www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i5.63

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

Peak Expiratory Flow Rate and Eosinophil Count in Jute Workers: A Cross- Sectional Study

Authors
***Devendra Nath Tiu[1], Sajjan Lal Verma[2], Pramita Dubey[3]**
[1]Associate Professor, [3]Professor, [3]Assistant Professor
Department of Physiology, Mayo Institute of Medical Sciences, Barabanki, Uttar Pradesh - 225001
Corresponding Author
Dr Devendra Nath Tiu
Associate Professor, Dept of Physiology, Mayo Institute of Medical Sciences, Barabanki, Uttar Pradesh 225001
Email: *dr.devendranathtiu@gmail.com*

Abstract
Background: *Occupational Asthma (OA) is a respiratory disorder frequently observed in workers involved in spinning, batching, winding, finishing, beaming, and weaving in jute mills.*
Objective: *In this scenario, the present study was scrutinized to measure Peak Expiratory Flow rate (PEFR) and Eosinophil count (EC) among the jute workers.*
Materials and Methods: *The study encompasses a total of 204 subjects in which 102 were male jute mill workers in nellimarla and 102 subjects were designated as control. The patient demographics details were collected. Then PEFR was measured by Mini-Wright Peak Flow Meter (mWPFM) and the blood samples were withdrawn for the estimation of EC.*
Results: *In the present study, the PEFR was significantly ($p<0.001$) decreased in cases as that of the control. Whilst, the Eosinophil count was significantly ($p<0.001$) increased in cases (jute workers) when compared to the control cases. Further, period of exposure displayed non-significant PEFR value in cases as that of the control. Meanwhile, there exists a moderate negative correlation between the PEFR values and Eosinophil count in the cases.*
Conclusions: *Thus, the present finding highlights that the jute workers are highly prone respiratory illness and allergic reactions.*
Keywords: *Jute workers, occupational asthma, respiratory disorders, PEFR, Eosinophil count.*

Introduction

Globally, the health condition of the working people is affected based on the occupation. During the advancing ages the human is prone to noxious hazardous exposure in the work place[1]. Respiratory related complications are the hallmark among the industrial workers. This might be due to the structural feature of the lung with large surface area, thin alveolar epithelium and extensive blood flow rate (450 ml/s or 12% of the body's total volume). Thus, lungs plays a vital site of contact with the various materials contained in the massive litres of air to which it is exposed daily [2]. In this scenario, inhalation is the prime

route of entry for the occupational agents into the body. Thus the lungs are considered as the organ of interest in the area of occupational medicine. The noxious effect of various organic, inorganic dusts/chemicals occupational agents on the lungs have been reported extensively for example jute, grain, flour, cotton. latex, and tea; soap and detergents, wood, and coal; asbestos, cement, aluminium, vinyl chloride, and acid anhydrides; amines; and diisocyanates[3-8]. These noxious agents may detoriate the lung and cause wide array of respiratory pathologies. Asthma is the chief respiratory disease prevalent in humans working in industrial places[9,10]. Occupational asthma (OA) is a disease characterised by variable airflow obstruction and airway hyper-responsiveness caused by a specific agent or process encountered in the work place, (and not to stimuli encountered outside the workplace) or the presence of respiratory symptoms at work, e.g. symptoms of wheezing, cough, dyspnea, and chest tightness that resolve after time away from work [11,12]. OA is commonly visualized in workers implicated in spinning, batching, winding, finishing, beaming, and weaving in jute mills. The pathophysiology mechanism of OA in jute mill workers is mainly due parenchymal injury in the lungs and allergic reactions to endotoxin derived from gram-negative bacteria inhaled jute mill industries. Further, nature and time of exposure of the material are the cardinal factor in the development of OA [13,14]. Co-morbidities like chronic bronchitis and hypersensitivity pneumonia have been reported in jute mill workers. Furthermore, the jute dust has the ability to aggravate preexisting airway inflammation which prelude to elevated airway hyper-responsiveness and remains modify immune responses to inhaled antigens or exaggerate the effect of other pollutants in the respiratory tract.

Reductions in pulmonary function indices are the mainstay in OA, presenting as an obstructive lung disorder. Betwixt the various pulmonary function markers, measurement of the peak expiratory flow rate (PEFR) is a simple and reproducible method of assessing the degree of airway obstruction [15, 16]. The mini Wright peak flow meter is an instrument used for measuring PEFR. PEFR is a highly sensitive and reasonably accurate index of airway obstruction. In this notion, the present study was undertaken to measure Peak Expiratory PEFR and Eosinophil count (EC) among the jute workers.

Patients and Methods

In our present study, a total of 204 subjects were recruited. Out of which 102 were regular male employees working in jute mill, nellimarla and 102 subjects were designated as control group. The suitable statistical techniques were followed to select the sample size. A brief clinical sheet regarding age, occupational particulars like duration of dust exposure smoking habit and presence or absence of respiratory symptoms were recorded. Peak expiratory flow rate (PEFR) was measured by Mini-Wright Peak Flow Meter (mWPFM). 3 ml of venous blood were collected in EDTA tube from median cubital vein, taking all aseptic precautions. The differential leucokocyte count in blood samples were analyzed by automated haematological analyzer at the pathology lab of the Institution.

Results

In the present study, the age distribution is 40% and 41% of 40-50 years in controls and cases respectively. The 51-60 years contributed 60% and 59% for control and cases respectively.

Further the mean PEFR in control was 457.05 L/min±88.44, whereas the Eosinophil count in control was 2.60±1.26.Meanwhile, in cases (jute workers) the PEFR level was 385.88 L/min±87.81 and the Eosinophil count was 4.73±1.77 respec-tively. On comparison the level of PEFR was significantly ($p<0.001$decreased in cases as that of the control. In contrast, the Eosinophil count was significantly ($p<0.001$) elevated in cases (jute workers) when compared to the control (Table 1).

Table 2 shows the effect of jute exposure period on PEFR and Eosinophil count among the cases

(jute workers). In our study the PEFR level (396.59 L/min±78.97) in cases exposed to 20-30 to jute was non–significant (p >0.1) when compared to the cases exposed to > 30 years (377.75 L/min±93.82). Meanwhile, the Eosinophil count was also found to be non significant (p >0.1) among the cases exposed to jute 20-30 and > 30 years (4.45±1.53 vs 4.94 ±1.77) respectively.

Fig 1 displays the correlation between mean PEFR and Eosinophil count in cases (jute workers). In our study the peak PEFR value in case was 385.88 L/min±87.81, whereas the Eosinophil count in cases was 4.73±1.77. However, the correlation between PEFR and Eosinophil count elicited a moderately negative correlation.

Table 1: PEFR and Eosinophil level in control and cases

Group	PEFR (L/min)	Eosinophil count
Control	457.05±88.44	2.60±1.26
Cases (Jute workers)	385.88 ±87.81 [a, ***]	4.73±1.77 [a,***]

The values were expressed as mean±S.D (n=102). The comparison was made between a: control vs cases. *** denotes statistically significant (p<0.001).

Table 2: Effect of jute exposure period on PEFR and Eosinophil count in cases

Cases (Jute Workers)	Exposure years wise		z-test	p value
	20-30yr (n=102)	>30 yr (n=102)		
Mean PEFR (L/min)	396.59±78.97	377.75±93.82	1.09	>0.1
Eosinophil count	4.45±1.53 [a,NS]	4.94±1.93 [a,NS]	1.43	>0.1

The values were expressed as mean±S.D (n=102). The comparison was made between a: 20-30 years vs > 30 years. [NS] denotes statistically non significant (p>0.1).

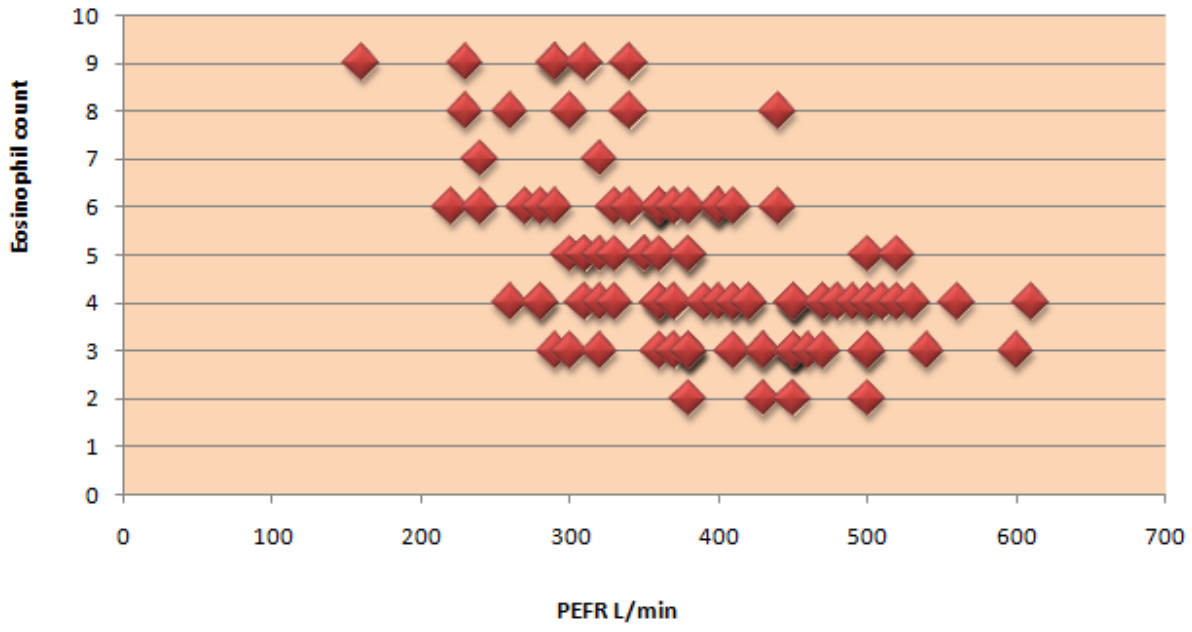

Fig 1: Correlation between Eosinophil count Vs PEFR among the cases

Discussion

The present study focuses the evaluation of respiratory functions among the jute workers. In our study the age distribution is 40% and 41% of 40-50 years in controls and cases respectively. The 51-60 years contributed 60% and 59% for control and cases respectively. According to Gregg and Nun (1973) [17] reported that in both

sexes PEFR does not decline until the age of 35 years. Very similar finding were reported by Brooks and Walter (1972) [18]. In our study both control and cases are above age of 40 years.

In our study, decrease in mean PEFR cases was statistically highly significant, in comparison to values in the control group. Dudhmal et al (2006) [19] reported that there is a significant decrease at 5% level of PEFR. This is probably due to hypertrophy of mucosal cells due to irritation by inhaled dust resulting in increased secretions of mucus and formation of mucosal plugs which causes obstruction to the exhaled air. This suggests that dust has an effect on PEFR.

In the present study, the increase in eosinophil count in the cases was statistically significant in comparison with eosinophil count in the control group. Sordrager et al (1995) [20] evidenced that elevated Eosinophil count might be induced immunological and cytotoxic process causing asthma. Thus, the elevated Eosinophil level among the worker displayed decreased pulmonary functions test values.

Further in our study there was no significant difference in the values of mean PEFR and Eosinophil count between the period of exposure 20-30 years and more the 30 years (>30 years).

Furthermore, the correlation between PEFR and Eosinophil count had displayed a moderately negative correlation. B.P. Chattopadhyay et.al (2007) [21] narrated that the PEFR results were presented according to the blood Eosinophil level. The decrement of mean PEFR level were noticed as the blood levels of eosinophils were gradually increased from 4- 10% the maximum number of workers belong to higher Eosinophil levels which is similar to our study.

References

1. Ankrah TC. Respiratory symptoms and lung function tests invan African Jute factory workers. West Africa J Med 1989: 98–105
2. Obionu CN. Some specific occupational diseases. In Synopsis of occupational and environmental health. Enugu, Nigeria: Cedar Top Press Ltd, 1999: 35
3. Deacon SP, Paddle GM. Respiratory symptoms and ventilator function in workers exposed to grain and grain based dust. Occup Med 1998; 48: 227–30.
4. Ige M, Awoyemi OB: Respiratory symptoms and ventilator function of bakery workers in Ibadan, Nigeria. West Africa J Med 2002; 21: 316–18.
5. Talini D, Benvenuti A, Carvara M, et al. Diagnosis of floor-induced occupational asthma in a cross-sectional study. Respir Med 2002; 96: 236–43
6. Christian DC, Wegman DH, Eisen EA, et al. Pulmonary function among cotton textile workers. Chest 1994; 105: 1713–21.
7. Grammer LC, Harris KE, Yarnold PR. Effect of respiratory protective devices on development of antibody and occupational asthma to an acid anhydride. Chest 2002; 121: 1317–22.
8. Lemiere C, Malo IL, Boulet LP, Boutet M. Reactive airways dysfunction syndrome induced by exposure to a mixture containing isocyanates: functional and histopathologic behaviour. Clin Allergy 1996; 51: 262.
9. Chan-Yeung M, Malo JL. Aetiological agents in occupational Asthma Eur Respir J 1994: 7: 346–71.
10. Vandenplas O, Malo JL. Inhalation challenges with agents causingoccu-patio-nal asthma. Eur Respir J 1997;10:2612–29.
11. Definition of occupational asthma. In Asthma in the workplace. Eds Bernstein IL, Bernstein DI, Chan-Yeung M, Malo JL. New York: Marcel Dekker Inc.,1999: 1–4.
12. Chan-Yeung M. Assessment of asthma in the work place: American college of physicians consensus statement. Chest 1995; 108;117.
13. Ghawabi EL. Respiratory function and symptoms in workers exposed

simultaneously to jute and hemp. Brit J Ind Med 1978); 5: 16–20.
14. Zhou C, Liu Z, Ho C, Lou J Respiratory symptoms and lung function in jute processing: A primary investigation. Arch Environ Health 1989; 44; 370–4.
15. Brevis RAL. Practical pulmonary function tests. Practitioner 1977; 219: 681–91
16. Aderele WJ, Oduwole O. Peak flow rate in healthy school children. Nig J Paed 1983; 10: 45–55.
17. Gregg I, Nunn J. Peak expiratory flow rates in normal subjects. Br Med J 1973; 3: 282-4.
18. Brooks AGF, Waller RE. Peak flow measurement s among visitors t o a public health exhibition.Thorax 1972; 27:557-6.
19. Dudhmal VB, Afroz S, Jadhav SS, Karadkhedkar SS. Pulmonary function tests in saw mill factory workers. Indian J Physiol Pharmacol 2006; 50:313–315.
20. Sordrager B, Pal TM, Looff AJ, de Dubois AE, de Monley JG. Occupational asthma in aluminium potroom workers related to pre-employment eosinophil count. Eur Respir J 1995;8:1520–4.
21. Chattopadhyay BP, Mahata A, Kundu S, Alam J, Das S, Roychowdhury A. A study on blood eosinophil level and ventilatory pulmonary function of the workers exposed to storage grain dust. Indian J Occup Environ Med 2007 ;11:21-5.