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Assessment of Health Problems among Brick Kiln Factory Workers in a District of Uttar Pradesh -A Cross Sectional Study

Ms. Swati Sharma[1], Dr. Ruchi Juyal[2]*, Dr. Sudeep Bhattacharya[3], Dr. Deep Shikha[4]
[1]Research and Development Centre, DMC and Hospital, Ludhiana, Punjab, India.
[2,3,4]Department of Community Medicine, Himalayan Institute of Medical Sciences, Swami Rama Himalayan University, Dehradun, Uttarakhand, India.

(*Corresponding Author)

Abstract

Introduction: The brick industry is considered as an informal industry and is highly demanding. However, the brick kiln workers are not only exposed to the heavy pollutants, but also to the unaccustomed postures for long hours along with exposure to immense heat (800-1100^0 C), thus becoming prone to development of multiple health disorders.

Aims and Objectives: This study identify the health problems experienced by the workers and correlate it with their working profile.

Methodology: The present study included a sample size of minimum 90 study subjects. The study was conducted in natural settings (Brick Kiln Factory) of the study participants. Questionnaire was used to collect data samples. All the variables were described as mean ± standard deviation and all the categorical variables conferred in terms of frequencies and proportions and analysed using SPSS software.

Results: About 12% of the male workers and no female worker reported always having body aches. For health-related problems encountered at workplace, 18 (20%) of workers have had met with physical injuries while working. On further analysis, it was seen that more male workers suffered from physical injuries and sometimes hospitalization as compared to female workers (32.7% vs 4.9%) and this difference was statistically significan ($p<0.01$). Other health problems reported by workers were irritation in the eyes (41.1%) and irritation in skin/body (40%). Apart from these, 28.9% reported throat irritation, shortness of breath (27.8%), frequent coughing (22.2%) and tightness in the chest (15.6%).

Conclusion: The most common morbidities among the brick factory workers were eye problems, followed by ENT, heart, musculoskeletal and skin complaints. Additionally, most of them were suffering from hypertension, followed by diabetes, tuberculosis, CVD, and cancer.

Keywords: Brick-klin, Health problems, Immense heat, Physical injuries, Irritations.

1. Introduction

Traditionally, from thousand years back to till date, brick is made by mud, so it is said that the study of brick making is compared with the study of any civilization.(1) Due to rapid

urbanization, the demand of brick production has also increased and as a result, brick industries are rapidly expanding, and brick workers are pressured to work more to increase the production. Available data suggests that over 400,000 workers are associated with the brick industry in India.(2)

However, the brick industry in India is of low technology and labor insensitive, which generates minimal income for the brick workers and maximum profit for the owners. To cut the cost of brick production, the brick industry owners commonly provide minimum wages to their employee and do not consider the safety components like provision of personal protective gears, even though brick making is associated with high risk.(3)

Commonly, the brick kiln workers are involved in three types of tasks viz mining and transport of clay dust and bricks, shaping of wet clay into bricks followed by drying, and burning of molded bricks in furnaces under a temperature of 800-1100^0 C. During these activities, they are not only exposed to the heavy pollutants, but also to the unaccustomed postures for long hours along with exposure to immense heat, thus becoming prone to development of multiple health disorders.

Brick manufacturing industries in India are considered as the most polluted workplaces exposing their workers to respiratory, musculoskeletal, gastrointestinal, reproductive, psychosocial, and skin diseases.(4)

1.1 Aim and Objectives

1. To study the demographic profile of brick kiln factory workers in a district of Uttar Pradesh.

2. To identify the health problems experienced by the workers and correlate it with their working profile.

2. Review of literature

Shaikh S, and Khetpal V in a cross sectional study in among brick kiln workers of rural Pakistan found that 22.4% of the workers had chronic cough, 21.2% reported chronic phlegm, 13.8% had shortness of breath attacks, 17.1% were suffering from chronic bronchitis, 8.2% reported physician diagnosed asthma and 8.9% non-smoking workers had chronic bronchitis.(4)

Chaudhary, Biswas, and Roy conducted a study to understand the different types of pain experienced by female brick kiln workers in West Bengal, India. They wanted to see if the pain was due to nerve damage (neuropathic) or from tissue damage (nociceptive), specifically focusing on chronic back pain. They also wanted to learn about the causes and effects of this pain. The research found that many workers experienced ongoing pain or discomfort in their lower back, neck, and wrist. Out of all workers, 72% experienced high levels of pain above 20 on the pain scale using the pain detect tool. Additionally, 80% of workers were unhappy with the treatments they received.(5)

Inbaraj, Haebar, and Saj interviewed brick kiln workers in rural Southern India to find out how common musculoskeletal disorders are. The scale helped measure how much pain the person was feeling. Around 87% of workers said they regularly experience pain. The most common types of back pain are chronic low back ache, which lasts for a long time, and acute back pain, which lasts for a short time. Chronic knee pain is also common. Researchers found

that brick kiln workers who maintained a certain position for long periods of time experienced strong pain in their muscles and bones. This pain made it difficult for them to perform everyday tasks and also affected their ability to work effectively.[6]

3. Methodology

The study was conducted under the department of Community Medicine, Himalayan Institute of Medical Sciences (HIMS), SRHU, Swami Ram Nagar, Dehradun, among workers of a Brick-kiln factory over a period of 3 months, after obtaining informed consent.

3.1 Study Design

Type of study: It was an observational cross-sectional study

Sample Size: A sample size of minimum **90** study subjects.

Study Settings: The study was conducted in natural settings (Brick Kiln Factory) of the study participants.

Study Population: Workers who were willing to participate in our study were considered.

3.2 Selection of subjects

3.2.1 Inclusion Criteria

1. Respondent who was working continuously in the sampled factory for the last 4 weeks.
2. Respondent giving written consent to participate in the study.

3.2.2 Exclusion Criteria

1. If >20% of the data is missing in the questionnaire.
2. Unwilling workers

3.3 Data Management & Statistical Analysis

Data was entered in the Statistical Package for Social Sciences (SPSS) software (version 23). All the continuous variables were described as mean ± standard deviation and all the categorical variables conferred in terms of frequencies and proportions. Microsoft Excel was used for making graphs, charts. Online consent was taken from the participants.

4. Results

The present study was carried out under the department of Community Medicine, Himalayan Institute of Medical Sciences, Swami Rama Himalayan University in order to assess the health problems among Brick Kiln Factory Workers. The study population consisted of all the workers in a Brick Kiln Factory of a district of Uttar Pradesh. Overall, 90 participants were interviewed, out of which 54.4% were male and the rest were female (Table 1).

Table 1: Age and Sex distribution of the study subjects:

Age group (in years)	**Male**		**Female**	
	N	**%**	**N**	**%**

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21 to 30	14	28.6	20	48.8
31 to 40	22	44.9	14	34.1
41 to 50	13	26.5	7	17.1

The age range was 21-50 years (mean age 34.3 ± 7.8 years), so workers were categorized in three age groups viz 21-30 years, 31-40 years, and 41 to 50 years. Maximum participants belonged to the 31-40 years age group (40.0%) followed by 21-30 years and 41-50 years age groups (37.8% and 22.2% respectively). On calculating the socio-economic status by BG Prasad classification, all the participants fell in the lower socio-economic category (Table 2). Majority of the surveyed participants were Hindu (91.1%) and rest were Muslim by religion. Most of the participants (82.2%) belonged to the nuclear family.

Table 2: Socio-demographic distribution of study subjects

Demographic Characteristics	**N**	**%**
Religion		
Hindu	82	91.1
Muslim	8	8.9
Types of family		
Nuclear	74	82.2
Joint	16	17.8
Monthly income		
<5000	3	3.3
<10000	81	90
10000-15000	6	6.7

Majority of the participants (90.0%) had a monthly income level of less than 10000 INR and 3.3% had <5000 INR per month income.

About the addiction history, 38.9 % participants accepted drinking alcohol (local brand) on a regular basis. Among them 65.7% gave a history of taking 1-2 drinks daily (1 drink =60 ml), followed by 2-4 drinks per day (28.5%) and 5.7% accepted taking more than 4 drinks daily. Among the participants, 65.4% were smokers and most of them ((86.4%) were smoking bidi. About 40% of the participants were regularly chewing tobacco and 39% of them were chewing gutkha, followed by pan masala (33.3%).

Regarding types of work (Table 3), many workers were engaged in more than one function. Most of the participants (60.0%) were involved in drying the green bricks, closely followed by moulding of the clay and carrying the dried bricks (56.7% each). Most of the male workers were involved in carrying the dried bricks (81.6%), followed by drying of green bricks and baking them in kiln fire (49.0% and 44.9% respectively).

Table 3: Distribution of study subjects by type of work

Type of Work	**Male (49)**		**Female (41)**		**Total (90)**		**R^2, df, p value**
	N	%	**N**	%	N	%	
Clay preparation	11	22.4	28	68.3	39	43.3	19.1,1, <0.001
Clay moulding	21	42.9	30	73.2	51	56.7	8.35,1, <0.001
Drying of green bricks	24	49.0	30	73.2	54	60.0	5.4,1,<0.05
Carrying dried bricks	40	81.6	11	21.6	51	56.7	25.11,1, <0.001
Baking in fire	22	44.9	4	15.4	26	28.9	111.76,1, <0.01**

* Multiple responses ** Yates correction

In contrast, female workers were mostly involved in clay molding and drying of green bricks (73.2% each), followed by clay preparation (68.3%). Very less proportion of female workers were involved in carrying and firing the bricks (21.6% and 15.4% respectively) and this difference was found to be statistically significant. For health-related problems, only 27.8% of the workers responded positively for having any health-related problem (Table 4 and Table 5).

Table-7: Self-reported health problems among participants

Health related	**Male (49)**	**Female (41)**	**Total (90)**

problems	N	%	N	%	N	%
Yes	18	36.7	7	17.1	25	27.8
No	31	63.3	34	82.9	65	72.2

-with Yates correction – 3.38, df-1, p value >0.05.

Table 5: Distribution of participants by type of self- reported health problems:

Self reported health problem (system-wise)	Male (18)		Female (7)		Total (25)	
	N	%	N	%	N	%
Ear, Nose and Throat	7	38.9	3	42.9	10	40.0
Eye	9	50.0	2	28.6	11	44.0
Heart	9	50.0	1	14.3	10	40.0
Musculoskeletal	2	11.1	2	28.6	4	16.0
Skin	6	33.3	3	42.9	9	36.0
Other	4	22.2	0	0.0	4	16.0

More male workers self-reported having health problems as compared to female workers (36.7% and 17.1% respectively). Most of the male workers (9/18) reported eye and heart problems (50.0% each), while most of the female workers reported ENT and skin related problems (3/7, 42.9 % each). Almost one third of the surveyed workers accepted having one or the other kind of non-communicable diseases. There was no significant difference in the male and female workers in having NCDs (Table 6). Hypertension was the highest reported disease (17.8%) followed by diabetes (11.1%).

Table 6:Distribution of participants by presence of non-communicable diseases

Presence of NCDs	Male (49)		Female (41)		Total (90)	
	N	%	N	%	N	%

Yes	17	34.7	10	24.4	27	30.0
No / Don't know	32	65.3	31	75.6	63	70.0

Two workers reported having cancer (2.2%), while only one (1.1%) reported having heart disease. About 30% of the workers having NCDs (8/27) were taking regular medication for their conditions.

According to the responses given by the workers, NCDs were significantly more in the workers who were employed in the brick kiln factory for more than one year (Table 7).

Table 7: Distribution of workers by duration of work and Non-Communicable Diseases

NCD	**Yes**		**No/ Don't Know**		**Chi- square value, df, p value**
Duration of work	**N**	**%**	**N**	**%**	
< One year	**15**	**22.1**	**53**	**77.93**	**6.317, df-1, p < 0.05**
One year or more	**11**	**50.0**	**11**	**50.0**	

Almost all but one worker felt tired after the working hours. The frequency of feeling tired was more in male workers as compared to female workers. 12.2% of the male and 2.4% of the female workers reported always feeling tired after work. Figure 2 represents self-reporting of tiredness among the participants. Table 8 shows distribution of workers by body ache while working at a stretch.

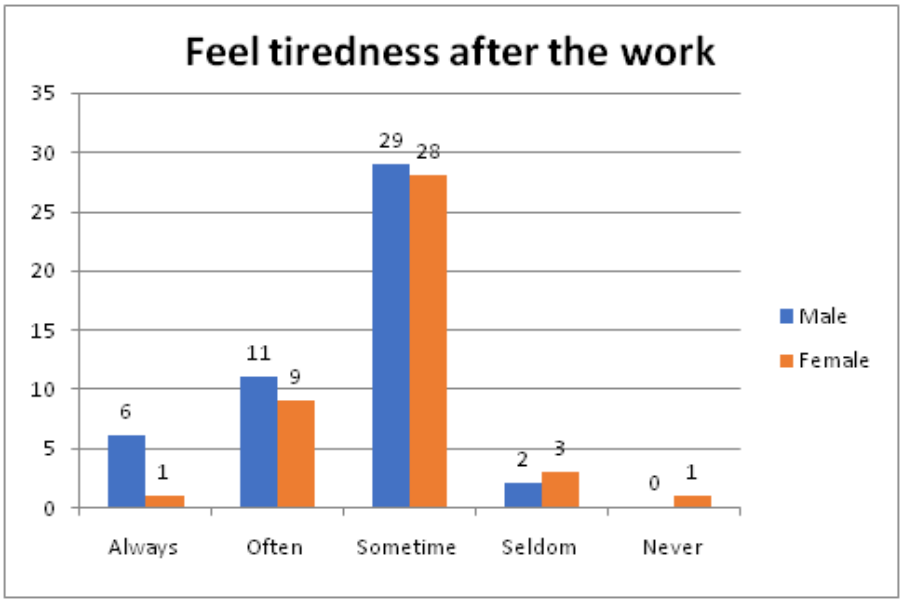

Figure 2: Self-reporting of tiredness among the participants.

Table 8: Distribution of workers by body ache while working for long

Bodyache while working at a stretch	Male (49)		Female (41)		Total (90)	
	N	%	N	%	N	%
Always	6	12.2	0	0.0	6	6.6
Sometimes/ Occasionally	29	32.7	23	17.1	52	57.8
Never	14	28.6	18	43.9	32	35.6

About 12% of the male workers and no female worker reported always having body ache while working at a stretch. About 35% of the workers (28.6% men and 43.9% women) never suffered from body ache due to work.

On enquiring about the health-related problems encountered at workplace, 18 (20%) of them responded that they have met with physical injuries while working. On further analysis, it was seen that more male workers suffered from physical injuries as compared to female workers (32.7% vs 4.9%) and this difference was found to be significant statistically ($p<0.01$).

Other health problems reported by workers while working in the factory were irritation in the eyes (41.1%) and irritation in skin/body (40%). Apart from these, 28.9% had irritation in the throat, 27.8% had shortness of breath, 22.2% had frequent coughing, while 15.6% of them reported feeling tightness in the chest.

Association of Occupational health Problems with the working profile of the participants:

It was seen that worker in this occupation for more than one year complained of having pain in different parts of the body as compared to those who had less than one year experience and this difference was found to be statistically significant.

The workers working in both sitting and standing postures were having significantly more pain in different parts of the body than those working in sitting or standing postures (Table 9).

Table 9: Distribution of workers by body posture at work and area of predominant pain

Body Posture / Area of Predominant Pain	Sitting (29)	Standing (19)	Both (42)	Chi-square value, df, p value
Neck	2 (6.9)	0 (0.0)	7 (16.7)	Chi^2- 4.496, df-2,

				p >0.05
Shoulder	2 (6.9)	4 (21.1)	17 (40.5)	Chi^2- 10.424, df-2, p<.01
Wrist	4 (13.8)	4 (21.1)	11 (26.2)	Chi^2- 1.583, df-2, p >0.05
Back	4 (13.8)	0 (0.0)	33 (78.6)	Chi^2- 46.548, df-2, p<.001
Knee	1 (3.4)	5 (26.3)	16 (38.1)	Chi^2- 11.196, df-2, p<0.01

It was seen that those respondent working in both the sitting and standing positions had significantly more complaints of pain in shoulder, back and knee as compared to those working in one position only.

5. Discussion

Brick kiln workers in India are a group of people who have less money and opportunities. They often get sick more often than other people. The reason why brick kiln workers often have more health problems compared to others is because of the kind of job they do and where they live. The primary cause of illness and distress among them was the injuries that occurred at the workplace.

The present study was conducted to assess the health problems among Brick Kiln Factory Workers in A District of Uttar Pradesh. We found that our participants were suffering from various kinds of general health related problems as well as occupational health related problems.

Half of our study participants were male, and the rest half were female. Most of them belonged to the 31-40 years of age group. Majority of the participants were Hindu, they belonged from nuclear families and had their monthly income less than 10,000 INR.

A study conducted by Navya CJ also revealed similar results that male and female workers ratio was same (fifty-fifty) and majority of them also belonged to nuclear families.[(14)]

A study conducted by Kazi RN and Bote MN. at Mumbai revealed that more than half of the participants belonged to the age group of 26-40 and nearly half of them were males and the rest were females. This finding is similar with us.[(15)]

In another research done by Navya CJ and others. With regards to our study, it was found that brick kiln workers have a shorter workday, unlike the study conducted in South India where the majority of workers are mandated to work for more than 10 hours daily.Many workers said they worked extra hours, which can make them more likely to get sick. They might make money based on the number of bricks they produce, instead of how many hours they work. This makes them want to work all day, starting early in the morning and finishing late at night.[(14)]

We also found that females were more involved in clay preparation, clay molding and drying of the green bricks. Whereas males were more involved in strenuous and riskier works like carrying of dried bricks and baking of green bricks. The study conducted by Shaikh et al., revealed that more than half of the workers were involved in molding work, the rest were involved in carriage, placement and baking with equal proportion. Although they did not stratify the work on the basis of gender like what we did.(16)

One third of our participants had health related problems and male proportion was double that of the female. Most commonly they had eye, ENT, heart, musculoskeletal and skin problems. Among all, male was having more problems with eye, ENT, heart, musculoskeletal system as compared to the females, but regarding skin related problems we did not find any gender differences. As discussed earlier, men in the present study used to do more strenuous/risky work than females, so, maybe the prevalence of these problems were high in males.[15]

A study conducted by Kazi RN and Bote MN. at Mumbai revealed that most common health problems were musculoskeletal problems followed by respiratory problems, skin problems, heat related problems, fever, others, injuries, eye complains, gastrointestinal complaints and burns.[15]

When the results are stratified with gender it was found that male had more health problems especially musculoskeletal, respiratory, and dermatological complaints than females. This may be due to differences in smoking patterns, and nature of work performed by the male workers. It was also revealed that a significant association was observed between musculoskeletal, respiratory, and dermatological problems with age, gender, nature of work and working experiences.[15]

Another research study was carried out by Navya CJ and other participants. The primary health issues faced by individuals employed in brick kilns in South India consisted of bodily aches and pains, inadequate body weight, difficulty in breathing, dermatological conditions, impaired vision, and occupational injuries, according to a study conducted.[14]

Other studies in similar settings have also identified respiratory and musculoskeletal morbidities as the most common among brick factory workers.[17-18] Nearly half of the male and female participants both, sometimes experienced generalized weakness in daily routine. However, one sixth of our male participants responded that they always feel generalized weakness. In addition to strenuous work this may be due to their addiction, as we know that males used to take alcohol on a regular basis, this may be due to alcohol related problems.

In a study conducted by Johsi, Dahal, Pudel and Sherpa in Nepal revealed that the prevalence of injuries was nearly half, and most common site injuries were upper and lower limbs. The study also revealed that the commonest type of injuries were cuts, followed by bruises, crushing of body parts, upper and lower limbs pains and back problems.[19] Other than the thermal injury, one fifth of our workers experienced chest tightness, shortness of breath, irritation of respiratory tract and irritation of skin which was localized as well as generalized both.

Another study revealed that a high frequency of respiratory symptoms which included chronic cough, chronic phlegm, shortness of breath with wheezing. The study also revealed that nearly one fifth of the workers were suffering from Chronic Bronchitis while one tenth of workers were diagnosed with asthma and other illnesses. As per the study Age, nature of work and smoking were strong predictors of developing these symptoms and illnesses.[17] Similar findings were observed in other studies also.[20, 21]

6. Conclusion

The most common morbidities among the brick factory workers were eye problems, followed by ENT, heart, musculoskeletal and skin complaints. Additionally, most of them were suffering from hypertension, followed by diabetes, tuberculosis, CVD, and cancer. They were also complaining about their generalized weakness and tiredness on a routine basis. Regarding adherence, most of our participants used to take medicines regularly. To relieve the pain, they occasionally used to take alcohol and painkillers. The prevalence of health problems was more in males than females. Regarding adherence, most of our participants used to take medicines regularly. Frequently our participants encountered injuries (male>female) although most of them were of moderate grade and sometimes they needed hospitalization.

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