reading less than 50%. This may be due exposure of pollutants which are inhaled by them. It is also possible due to poisonous gases such as carbon monoxide, sulphur dioxide, nitrogen, benzene, formaldehyde, lead, polycyclic hydrocarbons and ammonia emitted from vehicles and decomposing matter which is inhaled by sweepers may also impair lung function and in construction workers it may be due to exposure to isocyanates, dust and fluorides etc.

In teachers 13 participants were having PEFr readings less than 50% where as in painters 7 participants were having PEFr readings less than 50%. In teachers indoor air pollution was the major factors responsible for respiratory impairments. In a study of respiratory symptoms and pulmonary function tests in school teachers of Shimla stated that extreme variations in ambient temperature, exposure to dust and overcrowding were reasons put forward by wig. In painter due to high solvent exposure results in deterioration in lung function parameters. The symptoms observed were irritation of skin, eyes, cough breathlessness etc.

In this study 5 participants from teachers, 12 participants from painters, 11 participants from flour mill workers, 4 participants from sweepers and 5 participants from construction site workers

were having PEFr readings between 50-79%. This is a zone of caution. The reason would be due to age, height and demographic parameters which are also responsible.

Dr. Ajay KT et al in their study stated that the reduction in FEV1 and PEFr is associated with chronic sweeping can be partially explained loss of lung elastic recoil pressure which reduces the forced required to drive air out of lung. A high level of sulphur dioxide causes higher incidence of chronic bronchitis in which the values of FEV1 are reduced and sulphate pollution also increases the risk of respiratory infections and bronchostriction. From the above study it is concluded that the occupations which are related to dust or various hazards which effects on respiratory tract have very high incidences of respiratory impairments in occupational workers and hence awareness and protective measures should be taken and also ergonomic advices should be given.

Conclusion: -

There was high incidence of respiratory impairment in sweepers and construction site workers as compared to painters, teachers and flour mill workers.

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