Lead Poisoning in South Asia: A Public Health Crisis

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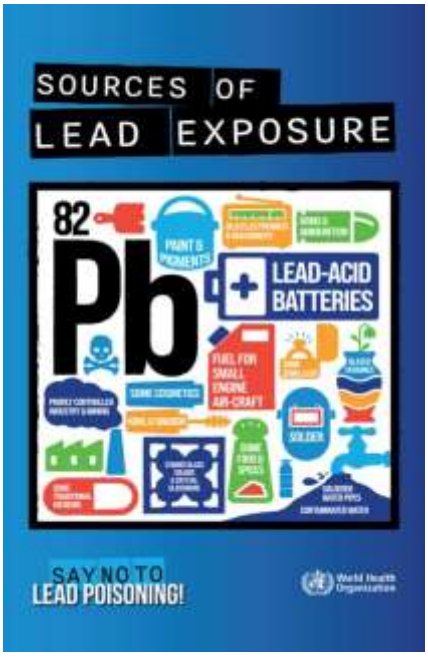
KEY TAKEAWAYS

- Lead exposure causes irreversible effects on child growth, intellectual ability, and birth outcomes.
- Lead chromate, a highly toxic pigment, continues to be produced and exported from India.
- Lack of comprehensive blood lead level data hinders understanding of the issue's extent.
- Insufficient knowledge exists about specific sources of lead contamination in different populations.
- Inadequate monitoring and enforcement of regulations hamper effective policy responses.



Lead (Pb) poisoning has been a persistent problem in South Asia for many years, although it has recently gained renewed attention. Estimates suggest that half of the 800 million children worldwide with elevated blood lead levels (≥5 µg/dL) live in South Asia[1]. This alarming statistic has lightened panel discussions around a long-standing issue about how can we effectively address lead poisoning in South Asia by examining its impact, challenges, and evidence-based policy solutions?

There are two key reasons why this seemingly simple question is difficult to answer:

Scope and Severity of the Lead (Pb) poisoning

First, the Scope and Severity of Lead poisoning is extensive and complex. Lead exposure is a major issue for a significant number of children in South Asia, as UNICEF has found that close to 400 million children in the region, almost half of the global total is affected by lead poisoning. The rate of elevated blood lead levels in children under 5 ages in South Asia exceeds the BLL threshold (5 µg/dL) set by the World Health Organization[2]. Children are most vulnerable to lead exposure from common sources like soil, paint, and household dust often through hand-to-mouth contact during play on ground or with toys. It is concerning because lead interferes with the proper functioning of enzymes and disrupts the sensitive growth and development of the brain, even at very low blood lead levels as low as 1 microgram per deciliter. The consequences of lead exposure are far-reaching, ranging from negative birth outcomes to stunted growth, reduced cognitive abilities in children, and heightened risk of cardiovascular disease in adults. Lead exposure during pregnancy can also have detrimental effects on fetal nervous system development and increase the risk of hypertension in pregnant women with higher bone lead levels. In regions with high levels of environmental contamination, this exposure is especially concerning. Occupational lead exposures are more common in South Asia, where workers in industries like construction, painting, and battery manufacturing may contact with lead-containing materials. This can lead to contamination being brought home, increasing the risk for both children and pregnant women. Therefore, it is imperative to conduct more comprehensive evidence-based studies on the various sources of lead exposure, such as common household items, occupational hazards, and other environmental influences, to gain a deeper insight into this multifaceted issue.

[1] UNICEF, & Pure Earth. (2020). The toxic truth: Children's exposure to lead pollution undermines a generation of future potential. https://www.unicef.org/reports/toxic-truth-childrens-exposure-to-lead-pollution-2020

[2] World Health Organization. (2021). *WHO guideline for the clinical management of exposure to lead*. Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO.

Policy and Implementation Gaps?

The second policy issue lies in the lack of adequate policies and their effective implementation, especially when it comes to the low screening and testing of blood and bone lead levels. There is also a widespread lack of awareness about the sources of lead poisoning due to the absence of nationally representative data on blood and bone lead levels. This lack of data hinders our understanding of the true extent of lead exposure, making it hard to target high-risk areas and populations effectively. Accurate data is crucial for monitoring the prevalence and trends of lead exposure in the region. Despite the pressing need for comprehensive information, most existing studies are limited in scope, leading to significant gaps in our knowledge of the sources of lead contamination and its impacts on different groups of people. Moreover, South Asia lacks comprehensive policy frameworks to address lead exposure, and even when policies exist, they are often poorly enforced, leaving vulnerable populations at risk. For example: the informal and formal lead battery recycling sectors in South Asia also contribute to environmental lead contamination, with poor regulations and unsafe practices worsening the issue and putting nearby communities at risk. Notably, lead chromate, a highly toxic lead-based pigment found in paints and polishes, remains a significant concern primarily due to its toxicity and widespread use in everyday food items and in paints, however no policies in place. To effectively eliminate lead exposure, we must implement stronger policies and laws targeting at-risk populations. By conducting thorough research, strengthening policy frameworks, and improving enforcement, we can safeguard vulnerable communities and improve public health.

Figure 1. Burden of Disease from Lead Exposure

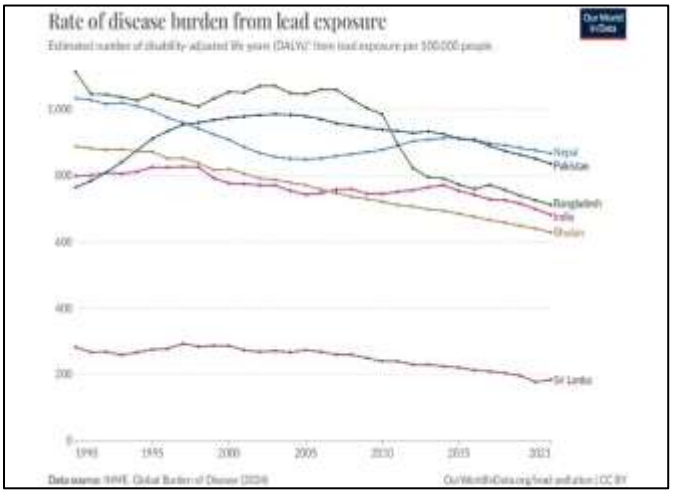
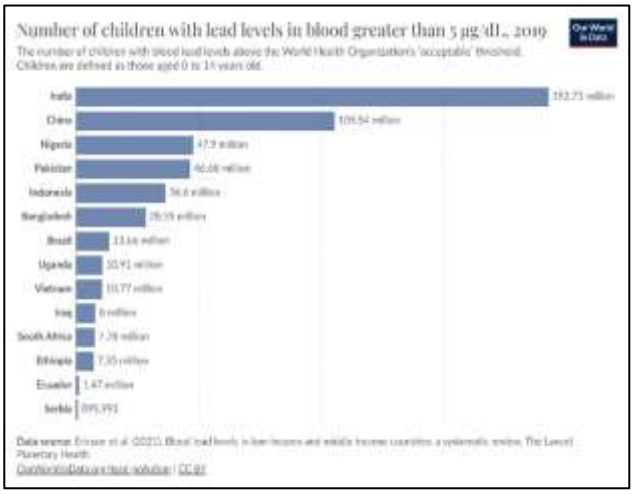


Figure 2. Children with BLL above the WHO threshold



Stop Producing and Trading Lead Chromate

India emerged as the sixth largest producer of lead globally in 2022. Lead consumption in India has also been on the rise, increasing from 1 million metric tons in 2020 to 1.11 million metric tons in 2021, and this upward trend is projected to continue in 2022. The automotive industry, specifically the need for lead-acid batteries, is the primary factor driving lead demand in India, resulting in increased lead consumption in the country[3]. India is also a significant exporter of *lead chromate*, with substantial quantities shipped to various countries. In recent years, the export volumes have been notable, indicating a robust market despite the health concerns. The total export volume of Pb chromates from India amounted to 9,849 metric tons in 2022, with top importing nations being

[3] Hindustan Zinc Limited. (2022). Integrated annual report 2021-22. https://www.hzlindia.com/wp-content/uploads/Integrated-Annual-Report-2021-22.pdf 3

Lead chromate is comprised of two heavy metals, lead and chromium. It is a bright yellow-orange solid, poorly soluble in water.

Uses

Lead chromate is a chemical compound often used to enhance the color of spices and commonly found in products such as paints and various consumer goods plays a significant role in various industries due to their versatile properties such as durability. Yellow, orange and green paints and coatings for toys, ceramic, vehicles, bridges, plastic products, pyrotechnic devices, and other applications that require a durable, vibrant yellow color or orange color.

Toxic and Health effects

When ingested or inhaled, it enters the bloodstream and can lead to blood cell damage, destruction with red blood cells, skin conditions and potentially kidney and liver failure. Neurotoxic and Carcinogenic that can damage DNA and potentially lead to cancer.

Turkey, the United Arab Emirates, Saudi Arabia, South Africa, Nigeria, and Vietnam[4].

The utilization of lead chromate for color enhancement poses a significant public health concern in South Asia. Recent studies have revealed alarming levels of lead contamination in turmeric samples across countries such as India, Pakistan, Bangladesh, and Nepal, with some samples containing dangerously high concentrations of lead. Research has identified a prevalence of lead and lead chromate in turmeric samples from South Asian regions (Patna, Karachi, and Peshawar) which could lead to children having blood lead levels up to 10 times higher than the CDC's safety threshold. Bangladesh, has been significantly impacted using lead chromate in turmeric prompting concerns about potential health risks, as lead is known to be a neurotoxin that can impact cognitive development. Urgent action is required to address the presence of lead chromate in turmeric supply chains in South Asia to safeguard public health and prevent further harm[5]. Bangladesh has also implemented a series of interventions aimed at reducing lead chromate adulteration in turmeric. Similarly in Sri Lanka, certain types of paints, including lacquers, anti-corrosion paints, and enamel paints, still contain dangerously high levels of lead. Despite regulations, lead chromate pigments are still being used in some enamel paints. To address this issue, it is recommended that Sri Lanka adopt a lead paint standard of 90 ppm, in line with international guidelines. Prohibiting the use of lead chromate, a known carcinogen, should be a priority, following the lead of the European Union in banning its import, export, production, and usage[6]. The European Union has implemented stringent regulations against the use of lead chromate in consumer goods, paints, and coatings due to its hazardous nature. The EU has designated lead chromate as a substance of high concern under the REACH regulation and is considering adding it to the Authorization List, which would require companies to seek approval for its usage. Lead

[4] IPEN. (2023). Initial estimates of trade flows of lead chromates from India.https://ipen.org/sites/default/files/documents/initial_estimates_trade_flows_of_lead_chromates_from_india.pdf

[5] Forsyth, J. E., Mistree, D., Angrish, M., Nash, E., & Luby, S. (2024) Elevated Turmeric Lead Levels Threaten Public Health Across South Asia. Available at SSRN 4673680.

[6] Rubesinghe, C., Abayawardhana, H., & Gottesfeld, P. (2021). Lead content of paints in Sri Lanka Centre for Environmental Justice (CEJ), Sri Lanka & Occupational Knowledge (OK) International, USA. https://ipen.org/sites/default/files/documents/2021_lead_report_cej_oki_joint_study.pdf

chromate has also been prohibited in certain other advanced nations due to its detrimental effects and health hazards[7].

However, in developing regions lacking proper risk management protocols, lead chromate is still utilized. Bangladesh Food Safety Authority (BFSA) has been actively involved in enforcing policies against the use of lead chromate, which has been identified as a major source of lead exposure. The Food Safety and Standards in Bangladesh oversees the regulation of food additives, including colorants. There are ongoing discussions regarding the need for stricter regulations to combat the illegal use of toxic substances, such as lead chromate, in food products. The current focus is on improving labeling standards and enforcing comprehensive regulations to prevent the use of harmful additives[8], [9].

India has specific guidelines for the export of SCOMET (Special Chemicals, Organisms, Materials, Equipment, and Technologies) items, which include lead chromate. These guidelines require exporters to obtain end-use and end-user certificates to ensure that the chemicals are not used for prohibited purposes, *such as in the production of chemical weapons.* Additionally, Lead chromate is classified as a "Priority Substance" under Schedule II of India's Chemicals (Management and Safety) Rules, 2021[10]. The Bureau of Indian Standards has established specifications for lead chromate in explosive detonators and pyrotechnics (IS 7602:1975), indicating its ongoing use in these applications [11]. The Central Pollution Control Board (CPCB) has implemented pollution control laws that indirectly affect the use of hazardous substances like lead chromate, aiming to mitigate health and environmental risks [12]. However, these regulations do not impose stringent restrictions on the domestic use of lead chromate, which continues to be used as an adulterant in spices and paint in India and other South Asian countries. Despite the known dangers, there are currently no established maximum limits for chromium or lead chromate in food items by Indian health authorities like the Food Safety and Standards Authority of India (FSSAI). India has not banned lead chromate in consumer products which remain widely available.

Policy Considerations

Leveraging The Rotterdam Convention to Address Lead Chromate in India

The Rotterdam Convention is a global agreement that promotes the regulation of hazardous chemicals like lead chromate to encourage the use of safer alternatives.

The Rotterdam Convention is a crucial international treaty that can help South Asian countries tackle the issue of lead chromate, a widely used lead pigment that contains carcinogenic hexavalent chromium. The Rotterdam Convention is a treaty that requires countries to obtain permission from importing nations before shipping the hazardous chemicals listed in Annex III.

Under the Rotterdam Convention, countries can use the PIC procedure to manage imports of lead chromates. This allows governments to deny consent for imports based on public health considerations. If lead chromates are listed under the Convention, countries must decide within nine months whether to allow imports and under what conditions. *Listing lead chromates under the Rotterdam Convention requires exporters to obtain consent before sending pigments or paints containing them.* This would make it easier for countries to enforce their national lead-paint laws and encourage more countries to adopt lead-paint

[7] IPEN. (2023). EU tribunal deems lead chromates authorisation illegal. https://ipen.org/news/eu-tribunal-deems-lead-chromates-authorisation-illegal

[8] Hossain, M. S., Fakhruddin, A. N. M., Chowdhury, M. A. Z., Khorshed Alam, A. H. M., & Akter, M. S. (2023).

[9] Food safety policy enforcement and associated actions reduce turmeric lead chromate adulteration across Bangladesh. Food Control, 141, 109172. https://doi.org/10.1016/j.foodcont.2022.109172

[10] Ministry of Commerce & Industry, Department of Commerce Directorate General of Foreign Trade. (2018). India's export control system: Special chemicals, organism, materials, equipment and technologies (SCOMET).https://ibkp.dbtindia.gov.in/DBT_Content_Test/CMS/Guidelines/20181115135754468_Export%20of%20SCOMET_guidelines.pdf

[11] Bureau of Indian Standards. (1975). IS 7602:1975 Specification for lead chromate for explosive and pyrotechnic compositions. https://law.resource.org/pub/in/bis/S02/is.7602.1975.pdf

[12] National Productivity Council. (2019). Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016: Compliance Tool Kit.
Ministry of Environment, Forest and Climate Change, Government of India. Retrieved from https://www.npcindia.gov.in/NPC/Files/delhiOFC/EM/Hazardous-waste-management-rules-2016.pdf

controls[13].

IPEN and its global network are advocating for lead chromates to be classified as hazardous chemicals under the Rotterdam Convention, with limits on exports. NGOs in South Asia are actively involved in these efforts and are urging their governments to submit notifications to list lead chromates in Annex III. This move would help reduce lead poisoning in the region, but further regulations are needed to fully address the issue of lead chromate contamination and exposure[14].

Rashtriya Bal Swasthya Karyakram (RBSK) in India

The Rashtriya Bal Swasthya Karyakram (RBSK) is a national program aimed at improving child health. RBSK operates through a network of mobile health teams and district early intervention centers, ensuring that children receive timely screening, treatment, and follow-up care at no cost to their families. This programme aims to provide comprehensive healthcare services to children from birth to 18 years, focusing on early detection and screening for various health conditions, some of them are associated to lead poisoning including:

- Defects at Birth
- Developmental Delays
- Cognitive delay
- Language delay
- Learning disorder
- Behaviour disorder (Autism)
- Attention deficit hyperactivity disorder

This programme presents a unique opportunity to integrate lead poisoning prevention and management into its framework. By including blood lead (Pb) level tests in regular health assessments, the program can quickly identify children who may be at risk. Mobile health teams are used to reach children in remote and underserved areas, providing important screenings and interventions, especially for lead poisoning cases that may not be detected otherwise. RBSK can integrate lead screening into existing health evaluations by utilizing Anganwadi centers and schools, increasing the chances of identifying lead exposure in children through collaboration with educational and community health services. Children diagnosed with lead poisoning can receive specialized care and management at District Early Intervention Centers, which offer necessary follow-up services to ensure ongoing treatment and support. RBSK can also help educate families about the dangers of lead exposure and ways to prevent it. RBSK has the potential to greatly impact the decrease of lead poisoning in children, leading to better health and quality of life[15].

Recommendation

- Implement a comprehensive system to monitor blood and bone lead levels across the country to effectively target interventions and track progress.
- Revise the 1975 Bureau of Indian Standards specification for lead chromate in explosives to phase out its use.
- Integrate lead poisoning prevention and management strategies into existing health initiatives, such as the Rashtriya Bal Swasthya Karyakram (RBSK), including routine blood lead level screenings in schools and community health facilities.
- Advocate for the inclusion of lead chromates in international agreements like the Rotterdam Convention to bolster global efforts against lead exposure, particularly in paint and other products.
- Involve private companies in reducing lead emissions and encourage the production of lead-free products through partnerships and incentives.

[13] IPEN. (2023). Controlling lead chromate pigments: The case for a Rotterdam Convention listing. https://ipen.org/sites/default/files/documents/controlling_lead_chromate_pigments_may_2023.pdf

[14] IPEN. (n.d.). Listing lead chromates under the Rotterdam Convention. https://ipen.org/site/listing-lead-chromates-under-rotterdam-convention

[15] Ministry of Health & Family Welfare, Government of India. (n.d.). Rashtriya Bal Swasthya Karyakram (RBSK). Retrieved July 26, 2024, from https://rbsk.mohfw.gov.in/RBSK/

Colloquia Experts Panel

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Abbreviations

UNICEF- United Nations International Children's Emergency Fund
WHO- World Health Organization
CDC- Centre for Disease Control