



Occupational and environmental health hazards in brick kilns

Mrinal Kanti Saha¹, Syed Jamal Ahmed², Mohammad Abu Hanif Sheikh³, Md Golam Mostafa^{1,*}

¹ Institute of Environmental Science, University of Rajshahi, Rajshahi, Bangladesh

² Department of Physics, Dhaka University of Engineering and Technology, Gazipur, Bangladesh

³ Department of Geography and Environmental Studies, University of Rajshahi, Rajshahi, Bangladesh

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CORRESPONDING AUTHOR:

mostafa_ies@yahoo.com

Tel: +880-721-711573

Fax: +880-721-750064

ABSTRACT:

Introduction: Industrial safety and a healthy environment reduce the illnesses, injuries, and accidental incidents of the workers as well as property damages. The study aimed to identify the health risk issues and assess their impacts on labors around the brick kiln areas in Bangladesh.

Materials and methods: The study conducted a survey based on a structured questionnaire to collect health-related compliance from the brick kiln workers. It also selected 12 brick kiln clusters in Rajshahi and Gazipur districts, and several samplings were made. The analyzed data were compared with the prescribed national and international standards.

Results: The survey results showed that the respondents were suffering from different diseases like respiratory and skin diseases, eye irritation, fatigue, hearing problem, headache, etc., due to the occupational hazard in the kiln areas. The study results illustrated that the particulate matter pollutants, including PM_{2.5}, PM₁₀, and SPM were found higher than the permissible standard that caused asthmatic disease. Most of the physicochemical parameters for surface water analysis exceeded the permissible standard indicating water pollution occurred around the kiln areas. The sound level was found higher than the acceptable level of Department of Environment, Bangladesh (DoE) standard 75 dB.

Conclusion: The study observed that brick kiln emitted gases caused huge pollution in the areas threatened the human health and the crusher machine created the high intensity of noise resulted in significant adverse health impacts of the brick kiln labor. However, most of the labors were not well aware of occupational safety and hazards, and health-related compliances in the kiln areas.

Introduction

A safe workplace is one of the fundamental rights of labors as the labors are a vital part of any work process. Occupational safety and health are key components of fruitful work circumstances. It means the condition of the workplace where la-

bors work is free from all kinds of hazards and risks. A safe work environment ensures safety and healthiness for every labor at the workplace preventing hazards and risks. Risk comes in many forms-repetitive tasks, long hours of work, and exposure to harmful substances like dust,

gas and fumes, high-intensity noise, insufficient lighting, damage to equipment, and psychological and physical harassment. As a fast-growing developing country, Bangladesh is gradually flourishing in its commerce and industry. At the same time, the number of labors is also increasing day by day in industries and factories. A large number of labors lose their valuable lives and are injured because of poor occupational safety and health conditions in Bangladesh. Though there is no enough data for how many labors suffer from occupational diseases and accidents in Bangladesh every year. The manufacturing industry, including brick-making, has been categorized by the ILO as dangerous and hazardous [1]. The difficult and risky working conditions of adults and children are heightened by the informality of the sector and its lack of regulatory, legal, and institutional frameworks. Illegal migration heightens workers' vulnerability to poor working conditions as the entire practice of recruitment is a 'clandestine' affair [2]. The work in the brick kiln areas is physically demanding and involves extraordinarily long hours without overtime or any protection from hazardous conditions. The labors at the brick kiln work relentlessly from dawn to dusk staying far away from their beloved family members. However, their miseries remain unsolved. Laborers, including children, can work six days a week and up 12-16 h every day to satisfy the owners of the kilns although working hours may be even longer if they are pressured to fulfill their quotas. In many cases, they are not entitled to leave or holidays although at times local workers who have low debts may get permission to leave for personal business as they do not have to travel far [3]. Moreover, they had stayed inhuman conditions around the kiln areas. They had no good

accommodation and sanitation facilities. Those who can resist will survive and others get inundated away. On the versions of the laborers, many of them being forced to work under the scrutiny of the bond. A research paper about brick kiln labor reported that mainly bonded labors worked at the brick kilns in rural Sind and some parts of the Frontier province in Pakistan [4]. Bonded Labor Research Forum conducted research in 2004 on brick workers in Pakistan and reported that about 70,000 bonded laborers are working in more than 5,000 brick kilns [5]. Though, there is the existence of strict laws against forced labor, the innocent labors having no place to run away. Sorry to say but those whoever tries to raise their voice to suffering severe consequences and been deprived of their basic rights. Even various namesake labor organization works quite actively shows a little bit of remorse against this kind of complete violation of the labor laws.

The main reason for poor emission from brick kilns is the poor quality of coal and uses of biomass mainly firewood. The main pollutants which are emitted from the brickfields are particulate matter (PM), some hazardous gases like CO₂, CO, NO_x, NO, and SO₂. The PM concentration appears to be low but it is expected to have long term massive impact on global environments as well as on human health [6]. One investigation described that the brick kiln industry play important role in the development of respiratory-related diseases, there was a significantly higher prevalence of chronic cough (31.8%), chronic phlegm (26.2%), and chest tightness (24.0%) in exposed workers, compared with control workers (20.1, 18.1 and 0%) (P<0.05) and this increased symptom frequency was also documented among non-smokers studied by age and by length of

employment, suggesting a work-related effect in the brick kilns [7]. Another study in Vietnam showed that respiratory disorders, musculoskeletal disorders, silicosis, and pneumoconiosis were common in workers of brick kilns [8]. The waste water from the sites of these brick kilns contains large quantities of suspended solids. Moreover, the workers of these kilns use open spaces near the river as latrines and urinals causing bad smell and unhygienic conditions [9]. Sewage and other oxygen demanding wastes come from these sites are the major water pollutants because their degradation leads to oxygen depletion, which affects fish and other aquatic life, impair domestic and livestock water supplies by affecting taste, odors, and colors [10]. Noise is recognized as a controllable pollutant that can yield to abatement technology. Although there are many sources of noise, which include industries, construction works and indiscriminate use of different instruments or machinery. The link between occupational noise and hearing loss is biological because that compared the prevalence of hearing the loss in different categories of occupations or particularly noisy occupations [11-14]. A report showed that a strong association between occupational noise and NIHL, an effect that increased with the duration and magnitude of the noise exposure and the risk for “blue-collar” construction workers was 2 to >3.5-fold greater than that for “white-collar” workers in other industries [15]. Another study reported that the rapid increase of brick kiln coupled with the haphazard manufactural set-up in the small area has resulted in a significant contribution of pollution load over the prevailing environment [16]. The rapid changes in technologies and life require increased flexibility in occupational health, hygiene, and safety requirements at all work-

places [17]. The study focused on occupational safety and health for the labor of brick kiln sectors.

Materials and methods

The study consisted of two parts, i.e., one was a questionnaire survey, and another was samplings. The study selected 12 brick kiln clusters in Rajshahi and Gazipur districts as there are many brick kiln clusters existed in these areas. The questionnaire survey was conducted through personal interviews schedule from the respondents of the selected kiln areas. A total of 350 respondents took part in the survey in both study areas. About half of the respondents were interviewed from both the districts. The research took all possible care to establish rapport with the respondents so that they would not feel any hesitation while starting the interview. The air, water and sound samples were recorded and compared with the national and international standard levels, which are the control variable that already exists. The sampling and data analysis technique of different samples discussed in the following sections.

Ambient air

The ambient air sampling is a very expensive process, and the air quality monitoring analyzer is very sensitive and bulky among all used instruments in this study. There were two types of ambient air sampling, continuous, and time-averaged in-situ samplings. In this research time-averaged in-situ samplings were conducted for ambient air sampling. A high volume air sampler was used (Gray Wolf Sensing, Ireland, and Casella CEL, UK) to evaluate the air quality around the brick kiln area. The sampling instrument was set up 3 m above ground and hourly mean values for all pollutants were measured

at each sampling location. The main pollutants considered for the study include criteria air pollutants (CO, NO_x, SO₂, PM_{2.5}, PM₁₀, and SPM) and trace ambient air quality parameters (O₂, CO₂, AT, RH, H₂S, C₈H₆, C₆H₆, and TVOC). The ambient air samplings were conducted in Rajshahi and Gazipur districts at some selected locations during the production season (January–April) of 2016 and 2017.

Surface water

The selection of the surface water body for the collection of water samples was based on nearness to brick kiln areas as the study comprised determination of contamination in water. The water samples were collected in 1 L plastic bottles, which were pre-washed with dilute HCl and rinsed three to four times with distilled water. Some major physical parameters like water temperature, pH, DO, EC, salinity, and turbidity were recorded immediately after collecting the samples in the spot to avoid further contamination. The samples for trace metal analysis were acidified with HNO₃ and adjusted the pH < 2. Samples were labeled, sealed, and transported to the laboratory and stored in a refrigerator at a temperature of 4°C until the samples were analyzed. The label contained the following particulars; a. date and time of sampling, b. sampling locations, and c. code number of samples. The surface water sample analyzed using different conventional and standard scientific methods. A total of 72 representative surface water samples were collected during the pre-production, production, and post-production season covering two years (September, 2015 to August, 2017). Of them, there were 48 and 24 numbers of samples collected from 8 and 4 sampling locations in Rajshahi and Gazipur, respectively.

Sound

There is no simple relationship between the physical measurements of sound pressure level and an individual's perception regarding the loudness of sounds. The sound is composed of various frequencies, but the human ear does not respond to all frequencies. The sound was recorded from different sampling locations in the study area. Sound level sampling was done during the brick production period. Sound level meters are usually equipped with weighting circuits which filter out selected frequencies. It has been found that the A-scale on a sound-level meter best approximates the frequency response of the human ear. Sound pressure levels measured on the scale of a sound meter are abbreviated dB. Many electronic instruments are available for measuring noise in the present day. During this study, a precision sound level meter (Lutron, SL-410, country of origin: Taiwan) was used. An instrumental survey of sound levels in different sampling locations of the study area was conducted during the production period (January – April 2017). A total of 24 sound sampling was done and the sound levels were recorded during peak working hours (09:30 AM – 04:30 PM) at the kiln areas. The sound levels were measured to detecting the level of intensity of different individual sources and also different sampling locations of the study area. The sound level meter was held approximately 1.5 m above the ground.

Data analysis

The data were analyzed with scientific software like MS Excel 2013. The statistical measurements such as maximum, minimum, mean, and standard deviation were calculated for categorization and describing the variables. The tables and graphs were used for the presentation of the findings.

Results and discussion

The increased brick kiln activities need a large number of labors. The majority of the brick kiln labors in the study areas faced different types of health hampered challenges. The data of the field survey and experimental study were analyzed and are discussed below.

Awareness and vulnerability level

A total of 350 labors of the brick kilns took part as respondents in the survey in Rajshahi and Gazipur districts. The respondents in the study area were assumed to face several issues which hampering labor health surrounding the brick kiln areas. The survey found that most of the brick kiln workers around the brick kiln areas were suffering from various diseases such as asthma, fatigue, headache, eye irritation and other diseases indicating the brick kilns emissions have some causes of such illness. There were six assessment parameters considered to assess their extent of awareness and vulnerability. The results showed that the highest mean percentage of aware, partially aware and unaware were obtained to be 71.43, 51.43, and 18.57 in the asthmatic disease, fatigue, and labor health hampering, respectively. The lowest mean was obtained to be 38.57, 28.57, and

2.86 in the labor health hampering, asthmatic disease and fatigue, respectively (Table 1). The results showed that the respondents were aware of health hampering due to the brick kiln emissions. The survey results illustrated that the highest mean percentage of high, medium and low vulnerability were obtained to be 61.43, 35.71 and 35.71 in the asthmatic disease, eye irritation, and fatigue, respectively. The lowest mean percentage of high, medium, and low vulnerability was obtained to be 21.43, 24.28 and 10.00 in the fatigue, asthmatic disease and labor health hampering, respectively (Table 2).

Some of the respondents made their comments that the emitted dust, smoke and heat from the kiln were the main causes of illness around the kiln areas. The survey observed that asthmatic disease is one of the major causes of hamper labor health and the other parameters were also hampered the human health around brick kiln areas. A report of ILO on the health of children and youth who have been working in brick kilns in four South Asian countries found that respiratory diseases are one of the health conditions suffered by the children [18]. The selected health hampering parameters were raised due to brick kiln emissions which influenced the level of vulnerability.

Table 1. Survey responses to awareness level on labor health hampering in the study areas

Assessment parameters	Assessment on awareness level		
	Aware (%)	Partially aware (%)	Unaware (%)
Hamper labor health	38.57	42.86	18.57
Skin disease	54.29	38.57	7.14
Asthmatic disease	71.43	28.57	0
Fatigue	45.71	51.43	2.86
Headache	42.86	44.28	12.86
Eye irritation	54.29	31.43	14.28
Hearing problem	50.25	38.55	11.20

Table 2. Survey responses to vulnerability level on labor health hampering in the study areas

Assessment parameters	Assessment on vulnerability level			
	High (%)	Medium (%)	Low (%)	No comments (%)
Hamper human health	42.86	28.57	10.00	18.57
Skin disease	35.72	28.57	28.57	7.14
Asthmatic disease	61.43	24.28	14.29	0
Fatigue	21.43	40.00	35.71	2.86
Headache	28.57	35.71	22.86	12.86
Eye irritation	22.86	35.71	27.14	14.29
Hearing problem	45.40	28.25	15.15	11.20

A health survey clearly showed that people who lived near the brick kilns are more likely to suffer from illnesses, compared to those who lived in areas away from the kilns [19]. Therefore, it can be said that the respondents were frequently faced with different health hampering due to brick kiln emissions.

Air pollutants and health hazards

The study results illustrated that most of the parameters of ambient air samples exceeded the permissible standard (Table 3). All of the criteria air pollutants (CO, SO₂, NO_x, PM_{2.5}, PM₁₀, SPM) except CO exceeded the National Ambient Air Quality Standard (NAAQS) limit. The NO_x concentration of some air sampling was found higher the standard permissible limit at different locations in Rajshahi. The gaseous pollutant, CO was found to be very low in all air sampling indicating not be harmful to vegetation, animal and human health. The particulate matter pollutants including PM_{2.5}, PM₁₀ and SPM were determined much higher than the permissible standard. The concentrations of particulate matters including PM_{2.5} and PM₁₀, and SPM were ranged from 57 to 2573 µg/m³, 287 to 3875 µg/m³ and 519 to 1950 µg/m³, respectively were recorded during the study period (Table 3). Some of the trace ambient

air quality parameters including O₂, CO₂, ambient temperature (AT), relative humidity (RH) and benzene found below and or above the permissible standard. The results illustrated that O₂ and CO₂ concentrations were found lower and very higher, respectively compared to the ideal atmospheric conditions. Most significant parameters of ambient air are ambient temperature and relative humidity, which influenced the entire condition of ambient air quality. The AT was recorded in ambient air samples were ranged from 29.80 to 39.10°C in the study area (Table 3). A study reported that the average temperature of the Bangladesh varied from 7.2 to 12.8°C and 23.9 to 31.1°C during winter and summer, respectively [20].

Heat stress can occur in hot environments. Working in hot and humid atmospheres can suffer from heat exhausting, rash, intertrigo (chafing), skin maceration and supervening bacterial or fungal infections. Direct contact of the skin with external heat sources such as hot objects or surfaces might result in occupational thermal injuries such as contact burns and heat urticaria. The coal used as a major source of fuel during brick production in Bangladesh. A study reported that the coal contained pollutants are released into the air affected

Table 3. Ambient air quality and comparison with the standards

Parameters	Range	Permissible standard
NO _x	0.008 - 0.972 ppm	0.053 ppm [21]
SO ₂	0.039 - 0.612 ppm	0.03 ppm [21]
PM 2.5	57 - 2573 µg/m ³	50 µg/m ³ [21]
PM 10	287 - 3875 µg/m ³	15 µg/m ³ [21]
SPM	519 - 1950 µg/m ³	140 µg/m ³ [22]
O ₂	17.3 - 20.1%	20.95 % [23]
CO ₂	415 - 814 ppm	40.7 ppm [23]
AT	29.80 - 39.10°C	25 °C [23]
RH	65 - 76.5%	40-50 % [23]
C ₆ H ₆	0.0324 - 0.139 ppm	0.001608 ppm [22]

human health and the ecosystem [24]. Another study described that the people who live near the combustion sources such as coal-fired plants are reported to be exposed to higher levels of any of these pollutants [25]. Several reports on the effects of air pollution on human health illustrated that exposure to SO₂ and NO_x might be associated with serious health problems such as increased respiratory ailments, reduced lung function, nervous system damage in children, cardiovascular diseases, cancer in various forms and an increased number of deaths [26]. The study results indicated that the ambient air quality around the brick kiln areas was found harm to our environment as well as labor health.

Contaminated surface water and health hazard

The surface water analysis results showed that the pH, DO, and turbidity values are the most important for any aquatic bodies. Most of the samples contain DO range was very low and the lowest concentration of DO found 1.0 mg/L in Gazipur. The surface water quality parameters were significantly hampered the aquatic bodies around kiln areas. The study also revealed that very few numbers of samples exceeded the permissible standards in Gazipur and the water was more turbid in affected aquatic bodies. Among

the anionic parameters in surface water, only nitrate, nitrite, and fluoride ion exceeded the standard limits. The concentrations of anions including nitrate, nitrite, and fluoride ion were varied from 5.9 to 68.4, 2.7 to 24.1, and 0.14 to 2.15 mg/L, respectively. Among the cationic parameters, Pb, Cr, Cd, and Fe were found a bit higher than usual concentration indicating the threatened surface water quality. The concentration of cations such as Pb, Cr, Cd, and Fe ions was ranged from 0.1239 to 4.9528, 0.0015 to 3.9338, 0.009 to 0.095, and 0.154 to 3.012 ppm, respectively (Table 4). However, it indicated that the anions and cations were increased during the brick production season. The other indicators of surface water such as TC, FC, and color values were exceeded the permissible standard at all sampling locations. During the brick production season, a large number of temporary bondage labor worked and stayed around the as well as live in kiln areas. They have no sanitation facility and may use open spaces near the aquatic bodies as daily natural calls of defecation and other uses that may increase the amount of bacterial population. The results indicated that TC and FC were found higher in the production season compare to other seasons. The higher value of TC might

be due to a higher load of bacterial pollutants in the aquatic bodies. The study observed that the FC level in the surface water increased every year and the rate of increasing the trend indicating deteriorated the surface water quality. Furthermore, the FC is harmful and the increased amount of FC in an aquatic environment caused severe harm to human health and aquatic life. A report showed that the labors of these kilns use open spaces near the river as latrines and urinals causing bad smell and unhygienic conditions [9].

A study reported that, any living organisms who are consumed contaminated water then they can pose great danger [31]. Another study reported that the presence of heavy metals in excessive amounts in soil, water, and air leads to several health problems including neurotoxicity, kidney toxicity, sterility, anemia, etc. [32, 33]. Thus, the study revealed that the extent of aquatic contamination around the brick kiln areas found to be very highly vulnerable which leads to deterioration and degradation of surface water quality. So, the contaminated water would be exclusively threatened for aquatic and human life around the kiln areas.

Noisy environment and health hazard

High levels of occupational noise remain a problem in all parts of the world. The study was conducted the occupational noise of the workers due to the machinery operated in the brick production period. Fig. 1 shows that the sound pollution level of different types of machinery during the on-site sampling. The highest and lowest average values of the sound level were recorded to be 95.05 and 78.45 dB at the crusher and shallow tube well machine, respectively. All of the machinery used in brick kilns create huge noise around the brick kiln cluster and most of these machines are illegal to use in brick productions. However, the noise is associated with almost all working activities and are associated with particularly high levels of noise. The results observed that higher noise created in the brick manufacturing process that affects the occupants in the kiln areas. A report of occupational noise showed that the occupations at highest risk for NIHL (noise-induced hearing loss) include manufacturing, transportation, mining, construction, agriculture, and the military [34].

Table 4. Surface water quality and comparison with the standards

Parameters	Sample exceed/ below (%)	Range	Permissible standard
pH	6.94	5.15 - 7.65	6 - 9 [27]
DO	69.44	1.0 - 6.2 mg/L	4.5- 8.0 mg/L [27]
Turbidity	4.17	9 - 55.1 NTU	1 - 50 NTU [28]
NO ₃ ⁻	83.33	5.9 - 68.4 mg/L	10 mg/L [27]
NO ₂ ⁻	27.78	2.6 - 24.1 mg/L	10 mg/L[29]
F ⁻	4.17	0.14 – 2.15 mg/L	2 mg/L [29]
Pb	100	0.1239 – 4.9528 ppm	0.10 ppm [27]
Cr	68.05	0.0015 – 3.9338 ppm	0.50 ppm [27]
Cd	19.44	0.009 – 0.95 ppm	0.05 ppm [27]
Fe	29.17	0.154 – 3.012 ppm	2.00 ppm [27]
FC	100	0.9 -18.9 CFU/100 ml	0 CFU/100 ml [30]
TC	100	<100 - >200 CFU/100 ml	0 CFU/100 ml [30]
Color	94.44	7 - 97 pt-co	15 pt - co [30]

Most of the brick kiln clusters were situated along the roadside for easy transportations. The vehicular movement for loading unloading of bricks, the supply of coal, excavation of soil by excavator, etc., may also be contributing to a significant level of sound pollution in and around the brick kiln clusters. Among all of the sampling locations, the highest and lowest average value of sound level was recorded to be 92.55 and 78.80 at Kodda in Gazipur and Bhalupukur in Rajshahi, respectively (Fig. 2). A similar observation was reported at an ambient noise quality in brick industries cluster, which supported the study findings [16]. The report illustrated the noise pollution at Jinjira brick kiln cluster in West Tripura, India, which recorded the maximum noise level was 66.1 dB in 8 sampling locations. It may be mentioned that the sound level of all of the individual sources and different locations exceeded the permissible standard (75 dB) of the noise [28] indicating noise pollution occurred around the brick kilns. The sound quality of the study area was very hazardous for all living beings. Hence, the exposure time to stay at a high intensity of the noisy environment of brick kiln labors was also shocking in the present study. A report of the National Institute for Occu-

pational Safety and Health, USA stated that more than 30 million workers are exposed to hazardous noise in the USA as well as high levels of occupational noise remain a problem in all regions of the world [35].

Brick Kilns and labor health

The survey results reported that not only the environment has been polluted but also there is proven evidence of forceful labor, bonded labor, child labor, gender discrimination of labor, etc. Labors were faced with extreme weather conditions due to the accommodation facilities in the brick kiln areas. The brick production season generally starts from the early winter, especially in our country, and goes on until May, when the highest temperature recorded in the country. Lack of winter clothing and insufficient warm bedding supplies lead to frequent illnesses in winter while in summers workers are exposed to extremely high temperatures. Brick kilns are primarily located in remote rural and peri-urban areas and tend to be far from medical facilities. As a result, when suffering from an illness or injuries, labors either self-medicate or if they can afford it, they visit private physicians. The negative health effects of the pollutants and

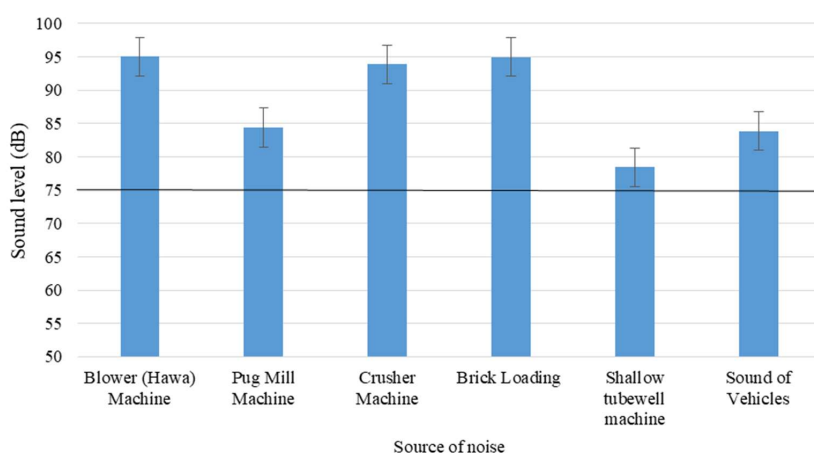


Fig. 1. Average sound pollution level of individual source during on-site sampling.

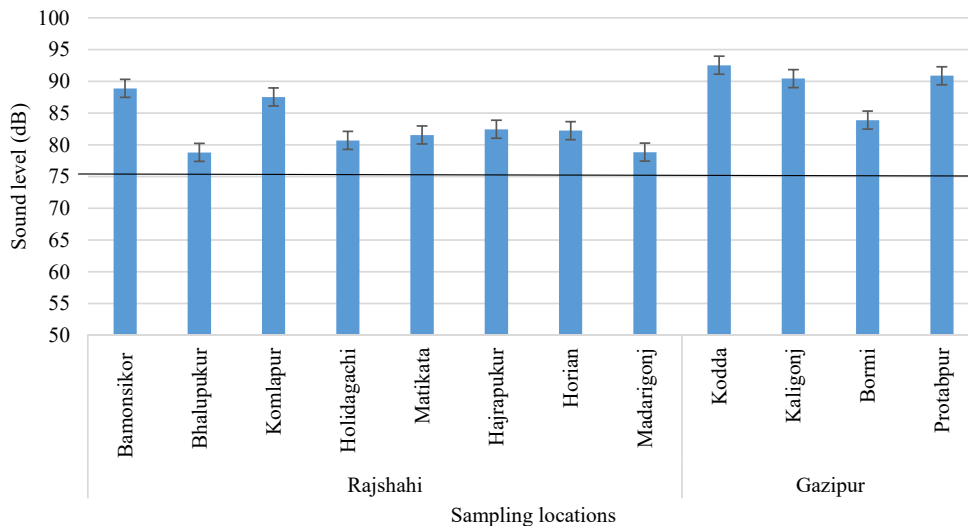


Fig. 2. Average sound pollution level during peak working hours (09:30 AM – 04:30 PM) in Rajshahi and Gazipur districts

the dusty environment, laborers' health is also affected by the highly dangerous and demanding nature of the tasks they perform. Child labor is also at a higher risk of receiving bruises and injuries. The extreme cold and hot temperatures in which laborers work can also adversely affect their health as they are not provided with weather-appropriate clothing. The laborers do not have any safety measures such as helmets, gloves, and gumboots. They are also not provided with suitable tools to perform some of the hazardous and physically demanding tasks. For example, baskets are rarely provided to carry bricks, with rags and ropes being used instead. Most of the laborers were work barefoot despite the uneven terrain while men working on top of the ovens with exceedingly high temperatures often wear flip-flops. A study report showed that 93 laborers working in five kilns in Pakistan found that injuries and deaths occur due to falls from the kiln roof [36]. The psychosomatic effects of working labor in the brick kilns are significant and are made greater due to the trap of debt bondage. Families may have no choice but to resort to extreme measures that increase the psychosomatic

effects of being in an extremely vulnerable condition. A study in Afghanistan, Pakistan, Nepal, and Bangladesh found that children working in the kilns were seven times more likely to feel mistreated than those who do not do this work [18]. Another study in Afghanistan showed that more than half of the children involved in the research felt stressed because of the long working hours and heavy loads. More than 80% of them also did not feel proud of their work and lacked self-esteem and two-thirds felt that they did not have the right to choose or control their lives [1]. The pregnant women working in the brick kilns are vulnerable to difficult pregnancies and deliveries. A study conducted among brick kiln laborers in Haryana, India reported that more than half of the mothers (57.1 percent) gave birth to their child at their houses near the brick kilns or their native places. Hence the healthy delivery among migrant women working at the brick kilns was low because of poor ante and postnatal health services [37].

Conclusion

The laborers were valuable assets of an organiza-

tion therefore the owner or employer has a legal responsibility to ensure their health and safety at the workplace. The survey observed that that the asthmatic disease is one of the major causes of hamper labor health. The particulate matter pollutants including $PM_{2.5}$, PM_{10} and SPM were determined much higher than the permissible standard. The concentrations of particulate matters including $PM_{2.5}$ and PM_{10} , and SPM were ranged from 57 to 2573 $\mu\text{g}/\text{m}^3$, 287 to 3875 $\mu\text{g}/\text{m}^3$ and 519 to 1950 $\mu\text{g}/\text{m}^3$, respectively were recorded during the study period. The brick kilns emitted huge amounts of dust and gases in the surrounding areas would cause adverse effects on labor health. The survey results showed that about 61.43% of the respondents suffered from the asthmatic disease cause of brick kiln emissions in the areas. Different type of heavy metals pollution occurs due to the brick kiln activity. The concentration of cations such as Pb, Cr, Cd, and Fe ions was ranged from 0.1239 to 4.9528, 0.0015 to 3.9338, 0.009 to 0.095, and 0.154 to 3.012 ppm, respectively. These high concentrated toxic metal ions and organometallic compounds are consumed by labors through drinking water and foodstuffs. The crushing process of crusher machine (average 95.05 dB) created the high intensity of noise among all of the noise source. The study found that the sound level is to be higher than the acceptable level of DoE standard 75 dB in all of the on-site sampling. The higher noise levels have resulted in significant adverse health impacts of the brick kiln labor. The noise in brick kiln areas caused a hearing problem of the labors. The study observed that brick kiln emitted gases caused of huge pollution in the areas threatened the human health. Publicity and awareness-building programs for brick kiln labors should be taken to reduce the impacts of health

hazards in the areas.

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Ethical considerations: The study did not deal with any experiment that harms humans and or animals.

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