



Study of Work Related Respiratory Symptoms and Pulmonary Functional Tests in Brick Kiln Workers

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Abstract

Brick kiln workers exposed to smoke & dust are at higher risk of developing respiratory diseases. pulmonary function test is the sensitive technique & helps in diagnosis & prognosis of occupational lung diseases. The present study was carried out in 75 brick kiln workers, who were working for more than 5 years & 75 healthy controls. Pulmonary function test was recorded with medspiror, pulmonary function parameters FEV1, FEV1/FVC, FEF 25-75%, MVV was significantly lowered in brick kiln workers as compared to healthy controls.

Keywords: FVC, FEV1, FEF25 – 75 %, MVV.

INTRODUCTION

Occupational risk factors are one of the major causes of respiratory symptoms and account for 13% of chronic obstructive pulmonary disease and 11% of asthma worldwide. Occupational respiratory diseases are usually caused by extended exposure to irritating or toxic substances that may cause acute or chronic respiratory problems. Occupational lung diseases are due to deposition of dust in the lungs and affected by type of dust, the period of exposure, the concentration and size, of airborne dust particles inhaled. ^[1]

Workers at brick kiln may be involved in carrying the clay dusts and bricks, molding or baking. Although all the workers are exposed to dust,

bakers have more proximal exposure to smoke. Brick kiln workers exposed to smoke and dust are at higher risk of developing respiratory diseases. ^[2]

Pulmonary function tests by spirometry is the only sensitive technique which is non time consuming, besides history and clinical examination, hence best suited in occupational health screening. It play significant role in diagnosis and prognosis of occupational lung diseases and describes the effects of restriction or obstruction on lung function. ^[3]

In the view of the fact that brick kiln smoke and dust put workers health in jeopardy, this study aims to investigate the frequency of chronic respiratory symptoms and associated between

these symptoms and different types of duration of the job.

AIMS AND OBJECTIVES

1. To study the frequency of chronic respiratory symptoms among brick kiln workers in rural district of nanded (wajegaon).
2. To study and compare pulmonary function tests parameters in controls and brick kiln workers exposed to brick dust.
3. To study the correlation between the duration of exposure to brick kiln dust and different pulmonary function tests.
4. To suggest recommendations based on study.

MATERIAL AND METHODS

Study Design

A cross-sectional study will be carried out in 150 subjects of either sex aged 25 – 50 years. [study group (n=75) and control group (n=75)]

Methodology

The present study was carried out at wajegaon village of nanded district, maharashtra, during the year 2013.

Selection of Study Group

Study group included 75 brick kiln workers working in brick kilns for >5 years; 6 hours/ day for 6 days / week.

Selection of Control Group

75 subjects not exposed to brick kiln dust and not having cardio- respiratory disease matched for age and sex and belonging to similar socio-economic strata were included.

Exclusion Criteria

1. Subjects with abnormality of vertebral column, thoracic cage, and, neuromuscular disease were excluded from study.
2. Diagnosed cases of ischemic heart disease, malignancy and subjects with past history of abdominal and thoracic surgery were excluded from the study.

Visits were paid to the different brick kiln sites and the workers aged 25-50 years were interviewed at brick kiln site after obtaining the informed consent from them. Detailed history regarding socio-demographic characteristics like age, sex, education, marital status, socio-economic status, presenting complaints, if any, past history, personal history were obtained.

Complete clinical examination, including general and systemic examination was done. The interview technique was used as a tool for respiratory symptoms (chronic cough, chronic phlegm, wheeze, chronic bronchitis and asthma) and data collection was done as per the predesigned and pretested respiratory questionnaire proforma. Same proforma was used for study and control group. Proforma is as per Annexure I.

Pulmonary function testing (PFT) was done with medspiror- recorders and medicare system. Medspiror is a computerized electronic type of PFT machine. It is a dry type of spirometer with internal correction of volumes to BPTS.

Based on Prasad's method of social classification considering per capita income (Rs per month) the subjects were divided into class IV social class. The current habits regarding physical activity was also assessed and subjects were categorized as having involved in heavy physical activity.

Statistical Analysis

Statistical significance between two groups were determined by student's t test. Correlation between different parameters will be determined by pearson's correlation coefficient. P value less than 0.05 were considered as statistically significant

OBSERVATIONS AND RESULTS

In the present cross-sectional study carried out in 150 subjects in the age group of 25 -50 years [study group (n=75) brick kiln workers and control group (n=75) not brick kiln workers] in rural area of wajegaon, district nanded, Maharashtra during the year 2013, the following observations were found,

It was observed that 46.7% of subjects in the study group and 13.3% in the control group were in the age group of 25 to 30 years. 18.7 % of subjects in the study group and 22.7% in the control group were in the age group of 31 to 35 years. And 13.3% in the study group and 16% in the control group were in the age group of 36 to 40 years. And 9.3% in the study group and 30.6% in the control group were in the age group of 41 to 45 years. 12% in the study group and 17.33% in the control group were in the age group of 46 to 50 years.

It was observed that 60% of males and 40% of females were in study group. 56% of males and 44% of females were in control group.

It was observed that maximum subjects i.e. 72% in the study group and 74.7% in the control group were Hindus. 28% of subjects in the study group and 25.3% in the control group were Muslim by religion. None of the study subjects belonged to other religion.

14.7% were found to have cough. 20% were found to have breathlessness. 16% were found to have both. 10.7% were found to have cough with sputum. 2.6% were found to have cough with hemoptysis. And 36% had no complaints.

Table 1: Comparison of Pulmonary function test of study subjects

Parameters	Study group	Control group	P value
FVC	2.38±0.59	2.46±0.48	0.07
FEV ₁	2±0.57	1.92±0.35	*0.00001
FEV ₁ /FVC%	85.03±16.12	78.77±8.99	*0.00001
FEF _{25-75%}	3.29±0.62	3.07±0.47	*0.018
PEFR	6.39±1.17	6.48±1.03	0.275
MVV	85±15.11	86.52±8.52	*0.0001

*statistically significant

The above table shows comparison of pulmonary function tests parameters in controls and brick kiln workers exposed to brick dust.

As seen from above pulmonary parameters FEV₁, FEV₁/FVC, FEF_{25-75%}, MVV were significantly lowered in study group as compared to control group

Table 2: correlation between duration of exposure to brick dust and different pulmonary function tests.

Parameters	Mean	SD	Correlation`r`	p-value
FVC	2.38	0.59	-0.1294	p<0.05 S
FEV ₁	2	0.57	-0.25706	p<0.05 S
FEV ₁ /FVC%	85.03	16.12	-0.23111	p<0.05 S
FEF _{25-75%}	3.29	0.62	-0.19458	p<0.05 S
PEFR	6.39	1.17	-0.05174	p<0.05 S
MVV	85	15.11	-0.03078	p<0.05 S

The above table reveals that there is significant negative correlation of duration of exposure with all these parameters

DISCUSSION

IN the present study we evaluated the association between duration of exposure of brick kiln workers with respiratory symptoms and pulmonary function tests.

The study showed that the symptoms cough, sputum, breathlessness, wheezing, were more prevalent in brick kiln workers exposed to dust than the persons who were not exposed to dust (control group). Chronic exposure to brick dust among brick kiln workers has led to significant lowered values of pulmonary function test as compared to non exposure group. Workers who had more exposure of brick dust for longer duration showed more prevalence in respiratory diseases.

A study done in brick manufacturing workers in Croatia shows that there is significantly higher prevalence of respiratory symptoms such as chronic cough (31.8%), chronic phlegm (26.2%) and chest tightness (24%) in exposed workers as compared to control workers (20.1%, 18.1%, 0%).

Particulate pollutions at these kilns is 7-8 times more than other types of kilns including vertical shaft brick kilns and fixed chimney. These air pollutants after inhalation incite inflammation and release of oxygen radicals leading to local tissue injury and pulmonary distress.

Studies in Ambala district and Pakistan confirm that workers at brick kiln sites are at high risk of developing respiratory diseases with ventilatory impairment and degree of impairment directly correlates with duration of exposure.

CONCLUSIONS

A statistically significant association was found between cases and control.

1. Pulmonary function test parameters – FEV₁, FEV₁/FVC%, FEV_{25-75%}, MVV was significantly lowered in study group as compared to control group.
2. A negative correlation was found between duration of exposure and pulmonary function test parameters.
3. Majority of brick kiln workers had breathlessness (20%), followed by cough with breathlessness (16%), cough (14.7%), cough with sputum (10.7%) and least had cough with haemoptysis (2.6%).

SUGGESTIONS

- 1) Awareness to be created among the brick kiln owners and the workers.
- 2) Effective dust control measures to be adopted by installation of hoods, dust filters, ventilators, face masks, general cleanliness and other safety measures so as to reduce the risk of respiratory problems.
- 3) Periodic health surveillance to be made essential.

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Conflict of interest – None

Ethical Approval - Taken

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I : Proforma (Confidential)

Name:

Age:

Sex:

Height:

Weight in kg:

Religion:

BMI:

Address:

1. Complaints of patient?
2. History of present illness:
3. History of past illness:
4. History of treatment, preventive measures, rehabilitation:
5. History of family illness
6. Enquiry about social circumstances and history:
7. Occupational history(past and present):
8. Residential environment:
9. Notable relevant information:
10. Questionnaire in relevance to general assessment of systems.

G.I.T:

C.V.S:

Haematological:

R.S:

Urinary:

Reproductive:

Skin:

locomotor:

nervous system:

Special senses:

Endocrine:

11. Occupational history:

Nature of work:

Duration of work:

12. Interview of patient in relevance to symptoms-

a) Cough:

- 1) Do you usually cough first in the morning?
- 2) Do you usually cough at other times during the day or night?
- 3) Do you cough on most days for as much as 3 months of the year?
- 4) For how many years have you had this cough?
- 5) Do you cough more on any particular day of the week?
- 6) Do you cough during any particular season of the year?

b) Sputum:

1. Do you usually bring up phlegm, sputum or mucous from your chest-

First thing in the morning?

At other times of the day or night?

On most days for as much as 3 months of the year?

2. For how many years have you raised phlegm, sputum or mucous from your chest?

Less than 2 years.....

2 to 5 years.....

5 years or more.....

c) Wheezing

- 1) Does your breathing ever sound wheezy?
- 2) Have you ever had attacks of shortness of breath with wheezing?
- 3) Have you ever had feeling of tightness in your chest?
- 4) At what age did wheezing first occur?
- 5) How frequently does wheezing occur?
- 6) Is it worse on any particular day of the week? What day?

d) Breathlessness:

1. Do you get short of breath when walking on level ground?
2. Do you get short of breath while walking up stairs?
3. How many flights of stairs can you climb up without stopping?
1 to 2? 2 to 3? More than 3?

e) Hemoptysis

Have you ever coughed up blood from your chest?

If yes, when was the last time this happened?

f) Smoking

(Currently)

1. Do you now smoke regularly(cigarettes, pipe, cigars)?
2. How old were you when started smoking?
3. For how many years have you smoked regularly?
4. How many cigarettes do you smoke each day?
5. How much pipe tobacco do you now smoke each week?
6. How many cigars do you now smoke each day?

(Formerly)

- 1) Have you ever smoked regularly?
- 2) How old were you when you started smoking regularly?
- 3) For how many years did you smoke regularly?
- 4) How long ago did you last quit smoking?
- 5) How many cigarettes did you usually smoke per day?
- 6) How many pipe tobacco did you usually smoke per week?
- 7) How many cigars did you usually smoke per day?

8) Investigation:

Date:

Environmental Temperature:

Pulmonary function tests:

Sr. no.	parameter	Predicted	observed	Percentage%
1	FVC			
2	FEV ₁			
3	FEV _{1%}			
4	FEF _{25-75%}			
5	PEFR			
6	MVV			