

## 1724e HEALTH STATUS OF BRICK KILN WORKERS IN NORTH EAST INDIA

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**Introduction** India produces 200–250 billion clay bricks annually, the second largest producer of clay fired bricks, accounting for more than 10% of global production, in 1 50 000 to 2 00 000 brick kilns. Each brick kiln employs between 250–300 workers, bringing the total number of workers to approximately 20 million, which is roughly 4 per cent of a total of 459 million workers in India, of which almost 40% are women. The Brick Industry in India is characterised by traditional methods of production technology and seasonal work.

**Methods** The study was done in Tripura, a state in North East India to assess the impact of traditional brick manufacturing technology on the health of the workers. A convenient available sample of 94 workers from 4 brick kilns who have worked for 5 years or more were taken from the total population of 280 (including children) of these kilns. The workers were interviewed to obtain information on demographics and personal habits followed by a general physical medical examination, blood test with complete haemogram, random blood sugar levels and pulmonary function test. The data were analysed using MS Office Excel 2007 & Epi. Info 7.2.1.0 version.

**Results** The average age of workers is 34 years, 27% were female and 73% male workers. 55% worker are loaders, 29% moulders and 7% fire-workers, 75% being migrant workers, 49% being underweight, 51% anaemic, 78% have eosinophilia (younger workers were more affected, *p* value 0.04), 66% have low back pain.

**Conclusion** Brick kiln workers are suffering from high morbidity in Northeast India because of their work. This demands urgent attention for health and safety programs and should include regular in-service training emphasising health risks of brick kiln work, preventive measures, technological interventions etc. Health surveillance of workers would be highly beneficial in achieving better health status.

## 1634 SILICA EXPOSURE AMONG YOUNG NEPALI BRICKWORKERS

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**Aim of special session** In Nepal there are approximately 1169 registered brick kilns in Nepal employing 2,50,000 people and up to 30% of workers are <16. Although there are a few studies of brick kiln workers, both historic and recent data indicate that silica exposure is a problem with exposures often exceeding 15 times the threshold limit value (TLV).

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## 1634a SILICA AND PAEDIATRIC PULMONARY DEVELOPMENT

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When families live and work in the same environment, respirable silica places all family members at high risk for developing chronic non-communicable respiratory diseases. Individuals exposed to silica are one of only a few high-risk groups that the World Health Organisation (WHO) recognises as being at substantial risk and in need of population-based screening for TB. According to the National Institute for Occupational Safety and Health (NIOSH), the association between TB and silicosis has been firmly established. Increased risk of TB has been repeatedly demonstrated in surveillance, case-control, and cohort studies from around the world. When compared with the general population, estimates of increased risk range from just over 2-fold to almost 40-fold, and increased risk of extra-pulmonary TB is almost 4-fold greater.

The failure to place a greater emphasis on occupational health in dusty trades may be a lost opportunity of enormous magnitude. While limited, data from several nations indicate that pneumoconioses are a large and persistent problem. We were not able to find any data on the risk of silica exposure to young workers or children living in silica-contaminated environments. However, work in dusty occupations, such as brick making, and living and working in a brick-kiln environment are common to children. The risk of silicosis increases with increased intensity and/or duration of exposure, and chronic silicosis may develop or progress even after exposure to silica has ended. Hence, it is important to understand the impacts of both childhood and cumulative lifetime exposure.

Although there are few studies of brick-kiln workers, both historic and recent data indicate that silica exposure is a problem. For example, in mechanised South African brickyards among workers with <10 years of service, the prevalence of silicosis was 1%, 4.5%, and 8.6% for those whose exposures had been rated as low, medium, and high, respectively. There was radiographic evidence of TB in 9.3% of workers. There are approximately 1200 brick kilns in Nepal and 1,40,000 in India employing an estimated 2 50 000 and 9 million workers, respectively. Between 10% and 30% of workers are <16 years old, although estimates vary greatly. The number of individuals living at the kiln itself is likely to be many orders of magnitude higher. In addition to work-related exposure, parents are compelled to bring their children and infants to the workplace due to a lack of childcare, thereby resulting in high dust exposures to this especially vulnerable population.

## 1634b BRICK KILNS OF NEPAL: RECOGNISING THE HAZARDS

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**Objective** To evaluate the airborne exposure concentrations of TSPM, RSPM and silica among brickfield workers including exposure of children workers (age >18 years).

**Methods** Personal samples for silica, respirable and total particulate and silica were collected following NIOSH methods. Logistic regression analysis adjusting age, duration of work and smoking practices was carried out at 0.05 level of significances.

**Results** A total of 86 silica samples, 72 samples for RSP and 89 samples for TSPM were collected for the similar exposure groups (SEG) in the brick kilns. Among the SEGs, red brick loaders had the highest mean and maximum exposures to silica, RSP and TSP. To summarise, mean results were as follows for the red brick loaders, respectively for silica, RSPM and TSPM: 0.388 mg/m<sup>3</sup>, 17.944 mg/m<sup>3</sup>, 22.657 mg/m<sup>3</sup>. Other SEGs also had exposures above recognised exposure limits to silica, RSP and TSP. Additionally, several SEGs had workers under the age of 18. Exposures were significantly high and results will be discussed.

**Conclusions** These findings indicate urgent action is required for protection of workers, including working children, from exposures and subsequent diseases associated with particulate matter and silica. Many other hazards exist in the brickfields including heat stress, acute injury and ergonomic hazards that should be addressed.

#### 1634c SILICA EXPOSURE AND CHILD LABOUR IN NEPAL BRICK KILNS

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**Objective** This study was conducted to estimate the prevalence of respiratory symptoms/illnesses and the magnitude of silica exposures among children working in Nepalese brick kilns.

**Methods** Personal samples for silica were collected following NIOSH methods. Bivariate and multivariate logistic regression analysis was carried out to evaluate association between respiratory symptoms/illnesses and participant groups (exposed and referent) and Similar Exposure Groups (SEG) among brickfield workers. Logistic regression analysis adjusting age, duration of work and smoking practices was carried out at 0.05 level of significance. Additionally, a cross-sectional study was conducted in Kathmandu valley targeting all the brickfield workers during February – March 2015. Out of 106 operating brick kilns in Kathmandu Valley, 16 kilns were selected for the study applying multi-stage probability proportionate to size (PPS) sampling technique. A total of 800 participants, 400 brick workers as exposed and 400 grocery workers as referent group were recruited for interviews.

**Results** A total of 86 silica samples, 10 were linked to children under the age of 18. These children worked in several of the SEGs. Among the SEGs, red brick loaders had the highest mean and maximum exposures to silica. Chronic cough (14.3%), phlegm (16.6%) and bronchitis (19.0%) were higher ( $p < 0.05$ ) among brickfield compared with grocery workers (6.8, 5.8 and 10.8%). Mean respirable (5.888 mg/m<sup>3</sup>) and total (20.657 mg/m<sup>3</sup>) dust exposures were highest for red brick loading tasks. Additionally, several SEGs had workers under the age of 18. Exposure were significantly high and results will be discussed.

**Conclusions** High dust exposures identified in this study may explain the increased prevalence of respiratory symptoms/illnesses among Nepalese children working in the brickfields, warranting action to reduce exposures.

#### 1634d BRICK KILNS OF NEPAL: RECOGNISING THE HAZARDS

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**Objective** To evaluate the airborne exposure concentrations of total suspended particulate matters (TSPM), respirable suspended particulate matters (RSPM) and silica in brickfields and the prevalence of respiratory symptoms and illnesses among brickfield workers.

**Methods** A cross-sectional study was conducted in Kathmandu valley targeting all the brickfield workers during February – March 2015. Out of 106 operating brick kilns in Kathmandu Valley, 16 kilns were selected for the study applying multi-stage probability proportionate to size (PPS) sampling technique. A total of 800 participants, 400 brick workers as exposed and 400 grocery workers as referent group were recruited for interviews. Samples for silica, respirable and total particulate were collected following NIOSH methods. One-way ANOVA along with Tukey's test were applied to compare significance of the extent of particulate matters among similar exposure groups (SEGs). Bivariate and multivariate logistic regression analysis were carried out to evaluate association between respiratory symptoms/illnesses and participant groups (exposed and referent) and SEGs among brickfield workers.

**Results** Mean results were as follows for the SEGs, respectively for silica, RSPM and TSPM: red brick loading/carrying (RBL/C), 0.388 mg/m<sup>3</sup>, 17.944 mg/m<sup>3</sup>, 22.657 mg/m<sup>3</sup>; green brick stacking (GBS), 0.204 mg/m<sup>3</sup>, 5.886 mg/m<sup>3</sup>, 16.271 mg/m<sup>3</sup>; green brick moulding (GBM), 0.119 mg/m<sup>3</sup>, 2.193 mg/m<sup>3</sup>, 4.581 mg/m<sup>3</sup>; fire master (FM), 0.111 mg/m<sup>3</sup>, 3.452 mg/m<sup>3</sup>, 3.435 mg/m<sup>3</sup>; and for coal crushing/carrying (CCC), 0.098 mg/m<sup>3</sup>, 7.478 mg/m<sup>3</sup>, 7.094 mg/m<sup>3</sup>. One-way ANOVA was conducted for silica, RSPM and TSPM showing significant relationships across the SEGs. The majority (55%) of brick workers complained of coughing during the previous year. The prevalence of chronic cough among this group was 14.3% compared to 6.8% for grocery workers. Brick workers were also significantly more likely to have chronic phlegm production while coughing, chronic bronchitis, wheezing, chest tightness and other chest illnesses. Among SEGs, green brick moulders were nearly six times more likely to experience chronic cough (OR: 5.80; 95% CI: 1.20 to 27.93;  $p = 0.028$ ) with red brick loaders three times more likely to have chronic bronchitis (OR: 3.08; 95% CI: 1.26 to 7.51;  $p = 0.013$ ) when compared with workers involved in CCC work. Age and duration of work were significant predictors for chronic cough ( $p = 0.001$  each). Age of workers ( $p = 0.003$ ) and smoking habit of workers ( $p = 0.002$ ) were significant predictors for causing chronic bronchitis. Smoking practice of the workers was a significant predictor of wheezing ( $p = 0.018$ ) and asthma ( $p = 0.026$ ) among work groups.

**Conclusions** All of the respiratory symptoms and illnesses were significantly high among brickfield workers. These findings indicate urgent action for protection of workers and prevention of diseases. Furthermore, the symptoms and illnesses are the clear signs that exposure to TSPM, RSPM and silica are affecting the brickfield workers.