

CASE REPORT

# Lead toxicity from Ayurvedic medications: a case report

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## ABSTRACT

**Background:** Lead toxicity in adults is rare and often presents with vague symptoms leading to diagnostic uncertainty. Occupational exposure can guide the clinician toward the correct diagnosis, but when no exposure is identified, there may be a delay in identifying the condition.

**Case Presentation:** We present a case of lead poisoning in a patient using Ayurvedic medicines. Ayurvedic medicine is a formal traditional medical system in India and South Asia with traditions dating back over 3,000 years. Ayurvedic medications, a component of Ayurvedic practice, are considered natural but can contain heavy metals such as lead, mercury, and arsenic.

**Conclusion:** Ayurvedic medications are an infrequent cause of lead poisoning, but this may increase as nontraditional, and natural medicines become more popular. Clinicians should consider the possibility of lead poisoning in patients who have used Ayurvedic medications and present with nonspecific symptoms.

**Keywords:** Ayurvedic medications, case report, lead toxicity, heavy metals.

## Introduction

Lead toxicity is often difficult to diagnose due to nonspecific symptoms. According to the 2020 Annual Report of the National Poison Data System of the American Association of Poison Control Centers, there were 2,100 cases of lead exposure with occupational exposure accounting for most adult cases [1]. Blood lead levels (BLL) have fortunately decreased over the years, as monitored by the Centers for Disease Control and Prevention's (CDC) state-based Adult Blood Lead Epidemiology and Surveillance Program [2]. However, as occupational exposures decrease, it is important to consider other potential sources of lead toxicity. Lead-containing medications are an increasing and underrecognized source of lead and other heavy metal exposure. This case report presents a case of lead toxicity resulting from Ayurvedic medications purchased in India to treat diabetes.

## Case Presentation

A 48-year-old man with a history of hypertension and diabetes presented to a medical toxicology clinic due to an elevated BLL of 78 µg/dl, which was incidentally discovered during the evaluation of recurrent abdominal pain. The patient was originally from India and had lived in the United States for an unspecified amount of time. During a trip back to India, the patient started taking Ayurvedic medicines, which included one teaspoon

of granular powder and two tablets per day of a pill reportedly made with gold and pearl. Shortly after that, he also started taking a brown liquid medication.

Two years after starting the Ayurvedic medications, the patient developed abdominal pain and sought care at the emergency department on multiple occasions. He underwent an extensive workup, including an unremarkable computed tomography scan of the abdomen and pelvis and upper and lower endoscopies. Laboratory testing revealed normocytic and normochromic anemia and normal basic metabolic panel, aspartate, and alanine transaminases. Notably, the patient had elevated levels of urine porphobilinogen, coproporphyrin, and delta-aminolevulinic acid. Given his history of occupational exposure in an electroplating plant, he was tested for heavy metal toxicity, including lead. The patient's BLL was found to be 78 µg/dl (reference range: <3.5 µg/dl). As a result, the patient underwent several courses of

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intravenous chelation therapy with calcium disodium ethylenediaminetetraacetic acid.

The patient was lost to follow-up for 2 years, during which time he remained asymptomatic. On follow up, his BLL was again found to be elevated at 77 µg/dl, prompting a referral to a medical toxicologist. During this visit, the patient's use of Ayurvedic medicines was discovered. Analysis of the substances using inductively coupled mass spectroscopy at the National Medical Services Laboratory revealed that the tablets contained 43,000 µg/g of lead, while the powder contained 3,700 µg/g, and the liquid contained 11,000 µg/l. The patient was subsequently treated with succimer for 5 days.

## Discussion

Ayurvedic medicine is a formal traditional medical system in India and South Asia that dates back over 3,000 years and focuses on a holistic approach to health. Although the emphasis of Ayurvedic medicine is on diet, exercise, and spiritual well-being, medicines also play a significant role. Herbal medicines are the most significant class and while considered natural, often contain heavy metals. It is estimated that of the approximately 6,000 Ayurvedic medicines, 35%-40% contain at least one heavy metal with many herbal preparations containing toxic levels of lead, mercury, arsenic, and cadmium [3-5].

Heavy metals can contaminate herbal medicines in several ways, including natural contamination, accidental introduction during processing, and deliberate introduction during a manufacturing process known as *rasa shastra*. Some Ayurvedic practitioners believe adding metals can be beneficial to health without toxicity. Two studies analyzing the lead, arsenic, and mercury content of ayurvedic medications purchased in stores and on the internet found harmful levels of at least one metal in 20% of these medications with *rasa shastra* products twice as likely to contain metal. Bolan et al. [4] compared the metal concentrations between six herbal medicines and six Ayurvedic medicines and found the concentrations of lead, mercury, and arsenic to be significantly higher in the Ayurvedic medications with lead being the most prevalent [6].

Lead toxicity can present with various symptoms in adults, from nonspecific concerns such as fatigue, headache, and abdominal pain to central and peripheral neurologic deficits. In 2012 in South Africa there was an outbreak of 12 cases of lead poisoning related to Ayurvedic medications with gastro-intestinal (GI) symptoms and fatigue being the most common symptoms reported [7]. Between 2000 and 2003, 12 cases of lead toxicity related to Ayurvedic medications were reported to the CDC with GI symptoms being the predominant complaint [8]. These patients may also have microcytic anemia, often prompting extensive GI workups prior to being diagnosed with lead poisoning [9].

The increasing popularity and availability of herbal medicines, including Ayurvedic medications, are attributed to a greater awareness of traditional practices and widespread availability through the Internet and health food stores [10]. There is, unfortunately, a misconception that herbal medicines are "natural" and without

adverse effects. Furthermore, herbal medications are classified as dietary supplements and are not subject to the regulatory oversight of the US Food and Drug Administration [11]. While India has released Good Manufacturing Practice rules regulating drugs made in Ayurvedic pharmacies, many groups are exempt due to the inability to monitor the number of prescribers [10].

## Conclusions

The use of Ayurvedic medications is on the rise and so are the risks and complications. Although uncommon, lead poisoning should be considered in patients with nonspecific symptoms, especially abdominal pain, without an identified etiology. A thorough medication history, including herbal and alternative medications, and analytical testing when necessary, can aid in identifying heavy metal contamination. Increased regulatory oversight and monitoring of Ayurvedic pharmacies and medications may also help reduce the incidence of heavy metal toxicity.

## Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

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## Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

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## References

1. Gummin DD, Mowry JB, Beuhler MC, Spyker DA, Bronstein AC, Rivers LJ, et al. 2020 Annual report of the American Association of Poison Control Centers' national poison data system (NPDS): 38th annual report, Clin Toxicol (Phila). 2021;59:12, 1282–501. <https://doi.org/10.1080/15563650.2021.1989785>
2. Centers for Disease Control and Prevention (CDC). The National Institute for Occupational Safety and Health (NIOSH). [cited 2022 Aug 6]. Adult blood lead epidemiology and surveillance (ABLES). Available from: <https://www.cdc.gov/niosh/topics/ables/data.html>
3. Ernst E. Heavy metals in traditional Indian remedies. Eur J Clin Pharmacol. 2002;57(12):891–6. <https://doi.org/10.1007/s00228-001-0400-y>
4. Bolan S, Naidu R, Kunhikrishnan A, Seshadri B, Ok YS, Palanisami T, et al. Speciation and bioavailability of lead in complementary medicines. Sci Total Environ. 2016;539:304–12. <https://doi.org/10.1016/j.scitotenv.2015.08.124>
5. Saper RB, Kales SN, Paquin J, Burns MJ, Eisenberg DM, Davis RB, et al. Heavy metal content of ayurvedic herbal medicine products. JAMA. 2004;292(23):2868–73. <https://doi.org/10.1001/jama.292.23.2868>

6. Saper RB, Phillips RS, Sehgal A, Khouri N, Davis RB, Paquin J, et al. Lead, mercury, and arsenic in US- and Indian-manufactured ayurvedic medicines sold via the Internet. *JAMA*. 2008;300(8):915–23. <https://doi.org/10.1001/jama.300.8.915>
7. Mathee A, Naicker N, Teare J. Retrospective investigation of a lead poisoning outbreak from the consumption of an ayurvedic medicine: Durban, South Africa. *Int J Environ Res Public Health*. 2015;12(7):7804–13. <https://doi.org/10.3390/ijerph120707804>
8. Centers for Disease Control and Prevention (CDC). Lead poisoning associated with ayurvedic medications--five states, 2000-2003. *MMWR Morb Mortal Wkly Rep*. 2004;53(26):582–4.
9. Gunturu KS, Nagarajan P, McPhedran P, Goodman TR, Hodsdon ME, Strout MP. ayurvedic herbal medicine and lead poisoning. *J Hematol Oncol*. 2011;4:51. <https://doi.org/10.1186/1756-8722-4-51>
10. Keen RW, Deacon AC, Delves HT, Moreton JA, Frost PG. Indian herbal remedies for diabetes as a cause of lead poisoning. *Postgrad Med J*. 1994;70(820):113–4. <https://doi.org/10.1136/pgmj.70.820.113>.
11. Marcus DM, Grollman AP. Botanical medicines--the need for new regulations. *N Engl J Med*. 2002;347(25):2073–6. <https://doi.org/10.1056/NEJMs022858>