



LETTER TO EDITOR

The Silent Menace- Lead Exposure: A Major Unseen Burden In Pakistan

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Lead, a naturally occurring element, poses risks particularly in neurodevelopment. According to the World Health Organization, lead is a cause of mental retardation, accounting for 9.8 million disability-adjusted life years, surpassing cardiovascular disease at 3.1 million each year.¹ It has profound implications for neurodevelopment in children. Its pervasive presence in various sources, coupled with neurotoxic properties, raises concerns about its impact. Children are at increased vulnerability to lead, due to higher absorption rates and more hand-to-mouth activity, adversely affects brain development, resulting in an overall decrease in IQ levels and productivity.

The developing nervous system's vulnerability to lead is underscored by its interference with fundamental processes like synaptogenesis, myelination, and neurotransmitter regulation². The biological plausibility of lead-induced neurodevelopmental disorders lies in the metal's ability to interfere with key neurobiological processes. Lead can readily cross the blood-brain barrier, disrupting neural function. Its also interfere with critical processes for neuronal signalling and synaptic plasticity. Additionally, oxidative stress and inflammation contribute to neuronal

damage which can be further amplified.

Globally, lead exposure remains a public health concern, affecting millions of children annually. The global burden of disease attributable to lead exposure disproportionately affects children, leading to decreased intelligence quotient (IQ) scores, increased rates of attention deficit hyperactivity disorder (ADHD), and behavioral problems. Lead exposure originates from legacy sources such as leaded gasoline, lead-based paint, and industrial emissions. Contemporary sources like lead-acid batteries, mining activities, and certain traditional practices further contribute to regional variations in lead exposure. In Pakistan, lead exposure poses a significant public health challenge, with diverse sources including leaded gasoline, industrial emissions, lead-acid batteries, and contaminated water and soil.³ Karachi, the largest and most industrialized cities in Pakistan, is particularly susceptible to elevated lead levels due to its high population density, industrial activities, and traffic congestion.⁴

Historically, the use of leaded gasoline globally was a major contributor to lead exposure. While many countries have phased out leaded gasoline, remnants of this legacy

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source may still pose a threat in certain areas, especially those with older vehicles.⁵ In Pakistan, the phase-out of leaded gasoline began in the early 2000s, and the transition to unleaded gasoline is underway. However, in Karachi, unregulated industrial activities, improper waste disposal, and outdated emission control measures contribute to lead exposure. The widespread use of lead-acid batteries is a contemporary source of lead exposure, with improper disposal and recycling practices contributing to soil and water contamination.

Recognizing the urgency of addressing lead exposure aims to impact public health. The key interventions include the global phase-out of lead gasoline helps in reducing atmospheric lead. In Pakistan, the transition to unleaded gasoline is an important step in mitigating historical sources of lead exposure. Efforts to regulate industrial emissions and enforce emission control measures are essential. Improved monitoring, stringent emission standards, and public awareness campaigns are crucial components of interventions targeting industrial sources of lead. Implementing regulations on proper recycling and disposal of lead-acid batteries is essential to prevent environmental contamination.

Authors' contributions

ZA: Contributed to the conception, data collection, drafting, and critical revision of the letter. Provided final approval of the manuscript and ensured the accuracy and integrity of the work.

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Conflict of interest

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