



Addressing the silent threat - Strategies to reduce lead exposure in opium-user populations: Integrating health and policy

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Keywords	Abstract
Lead Opium Addiction Substance use disorder Policy brief	Background and Objectives: Earlier literature on Iran points out to a critical public health issue concerning elevated blood lead levels (BLLs) among individuals who use opium through oral ingestion or inhalation of opium. The findings of literature underscore the health risks faced by this at-risk group, highlighting the need for prompt action and targeted interventions. Methods: This article presents a “health policy brief” for policymakers and healthcare authorities for this vulnerable population in Iran. Policy Options: This policy brief advocates a multi-faceted strategy toward the lead exposure of opium users. Six policy options are proposed: (1) Establishing formal coordination for routine screening of individuals at risk of lead exposure associated with opium use and advocating for relevant legislative changes; (2) Enhance public awareness campaigns for risk of lead exposure related to opium use and integration of lead exposure education into healthcare training; (3) Production of opium products under official supervision and conducting necessary quality control with relevant legislations; (4) Expand access to cessation programs to eliminate the source of contamination and develop support networks for affected families; (5) Promote research on opium contamination and development of safe opium alternatives with an emphasis on international research collaborations; (6) Utilize technology for monitoring and education. Conclusion: Emphasizing on awareness, screening, research, community support, and targeted interventions leads to the improvement of health conditions and a decrease in lead-related risks in individuals with opium use disorder.

Highlights • A multi-faceted strategy toward blood lead exposure among opium users is needed. • Increasing public awareness, stricter regulations, expanded cessation programs, and collaboration among stakeholders should be considered. • Placing emphasis on research, community support, and targeted interventions leads to the improvement of health conditions and a decrease in lead-related risks.	
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Introduction

Lead is a harmful heavy metal associated with serious health issues, such as damage to the nervous, renal, and cardiovascular systems, as well as anemia and developmental problems [1-3]. In Iran, in addition to common sources of lead exposure, lead contamination of opium has been reported in clinical reports, review articles, and observational studies as a novel source of exposure. Opium, which is frequently mixed with lead to increase its weight, presents a significant risk of lead exposure in opium dependents which is potentially preventable source of exposure [4-9]. The policy issue is complicated by the illegality of opium production and trading, the limited information about pollution in illegal markets, and obstacles that prevent drug users from using health services.

Materials and Methods

Evidence Synthesis

Our previous systematic review and meta-analysis study highlighted a significant public health concern regarding blood lead concentrations among individuals who use opium through oral ingestion or inhalation of opium smoke. In that study, we evaluated data from various studies, showing that individuals who use opium had notably higher BLL than non-users, with a pooled Hedges' *g* effect size of 1.39 (95% CI: 0.94–1.85) [5]. In this systematic review 13 studies were included, involving 1,473 individuals (690 opium users and 783 in a comparison group). It revealed that in 11 of the 13 studies, BLLs were significantly higher among opium users. Even after excluding studies with widely divergent results, the overall difference remained substantial. BLLs among users varied considerably across the different studies, indicating that the extent of exposure can differ depending on circumstances and the source of the opium.

The available evidence, drawn from various regions of Iran, consistently points to a significant association between opium use and elevated BLL. Variations in consumption methods and duration of use may also influence exposure levels, though the evidence in this regard is inconsistent. Therefore, while these studies do not allow for a nationwide estimate of the prevalence of lead poisoning, the existing evidence indicates that lead contamination in opium constitutes a genuine and significant public health issue that requires identification, monitoring, and timely intervention. Consistent to our study many other studies highlighted the risks of elevated lead levels in

opium dependents [8-11]. As mentioned before, previous studies highlighted the significant health risks associated with lead contamination in opium, particularly in regions such as Iran where opium use is prevalent.

In Iran, the production and trade of opium are officially banned and illegal markets still exist. This backdrop underlines the need for a strong regulatory framework that can efficiently handle the health concerns but also the realities of the opium trade. This issue is critical for stakeholders and health policymakers as it underscores the urgent need to address the health implications associated with lead exposure in this vulnerable population. This evidence calls for urgent action from policymakers to reduce lead exposure among opium users and safeguard public health.

Policy objectives

The objective of this policy brief is to provide a concise, accurate, and informative summary for target audiences, including policymakers, government officials, and health administrators. We aim to enhance awareness of the current health problem and its urgency, facilitating a better understanding of the potential risks involved. This policy brief outlines some potential recommendations that can be implemented to mitigate the health risks associated with lead exposure among opium users. Each proposed strategy includes an analysis of advantages, disadvantages, cost-effectiveness, and practical and ethical considerations, along with monitoring and evaluation measures to assess the effectiveness of the interventions. By equipping policymakers with this essential information, we hope to foster informed decision-making and prompt action to address this pressing public health issue.

Results and Discussion

Policy Recommendations

The above-mentioned reports underscore the potential health risks associated with adulterated opium with lead in Iran. Here several policy alternatives and strategies have been suggested aimed at are likely to protect against the problem of increased toxic metal concentrations in opium dependents. The proposed policy recommendations are presented in order of priority, bearing in mind that—depending on prevailing conditions—many of the measures could be implemented concurrently, a matter to be determined by policymakers.

Establishing formal coordination for routine screening of individuals at risk of lead exposure associated with opium use and advocating for relevant legislative changes: *a)* Implementation: Implement regular health screenings for BLL in vulnerable populations such as opium users, individuals referring to rehabilitation centers for opium cessation, pregnant women with opium use, newborns or nursing infants of addicted mothers, and children living in homes with opium users, Establishing a formal coordination framework involving public health authorities, healthcare providers, toxicology laboratories, forensic medicine institutions, addiction treatment services, relevant regulatory and law enforcement bodies, research institutions, non-governmental organizations (NGOs), and community groups. Within this framework, the monitoring of at-risk individuals must be formulated as a health program by Ministry of Health officials and communicated to relevant subordinate units. Public health authorities are responsible for coordinating monitoring activities, establishing reporting procedures, aggregating relevant data, and facilitating inter-sectoral communication. Healthcare facilities must identify suspected cases of lead exposure due to opium use, conduct appropriate clinical assessments, initiate or coordinate blood lead testing where necessary, and report suspected cases through designated channels. Addiction treatment services must facilitate risk assessment, treatment referrals, and follow-up for individuals with opioid use disorder. *b)* Advantages: Early identification of lead exposure can help prevent serious health issues and facilitate prompt interventions, utilizes a range of expertise and resources, promoting a comprehensive approach to the issue. *c)* Disadvantages: This initiative requires resources for testing and follow-up care, Coordination may be complicated and time-consuming, necessitating strong leadership and commitment. *d)* Cost-effectiveness: Early intervention can lead to reduced long-term healthcare expenses related to lead exposure; Collaborative efforts can result in more efficient solutions and better resource allocation. *e)* Ethical Considerations: Ensure fair representation of all stakeholders, especially those most impacted by opium use. Ensure that screening programs are voluntary and uphold individuals' rights. *f)* Monitoring and Evaluation: Evaluate the effectiveness of these collaborations and adjust strategies as necessary Monitor screening results and health improvements over time.

Enhance public awareness campaigns for risk of lead exposure related to opium use and integration of lead exposure education into healthcare training: *a)* Implementation: Create focused campaigns aimed at educating both opium users and the wider community about the dangers of lead exposure and ways to stay safe; Create community-based programs aimed at educating families about the risks of adulterated opium and encouraging healthy practices; Integrate training on lead exposure risks and prevention into medical and public health education programs. *b)* Advantages: Enhances understanding and promotes safer practices among users; Involves local populations and empowers them to take charge of their health; Prepares healthcare providers to screen and manage lead exposure in susceptible individuals. *c)* Disadvantages: Changing behavior can take time and necessitates ongoing effort and resources; requires continuous funding and active community participation to be effective; Necessitates updates to the curriculum and allocation of training resources. *d)* Cost-effectiveness: This approach is economical, particularly when incorporated into existing health initiatives; Community-led initiatives can be more affordable and sustainable compared to top-down approaches; Well-informed providers can facilitate earlier detection and intervention, leading to reduced long-term healthcare costs *e)* Ethical Considerations: Ensure that messaging is culturally appropriate and resonates with various communities. *f)* Monitoring and Evaluation: Assess shifts in knowledge and behavior through surveys conducted before and after the campaigns; evaluate the impact of training on healthcare providers' practices and patient outcomes.

Production of opium products under official supervision and conducting necessary quality control with relevant legislations: *a)* Implementation: Given the current legal restrictions on opium use in Iran, it may be necessary to explore avenues for regulated production or a legal framework that allows for oversight while addressing public health concerns. It should be noted that prohibition of opium production and trade and existence of illegal markets complicate efforts to regulate and ensure the safety of opium products. *b)* Advantages: Lowers lead exposure by ensuring the quality of opium. *c)* Disadvantages: May face resistance from the opium trade and challenges in enforcement. *d)* Cost-effectiveness: While initial costs may be significant, the long-term health benefits will likely outweigh these expenses. *e)* Monitoring and Evaluation:

Conduct regular assessments of lead levels in opium and monitor health outcomes among users.

Expand access to cessation programs to eliminate the source of contamination and develop support networks for affected families:

a) Implementation: Offer extensive support for cessation, including counseling, medication, resources, psychological, and community support groups for opium users; Establish support groups for families impacted by lead exposure and opium use to share experiences and resources. **b)** Advantages: Directly tackles the root cause of lead exposure by decreasing the use of contaminated opium; Offers emotional support and practical guidance for managing health issues related to lead exposure. **c)** Disadvantages: Requires a long-term commitment for ongoing success and sufficient funding, and demands substantial investment in healthcare infrastructure and trained staff. **d)** Cost-effectiveness: Demonstrates effectiveness in enhancing health outcomes and lowering healthcare costs over time; Peer support can enhance health outcomes at minimal cost. **e)** Ethical Considerations: Ensure that cessation services are accessible and culturally sensitive to all demographics, particularly marginalized groups; ensure that support networks maintain confidentiality and respect participants' privacy. **f)** Monitoring and Evaluation: Track cessation rates and their effects on BLL and overall health outcomes; Assess the effectiveness of support networks through participant feedback and health outcome evaluations.

Promote research on opium contamination and development of safe opium alternatives with an emphasis on international research collaborations:

a) Implementation: Allocate funding and support for research initiatives aimed at understanding how lead contamination occurs in opium and its health effects; providing special support for needs-based, impactful, problem-oriented, and technology-driven projects in this field; Collaborate with international organizations and researchers to investigate opium related lead exposure and its health impacts. **b)** Advantages: Establishes a strong evidence base for informed policy decisions and targeted interventions, helping to minimize reliance on contaminated opium; Access to global expertise and resources can strengthen local research initiatives. **c)** Disadvantages: Requires ongoing funding and collaboration among various research institutions; Coordinating between international and local entities can be challenging. **d)** Cost-effectiveness: Research can yield significant

long-term health benefits and cost savings; Collaborative research can yield more comprehensive studies and findings that benefit multiple regions. **e)** Ethical Considerations: Ensure that all research complies with ethical standards and respects participants' rights. **f)** Monitoring and Evaluation: Continuously review research outcomes and adjust policies as needed.

Utilize technology for monitoring and education:

a) Implementation: Create mobile apps or online platforms that offer information about lead exposure for opium users. **b)** Advantages: Enhances accessibility to information and support services. **c)** Disadvantages: Requires technological infrastructure and user literacy. **d)** Cost-effectiveness: Technology can reach a broad audience with relatively low ongoing costs. **e)** Ethical Considerations: Ensure that platforms are secure and safeguard user privacy. **f)** Monitoring and Evaluation: Monitor user engagement and health outcomes related to the use of these technologies.

An Urgent Institutional Call to Action

To mitigate preventable harms associated with lead-contaminated opium, urgent institutional actions must focus on a limited number of clear, specific priorities. First, public health authorities must establish a coordinated mechanism for raising awareness, diagnosing, and investigating suspected cases of lead contamination. Second, healthcare facilities and primary care services must implement a confidential risk-assessment and referral pathway for individuals with a history of opium use or exposure, ensuring access to blood lead testing and appropriate clinical evaluation where necessary. Third, addiction treatment services must ensure that individuals with opioid use disorder identified through this pathway have access to voluntary, evidence-based treatment and follow-up care. These measures should be implemented within the framework of existing legal and health system structures, initially focusing on practical pilot settings where surveillance, laboratory, and referral capacities can be established.

Contextual Considerations for Iran

The design and implementation of proposed policy options must take into account the epidemiological and legal context, as well as the state of the health system in Iran. Opium use has a long history in certain communities, yet the composition and level of contamination in illicitly supplied opium can vary across geographic regions and sources. Consequently, exposure assessments and contamination monitoring

must factor in regional differences rather than assuming a uniform risk pattern nationwide.

Priority should be given to the monitoring of health of opium users, identifying suspected cases of contamination, conducting confidential clinical assessments, and ensuring appropriate referrals for treatment. A phased, locally adaptable approach—beginning with pilot implementations in selected settings, followed by evaluation and scaling up—would be appropriate. However, the feasibility, resource requirements, and effectiveness of these approaches must be evaluated through operational research suited to the local context; they should not be taken for granted.

Conclusion

The concerning levels of blood lead among opium users require urgent action from health policymakers. By adopting stricter strategies, policymakers can enhance their efforts to combat lead exposure in this population. A comprehensive approach that incorporates education, community engagement, and targeted interventions such as BLL screening, antidote (chelator) availability, Opioid agonist therapy expansion, and toxicological surveillance will be essential in reducing health risks and promoting a healthier community. These initiatives will not only tackle immediate issues but also contribute to long-term improvements in public health and well-being.

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Authors' Contributions

SN, KT, ZR, and BR contributed to writing parts of the manuscript. All authors significantly contributed to drafting and critically revising the manuscript for important intellectual content. The final version of the manuscript has been approved by all authors.

Data availability

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Conflicts of interest

The authors declare that they have no competing or conflicting interests in conducting this study.

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Ethics approval and consent to participate

Not applicable. As a policy paper, this study did not require ethical approval or an ethics code. In the preparation of this work, the authors utilized services such as Grammarly and the ChatGPT tools to enhance readability and correct grammar issues and typos. After using these tools, the authors thoroughly reviewed and edited the content as necessary and take full responsibility for the publication's content.

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