ORIGINAL ARTICLE

Prevalence of Chronic Obstructive Pulmonary Disease as Occupational Lung Disease among Brick Kiln Workers

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ABSTRACT

Objectives: To determine the prevalence of chronic obstructive pulmonary disease as Occupational Lung Disease among Brick Kiln Workers and to compare the prevalence of chronic obstructive pulmonary disease between brick kiln workers and surrounding population.
Study design: Comparative - Cross Sectional (Analytical) Study.
Place and duration of study: District Nawabshah, from October, 1st to November 30th 2007.
Methods: This was a Comparative - cross sectional (analytical) study conducted on 407 kiln workers and 407 non kiln workers of district Nawabshah, Sindh.
Results: The mean age of the participants was 35 years. The main symptoms of study group were (57% v/s 6%) were have cough, (33% v/s 3%) were have sputum and (14% v/s 1%) were have dyspnea. Spirometeric results showed that prevalence of Chronic Obstructive Pulmonary Disease in Brick kilns workers compared to controls living in the radius of five kilometers away from kilns was (18.9% v/s 2.6%, p <0.01).
Conclusion: There is increased risk (18.9% v/s 2.6%) of developing Chronic Obstructive Pulmonary Disease in Brick kilns workers compared to controls living away from brick kiln industry.
Keywords: Occupational hazards, chronic obstructive pulmonary disease, pulmonary function test.

INTRODUCTION

In Pakistan there are more than 1.8 million workers involved in brick kiln work[1]. Brick kiln workers are scattered across all four provinces of Pakistan because the largely informal construction sector provides employment to a large number of workers who owing to the fact being illiterate are vulnerable to occupational health and safety risks. These workers are not even provided with the protection that is available to other industrial workers, because most of the labour laws do not apply to this sector. Consequently, the rate of accidents, diseases and injuries is much higher. Brick dust mostly causes lung infection, eye allergies, backache, depression and skin problems[2]. Some estimates have been based on the occupational injuries and diseases reported in official statistics. But a large number of injuries and diseases caused by workplace hazards are not reported. ILO and WHO estimate that there may be as many as 250 million occupational injuries each year, resulting in 330 000 fatalities[3]. Occupational lung disease is the number one work related illness in the United States based on the frequency, severity and preventability of diseases. These illnesses are usually caused by extended exposure to irritating or toxic substance that may cause acute or chronic respiratory ailments, although severe single exposures can cause chronic lung disease as well. Overall 2.5 per 10,000 full time workers developed nonfatal occupational respiratory diseases. Occupational lung diseases are often not curable, but are always preventable. Improving ventilation, wearing protective equipment, changing work procedures, and educating workers are the key factors for prevention[4]. Many acute and chronic pulmonary diseases are directly related to inhalation of noxious substances encountered in the work place like pneumoconiosis, hypersensitivity pneumonitis, obstructive airway disorders**,** toxic lung injuries, lung cancer and plural diseases[5]. Yet chronic obstructive pulmonary disease fails to receive adequate attention from health care community and government officials. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases[6]. Many hazardous substances encountered in the work place gain entry to the body through inhalation, inhaled materials may affect the lung directly or may be directly absorbed from the lung and affect other parts of the body. Particle deposition throughout the respiratory tract depends on a verity of factors, including particle size, ventilation rate and the

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presence of disease. Occupational Chronic obstructive pulmonary disease is more common than had once been thought, although in many cases specific causes are not able to be identified[7]. Adoption of safer working practices, improvement of safety systems and changes in behavioral and management practices could reduce accident rates, even in high risk industries, by 50% or more within a relatively short time[8]. It was also concluded in a study carried out in Luknow India on brick kiln workers concluded that the workers engaged in these kilns were at high risk from dust related diseases[9]. Brick constitutes the major material used for the construction[10]. Although the design, shape and weight of bricks have undergone numerous historical transitions, the production technology has experienced very limited changes[11]. Population and economy growth in developing countries around the world lead to more construction sites and therefore a higher demand of cheap construction materials[12]. A study on environmental pollution from rural brick making operations and their health effects on workers in China reveals that during the firing process, a large amount of fuel is consumed that causes serious air pollution and negatively influence human health. Those people who live in the area nearby the brick kilns are always at risk of exposure to the pollutants, and workers who work and live in the brickfield are at the highest risk people. Children under the age of 5 years are worst affected. Epidemiological studies done in different places around the world have found increases in the prevalence of bronchitis, asthma, decreased lung function, pharyngitis, cough, eye irritation, pulmonary fibrosis, emphysema, allergic rhinitis, low birth weight, that are linked with deteriorating ambient air quality[13]. According to different scientific researches informal firms are usually more pollution intensive than large firms in the same industry because they lack pollution control equipment. Since the traditional informal brick industry is a significant source of employment and is often situated in poor residential areas, its emissions directly affect a considerable population[14].

The consequences of exposure to ambient air pollutants is very hazardous to human health as it can cause number of respiratory and other ill health effects leading to high mortality and morbidity. Studies on the environmental impacts of brick kilns are scarce while data on emissions from brick kilns is not available. This unregulated industry in Pakistan poses a public health hazard by virtue of its emissions leading to a risk of respiratory and other disease, especially in brick kiln workers and peoples living in the vicinity. The current study proposes to decrease morbidity in brick kiln workers due to respiratory problems living near brick kilns. Results of this will help identify kiln emissions as a potential risk for respiratory problems among population and also help in putting up recommendations for the policy makers to help this industry regulate emissions for the larger public health and environmental interest.

METHODOLOGY

This was a Comparative cross sectional (analytical) study conducted on 407 kiln workers and 407 non kiln workers of district Nawabshah, Sindh. From October, 1st to November, 30th 2007; to determine the prevalence of chronic obstructive pulmonary disease as occupational lung disease among brick kiln workers and to compare the prevalence of chronic obstructive pulmonary disease between brick kiln workers and surrounding population. Brick kiln workers from age 25 to 65 years and having at least 5 years brick kiln work experience were included while Workers with history of chronic diseases like (tuberculosis, asthma, mental disability) before joining brick kiln work and Smokers were excluded, for Controls criteria were as: One control for each kiln worker was selected from surrounding population in such a manner that they are matched for age, sex and education, so as to minimize the effects of confounders. Those controls who were engaged in pottery manufacturing or other types of kilns (i.e. iron, pottery) work history were also excluded from the study. Sampling technique was Stratified simple random sampling. The sample size was calculated using software Epi-Info 3.2.2. Using statcalc of the software for comparative cross sectional study assuming that prevalence of the disease under study is not known in the exposed population i.e. the brick kiln workers and may be taken as 50%. Using a difference of 10% between the exposed population and control group, the sample size for each group comes to 407, a total of 814 with 95% confidence interval and 80% power and a ratio of 1:1 between exposed group and controls. Instrument: Microlop /micro medical+microrint (air way resistant). Spirometry tests were performed in the standing position. The best values were used for analysis. All Spirometry measurements were performed in accordance with the American thoracic society criteria guidelines. Normal value: The forced expiratory volume in one second expressed as a percentage of the forced vital capacity is an excellent measure of airflow limitation. In normal subjects it is around 75%.

RESULTS

The mean age of the participants was 35 years. The main symptoms of study group were (57% v/s 6%)

were have cough, (33% v/s 3%) were have sputum and (14% v/s 1%) were have dyspnea. Spirometeric results showed that prevalence of Chronic Obstructive Pulmonary Disease in Brick kilns workers compared to controls living in the radius of five kilometers away from kilns was (18.9% v/s 2.6%, p <0.01). This study revealed that prevalence of Chronic obstructive pulmonary disease in Brick kilns workers compared to controls living in the radius of five kilometers; away from kilns was (18.9% v/s 2.6%, p <0.01). Chi Square; a test of significance was applied for the results. There is increased risk of developing Chronic obstructive pulmonary disease in Brick kilns workers compared to controls living away from brick kiln industry. Cases of Chronic obstructive pulmonary disease were higher in kilns workers compared to population living away from kilns. The Brick kilns workers and population living away from kiln industry involved in the study was from similar socio economic back grounds. As the distance for controls is just about 5 kilometers in the radius of every kiln, there were not too much socio economical and cultural variations.

DISCUSSION

The present study results showed a significant decrease in the mean values of FVC, FEV_1, and ratio between FVC/FEV_1 and this impairment was increased with duration of exposure in the brick kilns. This group of brick kiln workers had occupationally related pulmonary function impairment. Brick kilns workers and population living away from kiln industry were studied for the prevalence for COPD and compared to observe the difference. Cases of COPD were higher in kilns workers compared to population living away from kilns (18.9% v/s 2.6%, p <0.01). Main objective of the study was to determine morbidity of chronic obstructive pulmonary disease among brick kiln workers and to compare the prevalence of chronic obstructive pulmonary disease among non brick kiln living away from kiln industry. The aim and objective of the study was to build evidence of the environmental impacts of brick kilns on brick kiln workers and non brick kiln controls, since such evidence is scare and paid less attention in our country. Linked to this is perhaps poor legislation regarding the environmental hazards of pollution due to these kilns. Chronic obstructive pulmonary disease among brick kiln workers have received far less attention in humanitarian relief policies and programmes in Pakistan, despite being the largest baseline contributor to disability-adjusted life-years lost and the leading single cause of mortality worldwide. A study carried out at Croatia, We studied 233 male workers employed in two brick manufacturing plants and 149 matched control workers. The mean age of the brick workers was 35 years, with a mean duration of employment in this industry of 16 years. The prevalence of chronic respiratory symptoms as well as acute symptoms during the work shift was recorded. Lung function was measured during the work shift by recording maximum expiratory flow-volume (MEFV) curves, from which the forced vital capacity (FVC), the one-second forced expiratory volume (FEV_1) and flow rates at 50% and the last 75% of the FVC (FEF50, FEF75) were measured. There was a significantly higher prevalence of chronic cough (31.8%), chronic phlegm (26.2%), and chest tightness (24%) in exposed workers, compared with control workers (20.1%; 18.1%; 0%) (P<0.05). This increased symptom frequency was also documented among nonsmokers studied by age and by length of employment, suggesting a work-related effect. Among work shift-related symptoms, high prevalence's were noted for upper respiratory tract symptoms (e.g., dry throat, eye irritation, throat irritation). The measured FVC and FEV_1 were significantly lower than predicted for brick workers and suggested a restrictive pattern. The mean FVC (as a percent of predicted) was 78.1% and FEV_1 was 88.1%. The FEF50 and FEF25 were not significantly decreased. These findings of a restrictive lung function pattern in brick workers. Additionally, a bronchitic component, as suggested by the respiratory symptoms, may also be present[15]. Similar study carried out at China on pneumoconiosis and pulmonary function defects in silica exposed firebrick workers in which 526 exposed workers were compared with 164 non exposed control workers. The pulmonary function test revealed that the prevalence of pneumoconiosis increased with duration of employment and the exposed group experienced significantly more wheezing compared with the control group. It also revealed that pneumoconiosis and pulmonary function defects occurred frequently in workers who participated in the burning operations of bricks which causes exposure to the high level of silica dust and concluded that exposure to silica dust in workers at brick factories leads to pneumoconiosis and pulmonary function damage[16].

CONCLUSION

Brick kilns are known to be a leading cause of ambient air pollution. The levels of TSP and PM10 are major problems in area near Kiln industry because these levels mostly cross WHO guidelines and can cause health problems, particularly in the respiratory system[17]. The primary reason for air

pollution and health hazards is the use of poor quality fuel. The consequences of exposure to ambient air pollutants is very hazardous to human health as it can cause a number of respiratory and other health effects leading to high mortality and morbidity.

Results from the present study may be useful to be used as base line for further studies and for making policy recommendation for the safety of children living near kiln industry. We must focus on appropriate strategies to reach our objective of minimizing chronic obstructive pulmonary disease. We must identify the strategies to prevent chronic obstructive pulmonary disease from working environment, if we fail or delay our task to launch appropriate programs, the situation of chronic obstructive pulmonary disease will never be solved.

RECOMMENDATIONS

- Health Programs should be instigated to ensure that the local people, brick kiln owners, kiln workers and families living nearby are aware of the environmental and health impacts of the kilns.
- Strengthening of national policies for health at work and development of policy tools.
- Improvement of healthy work environment work practices and promotion of health.
- Intensification of occupational health services & establishment of support services for occupational health.
- Progress of occupational health standards based on scientific risk assessment.
- Expansion of human resources for occupational health.
- Organization of information systems, institutional development, legislation and enforcement.

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