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LEAD POISONING IN SOUTH ASIA: A PUBLIC HEALTH CRISIS AND THE NEED FOR URGENT ACTION

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(Lead Working Group)

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APRIL 26, 2024

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BACKGROUND

The World Health Organization (WHO) has reported that approximately one million global annual deaths caused bychemical exposure are due to lead exposure **(**World Health Organization (2016). In a detailed analysis of the globaldisease burden by the Institute for Health Metrics and Evaluation (IHME) from 1990 to 2019, it was found that the number of deaths attributable to lead exposure increased from 0.53 million in 1990 to 0.90 million in 2019, representing a 70.19% increase over the 30-year period (Zhou, N. et al (2022). Lead exposure in 2019 caused approximately 901,720 deaths and 21.68 million DALYs globally, with a significant impact on individuals aged 60years and older, accounting for 61.21% of the burden. Lead poisoning is a significant environmental health concernwith severe impacts on the human body. Various sources contribute to lead exposure, including informal battery recycling, traditional medicines, household dust, paint, glazed ceramics, lead-contaminated water, food grown in lead-contaminated soil, and lead found in consumer goods like cosmetics, toys, spices and even cookware (Obeng- Gyasi, E. (2019). Lead exposure led to 30% of global cardiovascular deaths (5.5 million deaths) and the loss of 765million IQ points in children under 5 in 2019. Approximately 90% of these cardiovascular deaths and 95% of the IQloss occurred in low- and middle-income countries (LMICs). Lead exposure also accounted for a significant portionof the global burden of other diseases like intellectual disability (62.5%), hypertensive heart disease (8.2%), ischemicheart disease (7.2%), and stroke (5.65%), with the effects being most pronounced in low Socio-Demographic Indexregions like South Asia, North Africa, and the Middle East (Xu, T et al (2023).

Lead exposure can occur through inhalation, ingestion, or skin contact. In adults, about 35-40% of inhaled lead dustis deposited in the lungs, while approximately 95% enters the bloodstream. When ingested, around 15% of inorganiclead is absorbed, with higher rates seen in children, pregnant women, and individuals with calcium, zinc, or iron deficiencies. Lead stored in tissues like bones, teeth, hair, or nails is considered less toxic due to limited availabilityto other tissues. The absorption rate in bones and teeth is high, especially in children, leading to serious health effects.Prolonged exposure results in lead accumulation in various tissues like the brain, spleen, kidneys, liver, and lungs, contributing to long-term health risks. Lead is a harmful substance that can affect our bodies in many ways. It disruptsnormal bodily functions by restricting the proper utilization of calcium, interacting with proteins, and displacing minerals in place of calcium. Lead also interferes with the enzymes that help in the synthesis of vitamin D and with

enzymes that maintain the integrity of the cell membrane. Lead creates reactive radicals which damage cell structures,including DNA and cell membrane, and red blood cells, which results in anaemia. Lead can also influence the functioning of our genes and the process by which our bodies produce blood (Ara, A., & Usmani, J. A. (2015); Sharma, P., et al (2015).

The study by Rehman et al. (2018) highlights the significant health risks associated with heavy metal exposure suchas like lead, mercury, cadmium, arsenic, chromium, nickel, and zinc, focusing on the detrimental effects on variousorgans and bodily functions. These health risks range from skin irritation, headaches, and fatigue to more serious conditions such as organ failure, neurological diseases, kidney damage, respiratory problems, liver damage, anemia,and cancer. Lead specifically impacts the nervous system, resulting in symptoms like lack of attention, headaches, and memory loss. Pregnant women exposed to lead can transmit it to the fetus, potentially causing developmental abnormalities in children. Chronic lead exposure can lead to anemia, hypertension, renal impairment, and nervous system damage (Rehman, K et al. (2018).

Health Problems	**Effect of Lead exposure on health**
Brain Effects Thinking andLearning Memory Problems Language Skills	Lead exposure can harm the brain by interfering with its growthand function. It affects nerve connections and brain chemicals, making itchallenging to think and learn. Even low levels of lead in the blood can reduce intelligence andhinder learning abilities. Prolonged exposure to lead can impair memory, affecting bothverbal and visual recall, as well as impact decision-making abilities.
Blood Issues	Lead can stop important enzymes in our bodies from working properly, leading to a type of anemia where our red blood cells are affected.
Reproductive Health Pregnancy Risks	Lead exposure can affect fertility in both men and women. In men, it can reduce sperm count, while in women; it increases the risk of stillbirths and miscarriages. During pregnancy, lead exposure can result in premature birth and low birth weight, or even abortion. Infants born to mothers
Children's Health	with high lead exposure may affecting the baby's bone growthand exhibit neurological deficits. In Children, behaviors like crawling on the floor and hand to mouth lead to Lead exposure that can lead to symptoms such asstomach pain, learning difficulties, anemia, and vomiting.

Vitamin D Levels	Lead exposure can lower the amount of vitamin D in our bodies, which is important for our health.
Cancer Risk	Lead has been linked to an increased risk of certain cancers, like bladder, stomach, and lung cancer.
Heart Health	Lead exposure can raise our blood pressure and increase the risk of heart problems

EVOLUTION OF LEAD USAGE AND CONTAMINATION IN INDIA

EVOLUTION OF LEAD OVER TIME

Ancient Practices

Lead has played a significant role in human history, with its use evolving over time. Lead was initially produced asa byproduct of silver and smelting, with its usage in practices like mixing molten lead with water in regions like Ancient Greece and Anatolia 6500 years ago. The mining of lead declined in the dark ages, but rose again in medievaltimes. In the medieval period, Egyptians and Greco-Romans utilized lead in various applications, including pottery glazes, piping, and roofing, as well as in the production of stained glass. Despite being more expensive than iron, lead also became central to the production of bullets and firearms, and construction materials like soldered sheets (Dartmouth College (2024); Big Olaf, 2001).

In the early 1600s, the American colonists reported medical complications related to lead exposure. The Romans were aware of the dangers of lead poisoning as early as 1400 years ago but warnings were often ignored. During 1400-1500 years ago, lead was used in the production of moveable type, the printing press, architecture, and production of guns and ammunition. Lead poisoning is an occupational disease described thousands of years ago, with epidemic outbreaks still occurring today. The toxicity of lead was acknowledged as early as 2000 BC, highlighting early awareness of its harmful effects (Dartmouth College (2024); Big Olaf, 2001).

The Chinese and ancient Greeks and Romans used lead to make coins. During the Industrial Revolution (1760s to 1840s) saw a surge in lead demand for ammunition, plumbing, roofing, and piping, leading to widespread usage across various sectors and depletion of Britain's mines by the mid-19th century. In Rome, lead was extensively usedin aqueducts and as a sweetener for wine, contributing to health problems like gout (Bell, T. (2020; (Big Olaf, 2001). Lead was again in high demand for use in plumbing and paints, but this increased exposure among the working classresulted in a rise in lead poisoning cases. This inspired research into the effects of lead intake and consumption, prompting the UK to implement the first laws aimed at reducing lead exposure in the 1870s and 1880s. Further evidence of the harmful nature of lead was discovered in the late 19th and early 20th centuries, leading to the phasingout of the material in public use among countries such as the USA and parts of Europe. Legislation to control lead air pollution was introduced in the 1970s in Western Europe and the United States. The main product involving theutilization of lead at the end of the 20th century was the lead-acid battery, and the production of lead continues to increase worldwide because of this use (Needleman, H. L. (1999).

HISTORY OF LEAD IN INDIA

Lead has been used in various applications throughout history, including in ancient India. The earliest recorded use of lead in India dates to around 2000 BC, during the Indus Valley Civilization. Lead was used for making ornaments,amulets, and other decorative items. The use of lead in India continued through the Vedic period, where it was mentioned in the Atharvaveda as "sisa" or "trapu" alongside other metals like silver and tin. In the classical era, leadmining and production increased significantly in India, particularly in the southern regions. The ancient Indians usedlead for various purposes, including in cosmetics, as a writing material, and for making coins. Lead was also used inthe construction of buildings and monuments, such as the famous Delhi Iron Pillar, which stands as a testament to the advanced metallurgical skills of the ancient Indians. In modern times, India has continued to be a significant producer and consumer of lead. The main product involving the utilization of lead at the end of the 20th century wasthe lead-acid battery, and the production of lead continues to increase worldwide due to this use. Lead is still used invarious applications, such as radiation, ballast, ammunition, and various other applications, but its use in plumbing has been replaced with alternative materials. In India, lead is used in certain consumer products, such as jewelry, spices, paint, toys where it is used to make the product heavier, brighten colors, and stabilize or soften plastic (VedicHeritage. (2024). The use of lead in India has also been associated with significant health risks. Studies have shownthat lead exposure is a major public health concern in India, particularly in rural areas where the use of lead-based paint and other products is common. Lead consumption by Batteries (42%), Cables (22%), Paints (10%), Sheets/Pipes (10%), Industrial alloys (8%), and Miscellaneous (8%) were identified as significant sources of lead intake in South Indian rural populations (Big Olaf, 2001).

Table 1: Analysis of Research Findings and Gaps from a review of Studies on Lead Exposure by Sources

Source	Place	Study design and findings	Gap	Reference
Paint	Nepal	A Cross-sectional study investigates the occurrence and potential contributing factors for high lead concentrations in infants and toddlers' blood within the Kathmandu Valley region of Nepal, approx. 64.4% had high BLL levels.	The study identified a significant association between BLLs and exposure to enamel paints in households, particularly with painting materials on various surfaces like walls, windows, and doors.	Dhimal et al (2017)
Paint	Nepal	A study revealed that 63% of primary school children had detectable blood lead levels (BLL), with 54% having BLL ≥ 5 ug/dl.	Factors such as the use of enamel paints in households and belonging to socially disadvantaged caste groups were associated with higher BLLs in children.	Sherchand, O. (2014)

Paint	Nepal	A global study estimated that over 65% of Nepal's child population has elevated blood lead levels, with one of the main sources of contamination being paints containing lead and recycling of lead batteries.	This contamination poses significant health risks to children, affecting their neurological, cognitive, and physical development.	Sah, B. K. (2017).
Paint	India	A study conducted in 2012 revealed that 39% of the total paints tested (148 samples) contained lead more than 300 ppm, (the voluntary limit prescribed by the Bureau of Indian Standards (BIS)). Approximately, 45% of the tested paints contained lead more than 90 ppm, the US limit.	The study also found that only 5% of the tested paints manufactured by organized sector companies contained lead more than 300 ppm, while 93% of the tested paints manufactured by unorganized sector companies contained lead more than 300 ppm.	Mohanty, A. (2013)
Paint	India	The study conducted by Toxics Link and the International Pollutants Elimination Network (IPEN) in India found that over 90% of paints used for house painting in the Indian market contained lead concentrations above the permissible limit of 90 parts per million (ppm), with 76.4% of these paints exceeding the limit by more than 100 times.	The toxic effects of lead on children's brains are irreversible, making children aged six years and below the most vulnerable to lead poisoning. Despite voluntary regulations in place since 2017, poor market surveillance has allowed many brands to continue selling paints with lead levels exceeding permissible limits.	World Health Organization. (2022) and Toxics Link & International Pollutants Elimination Network (IPEN) (2018)
Paint	Sri Lanka	A study conducted by the Centre for Environmental Justice (CEJ) found that out of 37 paint samples tested. The study found that 14% contained lead concentrations exceeding 90 ppm, with 97% of samples below 600 ppm, the legal standard for lead concentration in enamel and floor paints permitted in Sri Lanka.	It also highlighted that lead chromate pigments were still being used in paints despite restrictions.	Centre for Environmental Justice (CEJ), & Occupational Knowledge International (OKI) (2021).
Paint	Bhutan	The study was conducted in 2018 in Thimphu and Phuentsholing, Bhutan assessed blood lead levels in children aged 2 through 59 months. In Bhutan, children of this age group are of a significant concern, with nearly half of the study children in two cities in Bhutan having elevated blood lead levels.	The study identified paint on outdoor playground equipment as having excessive amounts of lead, but numerous other sources still need to be identified. The study's findings highlight the importance of addressing lead exposure in children to prevent permanent health impacts associated with lead poisoning, especially in children under five years old.	Erbele, P eta al (2019).

Paint	Bangladesh	A study conducted in Bangladesh found that 32% of solvent-based paints for home use contained lead concentrations above 90 ppm, with 10% having extremely high lead concentrations exceeding 10,000 ppm.	The study also revealed that yellow paints most frequently contained extremely high lead concentrations.	ESDO & IPEN. (2021).
Paint and recycling activities	India	Ericson et al. evaluated data from multiple studies (51) in India to understand population-wide exposure levels. The study found that children had a mean blood lead levels (BLL) of 6.86 µg/dL and non-occupationally exposed adults had a mean blood lead levels (BLL) of 7.52 µg/dL. These exposures resulted in 1.06 million disability-adjusted life years (DALYs) attributed to lead exposure in some Indian states.	The authors highlight the need for interventions to reduce lead exposure in India, including reducing lead in paint, improving air quality, and promoting lead-safe recycling practices.	Ericson et al. (2018).
Paint, dust, and water	Indian cities	A Cross-Sectional Study was conducted to evaluate the blood lead levels (BLL) of school children (2247) from 60 schools in ten cities in India. Overall, 82.5% of participants had BLL above ≤4 µg/dl. The overall median (interquartile range) BLL was 8.8 (4.8, 16.4) µg/dl. The highest median BLL was found in Manipal (30.6µg/dl) and the lowest in Dibrugarh (4.8 µg/dl).	The study found that specifically, children of a lower socioeconomic status, poorer anthropometric indicators, and lower hemoglobin levels were associated with higher BLL. The study's findings highlight the need for regular monitoring and surveillance of BLLs in school children across India and include measures such as reducing lead in paint, dust, and water, as well as implementing lead-safe practices in schools and childcare facilities, providing nutritional supplements, iron supplements to reduce lead absorption and promote healthy development.	Kumar, D. (2023).
Paints and Contaminated soil	India	One study found that BLLs (n = 1078) in children less than 3 years of age in Mumbai and Delhi were associated with intellectual impairment. Children between 4-11 months and 12-23 months of age had 84% and 146% higher BLLs, respectively, compared to children less than or equal to 3 months of age.	This finding indicates that children from low-income households may be more exposed to lead due to environmental factors such as lead-based paints and contaminated soil. A low standard of living correlated with a 32.3% increase in BLLs.	Jain, N. B., & Hu, H. (2006).

Playground equipment, particularly in items like toys, furniture, paints, and soil.	Bhutan	A study conducted on potential sources of lead in children's environments in Thimphu, Bhutan. The study aimed to identify sources of lead in the environment at health facilities, early childhood care and development centers, public playgrounds, and schools particularly in items like toys, furniture, paints, and soil. The study utilized an environmental survey from May 2021 to April 2022 to test the amount of lead, and 15 out of 16 tests with excessive lead levels were found in playground equipment at public playgrounds.	The study revealed that excessive amounts of lead were detected in playground equipment, with the most common color containing high lead being yellow. The study emphasizes the detrimental effects of lead exposure on children's health, including neurological impairments, learning problems, poor school performance, and behavioral changes, even at blood-lead levels below 5 µg/dl.	Pem, D. (2022)
Soil	India	Research conducted in Kanpur, India, assessed lead levels in various food products such as leafy vegetables, non-leafy vegetables, fruits, pulses, cereals, and milk. The average daily lead intake through diet was (114 micrograms/day for adults and 50 micrograms/day for children) with tolerable limits set at 250 micrograms/day for adults and 90 micrograms/day for children.	The study revealed that leafy vegetables and pulses had the highest lead content, with children at a higher risk due to their lead intake per unit body weight	Sharma, M. (2005)
House dust and loose, locally sourced spices	India	The study enrolled children aged 1-5 years, with 67 children living in proximity to battery recycling operations (Proximal group) and 68 children living distal to these operations (Distal group) (Total 462 children) in Patna, Bihar. The study collected blood samples from the children to measure BLLs, and environmental samples from their households, including dust, soil, water, spices, and cookware. The study found that the mean BLL for all children was 11.6 µg/dL	The study also found that lead levels in house dust and loose, locally sourced spices were the most likely to increase BLLs. The study also found that lead concentrations were significantly higher in Proximal households, including soil and dust, while lead concentrations in spices were significantly higher in Distal households. The study highlights the need for increased awareness and monitoring of lead content in consumer products, foodstuff, and spices. The study also emphasizes the importance of integrating BLL surveillance of children into routine pediatric care.	Brown, M. J. et al (2022)

Dust	Sri-Lanka	A study highlights that lead levels in dust from schools and preschools in Sri Lanka are of high concern, as dust is a major source of lead exposure for young children, directly affecting their blood lead levels.	It mentions that despite efforts by market leaders to reduce lead levels, paints from small and medium-sized producers in Sri Lanka still contain unacceptably high lead levels.	Rubesinghe et al (2014)
Traffic and pollution	India	A study estimated the BLL in 426 primary school going children of Jodhpur and found that the average BLL were 4.25 µg/dL and 3.5 µg/dL respectively.	The study also found that BLL was higher in children of illiterate mothers, those residing near traffic dense areas, urban region, and studying in government schools of urban region. The study highlights the need for screening and awareness programs regarding potential sources of lead exposure to improve BLL in children.	Sharma, S (2021).
Industrial emission	India	The study on aimed to assess the mean blood lead levels (BLL) in 200 children aged 3-12 years following the phase-out of leaded petrol in Lucknow. The average BLL of the evaluated was 9.3 micrograms per deciliter (µg/dL), with 37% of children having BLL above the higher level of concern (10 µg/dL).	Factors such as low socioeconomic status, proximity of home to traffic density, and mother's illiteracy were identified as contributors to elevated BLLs in Lucknow children. Despite phase out of leaded petrol, industries remain a major source of environmental lead contamination	Ahamed, M. et al (2010).
Industrial emissions/Leaded gasoline	Bangladesh	The study by Mitra et al. (2009) assessed lead poisoning risk in 345 children from one rural and two urban areas in Bangladesh. The study identifying Tongi as a disaster area where 99% of children tested had blood lead levels above 10 micrograms per deciliter (µg/dL).	Industrial emissions and leaded gasoline from two-stroke engine vehicles were identified as potential sources of lead in Tongi. However, over 90% of parents were unaware of the health risks associated with lead exposure.	Mitra et al. (2009)
Industrial emissions and traditional medicines	Bangladesh	A cross-sectional study that aimed to determine the prevalence of lead poisoning and its risk factors in 919 young children in urban and rural communities of Bangladesh. The study found a high prevalence of lead poisoning, ranging from 50% to 99%, in several areas in the metropolitan city of Dhaka. (54%) children had high blood lead levels (>10 µg/dL), with higher levels observed among children aged 5-9 years compared to children of other ages.	The study identified proximity to industry and the use of indigenous medicines as significant predictors of high blood lead levels. The paper highlights the need for regular monitoring of industries, gasoline, and other sources of lead contamination in the country, as well as the need for remedial measures to control industrial discharges of lead in the environment. The study also suggests the importance of educating people about the	Mitra, A. K. (2012).

			problem of lead poisoning in developing countries, including Bangladesh	
Ayurvedic medicines	India	The study by Kalra et al. (2003) estimated the mean BLL and prevalence of lead toxicity in two groups (n=125 and n=65), of children in Delhi. The study found that the mean blood lead level (BLL) in children from schools and an urban slum in Delhi was 7.8 µg/dl. The proportion of children with BLL ≥ 10 µg/dl was 18.4 per cent.	The authors suggest that vehicular pollution may be a major contributing factor in lead contamination of the environment in their setting.	Kalra et al. (2003)
Ayurvedic medicine and cosmetics (Kohl).	India	In a study assessed the blood lead levels of children in pediatric Ayurvedic outpatient clinic in South India. The feasibility study enrolled 29 children with a mean age of 3.8 years with 87% of children having BLLs ≥5 µg/dL using traditional Indian medicine and cosmetics.	About 72% of the children had used Ayurvedic medicine in the past 2 years, and 55% reported kohl use, containing median concentrations above the actionable (BLL). The study emphasized the importance of community relationships and hospital staff collaboration in conducting such research	Keosaian, J et al. (2019).
Ayurvedic medicines	India	A case study involved a retired IAS officer and secretary who presented with symptoms of lead poisoning, including severe weight loss, low hemoglobin levels, loss of appetite, and neurological weakness with wrist drop. Diagnosis was confirmed through blood lead level testing, revealing a high level of 80.9 µg/dL. The source of lead exposure was identified as ayurvedic herbal medications.	The findings underscore the potential dangers of lead contamination in herbal medications and the need for stringent quality control measures in the herbal medication industry to prevent adverse health effects from lead poisoning. The study underscores the importance of recognizing and controlling sources of lead exposure to prevent adverse health effects.	Chambial, S. et al (2017).

Occupational exposure (Battery manufacturing)	India	The case report describes two patients (23- and 25-year-old adults) who were exposed to lead, one in a lead-based battery manufacturing unit and other using set of cosmetics presented with symptoms of intestinal obstruction, chronic abdominal pain, constipation, nausea and a lack of appetite for two months. She was diagnosed with lead poisoning based on high blood lead levels (326.4 µg/L and 463.17 µg/L) and treated with intravenous calcium sodium edetate.	The source of lead exposure was identified as a set of cosmetics without a trademark, which she had used for more than half a year and had a lead concentration of 65.3 mg/kg, significantly higher than the national safety standard. The source of lead exposure was not explicitly stated but was likely related to his occupational exposure in the lead-based battery manufacturing unit. Both patients improved with treatment, and their blood lead levels decreased. This report emphasizes the importance of identifying and addressing sources of lead exposure, particularly in occupational settings, to prevent lead poisoning and its associated health effects.	(Tanwar, P. (2022).
Food (spices)	Bangladesh	The Bangladesh Food Safety Authority implemented a two-part approach to address the issue, starting with an education campaign to warn people about the dangers of lead, followed by raids to analyze turmeric and fine sellers who were selling adulterated products. The proportion of market turmeric samples containing detectable lead decreased from 47 percent pre-intervention in 2019 to 0 percent post-intervention in 2021.	This case serves as an example of how targeted interventions can effectively address public health risks associated with contaminated food products.	Forsyth, J. E. (2023).
Spices	India	A study aimed to determine the concentration of lead (Pb) in eleven spices commonly found in local Indian markets. With Atomic Absorption Spectrophotometry, the research found that most spices had lead levels within acceptable limits, except for cardamom, cinnamon, cloves, coriander, fenugreek, and ginger, which exceeded the maximum permissible limit (MPL) when consumed in 20 grams quantities by an adult.	The study highlights the importance of monitoring heavy metal contamination in spices and emphasizes the need for caution in consuming certain spices to avoid potential harmful accumulation of lead in the body over time. Excessive consumption of these spices, especially in concentrated forms like pickles or dried snacks, could pose health risks due to lead poisoning.	Goswami, K. (2014).

Spices	India, Pakistan, Bangladesh, and Nepal	Hore et al. (20) analyzed 1496 samples of more than 50 spices from 41 countries. The results showed that more than 50% of the spice samples had detectable lead, and more than 30% had lead concentrations greater than 2 ppm (ranging 690-2700 ppm). The highest concentrations of lead were found in spices purchased in the South Asian countries (India, Pakistan, Bangladesh, and Nepal).	Public health professionals and medical providers should also be aware of spices as a potential risk factor for lead exposure. The sources of lead contamination in spices can include lead chromate added to turmeric to enhance its golden color in all these countries. And lead is also given to chilli powders to achieve a rich red hue, and other spices such as saffron, cumin, coriander, and curry powder found in Nepal and Bangladesh.	(Hore et al. 2019).
Spices	Pakistan	The study assessed aflatoxins and selected heavy metals in both branded and non-branded spices in Multan city of Pakistan. The study collected 120 spice samples, including 60 branded and 60 non-branded spices, and found that with non-branded spices showing higher levels of contamination. However, the both kind of spices have, Pb was found beyond the allowable limits in Red Chilli, Turmeric, Black Pepper, and Garam Masala.	The level of lead (Pb) in spices samples from Pakistan is higher compared to findings from different countries. The factors involved were metal-contaminated soil and irrigation water, bioaccumulation of heavy metals in plants, use of toxic metal-containing fertilizers, and contamination during grinding in the high levels of Pb in spices from Pakistan. The study emphasized the need for regulatory measures to control contamination levels and improve the quality of spices available in the market.	Akhtar, S. at al (2020).
Spices	Bangladesh	A study identified various sources like food stored in solder-sealed containers, turmeric, and geophagous materials (soil, clay, or ash) contributing to lead exposure in rural Bangladesh. Turmeric showed lead concentrations up to 100 times higher than the standard Testing Institution's limit of 2.5 µg/g in children, in rural Bangladesh, and its consumption was linked to increase Blood Lead Levels through lead isotopic analysis.	The paper showed the necessity of monitoring and regulating the quality of other consumer goods and agricultural products to prevent further lead contamination	Forsyth et al. (2019)
Cosmetics (Sindoor)	India	Lead levels were assessed in these 140 antenatal women, and they were followed for adverse pregnancy outcomes. The study found women with high BLL ranged from 4 µg/dl-16.9 µg/dl with a mean BLL of 8.1 µg/dl.	The study found that among all pregnant women assessed to have IDA, 99 women were confirmed to be iron deficient. 90% of the women in the study were using cosmetics, especially sindoor, as part of their local religious habits. The women with or without high	Yadav, G et al (2020).

			lead levels were comparable in terms of source of drinking water, type of water supplying pipes, and area of residence (rural/urban).	
Plumbing, Cosmetics and Ayurvedic medicines	India	The study aimed to assess the blood lead levels in the adult population of Jodhpur. The study found a lead mean level of 6.89 ± 9.5 µg/dL in the healthy adult population of Jodhpur, which is higher than the safe limit of 5 µg/dL.	The study also identified common determinants of increased BLL (>5 µg/dl) such as usage of old metallic pipes for plumbing, water consumption without purification, usage of cosmetics and Ayurvedic/herbal medicines. The study highlights the significance of lead exposure from a health perspective and the need for further research to understand the impact of lead exposure on human health.	Chambial, S et al (2015).
Leaded petrol	Pakistan	The study discusses the blood lead levels in children in Pakistan for a period from 1989 to 2002. The study found that blood lead levels declined from 38 microg/dl in 1989 to 15 microg/dl in 2002, highlighting a positive trend in lead exposure reduction over the years. The phasing out of leaded petrol in Pakistan in July 2001 is recognized as a commendable mitigation measure.	The major sources of lead that directly or indirectly resulted in lead exposure of children included leaded petrol, father's occupation in lead-based industry, leaded paint, traditional cosmetics, and remedies. Need for comprehensive assessments to explore other sources of lead exposure that may contribute to adverse health effects in children,	Kadir, M. M (2008).
Water	Pakistan	A study conducted on drinking water in Karachi, the largest city of Pakistan, on the three main sources of water tested: piped water, water from hand pumps and water from tankers. The study found that lead levels in drinking water sources in Karachi are extremely high, particularly in groundwater sources, with almost all of them having higher lead concentrations than the World Health Organization (WHO) acceptable limit of 10 parts per billion (ppb).	The study found that mean lead quantities were greater than 150 ppb in groundwater sources in half of the districts of Karachi, indicating a severe lead contamination issue, The study emphasize the need for thorough testing of underground drinking water for unseen toxic substances such as lead, as these sources can be a significant source of heavy metal toxicity.	Ul Haq et al (2011).

Food and dust	Pakistan	The study by Fatmi et al. (2017) investigated the lead exposure levels in pregnant women, newborns, and children in Karachi, Pakistan. The study collected and analyzed various samples, including blood samples from pregnant women and newborns, food samples, house dust, respirable dust, drinking water, soil around the house, petrol, and engine lubricant samples from nearby gas stations. The study found that lead exposure levels in pregnant women, newborns, and children were significantly higher in areas with high lead levels in drinking water.	The study also identified food, house dust, and respirable dust as potential sources of lead exposure in these groups. The study emphasized the need for further research to identify the sources of lead exposure and to develop interventions to reduce lead exposure levels in these vulnerable groups.	Fatmi, Z et al (2017).
Aluminum cookpots	Afghanistan	The study investigates aluminum cookpots as a source of lead exposure in Afghan refugee children resettled in the United States. The study concludes that aluminum cookpots used by refugee families are likely associated with elevated BLLs in local Afghan children. Many aluminum cookpots contained lead more than 100 parts per million (ppm), with a highest detected concentration of 66,374 ppm.	The study suggest that stainless steel cookpots leached much lower levels of lead than aluminium cookpots. However, this investigation revealed that other U.S. residents, including adults and children, are also at risk of poisoning by lead and other toxic metals from some imported aluminum cookpots. The study recommends replacing imported aluminum cookware with stainless steel as a safer alternative.	Fellows, K. M (2022).

Understand the Scope/issue

In conclusion, lead exposure in children is a significant public health concern in South Asian countries, and the sources of lead exposure vary. However, there is no known safe blood lead concentration; even blood lead concentrations as low as 3.5 µg/dL may be associated with decreased intelligence in children, behavioural difficulties, and learning problems (World Health Organization (2016). The sources of lead exposure vary, includingpaints, spices, ayurvedic medicines, and lead-contaminated soil/food and so on. However, based on the Pure Earth'sRapid Market Screening Program (2021-2023), Metal food ware (51%), Ceramic food ware (45%), Paints (41%), Toys (13%), Cosmetics (12%) all had lead above the permissible limits not been research and assed yet (Pure Earth.(2023). Additionally, further research is needed to identify other potential sources of lead exposure and to develop effective interventions to reduce lead exposure in children. It is crucial to implement stricter regulations on lead content in these products and to raise awareness among parents and caregivers about the risks of lead exposure.

Table 2. Types of consumer products found to contain elevated lead levels in South Asia

Product Category	Examples	Potential Exposure (BLL)	Primary Exposure Pathway(s)
Foods	Leafy and non-leavy vegetables, pulses, pickles, dried snacks and	>10 µg/dL	Ingestion
Spices	Turmeric, and other spices	ranging 690-2700 ppm	Ingestion
Health Remedies	Rasa Shastra Ayurvedic medicines (India)	>10 µg/dL to 80.9 µg/dL	Ingestion
Cookware/Dish ware	Traditional "Kansa"/brass ware (South Asia) and aluminum in India	100 parts per million (ppm) to 66,374 ppm.	Lead can leach into food or drinks
Cosmetics and Cultural Powders	Kohl, Kajal, Surma and Tiro (South Asia, Africa, and the Middle East) Sindoor, Tika and Kum Kum (South Asia)	4 µg/dl-16.9 µg/dl	Hand-to-mouth contact
Toys/Novelty Items	Metal/painted parts of toys and novelty items	>5 µg/dl	Mouthing/ ingestion
Production and Informal Battery Recycling	Toxic battery recycling sites in India	326.4 µg/L and 463.17 µg/L	Inhalation
Water	Drinking water above the permissible limits (Pakistan, India, and Bangladesh)	> 150 ppb	Ingestion
Paint	Chips, and enamel paint (Nepal, India, Bangladesh, and Pakistan)	<90ppm to 10000ppm	Ingestion

Note: Inhalation is not a likely exposure pathway for lead-contaminated products unless such products are burned such as fossil fuel.

Table 3. Based on the information provided in the literature review on South Asian lead exposure and the Regulatory Measures

Country	Regulatory and Policy Measures	Research implications
India	The government has taken measures to: -ban the production, sale, and use of lead-based paints. -Regulates the recycling of lead batteries to prevent the release of lead into the environment. -No standards for lead in cookware and food. -Standards for occupational exposure within the permissible limits to lead dust and fumes in the work environment is 0.45 mg/m^3 (short-term exposure limit (15 min) -Hazardous waste with lead concentration ≥5000 mg/kg is considered hazardous waste under these regulations.	India faces a significant lead exposure challenge, with high levels in paints, spices, and consumer products. Lead poisoning, especially in lower-income children, poses health risks and long-term well-being concerns. Disparities between organized and unorganized sectors in paint lead content highlight the need for stricter regulations and improved market surveillance. Addressing lead sources, like contaminated soil, lead paints, and traditional medicines, is crucial to prevent poisoning and its effects. Interventions, including regulatory reforms, heavy metal monitoring in spices, and targeted programs for vulnerable groups, are essential to mitigate lead exposure in India. Emphasizing lead level monitoring in food and lead-safe practices is vital to safeguard population health, especially children, and ensure a healthier future.

Nepal	-The government implemented regulations in 2015 on lead content in household and decorative paint, with severe penalties for non-compliance. -In 2016, the government aimed to regulate the import, transport, and recycling of lead-bearing waste while minimizing environmental and health risks. In November 2019, the AEPC invited Expressions of Interest for the project "Permanent Establishment and Operation of a ULAB Management and Recycling Plant in Nepal". -No Standards for limits for lead in different food commodities, but specific guideline values for 3 lead compounds in the air (0.5 to 1 microgram/cubic metre per hour) plan to manage lead pollution.	Nepal faces a critical lead exposure situation, especially among children, with high blood lead levels linked to enamel paints and battery recycling. The prevalence of elevated blood lead levels in children is concerning, requiring immediate action. Lead exposure poses severe health risks, particularly for socially disadvantaged groups. Addressing lead-containing paints is paramount to protect children's health. Comprehensive measures, including regulatory reforms, public education, and monitoring of lead in consumer products, are essential to mitigate lead exposure in Nepal. The government has implemented some regulations, such as limits on lead content in paints and managing lead-bearing waste, but more is needed to safeguard public health, especially for children.
Bangladesh	Bangladesh has adopted laws to address lead in paint – there is now a 90-ppm lead limit for decorative paints -Moreover, the Bangladesh Food Safety Authority has started enforcing rules against lead in food, distributing flyers to people in wholesale markets selling turmeric to explain the hazards of lead chromate powder used on turmeric. -Currently (as of 2021), there is a lack of vehicle battery recycling regulations and law enforcement agencies do not monitor lead emissions via industrial waste disposal. -Regulations to omit lead in cookware have not yet been formulated. -No Standards for occupational exposure -Dhaka Division accounts for 45% of Smelting activities, and Bangladesh has 15 jurisdictions which cover common issues in mining laws and regulation	Bangladesh faces a pressing lead exposure issue, with high levels found in home paints, industrial soils, food products, and geophagous materials. A significant proportion of paints exceed safe lead levels, and lead is present in food like fish, vegetables, and turmeric. The Bangladesh Food Safety Authority's approach has been effective in reducing lead in turmeric, but further action is necessary to address contamination in other sources. Targeted interventions have proven effective, but monitoring and regulating consumer goods and agricultural products is essential. Urgent action is required to regulate the production and sale of paints with excessive lead content. Bangladesh has implemented a national action plan, adopted laws to address lead in paint, and started enforcing rules against lead in food. However, gaps remain in vehicle battery recycling regulations, lead emissions monitoring, and occupational exposure standards. Prioritizing this issue can safeguard public health and ensure a healthier future.
Bhutan	- Ministry of Health studying lead exposure in children from paint, toys, playground equipment, furniture, and soil - No established safety standard for lead content in paints	Bhutan faces a serious challenge with lead exposure, especially in children, due to lead-based paint on public playgrounds. Urgent action is needed to protect children's health, as lead exposure can cause permanent damage, particularly in those under five. Safer paint alternatives, regular monitoring of lead levels, and awareness campaigns are crucial to address this issue and safeguard children's well-being in Bhutan.

Pakistan	-The Pakistan Standards & Quality Control Authority (PSQCA) banned the manufacture, import, export, distribution, sale, and use of lead paints containing total lead concentrations exceeding 100 ppm in 2017. -Additionally, the National Environmental Protection Agency (NEPA) regulates the use of lead in various industries, including automotive, construction, electronics, and others. -No other standards guidelines for food, cookware, smelting and mining activities. -No regulation for battery recycling and occupational exposure.	Pakistan faces a significant lead exposure challenge, with lead found in non-branded spices and the phasing out of leaded petrol as a mitigation measure. However, comprehensive assessments are needed to explore other lead sources, such as paints, cosmetics, and remedies, which may impact children's health. Severe lead contamination in Karachi's groundwater emphasizes the importance of testing drinking water for toxic substances. Higher lead exposure in pregnant women, newborns, and children in high-lead water areas underscores the need for further research and interventions to reduce exposure in vulnerable groups. Pakistan has banned lead paint manufacturing and use, and the National Environmental Protection Agency regulates lead in various industries, but more standards and regulations are needed, particularly for battery recycling and occupational exposure.
Afghanistan	-One notable initiative involve Community health advocates provide education and prevention aimed at reducing lead exposure among Afghan arrivals. These programs focus on providing information about the sources of lead exposure, such as traditional cookware from Afghanistan, and offering practical solutions like exchanging aluminum cookware for safer alternatives like Instant Pots.	Afghanistan faces a significant lead exposure issue due to the use of aluminium cookpots, particularly harmful to children's health. Studies show stainless steel cookpots leach significantly lower levels of lead, emphasizing the need to transition to stainless steel. A strong policy advocating for the replacement of aluminium cookware with stainless steel is crucial to mitigate lead exposure risks and safeguard public health. By promoting stainless steel cookware, Afghanistan can reduce lead exposure and ensure a healthier environment for its residents.
Sri Lanka	- Standard for lead in drinking water set at 10 μg/l, aligning with WHO guidelines - Environmental protection licensing system in place for emissions from batteries and electronic equipment - Center for Environmental Justice worked to reduce lead content in paints - No standards on lead in cookware, food, or occupational exposure	Sri Lanka faces a significant lead exposure challenge, with a study revealing high lead levels in paints and dust, impacting children's health. Despite some compliance with legal standards, the use of lead chromate pigments and high lead levels in paints from smaller producers remain concerns. Stricter regulations and enforcement are crucial to protect public health, especially vulnerable populations like children. Aligning with WHO guidelines, Sri Lanka sets its standard for lead in drinking water at 10 μg/l. The country also has an environmental protection licensing system for emissions and substances like batteries and electronic equipment. Efforts by the Center for Environmental Justice have helped reduce lead content in paints, aiming to ensure a healthier future for all.

Source: Lead Regulations Profiles – Global Lead Forum, (2022)

The major gaps identified in the research are as follows:

1. **Limited Understanding of Lead Exposure Pathways**: The literature review highlights a lack of comprehensive understanding of the various pathways through which lead exposure occurs in South Asian countries. This gap indicates a need for further research to identify and quantify the different sources of lead exposure, such as paints, spices, food items, and other consumer products, to develop targeted interventions effectively.
2. **Inadequate Regulatory Frameworks:** The findings suggest a deficiency in the regulatory frameworks governing lead content in consumer products such as spices, household items and cookware in South Asian countries. The research also underscores the necessity for stricter regulations and enforcement mechanisms to control lead levels in paints.
3. **Insufficient Public Awareness and Education:** The literature review reveals a lack of sufficient awareness among communities, healthcare providers, policymakers, and the public about the dangers of lead exposure in South Asian countries. This gap emphasizes the importance of increasing educational campaigns and awareness programs to inform individuals to take preventive measures against lead exposure.
4. **Limited Research on Health Impacts and Interventions**: There is a gap in research focusing on the health impacts of lead exposure and the effectiveness of interventions in mitigating these risks in South Asian populations. This gap highlights the need for further studies to assess the health outcomes associated with lead exposure and to evaluate the efficacy of targeted interventions, such as product testing, public health campaigns, and regulatory measures, in reducing lead-related health risks.

Addressing these gaps is crucial for effectively addressing the lead exposure issue in South Asian countries and safeguarding the health and well-being of vulnerable populations.

References

1. Ahamed, M., Verma, S., Kumar, A., & Siddiqui, M. K. (2010). Blood lead levels in children of Lucknow, India. *EnvironmentalToxicology: An International Journal*, *25*(1), 48-54.
2. Akhtar, S., Riaz, M., Naeem, I., Gong, Y. Y., Ismail, A., Hussain, M., & Akram, K. (2020). Risk assessment of aflatoxins and selected heavy metals through intake of branded and non-branded spices collected from the markets of Multan city of Pakistan. *Food Control*, *112*, 107132.
3. Big Olaf. (2001). Current status of lead in India.
4. Brown, M. J., Patel, P., Nash, E., Dikid, T., Blanton, C., Forsyth, J. E., ... & Shrivastava, A. (2022). Prevalence of elevated bloodlead levels and risk factors among children living in Patna, Bihar, India. 2020. *PLOS Global Public Health*, *2*(10), e0000743.
5. Center for Global Development. (2023). A call to action to end childhood lead poisoning worldwide. Center for GlobalDevelopment
6. Centre for Environmental Justice (CEJ), & Occupational Knowledge International (OKI). (2021). Lead Content of Paints in SriLanka October 2021.
7. Chambial, S., Bhardwaj, P., Mahdi, A. A., & Sharma, P. (2017). Lead poisoning due to herbal medications. *Indian journal ofclinical biochemistry*, *32*, 246-247.
8. Chambial, S., Shukla, K. K., Dwivedi, S., Bhardwaj, P., & Sharma, P. (2015). Blood lead level (BLL) in the adult population ofJodhpur: a pilot study. *Indian Journal of Clinical Biochemistry*, *30*, 357-359.
9. Ciocan, C., Mansour, I., Beneduce, A., Loia, R. C., Milanesio, N., Declementi, M., ... & Pira, E. (2021). Lead poisoning fromAyurvedic treatment: a further case. *La Medicina del Lavoro*, *112*(2), 162.
10. Dartmouth College. (2024). Lead: Versatile metal, long legacy. Toxic Metals..
11. Dhimal, M., Karki, K. B., Aryal, K. K., Dhimal, B., Joshi, H. D., Puri, S., ... & Kuch, U. (2017). High blood levels of lead inchildren aged 6-36 months in Kathmandu Valley, Nepal: A cross-sectional study of associated factors. *PLoS One*, *12*(6), e0179233.
12. Erbele, P., Pem, D., Tobgay, P., Pelden, S., Gurung, M. S., Ugen, S., & Erbele, K. (2019). Blood Lead Levels in children 2 through59 months old in Bhutan. *Bhutan Health Journal*, *5*(2), 7-14.
13. Ericson, B., Hu, H., Nash, E., Ferraro, G., Sinitsky, J., & Taylor, M. P. (2021). Blood lead levels in low-income and middle-incomecountries: a systematic review. *The Lancet Planetary Health*, *5*(3), e145-e153.
14. ESDO & IPEN. (2021). Lead in Solvent-Based Paints for Home Use in Bangladesh October 2021 National Report.
15. Fatmi, Z., Sahito, A., Ikegami, A., Mizuno, A., Cui, X., Mise, N., ... & Kayama, F. (2017). Lead exposure assessment among pregnant women, newborns, and children: case study from Karachi, Pakistan. *International Journal of Environmental Research and Public Health*, *14*(4), 413.
16. Fatmi, Z., Sahito, A., Ikegami, A., Mizuno, A., Cui, X., Mise, N., ... & Kayama, F. (2017). Lead exposure assessment among pregnant women, newborns, and children: case study from Karachi, Pakistan. *International Journal of Environmental Research and Public Health*, *14*(4), 413.
17. Fellows, K. M., Samy, S., Rodriguez, Y., & Whittaker, S. G. (2022). Investigating aluminum cookpots as a source of lead exposurein Afghan refugee children resettled in the United States. *Journal of Exposure Science & Environmental Epidemiology*, *32*(3), 451-460.
18. Forsyth, J. E., Baker, M., Nurunnahar, S., Islam, S., Islam, M. S., Islam, T., ... & Rahman, M. (2023). Food safety policy enforcement and associated actions reduce turmeric lead chromate adulteration

across Bangladesh. *Environmental Research*, 116328.
19. Forsyth, J. E., Weaver, K. L., Maher, K., Islam, M. S., Raqib, R., Rahman, M., ... & Luby, S. P. (2019). Sources of blood lead exposure in rural Bangladesh. *Environmental science & technology*, *53*(19), 11429-11436.
20. Global Lead Forum. (2022). Lead Regulations. Country profiles.
21. Goswami, K., & Mazumdar, I. (2014). Lead poisoning and some commonly used spices: an Indian scenario.
22. Gunturu, K. S., Nagarajan, P., McPhedran, P., Goodman, T. R., Hodsdon, M. E., & Strout, M. P. (2011). Ayurvedic herbal medicine and lead poisoning. *Journal of hematology & oncology*, *4*, 1-6.
23. Hore, P., Alex-Oni, K., Sedlar, S., & Nagin, D. (2019). A spoonful of lead: A 10-year look at spices as a potential source of leadexposure. *Journal of Public Health Management and Practice*, *25*, S63-S70.
24. Institute for Health Metrics and Evaluation. (2019). Lead exposure — Level 3 risk. Global Burden of Disease (GBD) summaries.
25. Jain, N. B., & Hu, H. (2006). Childhood correlates of blood lead levels in Mumbai and Delhi. *Environmental healthperspectives*, *114*(3), 466-470.
26. Jain, N. B., & Hu, H. (2006). Childhood correlates of blood lead levels in Mumbai and Delhi. *Environmental healthperspectives*, *114*(3), 466-470.
27. Kadir, M. M., Janjua, N. Z., Kristensen, S., Fatmi, Z., & Sathiakumar, N. (2008). Status of children's blood lead levels in Pakistan: implications for research and policy. *Public health*, *122*(7), 708-715.
28. Keosaian, J., Venkatesh, T., D'Amico, S., Gardiner, P., & Saper, R. (2019). Blood lead levels of children using traditional Indian medicine and cosmetics: A feasibility study. *Global Advances in Health and Medicine*, *8*, 2164956119870988.
29. Khanal, M., & Adhikari, J. (n.d). *Studies Show High Levels of Lead Contamination in Nepal's Children.
30. Kumar, D., Awasthi, S., Mahdi, A. A., Singh, S., Pandey, A. K., Agarwal, G. G., ... & Singh, C. M. (2023). Assessment of bloodlead level of school children in 10 cities of India: A cross-sectional study. *Indian Journal of Pediatrics*, 1-7.
31. Majumder, A. K., Al Nayeem, A., Islam, M., Akter, M. M., & Carter, W. S. (2021). Critical review of lead pollution inBangladesh. *Journal of Health Pollution*, *11*(31), 210902.
32. Mehta, V., Midha, V., Mahajan, R., Narang, V., Wander, P., Sood, R., & Sood, A. (2017). Lead intoxication due to ayurvedicmedications as a cause of abdominal pain in adults. *Clinical Toxicology*, *55*(2), 97-101.
33. Mitra, A. K., Ahua, E., & Saha, P. K. (2012). Prevalence of and risk factors for lead poisoning in young children inBangladesh. *Journal of Health, Population, and Nutrition*, *30*(4), 404.
34. Mitra, A. K., Haque, A., Islam, M., & Bashar, S. A. M. K. (2009). Lead poisoning: an alarming public health problem inBangladesh. *International journal of environmental research and public health*, *6*(1), 84-95.
35. Mohanty, A., Budhwani, N., Ghosh, B., Tarafdar, M., & Chakravarty, S. (2013). Lead content in new decorative paints inIndia. *Environment, development and sustainability*, *15*, 1653-1661.
36. Obeng-Gyasi, E. (2019). Sources of lead exposure in various countries. *Reviews on environmental health*, *34*(1), 25-34.
37. Pem, D., Wangdi, U., Gyeltshen, N., Wangdi, K., Wangdi, C., & Erbele, P. (2022). Potential sources of lead in children's environments, Thimphu, Bhutan. *Bhutan Health Journal*, *8*(2), 13-17.
38. Pure Earth. (2023). Pure Earth RMS Final Report.

39. Rehman, K., Fatima, F., Waheed, I., & Akash, M. S. H. (2018). Prevalence of exposure of heavy metals and their impact on healthconsequences. *Journal of cellular biochemistry*, *119*(1), 157-184.
40. Rizvi, S. H. H., Mahmood, S., Younes, I., Shafiq, M., Nasir, J., & Mansha, M. Review of lead poisoning in children of Pakistan: ageographical perspective.
41. Rolston, D. D. (2011). Uncommon sources and some unsual manifestations of lead poisoning in a tropical developingcountry. *Tropical medicine and health*, *39*(4), 127-132.
42. Rubesinghe, C., Brosché, S., Denney, V., Clark, S., & Weinberg, J. (2014). National Report Lead in Household Dust in Srilanka.
43. Sah, B. K. (2017). High blood levels of lead in children aged 6-36 months in Kathmandu Valley, Nepal: A cross-sectional studyof associated factors. Journal Name, Volume(Issue), Page numbers.
44. Sharma, M., Maheshwari, M., & Morisawa, S. (2005). Dietary and inhalation intake of lead and estimation of blood lead levels inadults and children in Kanpur, India. *Risk Analysis: An International Journal*, *25*(6), 1573-1588.
45. Sharma, P., Chambial, S., & Shukla, K. K. (2015). Lead and neurotoxicity. *Indian Journal of Clinical Biochemistry*, *30*(1), 1-2.
46. Sharma, S., Mitra, P., Bhardwaj, P., & Sharma, P. (2021). Blood lead level in school going children of Jodhpur, Rajasthan,India. *Turkish Journal of Biochemistry*, *46*(4), 393-398.
47. Sherchand, O., Mehta, K. D., Poudel, P., Deo, B., & Baral, N. (2014). Blood Lead Levels of Primary School Children in Kathmandu Municipality, Nepal. *Journal of Institute of Medicine Nepal (JIOMN)*, *36*(3).
48. The Third Pole. (2022). South Asia's toxic battery recycling problem.
49. Toxics Link & International Pollutants Elimination Network (IPEN). (2018). Lead in Paints in India Concerns and Challenges.
50. Ul Haq, N., Arain, M. A., Badar, N., Rasheed, M., & Haque, Z. (2011). Drinking water: a major source of lead exposure in Karachi,Pakistan. *EMHJ-Eastern Mediterranean Health Journal, 17 (11), 882-886, 2011*.
51. United Nations Environment Programme. (2024). Global Alliance to Eliminate Lead Paint.
52. Whittaker, S., Rodriguez, Y., Fellows, K., Samy, S., & DeRoo, D. (2022). Lead in imported cookware: An emerging concern forlead exposure in Afghan refugee children. Journal of Exposure Science and Environmental Epidemiology, 32(2), 157-159
53. World Health Organization. (2016). The public health impact of chemicals: Knowns and unknowns. International Programme onChemical Safety.
54. World Health Organization. (2022). Lead in drinking-waters: Technical brief.)
55. World Health Organization. (2022). Update on the global status of legal limits on lead in paint, December 2021. Geneva.
56. Xu, T., Lin, K., Cao, M., Miao, X., Guo, H., Rui, D. & Yan, Y. (2023). Patterns of global burden of 13 diseases attributable to leadexposure, 1990–2019. *BMC Public Health*, *23*(1), 1-14.
57. Yadav, G., Chambial, S., Agrawal, N., Gothwal, M., Kathuria, P., Singh, P., ... & Sharma, P. P. (2020). Blood lead levels in antenatal women and its association with iron deficiency anemia and adverse pregnancy outcomes. *Journal of Family Medicine and Primary Care*, *9*(6), 3106-3111.

Bridging the Gap

The World Health Organization (WHO) has identified lead as a priority chemical hazard that should be included in national drinking-water quality standards and monitored as part of the global effort to eliminate lead paint. The WHOGuideline for clinical management of exposure to lead aims to support physicians in making informed decisions regarding lead poisoning from lead in paint, which is preventable and has cost-effective and technically feasible alternatives (World Health Organization. (2022).

The Center for Global Development's report, "A Call to Action to End Childhood Lead Poisoning Worldwide," underscores the significant health, learning, and economic toll attributable to lead poisoning, particularly in low- andmiddle-income countries (LMICs). The report concludes that lead poisoning poses a severe and preventable threat to health, education, and development prospects worldwide, with the burden falling disproportionately on LMICs (Center for Global Development. (2023).

The International Lead Poisoning Prevention Week (ILPPW) is an annual campaign of the Lead Paint Alliance, which aims to raise awareness about the health effects of lead exposure, highlight efforts to prevent lead exposure, particularly in children, and promote the use of technically feasible alternatives to lead in paint. ILPPW 2022 was asuccessful global campaign! Last years, the aim of the ILPPW 2023 of action is to raise awareness about the health effects of lead exposure, to highlight the efforts of countries and partners to prevent lead exposure, and to urge furtheraction to eliminate lead paint through regulatory action at a country level (United Nations Environment Programme. (2024).

*As the **Advanced Study Institute of Asia at SGT University**, we have a unique opportunity to contribute to this global effort by organizing a conference on lead poisoning, followed by colloquia on progress and policy and a workshop with Campbell South Asia on evidence gap maps. These initiatives can help raise awareness, promote evidence-based practices, and inform policies to prevent lead exposure and mitigate its health impacts. Prior to the conferencein February, some essential steps can be implemented to establish a robust foundation for the event. These steps will focus on organizing workshops, fostering collaborations, and organizing a roundtable for meaningful discussions and interactions during the Lead Conference.*

Thank You

Advanced Study Institute of Asia