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A STUDY OF LUNG FUNCTION TEST IN SUGARCANE FACTORY WORKERS OF DHARMAPURI DISTRICT, TAMILNADU

Pulmonary Medicine

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ABSTRACT

Introduction: Chronic exposure to occupation related dust causes respiratory diseases which have an impact on lung function. The study was done to identify the prevalence of restrictive, obstructive and mixed type of pulmonary impairment and association with years of occupational exposure.
Materials and methods: A cross sectional study was done on 88 workers of sugarcane industry in Dharmapuri district. Participants details were collected in proforma. Chest xrays were taken and pulmonary function test was performed with a portable spirometer. About 10 participants could not be followed up for PFT. So a total of 78 participants were studied by spirometry.
Results: In our study the workers had an exposure ranging from 8 to 36 years with a mean (SD) of 24.34 (3.30) years. Out of 78 subjects, 45 (57.69%) had abnormal pulmonary function test, of which 34(43.59%) had restrictive pattern.The pulmonary impairment was more with increase in years of exposure
Conclusion: The pattern of lung diseases in our study is towards restrictive pattern. Factory authorities must take needful measures to halt the disease progression in terms of health and also prevent loss to the workers in terms of economic status.. Appropriate knowledge should be provided to the workers regarding the work atmosphere.

KEYWORDS

Impairment, Obstructive Pattern, Pulmonary Function, Restrictive Pattern, Sugarcane Workers

INTRODUCTION

The lung diseases are of various etiologies and can be detected based on the air we inhaled. The detection of these diseases is easy as many modalities are available to check and recheck the way we breathe. Dust retention in the lung, and the inflammatory and fibrotic reaction to it, is often visible in chest radiographs, and pneumoconiosis were the first well-established occupational lung diseases. Chest Xray even though identifies many diseases confirmatory diagnosis is always not possible with it. The availability of spirometers measuring FEV1.0, and portable peak expiratory flow meters, has revolutionized the investigation of occupational related respiratory disorders and the documentation of provoking factors.(1)

Inhalation of sugar cane dust causes disease of respiratory system which is commonly described under the heading of hypersensitivity pneumonitis. Hypersensitivity pneumonitis is a group of lung disease caused by inhalation of wide variety of materials that usually are organic and always are antigenic.(2) Inhalation of these particles pave the way to inflammation in the upper airway tract prompting the reduction of mucociliary clearance. This in turn affects the lower airways leading to lung impairment.(3)

Spirometry is the most frequently used measure of lung function and is a measure of volume against time. It is a simple and quick procedure to perform: patients are asked to take a maximal inspiration and then to forcefully expel air for as long and as quickly as possible. Spirometry and the calculation of FEV1/FVC allows the identification of obstructive or restrictive ventilatory defects. A FEV1/FVC < 70 % where FEV1 is reduced more than FVC signifies an obstructive defect. (4) Many studies have shown decrease in pulmonary parameters for the exposed group compared to the unexposed.(1,5)

In our study we aimed to identify the prevalence of restrictive, obstructive and mixed type of pulmonary impairment and association with years of occupational exposure among the sugar cane workers.

MATERIALS AND METHODS

A cross sectional study was done among male workers of sugarcane industry in Dharmapuri district. The sample size was calculated based on the prevalence of obstructive type of pulmonary impairment among sugar cane workers in Maharashtra.(6) After applying the formula $z_\alpha^2 pq/d^2$ where z_α=1.96, p=21.43%, q=78.57% and d (absolute precision) =10% the sample size came up to 65. The sampling method adopted was universal sampling and the study was done for a period of three months. The subjects who don't have direct contact with sugarcane dust were excluded.

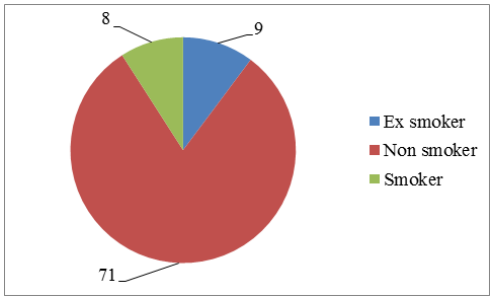
After obtaining informed consent participants details [age, gender, working years and presence of any respiratory disease symptoms] were collected. Chest X-rays were taken for all the 88 participants and pulmonary function test was performed with a portable spirometer. Ten participants didn't give consent for spirometry. So a total of 78 participants were studied by spirometry.

Data was entered in Micro Soft Excel and analyzed using statistical software. Descriptive details were presented as frequencies, means, medians, interquartile range and standard deviations. Inferential statistical methods were used to find any significant association. P value less than 0.05 was considered as significant.

RESULTS

The study population was aged between 38 years and 59 years. The mean (SD) age of the population was 49.77 (4.38) years. The workers had an exposure ranging from 8 to 36 years with a mean (SD) of 24.34 (3.30) years.

Figure 1: Smoking status among the study population



Among the study population 71(80.7%) were non smokers.(Figure 1)

In the study 1(1.1%) had history of asthma, 10(11.4%) had history of atopic allergy, 1(1.1%) had history of pulmonary tuberculosis and no one had any symptoms of Chronic Obstructive Pulmonary Disease (COPD).

During the study many respiratory symptoms (Shortness of breath, dry

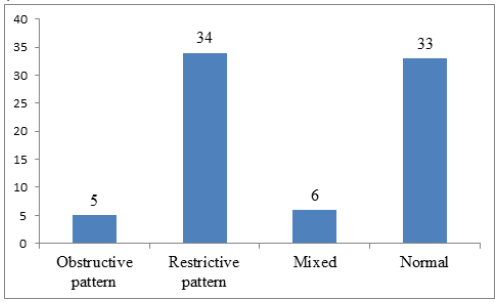
cough, wet cough, hemoptysis, and fever) were assessed. In that 20 (22.7%) had shortness of breath and 3(3.4%) had dry cough.
In the study 17(19.3%) were diabetic and under treatment.

Table: 1 Chest X ray features among the study population

Chest X ray characteristics	Frequency	Percentage
Normal	74	84.1
Abnormal	14	15.9

Abnormal X ray features include bilateral crowding of ribs, Haziness bilaterally, opacity on either sides or one side, scoliosis and fracture of singe rib.

Figure 2: Pulmonary impairment among the study population (n=78)



Among the study population 10 subjects didn't give consent to do pulmonary function test. So out of 78 subjects, 45 (57.69%) had abnormal pulmonary function test, of which 34(43.59%) had restrictive pattern.

Table: 2 Association of pulmonary impairment and years of exposure (n=78)

Years of exposure	Pulmonary impairment pattern		Table value	p value
15-19 years	Normal	5(50%)	10.12	0.03
	Restrictive	4(40%)		
	Obstructive	0		
	Mixed	1(10%)		
20-24 years	Normal	17(41.5%)		
	Restrictive	17(41.5%)		
	Obstructive	4(9.8%)		
	Mixed	3(7.3%)		
25-29 years	Normal	11(42.3%)		
	Restrictive	13(50%)		
	Obstructive	0		
	Mixed	2(7.7%)		
>30 years	Normal	0		
	Restrictive	0		
	Obstructive	1		
	Mixed	0		

Fischer's exact test
Significant p value<0.05
We had done an association between years of exposure and pulmonary impairment. The table shows that those who had 20-24 years of experience were having restrictive pattern of pulmonary impairment and is statistically significant.

Table: 3 Association of pulmonary impairment and presence of diabetes mellitus (n=78)

Presence of diabetes mellitus	Pulmonary impairment pattern		Table value	p value
Yes	Normal	5(29.4%)	2.14	0.62
	Restrictive	9(52.9%)		
	Obstructive	1(5.9%)		
	Mixed	2(11.8%)		
No	Normal	28(45.9%)		
	Restrictive	25(41.0%)		
	Obstructive	4(6.6%)		
	Mixed	4(6.6%)		

We had done an association between presence of diabetes mellitus and pulmonary impairment. It is shown that majority 9(52.9%) of those who had diabetes mellitus had restrictive pattern of pulmonary impairment. This association was not significant statistically but the increased proportion shows more presence of restrictive disease among diabetics. The association between pulmonary impairment and other variables (age in years and smoking status) were not statistically significant.

DISCUSSION

In our study we aimed to identify the prevalence of restrictive, obstructive and mixed type of pulmonary impairment and association with years of occupational exposure among the sugar cane workers.

Our study showed that the study population was aged between 38 years and 59 years. The mean (SD) age of the population was 49.77 (4.38) years. The workers had an exposure ranging from 8 to 36 years with a mean (SD) of 24.34 (3.30) years. Out of 78 subjects, 45 (57.69%) had abnormal pulmonary function test, of which 34(43.59%) had restrictive pattern.

In a study done in Maharashtra, India Significant reduction of FEV1.0 in Bagasse workers, Manufacturing dept. and Engineering dept. workers as compared with controls, indicated obstructive type of pulmonary abnormalities.(6) Reduced FEV1 has earlier been reported by Bohadana et al showed that workers exposed to sugar dust in the sugar cube manufacture workstation had significantly lower forced expiratory volume in 1s (FEV1) than the non-exposed ones.(7)

Many studies have shown similar result where significant pulmonary impairment is noted among sugar factory workers.(1,5,8) Majority of the studies has shown a predominance of obstructive pattern of pulmonary impairment compared to restrictive one in our study.(5,6)(9)

In our study 34(43.59%) had restrictive patter of pulmonary impairment. Obstructive lung disease and its characteristic narrowing of pulmonary airways hinder a person's ability to completely expel air from the lungs. Some common examples are COPD, asthma, cystic fibrosis etc. People suffering from restrictive lung disease have a hard time fully expanding their lungs when they inhale. Examples of restrictive lung diseases are interstitial lung disease, asbestosis and sarcoidosis etc.(10,11)

In our study those who had 20-24 years of experience were having restrictive pattern of pulmonary impairment 17(41.5%) and are statistically significant. The prevalence of restrictive pattern was also more 13(50%) among the 25-29 years age group. This shows the presence of lung impairment among workers who had more years of exposure to occupational dust were more compared to those who had less years of exposure. This result is comparable to other studies also.(5,6)(12)

In our study we had found an increased proportion 9(52.9%) of restrictive pattern of pulmonary impairment among diabetics. This finding is similar among many studies –(1315)where cause is still debatable. Many argues this can be due to increase presence of pulmonary fibrosis

The mechanism behind occurrence of pulmonary impairment is still debatable. A possible mechanism could be mobilization of neutrophils into the airways and the subsequent release of tissue irritating substances, either directly from neutrophils via platelets or by secretion of prostaglandins from macrophages. This lead to decreased diffusion capacity of alveoli leading to decreased oxygen saturation. This hypoxia leads to release of substances causing broncho construction. This hypoxia again leads to release of carbon dioxide leading to hyperpnoea which constricts bronchial muscles.

These can lead to thickening of bronchial walls due to aggregation of granulation tissue.(11,12,16)

CONCLUSION

In our study the study population was aged between 38 years and 59 years. The mean (SD) age of the population was 49.77 (4.38) years. The workers had an exposure ranging from 8 to 36 years with a mean (SD) of 24.34 (3.30) years. Out of 78 subjects, 45 (57.69%) had abnormal pulmonary function test, of which 34(43.59%) had restrictive pattern. In our study those who had 20-24 years of experience were having restrictive pattern of pulmonary impairment

17(41.5%) and are statistically significant.

The study had proved that dust exposure to workers can lead to lung impairment and the prevention of this early will lead to reduction in premature morbidity and mortality. The study should have been focused a little into the various spirometry measurements to see the defects lie where, in the expiration or inspiration. Also should have collected details about the protective gears used by these people and the awareness regarding it.

Through this study we recommend that effective protective measures should be taken to minimize the exposure to these occupational dust particles. Proper steady awareness should be given and reinforcements have to be done to tackle this risk factor. Primordial prevention should be employed to ascertain that the risk factor doesn't turn to disease.

CONFLICT OF INTEREST: Nil
SOURCE OF FUNDING: Nil
ETHICAL CLEARANCE: Obtained from Institutional Ethics Committee.

REFERENCES

1. Resident P. INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH A STUDY OF PULMONARY FUNCTION TEST IN SUGARCANE INDUSTRY WORKERS OF FAIZABAD DISTRICT , UTTAR PRADESH Physiology Afroz Ahmad Khan Nisar Ahmad Deepak Saxena KEYWORDS : 2017;(7):6–9.
2. Selman M, Pardo A, King TE. Hypersensitivity Pneumonitis. Am J Respir Crit Care Med [Internet]. 2012 Aug 15 [cited 2019 Mar 30];186(4):314–24. Available from: http://www.atsjournals.org/doi/abs/10.1164/rccm.201203-0513CI
3. Arbex MA, Santos U de P, Martins LC, Saldiva PHN, Pereira LAA, Braga ALF. Air pollution and the respiratory system. J Bras Pneumol [Internet]. [cited 2019 Mar 30];38(5):643–55. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23147058
4. Ranu H, Wilde M, Madden B. Pulmonary function tests. Ulster Med J [Internet]. 2011 May [cited 2019 Mar 30];80(2):84–90. Available from: http:// www.ncbi.nlm.nih.gov/pubmed/22347750
5. Patil SN, Somade PM, Joshi AG. Pulmonary function tests in sugar factory workers of Western Maharashtra (India). J Basic Clin Physiol Pharmacol [Internet]. 2008 [cited 2019 Mar 30];19(2):159–66. Available from: http://www. ncbi.nlm.nih.gov/pubmed/19024932
6. Nikhade NS, Sharma P. a Study of Pulmonary Function Test in Workers of Sugar Factory ,. 2013;2(1):52–8.
7. Bohadana AB, Massin N, Wild P, Berthiot G. Airflow obstruction in chalkpowder and sugar workers. Int Arch Occup Environ Health [Internet]. 1996 [cited 2019 Apr 1];68(4):243–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8738354
8. Pawar PM, Shinde SB. PREVALENCE OF IMPAIRMENT IN PULMONARY FUNCTION TEST IN SUGAR DISTILLERY INDUSTRY WORKERS IN KARAD TALUKA. 2019;12(2):0–3.
9. Oliveira SL, Mendes RF, Mendes LM, Freire TP. Particleboard Panels Made from Sugarcane Bagasse: Characterization for Use in the Furniture Industry. Mater Res. 2016;19(4):914–22.
10. Lung Institute | Obstructive vs. Restrictive Lung Disease [Internet]. [cited 2019 Apr 1]. Available from: https://lunginstitute.com/blog/the-difference-between-obstructive-and-restrictive-lung-disease/
11. Restrictive vs. Obstructive Lung Disease [Internet]. [cited 2019 Apr 1]. Available from: https://www.webmd.com/lung/obstructive-and-restrictive-lung-disease#1
12. Article O. Dynamic lung profile in sugarcane industry workers. 2011;(November).
13. Klein OL, Flores F, Samee M, Brenkley J, Tate D. DYSPNEA IN DIABETICS IS DUE TO RESTRICTIVE LUNG PATTERN, RATHER THAN DIASTOLIC DYSFUNCTION. Chest [Internet]. 2007 Oct 1 [cited 2019 Apr 8];132(4):616A. Available from: https://linkinghub.elsevier.com/retrieve/pii/S001236921644331X
14. Kopf S, Groener JB, Kender Z, Fleming T, Brune M, Riedinger C, et al. Breathlessness and Restrictive Lung Disease: An Important Diabetes-Related Feature in Patients with Type 2 Diabetes. Respiration [Internet]. 2018 [cited 2019 Apr 8];96(1):29–40. Available from: https://www.karger.com/Article/FullText/488909
15. High prevalence of restrictive lung disease found in type 2 patients | News | Nursing Times [Internet]. [cited 2019 Apr 8]. Available from: https:// www.nursingtimes.net/news/research-and-innovation/high-prevalence-of-restrictive-lung-disease-found-in-type-2-patients/7025242.article
16. Miller GJ, Hearn CE, Edwards RH. Pulmonary function at rest and during exercise following bagassosis. Br J Ind Med [Internet]. 1971 Apr [cited 2019 Apr 1];28(2):152–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/4995433