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SHORT COMMUNICATION

Surma eye cosmetic in Afghanistan: a potential source of lead toxicity in children

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Abstract

Surma is a traditional eye cosmetic used as an eyeliner for infants in Afghanistan, as well as in many other countries in Asia, the Middle East, and Africa. Surma has been reported to contain lead and to be a potential source of lead toxicity in children, which can lead to permanent damage to multiple organ systems. To our knowledge, assessment for lead in surma found in Afghanistan has not been performed. We determined the quantitative lead content of a convenience sample of 10 surma products acquired in Afghanistan. Analysis revealed that 70% of surma samples contained high levels of lead (range 35–83%). The remaining samples contained low levels of lead (range 0.04–0.17%).

Conclusion: The majority of surma samples contained very high levels of lead, a troubling finding that could potentially correlate with lead toxicity in Afghan children. Making available lead-free surma alternatives and providing health education, for both healthcare professionals and the general population, in locations where surma use is prevalent and for those involved in care of refugees and immigrants from Afghanistan, may be strategies to prevent lead poisoning in children.

What is Known:
- *Surma is a traditional cosmetic used as an eyeliner for infants in Afghanistan as well as in many countries in Asia, the Middle East, and Africa.*
- *Surma has been reported to contain lead and to be a source of lead toxicity in children.*

What is New:
- *Assessment for lead content in surma found in Afghanistan has not been performed.*
- *In this convenience sample of 10 surma products acquired in Afghanistan, 70% contained very high levels of lead.*

Keywords Surma · Lead · Lead toxicity · Blood lead level · Afghanistan · Lead poisoning

Abbreviations

CDC Centers for Disease Control and Prevention
US United States

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Introduction

Surma is a traditional eye cosmetic widely used as an eyeliner for infants in Afghanistan (Fig. 1). Although data on the prevalence of its use are not available, based on over a decade of experience in Afghanistan (JM), we estimate the majority of parents apply surma to the eyes of their infants. Surma is thought to protect the eyes and vision, promote eye health, and make the eyes look large, bright, and attractive. Some believe that surma will also help ward off evil.

Surma is extracted from an ore that is naturally occurring in Afghanistan and neighboring countries, and can be purchased as a powder or solid rock. Known by many other names, such as kajal, kohl, and tiro, traditional eye cosmetics are also extensively used in India and Pakistan and other countries in

Fig. 1 Infant in Afghanistan wearing surma

Asia, the Middle East, and Africa [3]. In many of these places, there is a firmly held belief that these cosmetics are safe to use [1]. However, surma and related products have been reported to contain lead and to be a potential source of lead toxicity in children [1, 3, 4, 6, 8, 10].

To our knowledge, there has been no formal assessment of the prevalence of lead toxicity in Afghanistan. However, many hotspots of lead exposure (defined as a location with a mean or median blood lead level ≥ 10 μg/dL) in nearby countries have been identified in the literature. For example, Nagpur, India, and Karachi, Pakistan, are hotspot locations where cosmetics are a suspected source [5]. To our knowledge, assessment for lead in various formulations of surma found in Afghanistan has not been performed. We sought to determine the quantitative lead content by weight of a convenience sample of 10 surma products acquired in Afghanistan.

Materials and methods

Between June and July 2017, we collected eight samples of surma from different locations in Afghanistan. These samples were purchased by four different individuals during a 1-month period. Additionally, one sample had been given to one of the authors (JM) as a gift and purchased in a remote province in Afghanistan. Lastly, one sample had previously been acquired in Saudi Arabia during the Haj and brought back to Afghanistan.

These 10 samples were sent to MAS Laboratory in Suwanee, Georgia, United States (US), for analysis. Samples were analyzed using EPA SW846 3050B/6010C methods. Results were reported as percentage of lead by weight.

Results

Seven of the 10 samples contained high levels of lead (range 35–83%), and six of those seven contained extremely high levels (range 65–83%). The other three samples contained low levels of lead (range 0.04–0.17%). Of the six samples thought to originate in Afghanistan, all but one contained high levels of lead. Of these six, the five that contained high levels of lead were all powder, and the one with low level was solid rock. Interestingly, the other sample of solid rock (from Jalalabad, Afghanistan) contained a very high level of lead (75%). Regarding the two samples that originated from Pakistan (both powder), one had an extremely high level of lead (83%) and one had a low level (0.17%). The one sample from a remote province in Afghanistan contained 35% lead. Of the two samples that were purchased in Kabul, the origins of which were unknown, one had a very high level of lead (75%) and one low (0.14%) (Table 1).

Discussion

The majority (70%) of surma samples contained very high levels of lead. However, some of the samples (30%) were nearly lead-free. Based on the results of this small study, it is difficult to draw conclusions about whether location of product purchase, place of sample origin, or composition of the surma (powder versus solid rock) affects lead content.

It is thought that lead from surma may be absorbed through oral ingestion from hand contamination with the cosmetic and possibly through the conjunctiva. A stable metallic element, lead can damage multiple organ systems, particularly in young children, including the central and peripheral nervous systems, the heme biosynthetic pathway, and renal system. No

Table 1 Concentration of lead in samples of surma collected in Afghanistan

Sample	Location of sample purchased[a]	Sample origin	Composition	% of lead by weight
1	Remote province	Afghanistan	Powder	35
2	Kabul	Afghanistan	Powder	76
3	Kabul	Afghanistan	Powder	76
4	Kabul	Unknown	Powder	75
5	Kabul	Afghanistan	Solid rock	0.04
6	Kabul	Unknown	Powder	0.14
7	Saudi Arabia	Pakistan	Powder	83
8	Jalalabad	Pakistan	Powder	0.17
9	Jalalabad	Afghanistan	Powder	65
10	Jalalabad	Afghanistan	Solid rock	75

[a] All samples were purchased in Afghanistan except for sample #7 (brought to Afghanistan from Saudi Arabia)

safe blood lead level in children has been ascertained. At lower lead levels, effects may be subtle, such as neurodevelopment with reduced IQ and behavioral problems such as ADHD. High levels may lead to seizures, encephalopathy, and even coma or death. Effects of lead toxicity may be persistent or irreversible [2].

We did not test blood lead levels in children using surma in Afghanistan. However, reports in the medical literature from other countries have documented both the presence of lead in surma and similar eye cosmetics, and elevated blood lead levels linked to their use. Case-control studies in India and Saudi Arabia found a close association between the use of surma and elevated blood lead concentrations [1, 8]. A retrospective chart review from a clinic in the US concluded that imported eye cosmetics from Pakistan strongly correlated with high blood lead levels [10]. In 2012, the Centers for Disease Control and Prevention (CDC) Morbidity and Mortality Weekly Report published a case of infant lead poisoning in Massachusetts, US, associated with use of tiro, an eye cosmetic obtained from Nigeria [4]. The following year, the CDC also reported that two siblings from Afghanistan at a refugee clinic in New Mexico, US, had elevated blood lead levels, determined to be from kajal, a traditional eye cosmetic purchased in Afghanistan [3].

In the US and Europe, phasing out of common sources of lead exposure such as lead-based paint and petrol has resulted in an overall decrease in blood lead levels in children [2]. Nevertheless, approximately 1% of children in the US have elevated blood lead levels [9]. Atypical sources are increasingly recognized in lead exposure cases [7].

Newly arrived refugees have been shown to have higher blood lead levels than the general US population [6]. In addition to typical exposures to lead-based paints and contaminated soil, refugees may be exposed to other sources of lead. An array of foods, spices, candies, toys, fashion accessories, cosmetics, traditional therapies, and other unregulated consumer products have been found to be the source of exposure for many refugee children [3, 7]. CDC recommends that all refugee children in the US aged 6 months–16 years be screened for lead within 90 days of their arrival and again 3–6 months after resettlement.

Health education, for both healthcare professionals and the population, to raise awareness about the potential adverse effects of lead exposure may be a strategy to prevent lead poisoning. Because application of surma in Afghanistan is a firmly embedded cultural and health practice that is thought to be safe by many in the general population, education must be provided in a culturally sensitive manner and lead-free surma alternatives made readily available.

Located in over 70 countries, Afghan refugees are the second largest refugee population after Syrians. After Iran and Pakistan, Germany has the largest number of Afghan refugees. Turkey, Hungary, Austria, and Indonesia are also common destinations for Afghan asylum seekers. Over 50% of Afghan refugees are children. Healthcare professionals involved in the care of Afghan refugees and immigrants, and other refugee and immigrant populations, must be aware of the potential risk of lead-containing eye cosmetics like surma. Notably, in the US, the Food and Drug Administration has banned the import of these products, but they are still brought into the country in personal luggage and may also be illegally distributed by retailers [3]. Certainly, if a child has an elevated blood lead level, parents should be asked about exposure to eye cosmetics like surma.

A limitation of our study was the non-random acquisition and small size of the sample of surma products. Also, we did not test blood lead levels in children in Afghanistan exposed to surma. Larger studies are needed to further assess lead content in surma across Afghanistan and to evaluate for an association between surma application and blood lead levels in children in Afghanistan.

To our knowledge, no prior study has assessed the lead content of surma products in Afghanistan. This small pilot study revealed that the majority of surma samples contained very high levels of lead, a troubling finding that could potentially correlate with lead toxicity in Afghan children.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants and/or animals This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Not applicable (no study participants).

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