

CASE STUDY

Occupational health risk in metal artisanal workplaces in Bhutan

Bhutan

This case study is on blood lead and mercury levels and related health impacts among metal artisans.

Goals and Objectives

This case study was conducted to:

- determine the prevalence of elevated blood lead and mercury levels in metal artisans and their families;
- determine the prevalence of common clinical symptoms associated with elevated blood lead and mercury levels; and
- assess the knowledge, attitudes and perceptions (KAPs) among workers regarding risks, handling, and safe management of lead and mercury use in the workplace.

Based on the findings, recommendations were made, actions were taken, and information, education and communication (IEC) materials were developed to increase awareness and sensitize workers and management to the issue.



Project Overview

Context

Metal casting is a commonly practiced trade in Bhutan used to make cultural artifacts for tourist and local consumption. There is widespread use of mercury and lead in the industry. Besides direct occupational exposure, there is also indirect exposure of families through dust on clothing. Both lead and mercury are harmful to health, causing multiple immediate and long-term adverse outcomes in adults, children and infants.

Site visits in response to concerns raised about the health and environmental risks of lead and mercury revealed numerous cases of potential exposure. This study was developed to further assess the lead and mercury exposure and health consequences among employees of three metal casting units in Thimpu. The Royal Centre for Disease Control led the study commissioned by the Occupational Health and Chemical Safety Programme, Ministry of Health.

This activity aligns with WHO Chemicals Road Map actions – specifically, the Knowledge and Evidence Action – in that it fills gaps in scientific knowledge; investigates the link between exposure and health impacts; and facilitates coordination of the Ministry of Health, health-care establishments and poison centres to enhance toxicosurveillance. It also aligns with the Risk Reduction Action in developing and launching public awareness campaigns, promoting communication of relevant information, and implementing risk reduction actions and prevention strategies.

Approach

This cross-sectional observational study recruited 177 participants (109 artisans, 25 non-artisans, 43 high-risk household members). Along with occupational health checkups, blood samples were collected and lead and mercury levels were tested.

Multiple national and international partners were involved in conducting the study. Financial support for the study was provided by the WHO Bhutan Country Office and Ministry of Health. Both private and public enterprises were key stakeholders and provided support in carrying out the study in their



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facilities. Blood lead and mercury testing was done at the Toxicology Laboratory, Ramathibodi Hospital and Poison Center, Mahidol University, Thailand. Other tests were performed at the Jigme Dorji Wangchuck National Referral Hospital and Kesar Gyalpo Medical Science of Bhutan.

Results

Of the total 177 participants, 38% had elevated blood lead levels (> 5 micrograms per deciliter interpreted as abnormal level of lead in blood) and 52% had elevated blood mercury levels (> 10 micrograms per liter interpreted as abnormal level of lead in blood). The levels were higher in the metal artisans than in their household contacts, and among the non-artisan employees. The most commonly reported clinical symptoms among the artisans included burning or watery eyes (58%), headaches (58%), anxiety (51.9%), muscle aches (47.3%), stomach cramps or pain (43.5%) and increased tiredness (38.2%). Elevated liver and kidney biomarkers, namely serum bilirubin, was found in 68% of the artisans. KAP analysis found that artisans were more aware of the health hazards and safety of mercury than that of lead.

The Ministry of Health shared findings from a study with management of the three metal artisanal units and IEC materials were developed and disseminated at the workplaces to sensitize workers. The management made changes in workplace safety, including replacing coal heating with electric heating for amalgamation, changing personal protective equipment (PPE), and ensuring proper ventilation in the workplace. The Ministry of Labour and Human Resources was brought in to enforce PPE change in workplaces. Workers were also recommended not to work at home so as to limit exposure of family members.

Lessons Learned

This is the first study in Bhutan exploring the prevalence of elevated levels of mercury and lead among metal artisan workers. The response rate to the study was 100% due to support from the management and participants. However, only three sites were studied; therefore, there are limitations in the generalizability of the findings. Additional testing at other sites may be necessary before policy-level decisions are made to improve worker safety in this sector.

The case study was authored by the Ministry of Health. The named authors alone are responsible for the views expressed in this publication.

Recommendations

Electroplating can reduce worker exposure to mercury and lead. However, regulations may be necessary to encourage the industry to move away from the traditional use of the amalgamation technique.

Lack of technical capacity was a challenge for Bhutan. Good relationships with Thailand were instrumental in helping Bhutan overcome its technical and financial constraints and have the blood testing performed in Thailand.



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This case study is one of a series of case studies coordinated by WHO to illustrate the implementation of the WHO Chemicals Road Map.



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