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Correlation of duration of exposure with PEFR in flour mill workers: A cross sectional study

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Abstract
Study objective: To correlate duration of exposure with PEFR in flour mill workers.
Materials and methods: 90 participants working in flour mill with duration of exposure ranging from 5 years to 50 years were enrolled in the study. Their predicted PEFR was calculated and actual PEFR was obtained using "Peak Flow Meter". Correlation was done according to the years of exposure.
Conclusion: There is a strong correlation between years of exposure and decline in PEFR in Flour mill workers.

Keywords: Exposure, PEFR, mill workers

Introduction

In olden times, flour used to be prepared by making use of conventional methods [1]. Flour milling industry combines both conventional and high technology methods [1]. Without the use of flour mills many of the grains consumed in variety of different forms would not be available to the general public [1]. The respiratory health effects have been documented in workers exposed to a variety of dusts in small and large scale industries, which generate dust during their production process [1].

Flour has a complex organic dust consisting of wheat, rye, millet, barley, oats, or corn cereal, or a combination of these, which have been processed or ground by milling [2]. Flour may contain a large number of contaminants including silica, fungi, and their metabolites, bacterial endotoxins, insects, mites, mammalian debris and various chemical additives such as pesticides and herbicides [2]. Presentation of obstructive airway disease in grain dust exposed workers is virtually identical to characteristic findings in cigarette smokers i.e., persistent cough, mucus hyper secretion, wheeze and dyspnoea on exertion [3]. The effect of grain dust exposure is additive to that of cigarette smoking with approximately 50% of workers who have smoking symptoms [3]. Smoking grain dust exposed workers are more likely to have obstructive ventilatory deficits on PFT [3].

Ground level flour mill machine is that the wheat is pulverized after entering the flour mill, and the bran is filtered out through a sieve or the like, and the rest is flour [2]. Bran is generally used as a feed [2]. The milled grain (flour) is collected as it emerges through the grooves in the runner stone from the outer rim of the stones and is fed down a chute to be collected in sacks on the ground or meal floor [2]. A similar process is used for grains such as wheat to make flour, and for maize to make corn meal [2]. In order to get safe flour from a flour mill the inputs like wheat, processes like cleaning, storing and milling and final products like flour should be defined by evaluating in terms of food safety [3].

Occupational lung disease is characterized by a variable airflow limitation and/or airway hyper-responsiveness resulting from causes and conditions attributable to a particular working environment and not to stimuli encountered outside the workplace [6]. It is been classified according to the exposure of particles like Inorganic(mineral) dust, Organic (grain, pollen, cotton) dust and Immunologic(allergic alveolitis, asthma) [6].

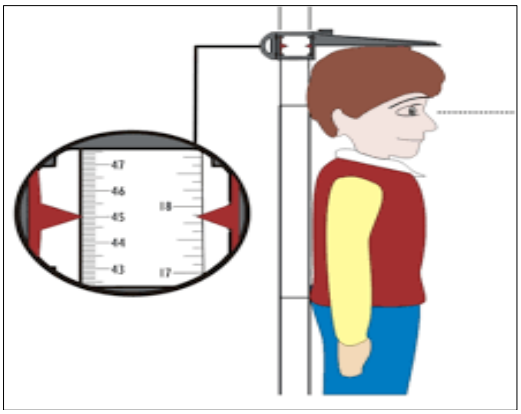
Flour dust is a hazardous substance; it is a sensory sensitizer and is known to cause allergic rhinitis and occupational asthma among bakers and millers.

Many other studies have shown that flour mill workers are at risk of developing obstructive airway disease due to continuous grain dust exposure.

Thus, there is need to see the correlation of duration of exposure with in PEFR in flour mill workers.

Material and methods

1. Peak flow meter
2. Height measuring scale



Height measuring scale

Peak flow meter

Inclusion criteria

- Flour mill workers at least working for 5 years or more.

Exclusion criteria

- Any recent abdominal surgery
- Smokers
- Unwilling participants.

Ethical approval was taken from ethical committee. The subjects were selected according to the inclusion and exclusion criteria. The study was explained to the subjects in detail and informed consent was obtained from each subject. Screening was done on total 100 subjects from which 10 subjects were excluded as they were not meeting the inclusion criteria. The total participants included were 90. Assessment of PEFR was done. The data was divided further according to the tenure of duration of exposure. The collected data was recorded and later the data was analyzed for the result.

Predicted PEFR was calculated using formula-

- (Males) PEF= -1.807(age)+3.206(height) [12].

Results

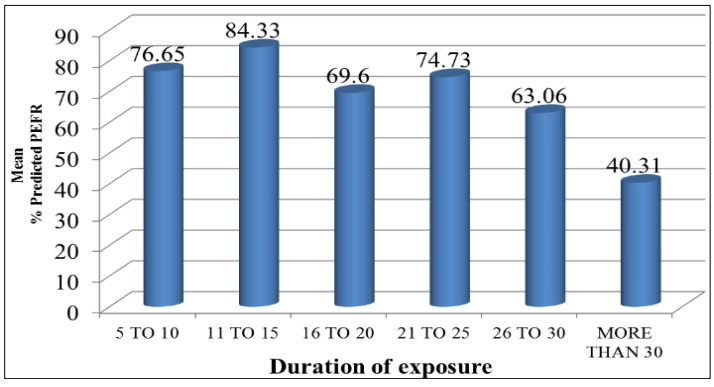
All the subjects assessed were males and were distributed according to the years of exposure with the following group of 5-10,11-15,16-20,21-25,26-30 and more than 30 [3].

- One way ANOVA revealed that there is significant difference in mean observed PEFR of flour mill worker with P value= 0.000.
- Also, significant interaction was observed with years of exposure and %predicted PEFR; linear correlation and regression revealed that there is negative correlation between %predicted PEFR and years of exposure with r = -0.5619.
- The % decline with the duration of exposure was calculated by the formula y=a+bx where,

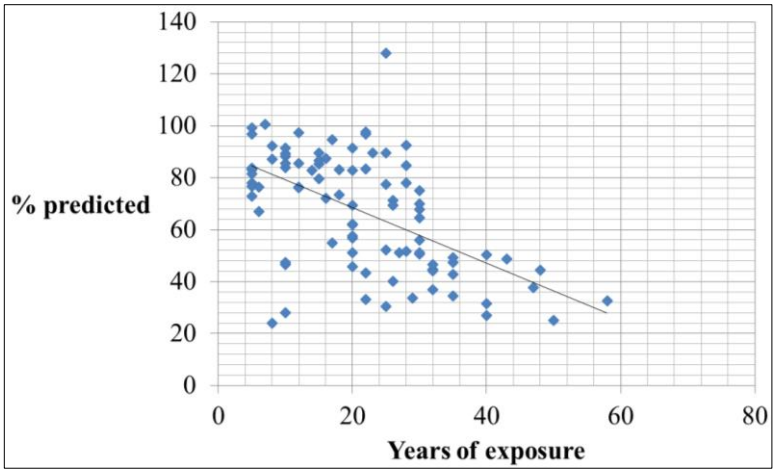
a= 89.87(y Int)
b= -1.066(slope)
x= duration of exposure
in which there was decline in %predicted PEFR with duration of exposure

Table 1: Showing mean and standard deviation of six groups

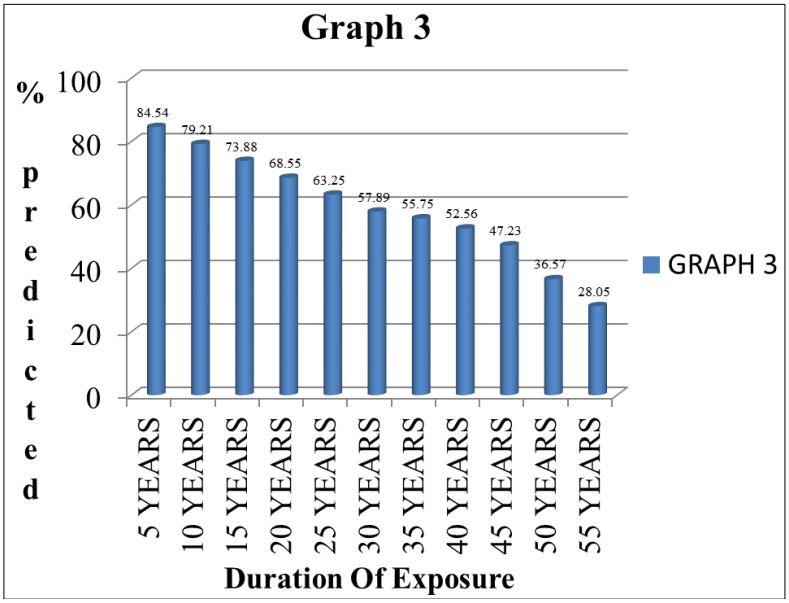
Group	N	Mean (% Predicted PEFR)	Std Dev	SEM
1 (5 to 10 years)	23	76.65	20.94	4.366
2 (11 to 15 years)	9	84.33	6.633	2.211
3 (16 to 20 years)	15	69.6	15.37	3.969
4(21 to 25 years)	11	74.73	30.97	9.338
5 (26 to 30 years)	16	63.06	16.13	4.033
6 (more than 30 years)	16	40.31	8.146	2.037



Graph 1: Showing the difference between mean% predicted PEFR



Graph 1: Correlation of %predicted PEFR and Years of exposure r = -0.5619



Graph 3: Showing the % decline with duration of exposure.

Discussion

Pneumoconiosis is a generic term for the lodgement, and subsequent non-specific pulmonary reaction of any inhaled mineral or organic dust in lung irrespective of the effects [1]. They are commonly categorized based on time of development of obvious disease (acute or chronic/prolong exposure) and on specific agent responsible for the disease [1]. Three broad factors: (a) intensity and duration of exposure, (b) individual susceptibility, (c) the nature, chemistry, geometric, aerodynamic and surface properties of each specific agent influence the character and severity of pulmonary reaction to dusts [1]. The particles leading to occupational lung disease need to be small enough (generally 0.5-5um) to reach the respiratory bronchioles and get deposited there [1].

The occurrence and severity of usual Occupational lung disease is less developed however, working conditions remain far from satisfactory [2]. The problem is compounded by: (a) lack of availability of exact figures relating to prevalence and incidence of occupation related diseases. (b) inadequate facilities for screening, diagnosis and management of these disorders and (c) absence of proper mechanism for worker compensation [2]. Workers exposed to husk during milling, transferring operations, mining process may develop respiratory diseases demonstrating relation between dust exposure level and the respiratory health status of workers and a dose relationship between dust exposure levels and chronic respiratory symptoms [3]. The exact mechanism of lung injury after inhalation remains unclear. Alveolar macrophages engulf inhaled free particles, gets activated and release cytokines, growth factors and oxidants. This stimulates pulmonary parenchymal inflammation and ultimately leads to obstruction of small airways [1].

Peak expiratory flow rate is the maximal rate of air flow which is a subject can achieve by a forced expiration. The peak flow, which is sustained for only a fraction of second occurs in the earliest part of expiration [11]. For, normal person it is 400 liter/min. PEFR is measured by the subject inhaling total lung capacity and exhaling into a peak flow meter with maximum effort [11].

In obstructive airway disease, it affects the airways that carry oxygen and other gases to and from the lungs [11]. These diseases cause the usually declining or blocking the airways. The reduction of PEFR is more significant in obstructive airway disease [4]. The drop in PEFR levels indicate that the patient has been exposed to allergenic environments [8].

The present study reported a decrease in peak flow rate since the workers may find it impossible to exhale fully and their respiration was also limited [8]. There was decline seen

in the peak expiratory flow rate of the workers, working for more than 8 hours and who were working for more than 20 years [7], and confirms the adverse effect of flour dust on workers PEFR which is associated with the dose effect of years of exposure to flour mill dust [7]. Our study found that, PEFR was significantly reduced in flour mill workers as compared to duration of exposure. The decline in PEFR was significantly associated with grain dust exposure and duration of exposure [8].

Our result are consistent with the other studies like, Effect of rice mill dust on PEFR among rice mill workers of Mysore district which concluded that, the mean PEFR was significantly ($P<0.001$) lower among rice mill workers than the controls [3]. The PEFR was found to be significantly decrease with increase in the length of exposure to rice mill dust ($P=0.03$) [3].

Other study, PEFR in flour mill workers, concluded that, PEFR was significantly reduced in flour mill workers as compared to compared group [4]. The decline in PEFR was significantly associated with grain dust exposure, tobacco smoking and presence of respiratory morbidity [4].

Conclusion

The decline in PEFR is strongly correlated with duration of exposure with P value = 0.000.

Clinical implication

Findings of the present study are alarming and thus there is extensive need for preventive measures. It is advisable, therefore for flour mill workers to adopt technical preventive measure such as having well ventilated work areas and wearing appropriate respiratory protective devices. These measures will help in preventing lung damage, which often, overtime, contributes to morbidity and mortality. It is also suggested that flour mill workers must undergo periodic medical surveillance test. This test will identify susceptible workers, so that they can take adequate preventive measures as well as medication.

References

1. Ashok Mahashur A. API Textbook of Medicine; Occupational and Environmental lung disease; Volume-2; 9th edition; Chapter 13-Occupational and Environmental Lung Disease, 1754.
2. Kasper Faugi, Hauser Longo, Jameson Loscalzo. Harrison's Principles of Internal Medicine; Volume-2; 19th edition; Chapter-Occupational and Environmental Lung Disease, 1691.
3. Sanjay Zodpey, Rajnarayan Tiwari. Peak Expiratory Flow Rate in Flour mill workers, 1997.
4. Uma Vijayshankar, Rajeshwari L. Effect of rice mill dust on peak expiratory flow rate among rice mill workers in Mysore district, 2018.
5. George Tzelepis E *et al*. Inspiratory maneuver effects on peak expiratory flow, 1997.
6. Cheryl Ann Melo *et al*. Lung function abnormalities in flour mill workers using spirometry, 2015.
7. George Mathew K, Praveen Aggarwal, Medicine, prep manual for undergraduates, 5th edition.
8. Robert Wilkins L, James Stoller K, Craig Scanlan L. Egan's Fundamentals of Respiratory Care, Eighth Edition.
9. Dr. Anju Asia A, Dr. Gajanan Atram G. Akola; Effect of chronic exposure to flour dust on pulmonary function test; IOSR Journal of Dental and Medical Sciences, 2016, 15.
10. APA, Peak expiratory flow rate in lung diseases, UK, Essays.
11. Hamdy Mohammadien A *et al*. Sohag University, Egypt Effects of exposure to flour dust on respiratory symptoms and pulmonary functions of mill workers; Egyptian Journal of Chest Diseases and Tuberculosis. 2013, 5.
12. Tirthankar Das *et al*. Karnataka; Prevalence of respiratory symptoms and disorders among rice mill workers in India; Environ Health Prev Med, 2014.
13. Mehta's PJ. Practical Medicine; 20th edition, 2017.
14. A study done by author-Kodgule RR *et al*. J Postgrad on Reference values for peak expiratory flow in Indian adult population using a European Union scale peak flow meter, 2014.