Case Report

Indian Journal of Emergency Medicine
Volume 9 Number 3, July - September 2023
DOI: http://dx.doi.org/10.21088/ijem.2395.311X.9323.11

Occupational Exposure of Lead in a 15 year Old Girl

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How to cite this article:
Shebin Althaf Ali, Siddharth Verma, Kishalay Datta/Occupational Exposure of Lead in a 15 year Old Girl/Indian J Emerg Med 2023;9(3):111 – 113.

Abstract

Lead is a toxic element found in the environment which leads to major complications once it enters the body in more than normal levels, affecting multiple organs and systems of the body. In this case report, we discuss a female girl child who got occupational exposure from her family pottery and toy business, we discuss the diagnosis, review of literature and management of lead toxicity.

Keywords: Lead Toxicity; EDTA Chelation; Succimer; Blood Lead Level.

INTRODUCTION

Lead toxicity is a severe medical condition with potential multi organ disorder and even death if lead is present in large amounts in the blood, representing a major health problem.[1] Lead is a soft, bluish-gray metal existing in both inorganic and forms[1] Lead toxicity in the pediatric population is an important health problem, accounting for around 0.6% of the total global burden of the disease according to the World Health Organization[2,3] As per the National Health and Nutrition Examination Survey recent data, approximately 2.6% of children between 1-5 years of age, presented blood lead level above 5µg/dL.[2,3] The ways of contamination include prenatal exposure, inhalation, ingestion and dermal exposure, but the most important and frequent ones are ingestion and inhalation.[1] In this case report, we discuss the difficulty in diagnosis, review of literature and management of lead toxicity in a female child with occupational exposure.

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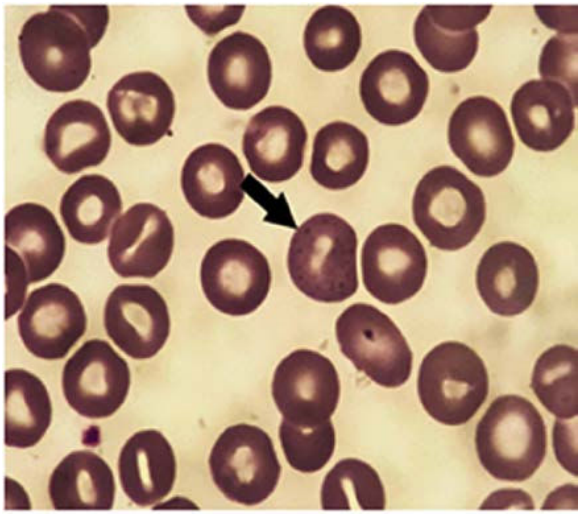
Received on: 15-03-2023
Accepted on: 20-04-2023

CASE

A 15 year old female child was brought to the emergency department with complaints of pain in the abdomen since last 1 week, associated with nausea and vomiting and intermittent fever. On examination, her vitals were stable with dull aching abdominal pain, and the patient had yellowish sclera with pallor. Her recent medical history revealed she had a travel history for the last 2 days where she consumed outside food and water. She was an active, fully vaccinated female child, for the last 7 days she is unwell. 1 month back, she underwent appendectomy for similar abdominal pain complaints. Her parents belong to low socioeconomic status and are into pottery and toy production.

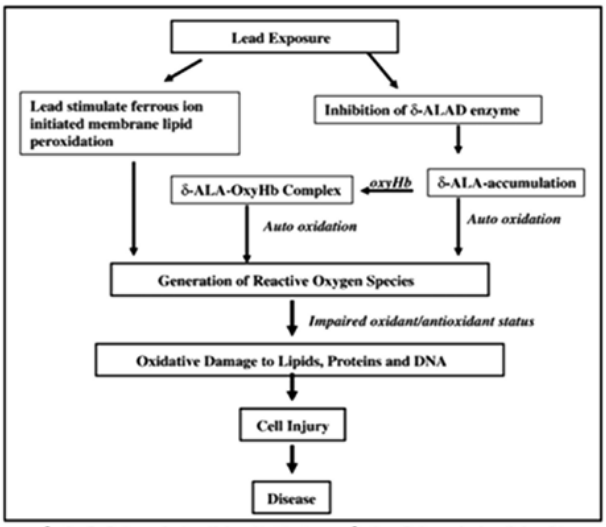
The routine laboratory investigations - hypochromic anemia (hemoglobin (Hb): 9.9g/dl, hematocrit (Htc): 31.6%, medium cellular volume (MCV): 75.6 fL), increased level of liver transaminases (alanine-aminotransferase (ALAT): 178. 4U/L, aspartate-aminotransferase (ASAT): 83U/L, gamma-glutamyl-transferase (GGT): 148U/L), conjugated hyperbilirubinemia (direct bilirubin (DBi): 1.64mg/dL), hepatitis A and E antigen-negative. Her peripheral smear has revealed "basophilic stippling" in the red blood cell. Blood lead levels were investigated and were found to be raised.



Along with hydration therapy and liver protective measures, the patient was treated initially with sodium calcium edetate (disodium calcium ethylenediamine-tetra-acetic acid, EDTA) 40 mg/kg intravenously every 12 h for 48 hours and then commenced succimer (2,3 dimercaptosuccinic acid, DMSA) 30 mg/kg orally for 5 days followed by 20 mg/kg for next further 14 days. Patient blood parameters improved, and blood lead levels settled. Patient was discharged on the 5th day with oral medications and during the further follow up, the patient's condition improved. Her parents were counseled about the potential risk of lead toxicity from the pottery and toy making process and educated for various measures to prevent lead toxicity for the patient and other family members involved in the process.

DISCUSSION

The patient was diagnosed with lead toxicity due to occupational exposure to pottery and toys. The half-life of lead in the human body is between 30 and 40 days in men, while in children and pregnant women it might be longer.[1] The two major ways of lead toxicity is through inhalation and ingestion. Ingestion routes are more common in children because of their tendency to chew everything.[1] In our patient, the possible exposure to lead might be by inhalation and ingestion as occupational risk due to the fact that our patient helped her parents in the pottery and toy making process. The mechanism that lead binds to the sulfhydryl group of proteins leading to toxicity for multiple enzyme systems.[1] Other occupations like demolition, remodeling and renovation projects, rubber and plastic industries, battery manufacturing and recycling plants, ammunition and manufacturing, automotive/radiator repair, lead soldering and welding, painting, plumbing are also at increased risk of lead toxicity.[1]



δ-ALAD: Delta-aminolevulinic acid dehydratase, δ-ALA: Delta-aminolevulinic acid, OgyHb: Oxy-hemoglobin

The clinical presentation of lead poisoning involves hematologic, nervous, renal, gastrointestinal systems impairment like - weakness, anemia, anorexia, vomiting, constipation, abdominal pain, hypertension, hyperirritability, reduced IQ, shortened attention span, increased antisocial behavior, reduced educational attainment, ataxia, stupor, coma, convulsions and even death.[1] (The possible mechanism of lead toxicity is described with the image above).

The diagnosis is based on the blood lead concentration in association with clinical symptoms.[4] This measurement is for inorganic lead. Urinary lead excretion following a dose of sodium calcium edetate has been used to estimate the organic burden in the body.[5] Other measures like urinary ALA excretion and ALAD activity, but are not used routinely. Lead exposure for the last 3 months can be estimated by zinc protoporphyrin (ZPP) levels. Routine monitoring of blood lead level must be advised to patients who are at risk of lead poisoning.

The mainstay aspect in management of lead toxicity is the removal of the patient from the source

of exposure.[6] The most widely used chelating agent is sodium calcium edetate (EDTA) because of its capacity to exchange calcium for lead.[7] The resulting lead chelate is rapidly excreted in the urine. The dosage is around 50–80 mg/kg in 1–2 doses/day for 2–5 days. More recently, succimer (2,3-dimercaptosuccinic acid, DMSA) has been increasingly used for heavy metal poisoning[8] The dosage is around 10–30 mg/kg/day for the first 5–7 days, and then at a reduced dose for a further 10–14 days.

CONCLUSION

Lead toxicity is a major health concern in the pediatric population. It is mostly due to the "chewing of anything" habits in children leading to small continuous exposure of lead into the body. Symptoms of lead toxicity vary, diagnosis is made by blood lead levels. Treatment of heavy metal poisoning including lead, is by chelating agents. Sodium EDTA and succimer are chelating agents used in the treatment of lead toxicity. The mainstay in treatment of lead toxicity is removal of toxic elements from source of exposure.

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