

Assessment of Peak Expiratory Flow Rate in Building Construction Workers in Maharashtra

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ABSTRACT

Background: In this era of globalization one of the growing industries is the construction industry and there are various occupational problems faced by the workers especially in Asian countries mostly in India; the problems are related to both physical and mental health. All the construction sites generate high concentration of dust particles from cement, silica, asbestos, concrete, wood, stand and stand that causes respiratory problems in the workers. PEFR is the maximum air that is generated after forceful expiration, after full lung inspiration. So if there is any accumulation of dust particles the PEFR decreases as the elasticity of lungs to recoil is distrusted due to the lodged particles.

Material and Method: A descriptive observation study was carried out on 50 building construction workers. The purpose of the study was explained and informed consent was taken. The PEFR was measured using peak expiratory flow meter. The data was analyzed using standard statistical software.

Result: The procedure of using peak flow meter that was carried out for 3 times and the highest value from the three was considered as peak flow rate, using statistical method mean and standard deviation were calculated. The mean of Peak Expiratory Flow Rate is 321.1 L/min.

Conclusion: This study concluded that the peak expiratory flow rate is reduced in building construction workers those who are working for than 2 years on the construction sites.

Keywords: construction workers, occupation diseases, PEFR, peak expiratory flow meter

INTRODUCTION

An occupation is considered as regular activity or work performed by an individual for money i.e. wages or salary.⁽¹⁾

In this era of globalization one of the growing industry is the construction industries and there is very less research of the occupational problems faced by the workers especially in Asian countries mostly India the problems are related to both physical and mental health.⁽²⁾ About 1.76 core workers are employed in construction working activities⁽³⁾

Occupational disease is the effect of sustained exposure of the workers to harmful physical, chemical, biological and

physiological factors.⁽⁶⁾ Maximum amount of dust is generated from the construction sites due concrete, silica, asbestos, cement, wood, stone, sand and leads to exposure of workers to airborne dust and air borne disease.^(9,7) It includes mesothelioma, occupational asthma, silicosis, chronic bronchitis, emphysema, lung function impairment, obstructive lung disease, restrictive lung disease and pneumoconiosis asbestosis, and sick building syndrome.^(9, 10)

These agents lead to vulnerable health problems which may include respiratory complications due to respiratory irritant from dust, fumes and even some gases, skin disorders which may occur due

to irritant or sensitising materials and even sunlight, cumulative trauma disorders (musculoskeletal injury) due to the adaption of uncomfortable working posture and also due to the repetitive activity, noise which can lead to hearing impairments and gastrointestinal related problems.⁽⁵⁾

Dust that inhaled by the workers at the construction site is the major risk factor for respiratory problems. This can be determined by decrease in the normal functioning of the lung which is caused by the reduction of the lung elasticity to accommodate the inhaled air volume leading to respiratory problems.⁽⁴⁾

The lung diseases that are caused by occupational work is more likely because of the time they spend at the work station, the exposure to dust particles that deposit in the lungs i.e. its leads to accumulation of dust particles in the breathing zones.⁽⁸⁾

The clinical features that may be present in the construction worker if there is any respiratory disorder are rhinitis, chest tightness, wheezing, chronic cough or phlegm depending upon constructive or restrictive respiratory condition and lung impairment. Non malignant features that include other non pulmonary features are conjunctivitis, headache, fatigue and headache. While malignant diseases associated with dust on the construction site are carcinoma of lung, adenocarcinoma of nasopharynx, also carcinoma of stomach and colon.⁽¹¹⁾

Peak expiratory flow rate (PEFR) is the maximum velocity of air forced out of the lungs in a single forced expiratory effort from the initial position of maximal inspiration. The unit of measurement is litres/minute. It is a simple and less effort requiring procedure for measuring the ventilator capacity of an individual. The normal value of peak expiratory flow rate is about 600-800 L/min.⁽¹²⁾ The device which is used to measure the PEFR is known as peak expiratory flow meter. This device is a small hand held device. It works on the principle of variable orifice that measures the expiratory airflow indirectly. The

pressure that is generated by the forced expiration leads the diaphragm to move and open progressively larger orifice and hence when there is no movement of the diaphragm is known to be the point of maximum pressure which is known as peak expiratory flow rate.⁽¹²⁾

METHODS AND MATERIALS

After the ethical clearance a Descriptive observational study was carried out on 50 healthy young construction workers. They were selected by simple random sampling. The inclusion criteria was age group of 20-40 years, Both male and female workers, working in building construction for more than 2 years, working 6 hours at least a day and 5 days per week. The Exclusion criteria were any respiratory or cardiovascular disease. Informed consent was taken. The assessment of peak expiratory flow meter was done for the participants.

PROCEDURE

- Ask the participant to loosen any tight clothing that might prevent them from breathing deeply.
- Make sure that the participant is in sitting or standing position with back straight while taking the test
- Use a peak expiratory flow meter device to measure the PEFR.
- The device should be held horizontally making sure that the fingers are not on the scale. And not obstructing the holes which are at the end of the apparatus. Cursor is set to zero mark.
- Give the instruction as breathe in as deeply as you can. Place the mouth piece in between the teeth and the lips maintain air tight seal.
- Blow into the mouth piece as quickly and as hard as you can in one shot. Do not put your tongue on the mouth piece as it will obstruct the air entry in the device.
- When air enters the device through the mouthpiece a small plastic arrow on the

device moves. This measures the airflow speeds.

- Than the cursor is moved to zero and more two times the test is taken. The test is done three times.
- While doing analysis the highest score was considered.

RESULT

The data was collected and analysis was done by taking the Mean and Standard Deviation (S.D.) of the PEFR reading. The study was done in Pravara Institute of Medical Sciences, Loni where total 50 construction workers working for the construction of girl's hostel were included in the study. The procedure of using peak flow meter that was carried out for 3 times and the highest value from the three was considered as peak expiratory flow rate the mean and standard deviation was calculated. The mean and S.D. of age was 28.58 and 7.637 respectively. The mean of Peak Expiratory Flow Rate was 321.1 L/min and S.D was 112.67.

Table 1: Mean and Standard deviation of age

Age	MEAN	SD
	28.58	7.637

Table 2: Mean and Standard deviation of PEFR

Peak Expiratory Flow Rate	MEAN	SD
	321.1L/min	112.67

DISCUSSION

The present study Assessment of Peak Expiratory Flow Rate in Building Construction Workers was conducted in Pravara institute of medical sciences, Loni where construction of new girl's hostel was going on. The mean of Peak expiratory flow rate was 321.1 L/min.

The result of the present study showed that the peak expiratory flow rate was reduced in the building construction worker & the probable mechanism behind this was prolonged exposure to the dust particles on the construction site which may lead to occupational respiratory disorder. Whenever the dust particles enter the lungs human body they recognize them as foreign particle and body produces defence

mechanism against the particles. These fine particles get lodged in the breathing zones of the lungs.⁽⁸⁾ The particles which are inhaled are lodged in the lung fields and causes irritation of the mucus lining and hyper secretion which leads to the decrease in the elastic capacity of the lung.⁽¹⁰⁾ When healing of this inflammation starts it leads to fibrosis which leads to impaired lung function and defective oxygen diffusion.⁽⁸⁾ As the lung elasticity reduces there are chances of many respiratory diseases like asbestoses, silica, occupational asthma and COPD or any other obstructive or restrictive respiratory disorder.^(5, 10) If there is any accumulation of dust particles the peak expiratory flow rate decreases as the elasticity of lungs to recoil is distrusted due to the lodged particles. The mechanism of peak expiratory flow meter device is same only the air is exhaled in the device which measures the rate.⁽¹²⁾

Naveen R, et al carried out a study on Respiratory function of workers at a construction company in Bangalore Urban district. About 197 participants were studied from Nov-Dec 2010. The study tools included were an interview schedule to study the respiratory function and all the possible associated factors and clinical examination which included anthropometry (height, weight) and using a Wright's mini peak flow meter to measure peak expiratory flow rate. The results were that the mean peak expiratory flow rate in males 457.43 l/min (SD 65.38 l/min) while among female workers, the mean peak expiratory flow rate was 326 l/min (SD 46.95 l/min). There was no such significant association ($p > 0.05$) between the following factors like respiratory function, the work duration more than a year at construction company, use of any face mask or addiction to smoking. The conclusion was respiratory function among the workers was decreased.⁽³⁾

CONCLUSION

This study concluded that the Peak Expiratory Flow Rate was reduced in

building construction workers those who were working for than 2 years on the construction sites.

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