www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v6i8.39

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Study of Effect of Air Pollution on Peak Expiratory Flow Rate in daily labour working at cement warehouse with and without Breathing Masks

Authors
Dr Sandhyarani Moharana[1], Dr Debasish Das[2]
[1]Prof. and Head of Dept. of Physiology, Govt. Medical College, Balasore, India
[2]Asst. Prof., Dept. of Physiology, Govt. Medical College, Balasore, India

Abstract
Background: *Peak Expiratory Flow Rate (PEFR) recording is an essential measure in the evaluation of lung function in the subjects exposed to cement and dust due to their work environment. It is helpful in monitoring exposure of cement and impairment of lung function and wheather breathing mask has any benificial effect.*
Aims and Objectives: *To evaluate and compare PEFR in daily labour working at cement warehouse with and without breathing mask near railway station, Baleswer, Odisha.*
Material and Methods: *The study group comprised of 100 healthy daily labour aged about 25 – 50 years. The study subjects were divided into two groups, group 1 comprised of 50 daily labour who were not using breathing masks and group 2 comprised of 50 daily labour who were using breathing masks. For the determination of PEFR we used Mini Wright Peak Flow Meter. At three time measurement, the highest value of PEFR was recorded. Formula for prediction of PEFR was estimated by linear regression analysis.*
Results: *There were no significant differences between the predicted value and actual value of PEFR in the labour using breathing mask and not using breathing mask though there were differences.*
Conclusion: *Reference values of PEFR are affected by regional, environmental and anthropometric factors. Hence, it is necessary to have regional reference values for daily labour.*

Introduction

Air pollution is a major environment related health threat and a risk factor for both acute & chronic respiratory disease. Epidemiological studies have demonstrated an association between air pollution as it occurs in various places around the world and lung function.(1)

One of the major work-related illnesses is occupational lung disease that is usually induced by extended exposure to irritating or toxic substance(2). This exposure to irritating or toxic substances results in lung function impairment, which is most common in industrial plants especially in the cement(3), wood (Liou et al., 1996) and welding (Meo, 2003) industries.

In developing countries millions of people work daily in dusty environments, especially in the cement industry. A number of dust-related studies conducted in cement production plants are available. Abou-Taleb et al. (1995)(4) and Rafnsson

et al. (1997)[5] stated that prolonged exposure to cement dust can develop local and systemic effects like cough, phlegm production, chest tightness, impairment of lung functions, pneumoconiosis, skin irritation, carcinoma of the lungs, stomach and colon.

In the long run, the pollutants may produce diseases like asthma and bronchitis in the exposed individuals with changes in normal lung functions[4]. The Wrights peak flow meter is accurate, portable equipment and thus can be used in field studies to measure Peak expiratory flow rate (PEFR)[5]. Therefore the present work was undertaken to evaluate and compare PEFR in the daily labour working at cement warehouse with and without breathing mask.

Material and Method

The cross- sectional study was carried out at Baleswer on normal healthy labour working on cement warehouse in the age range of 25 to 50 yrs over a period of 3 months. All subjects meeting inclusion criteria were enrolled in the study. Ethical clearance for the study protocol was obtained from institutional ethical committee. Workers of male sex only in the above age range belonging to the rural areas were provided with written information on the intension of the survey and written consent was obtained. History of exposure to cement dust was noted. The study subjects were divided into two groups, group 1 comprised of 50 workers who were not using breathing masks and group 2 comprised of 50 workers who were using breathing masks.

Exclusion Criteria

Workers with one of the following were excluded:

1. Diabetes mellitus.
2. Hypertension
3. Diagnosed renal or cardiac illness.
4. Smoker or alcoholic.
5. Persistent expectoration
6. Wheezing
7. Bronchitis
8. Asthma
9. Those on regular medication

Experimental Design

Age of the subjects and anthropometric measurements like height (cms) and weight (kgs) were recorded. Each person was weighed with normal light clothing and height measured without shoes and body mass index was calculated. The experimental protocol was fully explained to the participants to allay apprehension and method of blowing into the instrument was demonstrated. PEFR was measured using Pocket Peak Flow Meter. The subject was made to sit in an upright position without any back rest and was instructed to take maximal inspiration and blow into the instrument rapidly and forcefully. Close watch was made to ensure that a tight seal was maintained between lips and the mouth piece of the device. Three readings of PEFR were taken and the highest was selected.

Statistical Analysis

The data profile of subjects including name, age, height, weight, body mass index, with their mean and standard deviation are shown in table 1. The results were given in mean± standard deviation. Data analysis was performed using one way ANOVA to find the significance of study parameter between the two groups. The p value less than 0.05 or less was considered statistically significant.

Result

One hundred healthy male workers between 25 to 50 years were analysed for PEFR values. The mean age of the workers with and without breathing mask were 35yr and 36yr respectively. The mean of actual PEFR were 435 L/min and 426 L/min respectively. [Table:1 and 2] give the anthropometric and PEFR values respectively.

Table 1: Anthropometric parameters of the study group

Variable	Group1: workers without breathing mask	Group2: workers with breathing mask
Age (yrs)	36 ± 6.4	35 ± 4.8
BMI (kg/m^2)	22.3 ± 4.21	23.5 ± 2.30

Table 2: Comparistion of PEFR between workers with and with breathing mask

	N(total no of workers)	Actual PEFR (l/min)	Predicted PEFR (l/min)	P-value
Workers without breathing mask	50	426 ± 11	496 ± 32	‹ 0.001
Workers with breathing mask	50	435 ± 12	493 ± 42	‹ 0.001

Discussion

PEFR is a reliable indicator of the lung function. It depends on the force of contraction of expiratory muscles, elastic recoil of lungs and resistance of the bronchial tree and thus testing the function of all these. Reduction in PEFR values may indicate the risk of obstructive airway disease in the occupational group who are exposed to air pollutants everyday[7]. In the present study there was a significant reduction in the actual PEFR values in both the study groups when compared to predicted values ($p < 0.001$**). This shows that the workers of cement warehouse are probably at high risk of developing obstructive pulmonary disease. Secondly there was no statistically significant change in the actual PEFR values between the two study groups irrespective of whether they use breathing mask or not. This tells us that usage of Protective gears such as masks did not had any beneficial effect on PEFR values which is a marker of lung function. The probable reasons for not getting significant change between the two groups may be due to the following reasons: Even if they wear continuously, masks will prevent only the suspended particles but not the poisonous gases such as CO, SO2, and Oxides of nitrates. If similar study is undertaken in larger population, we might get statistically significant increase in the PEFR values between the two groups.

Conclusion

With this we conclude that the clean air act should be established which should identify all pollutants that may reasonably be anticipated to endanger the public. The current study has shown that working in cement dust infested environment could be associated with the impairment of lung function due to a reduction in lung volume. More study is necessary in this field to find out whether breathing mask has any role to prevent decrease of the lung function.

Reference

1. Brunekreef B, Janssen NAH, De Hartog J, Harssema H, Knape M, VanVliet P. Epidemiol 1997; 8:298- 303.
2. Meo, S.A.: Effects of Duration of Exposure to Wood Dust on Peak Expiratory Flow Rate among Workers in Small Scale Wood Industries, International Journal of Occupational Medicine and Environmental Health, 17, 2004, 4, 451 — 455.
3. Meo, S.A., Azeem, M.A., Ghori, M.G., Subhan, M.M.: Lung function and surface electromyography of intercostal muscles in cement mill workers, International Journal Occupational Medicine and Environmental Health, 15, 2002, 3, 279-287.
4. Abou-Taleb, A.N, Musaiger, A.O, Abdelmoneim, R.B.: Health status of cement workers in the United Arab Emirates, Social Health Research Journal, 115, 1995, 378-81.
5. Rafnsson, V., Gunnarsdottir. H., Kiilunen, M.: Risk of lung cancer among masons in Iceland, Occupational & Environmental Medicine, 54, 1997, 184-188.

6. Cotes JE. 1978, Lung function—Assessment and application in medicine. 4th ed. Blackwell Scientific Publication, Melbourne.
7. National Institute of Health, National Heart, Lung and Blood Institute (1995) Global initiatives for asthma: a global strategy for asthma management and prevention. NHLBI/WHO Workshop Report 20.
8. Pal P, Robert A, Dutta TK and Pal GK. Indian J Physiol Pharmacol 2010; 54(4): 329–36
9. Jain SK, Kumar R, Sharma DA. Lung India 1983; 3: 88-91.