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Original Research Article

Prevalence of respiratory morbidity among brick kiln workers: a cross sectional study from rural north India

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ABSTRACT

Background: Fired clay bricks, an important construction material, are manufactured in non-mechanized, labour intensive brick kilns which mostly employ unskilled men and women. The workers, as an occupational hazard, are exposed to dust and air pollution leading to respiratory diseases.
Methods: This cross sectional study was conducted among brick kiln workers in RS Pura block of Jammu district. The workers were assessed regarding respiratory symptoms and illnesses using translated version of American Thoracic Society Division of Lung Disease questionnaire (ATS-DLD-78A).
Results: 692 brick kiln workers were interviewed during the course of survey and 58.8%of them were males. 45% of the respondents were working since last less than three years. Among the respiratory symptoms chronic cough, was present in 23.55% and phlegm in 22.83% of the respondents. Chronic bronchitis was present in 20.52% of the respondents. Association of respiratory symptoms in relation to sex of the respondents was found to be statistically significant ($p<0.05$).
Conclusions: Respiratory symptoms and illness were found to be quite prevalent in the brick kiln workers. More research needs to be conducted to assess other health risks besides respiratory morbidity. Health planners need to plan for their basic sanitation facilities and periodic check ups.

Keywords: Brick kiln workers, Chronic bronchitis, Respiratory illness, Respiratory symptoms

INTRODUCTION

Brick kiln manufacturing units are among the fastest growing sector, owing to infrastructure development in the country. Smoke and dust from brick kilns contribute significantly to the air pollution and is an important cause of health problems among its workers.[1]

Three main steps involved in Brick manufacturing are clay shaping with water (moulding), drying with solar energy and firing with fuel (baking). In all of these steps brick kiln workers are exposed to enormous amount of dust and smoke.

Clay dust contains a mixture of inorganic compounds like magnesium compounds, free silica, lime, iron oxide, calcium sulfate, alkalis, calcium carbonate, sodium chloride and various organic materials. Burning of biomass fuels increase the exposure to gases including sulphur dioxide, hydrogen sulphide, carbon dioxide, and carbon monoxide and particulate air pollutants.

Next to smoking, occupational risk factors are major cause of chronic respiratory illnesses and account for 13% chronic obstructed pulmonary disease and 11% asthma.[2] A review of the literature shows that worker from different occupation exposed to dust and smoke including brick kiln workers are at a higher risk of developing chronic respiratory symptoms and illnesses.[3] It has been estimated that exposure to wood smoke is associated with 70% increase of having COPD.[4] These air pollutants after inhalation cause inflammation and release of oxygen radicals leading to local tissue injury and pulmonary distress.[5] Evidence shows that factors like length of job, lack of protective equipment, type of work and type of burning fuel is associated with respiratory illnesses in different occupations.[6-8]

Limited data is available regarding respiratory health of brick kiln workers in the developing countries including India, particularly in the northern part of the country. This information is essential to plan and develop a programme for brick kiln workers.

In Jammu a significant number of persons are working in brick kiln industry in the outskirts of the city. Majority of brick kilns uses wood and coal, which makes the brick kiln workers susceptible to high exposure of air pollution and its adverse health effects. This study was planned with the aim to understand and to evaluate the respiratory health problems of this high-risk population, as much information is not available from this region.

METHODS

A cross sectional study was conducted over a period of one year, among brick kiln workers in a rural area of Jammu district. All the brick kilns and workers working in units functional in and around Badyal Brahmana Zone of Block Pura RS were included in the sampling frame. Clearance from the ethics committee of Government Medical College Jammu was sought before the study.

Brick kilns owners in the study area were approached and explained the purpose of the study and their permission sought for the conduct of the study. All workers above 18 years of age and having worked in the kilns for at least 6 months were included in the study.

A written consent was obtained from the workers and those who consented were interviewed. Privacy was ensured while interviewing the workers. A pre-tested, semi structured questionnaire was administered to all the brick kiln workers. Five workers could be interviewed per day as each data collection procedure took 40 minutes to one hour on an average. Study was conducted for three days in a week.

History of chronic respiratory symptoms and illnesses was obtained by using American Thoracic Society Division of Lung Disease questionnaire (ATS-DLD-78A).[9] Following operational definitions of the study outcomes (from ATS guidelines) were used.

Chronic cough was defined as cough for 4-6 times per day occurring for most days of the week (>5days) for at least three months of the year and for at least two consecutive years.

Chronic phlegm was classified as sputum expectoration as much as twice a day for most days of the week (>5days) for at least three months of the year and for at least two consecutive years.

Dyspnea was divided into 5 grades with following definitions.

- Grade 0: No breathlessness except with strenuous exercise.
- Grade 1: Breathlessness when hurrying on the level or walking up a slight hill.
- Grade 2: Walking slower than people of the same age on the level because of breathlessness or has to stop for breath when walking at own pace or level.
- Grade 3: Stopping for breath after walking about 100 yards or a few minutes on the level.
- Grade 4: Too breathless to leave the house or breathless when dressing or undressing.

Chronic bronchitis was defined as cough and sputum expectoration occurring for most days of the week (>5 days) for at least three months of the year and for at least two consecutive years.

Statistical analysis

The data collected was compiled, coded and entered in Microsoft excel. The data was analyzed using Open Epi Software. Qualitative data was reported as proportions while Mean and SD were used to report quantitative data. Chi square test was used to measure the degree of association among the variables. P value less than 0.05 was taken as significant.

RESULTS

During the study period, 692 brick kiln workers were interviewed and 58.8 % of them were males. The results revealed that 33.09% of the workers were in the age group 41-50 years followed by 28.75% in 31-40 years whereas only 3.17% of the respondents were ≥60 years old. About 90% of the study population were married and 70% of them were found to be literate.

Regarding duration of work, 45% of them were found to be working since less than last three years and only 23.12% were working since last ≥5 years. Smoking habit was found to be present in 67.63% of the respondents (Table 1). Age and sex wise distribution of the study population is depicted in Table 2. Sex wise distribution of brick kiln workers according to their duration of work

was found to be statistically significant (p<0.05) (Table 3).

Table 1: Socio demographic profile of study population.

Variable	Number	Percentage
Age in years		
≤30	107	15.46
31-40	199	28.75
41-50	229	33.09
51-60	135	19.50
≥61	22	3.17
Sex		
Male	407	58.81
Female	285	41.18
Marital status		
Married	622	89.88
Unmarried	57	8.23
Divorced/separated/widow	13	1.87
Education status		
Illiterate	478	69.07
Upto primary	146	21.09
Middle and above	68	9.82
Duration of work in years		
< 3	312	45.08
3-5	220	31.79
≥5	160	23.12
Smoking		
Yes	468	67.63
No	224	32.36

Table 2: Age and sex wise distribution of study population.

Age in years	Male (n)%	Female (n)%	Total (n)%
≤30	62 (15.23)	45 (15.78)	107 (15.46)
31-40	107 (26.28)	92 (32.28)	199 (28.75)
41-50	142 (34.89)	87 (30.52)	229 (33.09)
51-60	81 (19.91)	54 (18.94)	135 (19.50)
≥61	15 (03.69)	7 (2.45)	22 (03.17)
Total	407 (100)	285 (100)	692 (100)

As far as distribution of respiratory symptoms in the study population, chronic cough was found to be present in 23.55% of them while 22.83% had phlegm. Dyspnoea (grade 1) was present in 14.59% of the respondents. Chronic bronchitis as a disease entity was found in 20.52% of the study population (Table 4).

When association of respiratory symptoms was analyzed on the basis of sex of the respondents, it was found to be significant (p<0.05). On the other hand, association between chronic bronchitis and gender of the study population was found to be statistically non-significant (p>0.05) (Table 5).

Table 3: Sex wise distribution of brick kiln workers according to duration of work.

Duration of work	Male n(%)	Female (n)%	Total (n)%
<3	167(41.03)	145(50.87	312(45.08)
3-5 years	145 (35.62)	75 (26.31)	220 (31.79)
>5 years	95 (23.34)	65 (22.80)	160(23.12)
Total	407 (100)	285 (100)	692 (100)

X^2= 8.19 df=2 p= 0.01, **statistically significant

Table 4: Distribution of respiratory symptoms and illness in the study population.

Variable	Number	Percentage
Chronic cough	163	23.55
Phlegm	158	22.83
Dyspnoea		
Grade 0	96	13.87
Grade 1	101	14.59
Grade 2	58	8.38
Grade 3and4	6	0.86
Chronic bronchitis	142	20.52

Brick kiln industry is predominantly a male bastion and it was aptly reflected with about 60% of the study population being males.

DISCUSSION

Among the respiratory symptoms, chronic cough and phlegm were present in 23.55% and 22.83% of the respondents respectively. These results are in agreement with those reported by Shaikh et al from Pakistan.[10] However higher frequency of chronic cough (31.8%) and Phlegm (26.2%) were reported among brick kiln workers in a study from Croatia.[11]

Table 5: Association of respiratory symptoms and illness with gender in the study population.

	Male (n=407) no (%)	Female (n=285) no (%)	Total (n=692) No (%)	X^2	p
Respiratory symptoms					
Present	96 (24.82)	87 (30.52)	183 (26.44)	4.14	0.04*
absent	311(76.41)	198(69.47)	509 (73.55)		
Chronic bronchitis					
Present	84(20.63)	58(20.35)	142(20.52)	0.008	0.92
Absent	323(79.36)	227(79.64)	550(79.47)		

In a case-control study from Egypt, Sheta S et al, reported higher frequency of chronic respiratory symptoms in brick kiln workers as compared to control group.[12] High frequencies of respiratory symptoms among brick kiln workers are best explained on the basis of increased exposure to air pollutants. Among the studies conducted in other occupations where workers are exposed to dust and smoke, results reported by authors were in congruence with the results of the current study.[13,14]

Among other symptoms of respiratory morbidity, Grade 1 dyspnoea was present in 14.59% of the respondents in the present study whereas Shaikh et al reported a Grade 1 dyspnoea to the tune of 11.8% in the study population.[10] Das S et al reported 31.8% of the study population symptoms related to respiratory morbidity.[15] Prevalence of chest symptoms among males and females was 10.4% and 8.3% respectively in brick kiln migrant workers in a study conducted by Thomas BE et al in South India.[16]

In the present study chronic bronchitis was present in 20.52% of the respondents which was higher than that reported by Shaikh et al.[10] Smoking, a known risk factor for chronic bronchitis was found to be present in about two-third of the respondents. Das S et al, in a study conducted in Bangladesh among brick field workers reported that 42.29% of the respondents were current smokers.[15] Despite smoking as a risk factor for chronic bronchitis, Shaikh et al reported that 24% of chronic bronchitis was contributed by non-smoking individuals which strongly support the role of occupational effect on respiratory illness.[10] Shrivastava AK et al, reported 12.1% diseases of respiratory system in the brick kiln workers.[17]

Among the limitations, spirometry could not be performed to assess the lung functions of the study population. Another limitation was lack of control group for comparison.

CONCLUSION

The findings of the present study have shown reasonably high levels of respiratory symptoms and illness among the study population. Association between respiratory symptoms and sex of the respondents was found to be statistically significant. Authors propose more studies to be conducted among brick kiln workers where besides respiratory morbidity, other morbidities like injuries, locomotor diseases, skin diseases etc. need to be assessed. Periodic examination of these workers would be useful for their health evaluation and preventing the disease progression to advanced stages. Authors also suggest that basic sanitary facilities and primary health care be provided to them on a priority basis.

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