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Research Article

OCCUPATIONAL HAZARD OF BRICK KILN WORKER AT HIGH INTENSITY NOISY ENVIRONMENT

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ABSTRACT

Evaluation of noise pollution load and its mitigation is a big challenge towards a sustainable environmental. The present study is an attempt to assess the noise pollution load of the study area and address the impacts of the noisy environment in brick kiln areas. An extensive noise level monitoring study was conducted at 12 pre-identified brick kiln cluster. The recorded data were interpreted and compared with the prescribed standard of Ministry of Environment, Forest and Climate Change to evaluate the ambient noise quality status around the study area. A structured questionnaire was prepared to collect noise related compliance from a brick kiln worker. The noise sources were identified and their levels at different brick kiln cluster during peak working hours between 09:30 AM – 04:30 PM were measured. The study results showed that the noise level in most of the brick kilns areas exceeded the acceptable level 75 dB in on-site sampling. However, brick kiln workers were not well aware of such types of occupational hazard and noise related compliance issue.

INTRODUCTION

The human ear responds to sounds in a very complex and efficient way. It is such a common part of our everyday life that we can not overlook its role in maintaining a healthy life. A human can escape the unwanted, disturbing sound that causes a nuisance in the eye of the beholder (Nunez, 1998). Although, there are many sources of noise including industries, construction works and indiscriminate from different instruments or types of machinery. High levels of occupational noise remain a problem in all regions of the world. In the United States of America (USA), for example, more than 30 million workers are exposed to hazardous noise (NIOSH, 1998). In Germany, 4-5 million people (12-15% of the workforce) are exposed to noise levels defined as hazardous. According to the World Health Organization (WHO), generally 60 dB sounds can make deaf temporarily and 100 dB sounds can cause complete deafness (WHO, 2002). The noise affects human being physically and psychotically. Disturbance and different diseases created by noise may cause hypertension, headache, sleeplessness, etc. Noise is recognized as a controllable pollutant that can yield to abatement technology. Sound and noise can take to mean the same thing but it considering the acoustic environment differentiating between these two terms. The noise may term as the effects of an undesirable sound (Trivedi and Raj, 1997). Molino (1979) illustrated that immediate organic damage to the ear can be done from excessive sound energy. Noise level at different locations including residential, commercial, industrial and transportation zones in Punjab of Pakistan is studied by Shahid and Bashir (2013). Various adverse impacts of the high noise level at the mentioned locations are also pointed out in the study. A comparison with other major cities in terms of noise level is also

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performed in the study. The adverse impact of noise pollution on the occupants of various zones of Delhi is studied by Singh and Davar (2004). Jamatia *et al*. (2014) 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.

RESEARCH METHODOLOGY

This research study consists of two parts. One is a questionnaire survey and another is sampling. The study area was Rajshahi and Gazipur districts because many brick kiln clusters existed in that area. During the time of research design, twelve brick kiln cluster was selected for research among eight in Rajshahi district and rest four in Gazipur district. Exploring the easiest strategy to complete the research work in due time a questionnaire survey was conducted. Surrounding noise samples were recorded and compared with the national standard level of surrounding noise quality parameters which is the control variable that already exists. In this way, we found the risk level of sound parameters.

Survey data collection

Survey data were collected through personal interview schedule from the respondents of the selected kiln areas. A total of 350 personal interviews were conducted in the selected kiln areas. The research took all possible care to establish rapport with the respondents so that they would not feel any hesitation while starting the interview. Wherever the respondents felt any difficulty in understanding any questions, the researcher took utmost care to explain and clarify.

On-site sampling

There is really 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. Surrounding noise was recorded from different sampling locations in the study area. Surrounding noise 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 noise levels in different sampling locations of the study area was conducted during the production period (January – April 2017). The measurement of noise levels was carried out during peak working hours (09:30 AM – 04:30 PM) at the kiln areas. The noise 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 meters above the ground.

Data analysis

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

RESULTS AND DISCUSSION

Extreme noise is an unwanted consequence of the surrounding environment. It can interfere with sleep, work, or reaction, and when it crossed the extreme limit then it may cause physiological and psychological disorder. Hence, this mental and physical stress affects the general well-being of those who are exposed to it. The increased brick kiln activities need excessive use of different types of machinery such as blower machine (Howa machine), pug mill machine, coal crusher machine, shallow tube well machine, the sound of vehicle's and brick loading etc. have led to a number of environmental problems in the study area. Majority of brick kiln worker in the study areas affected by this problem. The results of the questionnaire survey and field-based experimental analyzed data were discussed below.

Occupational hazards

A short survey was conducted to obtained information about occupational hazards due to noise pollution in brick kiln areas. Among the respondents who responded to noise pollution as a problem 47% of respondents saying noise as a bearable problem and rest 30% of respondents considered noise pollution as an unbearable problem (Fig. 1). Almost majority of the respondents said that noise pollution in the kiln area affected their physical and mental health whereas only a small portion of the respondents said that the noise pollution did not bring any significant health effect.

The brick kiln workers exposed time to high-intensity noise environment is shown in Table 1. About 22.86% of respondents stayed a maximum time of 4 hours at a high intensity of noisy environment during peak working hours (09:30 AM – 04:30 PM) at different sampling locations. Health effects due to noise pollution depend mainly on noise level and exposure time to stay high intensity of noisy environment. As well as the exposure time to stay at high intensity of noisy environment in brick kiln workers was also alarming. The study found that a large number of workers were suffering from different psychological disturbance. Table 2 shows almost all of the respondents suffering from the hearing problem (34.29%), headache (24.28%), sleeplessness (22.86%) and abnormal heartbeat (18.57%).

Maximum and minimum noise level

The study was conducted the occupational noise of the workers due to the machinery operated in the brick production period. (Fig. 2) shows that noise pollution level of the individual source during on-site sampling. The highest and lowest mean value of maximum noise level was recorded to be at the crusher machine and shallow tubewell machine respectively. The crusher machines are used for coal and brick crush. It is not legal and it makes a noisy environment at brick kiln cluster and surroundings. The highest and lowest mean value of the minimum noise level was recorded to be at blower (Hawa) machine and shallow tube well machine, respectively.

Table 1. Brick kiln workers exposed time to high intensity of noisy environment.

Time of exposure	No. of respondent (n)	Percentage (%)
Less than an hour	15	4.29
1 hours	30	8.57
2 hours	40	11.43
3 hours	65	18.57
4 hours	80	22.86
5 hours	55	15.71
6 hours	35	10.00
More than 6 hours	30	8.57
Total	**350**	**100.00**

Table 2. Health effects due to noise pollution.

Types of diseases	No. of respondent (n)	Percentage (%)
Abnormal heart beat	65	18.57
Headache	85	24.28
Sleeplessness	80	22.86
Hearing problem	120	34.29
Total	**350**	**100.00**

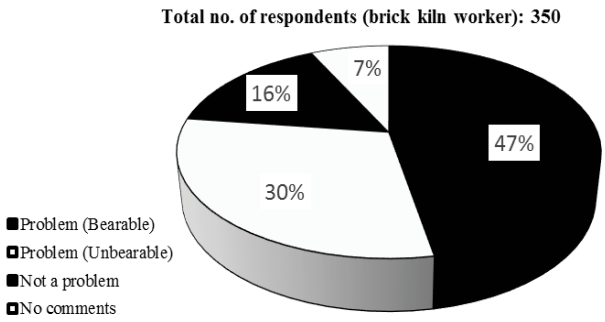

Fig. 1 Pie chart shows the percentage of different problems due to noisy environment for the brick kiln workers.

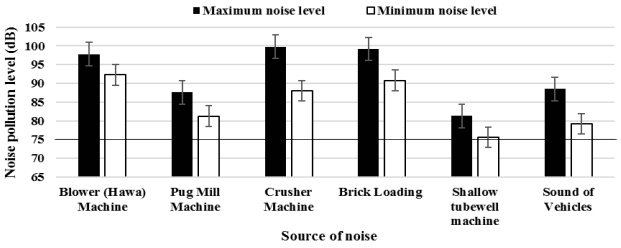

Fig. 2 Noise pollution level of individual source during on-site sampling.

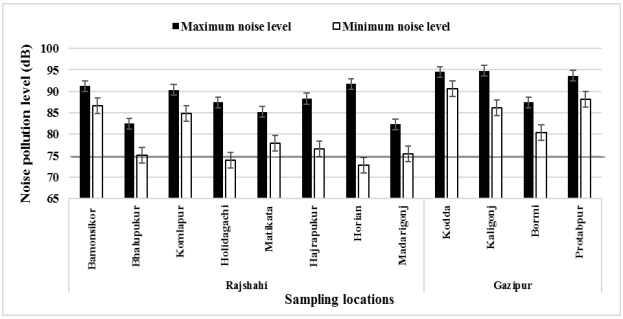

Fig. 3 Noise pollution level during peak working hours (09:30 AM – 04:30 PM) at different sampling locations during on-site sampling.

It was noticeable that all of the individual sources exceed the permissible standard (75 dB) of the noise level in an industrial area (ECR, 1997).

Among all of the sampling locations, the highest and lowest mean value of maximum noise level was recorded to be at Kaligonj in Gazipur and at Bhalupukur in Rajshahi respectively. The highest and lowest mean value of minimum noise level was recorded to be at Kodda in Gazipur and at Horian in Rajshahi respectively (Fig. 3). It was noticeable that most of the noise level from different sampling locations exceeds the permissible standard (75 dB) in an industrial area (ECR, 1997).

CONCLUSION

The study survey results revealed that the respondents suffered from the hearing problem

and other health effects including headache, sleeplessness, and abnormal heartbeat etc. caused by the noisy environment around the brick kilns area. The study results found that the crushing process of coal at the brick kilns created a high intensity of noise among all of the noise sources machinery in the study. It is therefore imperative to take immediate steps to combat the noise environment. Provision of green belts would be incorporated in consultation with local government unit along the road networks for attenuation of noise pollution. The environmental awareness workshops and promotion of using protective devices for the brick kiln workers would be a great help for developing environmentally friendly brick kilns. Noise pollution is a serious but neglected issue in brick kiln areas as well as in Bangladesh.

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