Risk factors for children's blood lead levels in metal mining and smelting communities in Armenia: A cross-sectional study

Ruzanna Grigoryan, Varduhi Petrosyan, Dzovinar Melkom Melkomian, Vahe Khachadourian, Andrew McCartor, Byron Crape

Department of Medicine

Abstract

Background: Children's exposure to lead poses a significant risk for neurobehavioral consequences. Existing studies documented lead contamination in residential soil in mining and smelting communities in Armenia. This study aimed to assess blood lead levels (BLL) in children living in three communities in Armenia adjacent to metal mining and smelting industries, and related risk factors. Methods: This cross-sectional study included 159 children born from 2007 to 2009 and living in Alaverdi and Akhtala communities and Erebuni district in Yerevan - the capital city. The BLL was measured with a portable LeadCare II Blood Lead Analyzer; a survey was conducted with primary caregivers. Results: Overall Geometric Mean (GM) of BLL was 6.0 μg/dl: 6.8 for Akhtala, 6.4 for Alaverdi and 5.1 for Yerevan. In the sample 68.6 % of children had BLL above CDC defined reference level of 5 μg/dl: 83.8 % in Akhtala, 72.5 % in Alaverdi, and 52.8 % in Yerevan. Caregiver's lower education, dusting furniture less than daily, and housing distance from toxic source(s) were risk factors for higher BLL. Additional analysis for separate communities demonstrated interaction between housing distance from toxic source(s) and type of window in Erebuni district of Yerevan. Conclusions: The study demonstrated that children in three communities adjacent to metal mining and smelting industries were exposed to lead. Investigation of the risk factors suggested that in addition to promoting safe industrial practices at the national level, community-specific interventions could be implemented in low- and middle-income countries to reduce BLL among children.