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Assessment of Personal Exposure to Lead and Blood Lead Levels in Peri-Industrial Vicinities of Ahmedabad: A Pilot Study

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Abstract

Introduction: Heavy metals are environmentally and biologically persistent sources of wide-spectrum adversity for all organ systems of our body, though are neglected in the developing and underdeveloped countries. Disease burden due to heavy metal, lead is responsible for ~2 million deaths, and 1 in 3 children having blood lead levels of >5µg/dl out of 800 million children worldwide. In a span of 30 years (1991–2021), the reference value of blood lead decreases from 10µg/dl to 5µg/dl to 3.5µg/dl in children, as well as in adults with a tag of 'no safe level'. Deaths due to air pollution in cities causes by lead and others, are in the top 5 risks that globally attributed to death of 3.75 million males and 2.92 million females. Therefore, in the above perspective, the present pilot study focusses on the scenario of lead toxicity among the residents of Ahmedabad city, if any, where residence areas are mixed-up with industrial areas.

Material and Methods: A community based cross-sectional study is conducted to achieve blood lead levels of the subjects of ≥18 years' age with no known sources of heavy metal exposure including lead (n=100) by ICP-MS. Also, 24-hr ambient air samples from the study areas are taken for the purpose along with food and drinking water samples as per the questionnaire-based survey on the study participants.

Results: The result shows blood lead levels of 18.98±9.19µg/dl (range: 1.7–43.2µg/dl; n=49) in males and 17.92±11.12µg/dl (range: 0.6–45.6µg/dl; n=48) in females, out of which, 97.95%, 95.92% and 83.67% of males, and 89.59%, 87.5% and 77.08% of females, are found above the blood lead level of 3.5µg/dl, 5µg/dl and 10µg/dl, respectively. However, lead is not detected in the blood of 3 subjects. Further, lead levels in drinking water samples are in the range of 3.03–18.53µg/l (n=8), which, in some areas, are slightly higher than the WHO and USEPA reference value of 10µg/l and 15µg/l, respectively, may be due to corrosion of the old metallic pipelines. Lead levels in the 24-hr ambient air reveals 0.108–0.218µg/m3 (n=7), which is within the CPCB reference limit of 1.0µg/m3. Food samples like, cereals, pulses, edible oils, etc., found 0.151–0.742ppm lead (n=7), which is higher than the FSSAI reference value of 0.1–0.2ppm.

Conclusion: The present data suggests a need for in-depth study involving large number of subjects from the same urban industrial residents of no known sources of exposures, which may throw a light on the public health scenario in the country.