

IRAN (Islamic Republic of)

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A. Regulation on sources

Source of lead	Relevant legislation/regulation	Government agencies	Data source
1. Air as a source of lead exposure	1. Air Pollution Act: Passed in 1995 and can be invoked on issues on controlling combustion processes, unintentional and unwanted generation of pollutants. Articles of this act can be used to prevent pollution and control unintentional pollution. 2. Environmental Protection Law: Adopted in 1974, measures for the protection and management of the environment.	a. Islamic Consultative Assembly (Parliament) b. Department of the Environment (DoE) c. Ministry of Health and Medical Education d. Ministry of Jihad-e-Agriculture e. Ministry of Industries and Mines	1. The Islamic Republic of Iran: National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants, 2008, UNDP. 2. ILO Labor Standards, Iran (Islamic Republic of) (168)
2. Soil as a source of lead exposure	1. Waste Management Act: Passed in 2004. A specific regulation for managing waste material from the first stage of generation (recycling, industrial, municipal, and agricultural waste), hazardous materials, and pollution from burning corpses on soil.	a. Islamic Consultative Assembly (Parliament) b. Department of the Environment (DoE) c. Ministry of Health and Medical Education d. Ministry of Jihad-e-Agriculture e. Ministry of Industries and Mines	1. The Islamic Republic of Iran: National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants, 2008, UNDP.
	No other standards found at this time for lead.		

B. International Agreements

Agreement	Year Ratified
1. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1993 (a) ¹
2. Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous Chemicals and Pesticides in international trade	2004
3. Minamata Convention on Mercury	2017
4. Stockholm Convention on Persistent Organic Pollutants	2006

C. Blood lead-level monitoring programs

Details	Data source
<ol style="list-style-type: none"> No details of a national or regional level structured program for blood lead level testing found. However, published studies point to some presence of testing programs at the local level. Data on the environmental exposure to lead in Iran 	<ol style="list-style-type: none"> Refer to section E on scientific papers that perform blood lead-level sampling First comprehensive review about lead toxicity in Iran: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6139886/

¹ Accession (a)

D. Inventory of toxic sites (Toxic Sites Identification Program (TSIP), Pure Earth)

No sites identified at this time.

E. Scientific papers on lead exposure (Please contact info@gahp.net for information on studies not in the public domain)

Topic	Authors	Year	Title	Abstract/ description
Blood-lead levels	Khoshnamvand, Nahid; Azizi, Nahid; Sadegh Hassanvand, Mohammad; Shamsipour, Mansour; Naddafi, Kazem; Oskoei, Vahide	2021	Blood lead level monitoring related to environmental exposure in the general Iranian population: a systematic review and meta-analysis	Abstract: Exposure to lead can cause adverse health problems incorporating hypophosphatemia, heart and liver disease, cancers, neurological and cardiovascular diseases, central nervous disorders, and sensory disorders. This study investigated the blood lead level in the general Iranian population with environmental exposure to lead. In the presented systematic review and meta-analysis, the authors searched Iranian dataset, including Magiran, SID, Iranmedex, and Nopa, and the main dataset, comprising PubMed, Scopus, Embase, and Web of Science, all available articles until 12 January 2019, and extracting 55 studies (with 63 data for analysis) to a meta-analysis. A comprehensive meta-analysis software, pooled standard deviation, mean, sample size, and the utterly random effects model was analyzed in this study. The results showed that the overall mean BLL (95% CI) in total inquiries was 6.41 µg/dL (5.96 to 6.87). Besides, the results for gender and age subgroups were as follows: mean BLL, 6.47 µg/dL, 95% CI, 5.79, to 7.15, mean BLL, 6.44 µg/dL, 95% CI, 5.96, to 6.91, respectively. Conclusively the mean BLL in the Iranian population was higher than the recommended level by the US Centers for Disease Control and Prevention (CDC). Results indicated that the mean BLL in men and adults was more elevated than in women and children, respectively. Therefore, BLL monitoring, and screening of the general Iranian population are necessary to determine a reference value.
	Zardast, Mahmoud; Khorashadi-Zadeh, Seyedeh Samira; Nakhaee,	2020	Blood lead concentration and its associated factors in preschool children in eastern	Background: Lead is a toxic metal that affects almost every organ in the body. Children are more susceptible to lead toxicity because they ingest non-food items (pica), have oral exploratory habits, absorb more substantial amounts of ingested lead compared to adults, and have a developing central nervous system. This study describes venous blood lead concentrations (BLC) in young children living in Birjand, Iran.

Topic	Authors	Year	Title	Abstract/ description
	Samaneh; Amirabadizadeh, Alireza; Mehrpour, Omid		Iran: a cross-sectional study	<p>Methods: A cross-sectional study was performed in 2016 on children 1–7 years of age who were referred to healthcare centers in Birjand City. Demographic information was obtained, and their BLC was tested using atomic absorption spectrometry (AAS).</p> <p>Results: Four hundred children were tested. Their mean age was 52.37 ± 23.77 months; their mean BLC was 2.49 ± 2.64 $\mu\text{g}/\text{dL}$ (median 1.85 $\mu\text{g}/\text{dL}$). Thirty-two (8%) children had a BLC > 5 $\mu\text{g}/\text{dL}$. A logistic regression model revealed that per one unit of increase in age, the chance of an elevated BLC decreased by 3% (OR (95%CI): 0.97 (0.96–0.99), $p < 0.01$). The risks of an elevated BLC was 61% lower in girls compared to boys (OR (95%CI): 0.39 (0.17–0.92), $p = 0.03$). Further, per one rate of increase in the BMI, the chance of an elevated BLC was higher (OR (95%CI): 1.13 (1.02–1.24), $p = 0.01$). Children whose fathers were laborers had higher BLC than those with employee fathers ($p = 0.01$).</p> <p>Conclusion: Of 400 children aged 1–7 years old living in Birjand, Iran, 8% had elevated BLC. BLC correlated with the child’s age, gender, body mass index, and father’s occupation.</p>

Topic	Authors	Year	Title	Abstract/ description
	Zamani, Nasim; Gholami, Narges; Hassanian- Moghaddam, Hossein; Farnaghi, Fariba; Gachkar, Latif	2019	Factors Associated With High Blood Lead Levels in a Sample of 100 Children in Tehran	<p>Background: Lead is considered a neurotoxic agent. This paper aimed to evaluate the blood level (BLL) in young population and determine probable risk factors of lead exposure in Iran.</p> <p>Methods: In a cross-sectional study, a total of 100 children were entered and their BLLs were checked.</p> <p>Results: In all, 25 and 8 patients had BLLs above 5 and 10 µg/dL, respectively. There was a significant univariate correlation between BLL and place of living, water pipe type, using dairy products, and stature in both cut-offs of 5 and 10 µg/dL. Binary regression analysis showed that pipe type was associated with high BLLs at cut-offs of 5 and 10 µg/dL, respectively. Also, there was an association between 50th percentile of stature for age and cut-off of 5 µg/dL.</p>
	Nakhaee, Sareh; Amirabadizadeh, Alireza; Nakhaee, Samaneh; Zardast, Mahmood; Schimmel, Jonathan; Ahmadian- Moghadam, Jalil; Akbari, Ayob; Mohammadian Darmian, Homeira; Mohammadi, Maryam; Mehrpour, Omid	2019	Blood lead level risk factors and reference value derivation in a cross-sectional study of potentially lead-exposed workers in Iran	<p>Objectives: This exploratory investigation aimed to measure blood lead levels and associated risk factors in exposed workers in Iran, and to derive appropriate reference values for blood lead in this population as a means of epidemiological comparison.</p> <p>Results: Mean and median BLCs were 6.5±8.1 µg/dL and 3.9 µg/dL (IQR: 2.9–5.8), respectively. Of the subjects, 85 (13.5%) had BLC ≥10 µg/dL. The derived reference BLC value in this study was 30 µg/dL for men and 14 µg/dL for women. Increasing work experience and age were associated with BLC >10 µg/dL. Radiator manufacturers were up to 12.9 times (95% CI 4.6 to 35, p<0.005) more likely than painters to have BLC >10 µg/dL. Most subjects reported multiple symptoms.</p> <p>Conclusions: The mean BLC was above the maximum recommended concentration. There was a significant relationship between higher BLC and age or working in a printing factory or radiator manufacturing. These findings can direct efforts towards reducing occupational lead exposure.</p>

Topic	Authors	Year	Title	Abstract/ description
	Hassanian-Moghaddam, Hossein; Zamani, Nasim; Hamidi, Fatemeh; Farnaghi, Fariba; Gachkar, Latif	2018	Blood lead levels in pregnant women referring to midwifery clinic in a referral center in Tehran	<p>Background: Lead effects on children and pregnant women are grave, and screening tests would be logical to detect high blood lead levels (BLLs) in early stages.</p> <p>Materials and Methods: Blood samples were taken from the pregnant mothers who referred to midwifery clinic with further phone interview postdelivery.</p> <p>Results: In 100 patients evaluated, the mean age was 29 ± 5 years (median interquartile range gestational age of 33 [24, 37] weeks). There was a significant correlation between polluted residential area and median BLL ($P = 0.044$) and substance exposure ($P = 0.02$). The median BLL was significantly lower in those without a history of lead toxicity in the family ($P = 0.003$). The only factor that could predict the BLL levels lower than 3.2 and 5 $\mu\text{g}/\text{dL}$ was living in the nonindustrial area. All pregnant women delivered full-term live babies.</p> <p>Conclusion: Positive history of lead toxicity in the family and living in polluted areas may pose a higher BLL in pregnant women.</p>
	Dadpour, Bitia; Mehrpour, Omid; Etemad, Leila; Moshiri, Mohammad	2013	Lead Poisoning-Induced Hypertensive Crisis Managed by Prazosin: A Case Report	<p>Abstract: Chronic lead exposure is known to be a risk factor for hypertension (HTN). No specific medication is recommended for the treatment of lead-induced hypertension (LIHTN).</p> <p>Case Presentation: Patient was a male admitted with the chief complaint of chronic abdominal pain. His whole blood lead level was reported to be 1961 $\mu\text{g}/\text{L}$. He also mentioned a previous history of HTN managed by propranolol (10 mg, TDS). He discharged himself by giving written consent and 19 days later, he was re-admitted due to high blood pressure of 220/140 mmHg. His Blood pressure (BP) was decreased to 180/110 mmHg with sublingual captopril; but, in maintenance therapy, higher doses of captopril could not further decrease BP. Amlodipine was tried which was discontinued due to the patient intolerance. Prazosin was then administered in gradual increasing doses up to 1 mg twice a day and captopril was tapered.</p>

Topic	Authors	Year	Title	Abstract/ description
	S.N.A.D., Moyaedi; Ali, Fani; H.R., Mohajerani; Mahbod, Seyed Ali	2008	The Relationship Between Blood Lead Levels and Clinical Syndromes in Residents of Arak, Iran	<p>Background: The presence of lead in the industrial fumes, sewage, and also in industrial paints, ceramic, and printing materials, make this element as one of the most common environmental contaminants. Lead can enter the body through respiratory and digestive tracts as well as through the skin and with progressive accumulation can have a destructive effect on several organs in the human body. Blood lead level is used as an index of lead contamination. Since Arak is an industrial city there is a danger of lead poisoning in its residents.</p> <p>Materials and methods: In this cross-sectional research, 1140 individuals > 10 years old were selected randomly from 20 population clones by the use of family codes. After face-to-face interview and a complete physical examination, blood samples were taken for laboratory tests: CBC, BUN, uric acid, creatine, and blood lead level. Collected data were analyzed by SPSS and Excel software and the association between blood lead levels and clinical symptoms was evaluated by logistic regression and one way ANOVA. A p-value less than 0.05 were considered significant.</p> <p>Results: From 1140 investigated residents, 463 individuals, (40.5%), had blood lead levels more than 10 mic gr/dl, (range 10-66 g/dl, mean 13.42 mg /dl). There was no significant difference between males and females, (p>0.05). The difference between age groups was significant, school-age children had the highest and housewives the lowest blood lead levels. We found a significant association between high blood lead levels, anemia and hypertension, (P<0.001).</p> <p>Conclusion: Lead contamination is present in all age groups in the residents of Arak city. Young people are the most susceptible group for lead poisoning. High blood lead levels count as risk factors for hypertension and anemia. We recommend that the sources of lead contamination must be eliminated from the environment in all industrial cities like Arak.</p>

Topic	Authors	Year	Title	Abstract/ description
Lead exposure	Mahmoud, Norouz; Latifi, Ali Mohammad; Ali Amani, Mohammad; Masoumbeigi, Hossein; Ghanizadeh, Ghader	2018	Data on the environmental exposure to lead in Iran	Abstract: The data was obtained to present the environmental and occupational exposure to lead in Iranian populations based on the published articles. To acquire the data, online resources including Google Scholar, Magiran, SID, Iranmedex, PubMed, and ScienceDirect were searched, and 104 articles were found out of which 70 that focused on the level of lead in blood, urine, milk, and hair of different Iranian populations were selected. Since the results of the studies were not homogenous, it was not possible to carry out a meta-analysis. The average blood lead level (BLL) among workers, ordinary people, patients with specific diseases, addicts, and pregnant women, women in labor, infants, and children are presented in this article. The average BLL was compared to the standards.
	Sayehmiri, Kouros; Shamloo, Marzieh; Khataee, Marzieh; Fakhr, Forghan; Azami, Milad	2016	Occupational exposure and biological evaluation of lead in Iranian workers- a systematic review and meta-analysis	Introduction: Lead exposure is considered as a global health problem. The irreparable harmful effects of this heavy metal on human have been proven in various studies. Comparing to general population, workers in related industries are more exposed to lead. Several studies have investigated lead occupational exposure and its biological evaluation in Iran; however, there is no overall estimate. Thus, the present study was conducted to determine the occupational exposure to lead and its biological evaluation in Iranian workers, using systematic review and meta-analysis. Result: In the 34 qualified studies, the mean blood lead level (BLL) concentration in Iranian workers was estimated 42.8µg/dl (95% CI: 35.15-50.49). The minimum and maximum BLL were belonged to west (28.348µg/dl) and center (45.928µg/dl) regions of Iran, respectively. Considering different occupations, the lowest mean value was reported in textile industry workers (12.3 µg/dl), while the highest value was for zinc-lead mine workers (72.6 µg/dl). Mean breathing air lead level of Iranian workers reported in 4 studies was estimated 0.23 mg/m3 (95% CI: 0.14-0.33).

Topic	Authors	Year	Title	Abstract/ description
	Salehipour, Mitra; Ghorbani, Hadi; Kheirabadi, Hossein; Afyuni Majid	2015	Health Risks from Heavy Metals via Consumption of Cereals and Vegetables in Isfahan Province, Iran	Abstract: The present study was conducted to assess the risks to human health from exposure to arsenic, lead, nickel, zinc, and copper through consumption of wheat, rice, and some vegetables in Isfahan Province, central Iran, using the total non-carcinogenic hazard quotient and cancer risk assessment estimates. Risk contribution from Ni is minimal compared with other metals and it was less than the U.S. Environmental Protection Agency guidelines. The results showed that total non-carcinogenic hazard of As and Pb, were greater than 1, and total cancer risk of As slightly greater than 1×10^{-4} for all age groups. Therefore, the inhabitants who reside in Isfahan Province may experience the adverse health risks via consumption of cereals and vegetables.
Lead in illicit drugs	Akhgari, Maryam; Moradi, Fatemeh; Ziarati, Parisa	2018	The Texture of Psychoactive Illicit Drugs in Iran: Adulteration with Lead and other Active Pharmaceutical Ingredients	Abstract: Psychoactive illicit drugs are widely used all over the world. Due to the high demand for illicit drugs, adulteration of substances with poisonous and active pharmaceutical ingredients is a common phenomenon in some countries. Lead and other active pharmaceutical ingredients are among adulterants added to illicit drugs intentionally. In the present study, we analyzed four major abused street drugs in Iran's drug black market (opium, Iranian crack, ecstasy tablets, and crystal methamphetamine) to assess active pharmaceutical ingredients and determine a quantitative assay of lead. A total of 40 psychoactive drugs were analyzed using high-performance liquid chromatography, gas chromatography/mass spectrometry, and flame atomic absorption spectroscopy. The results demonstrated that psychoactive drugs were adulterated with different drug categories, such as tramadol, ketamine, methadone, acetaminophen, and caffeine. Lead was found in all analyzed samples, ranging from 9-90 ppm. The smallest lead level was detected in methamphetamine samples. Iranian crack samples contained the highest amount of lead. Psychoactive illicit drugs were adulterated with different drug classes and also lead. Lead-adulterated psychoactive drugs are among the new sources of exposure to lead, while illicit drugs' contamination with different drugs may present a health hazard for drug-abusing patients.

Topic	Authors	Year	Title	Abstract/ description
Lead poisoning	Paezi, Maryam; Zamani, Nasim; Hassanian- Moghaddam, Hossein; Shadnia, Shanin; Zamani, Naghmeh; Chaleshi, Vahid; Ali Mafi, Amir	2019	Treatment of adult lead poisoning with D-penicillamine	<p>Background: The aim of the current study was to evaluate the efficacy of D-penicillamine in the treatment of lead poisoning mainly in the outpatient setting.</p> <p>Methods: In a case series study performed during the recent epidemic of lead poisoning in Iran, lead-poisoned patients referring to our outpatient clinic were treated with 250-mg D-penicillamine capsules administered every 6 h for 5 or 10 days based on availability of the medication. They were recommended to re-check blood lead level (BLL) 4 weeks after cessation of the treatment and refer to our clinic again.</p> <p>Results: In 63 patients with lead poisoning but without signs and symptoms of lead encephalopathy, median BLL was 106 [84, 131] µg/dL on presentation, which declined to a mean of 52.6 ± 28.8 µg/dL after a median treatment period of 7 [5, 10] days (p < 0.001). There was no statistically significant difference between the 5- and 10-day treatment protocols regarding complications and recovery. Treatment had resulted in a median decrease of 54 µg/dL [33, 90] (range: -20 to 231 µg/dL) in the patients' BLLs (33.9% declined in BLL measurements; range: -29.69% to 99.06%).</p> <p>Conclusions: D-penicillamine may be an acceptable substitute treatment in adult lead poisoning. Although our sample size was limited, we could not detect any serious adverse effects in our cases showing that D-penicillamine resulted in acceptable recovery rates. This may be helpful especially in epidemics with limitations in antidote access.</p>
	Ghane, Talat; Zamani, Nasim; Hassanian- Moghaddam, Hossein; Beyrami, Ali; Noroozi, Alireza	2017	Lead poisoning outbreak among opium users in the Islamic Republic of Iran, 2016–2017	<p>Methods: We used data from the country's largest poison treatment center to illustrate the epidemiology of an outbreak of lead poisoning in oral opium users. We describe the government's referral and treatment guidelines in response to the outbreak. Based on the number of individuals treated and previous studies on the prevalence of oral opium use we estimated the total number of people at risk of lead-contaminated opium nationwide.</p> <p>Findings: In February 2016, we noticed a steep increase in the numbers of oral opium users referred to our poison treatment center with abdominal pain, anemia and constipation. Numbers peaked in June 2016, but the</p>

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				<p>outbreak was ongoing in August 2017. The mean blood lead level in a sample of 80 patients was 140.3 µg/dL (standard deviation: 122.6). Analysis of an illegal opium sample showed 3.55 mg lead in 1 g opium. Treatment was exposure reduction with opioid substitutes and laxatives, or chelation therapy if indicated. Over 7 months, 4294 poison cases were seen at main referral hospitals in Tehran out of an estimated 31 914 oral opium users in the city. We estimate more than 260 000 out of 773 800 users nationwide remain untreated and at risk of poisoning.</p>
	<p>Hayatbakhsh, Mohammad; Oghabian, Zohreh; Conlon, Elvira; Nakhaee, Samaneh; Amirabadizadeh, Ali Reza; Zahedi, Mohammad; Moghadam, Sodief; Ahmadi, Bigham; Soroush, Somayeh; Aaseth, Jan; Mehrpour, Omid</p>	2017	<p>Lead poisoning among opium users in Iran: an emerging health hazard</p>	<p>Background: Lead (Pb) poisoning among people using opium has been an increasing problem in Iran. The present study highlights the clinical effects of lead toxicity associated with opium use in Iran, Kerman province.</p> <p>Methods: Between January 2016 and June 2016, patients with signs and symptoms of Pb poisoning were questioned to assess whether they had a history of opium dependency. In total, 249 patients were enrolled onto this cross-sectional study, all were opium dependent. Para-clinical data including blood lead level (BLL), demographic information, user preferences, and symptoms were obtained.</p> <p>Results: The patients used either opium (83.9%), refined opium (6.4%) or a combination of both (9.7%) via ingestion (71.9%), smoking (8.4%) or a combination of both (19.7%). The overall median BLL was 80.0 µg/dL [IQR: 51.7–119.0]. The median BLL did not differ significantly between opium and refined opium users. Further, BLL was not significantly affected by the type of substance, route of use, duration of use, or daily quantity consumed. Common symptoms included abdominal pain (86.9%), constipation (75.8%), anorexia (71.5%) and nausea (54.7%). Linear regression analysis showed log of BLL was significantly associated with abdominal pain, myalgia and anorexia.</p>

Topic	Authors	Year	Title	Abstract/ description
Lead toxicity	Mehrpour, Omid; Karrari, Parissa; Abdollahi, Mohammad	2012	Chronic Lead Poisoning in Iran; A Silent Disease	In general, data from Iran clearly show that everyone is in great danger of exposure and lead toxicity. Because of lead poisoning is a silent disease, screening of this disease has a high priority and with consideration of, we suggest screening test for everyone with nonspecific signs and symptoms, especially in subacute and chronic form like abdominal pain, constipation, irritability and anemia or even asymptomatic patients.
	Karrari, Parissa; Mehrpour, Omid; Abdollahi, Mohammad	2012	A systematic review on status of lead pollution and toxicity in Iran; Guidance for preventive measures	Abstract: Lead is an old environmental metal which is presented everywhere, and lead poisoning is an important health issue in many countries in the world including Iran. It is known as a silent environmental disease which can have life-long adverse health effects. In children, the most vulnerable population, mental development of children health effects is of the greatest influence. Low level lead exposure can significantly induce motor dysfunctions and cognitive impairment in children. The sources of lead exposure vary among countries. Occupational lead exposure is an important health issue in Iran and mine workers, employees of paint factories, workers of copying centers, drivers, and tile making factories are in higher risk of lead toxicity. Moreover, lead processing industry has always been a major of concern which affects surface water, drinking waters, and ground waters, even water of Caspian Sea, Persian Gulf and rivers due to increasing the number of industries in vicinity of rivers that release their waste discharges into river or sea. In addition, lead contamination of soil and air especially in vicinity of polluted and industrialized cities is another health problem in Iran. Even foods such as rice and fishes, raw milk, and vegetables which are the most common food of Iranian population are polluted to lead in some area of Iran. Adding lead to the opium is a recent health hazard in Iran that has been observed among opium addicts. There are few studies evaluated current status of lead exposure and toxicity in the Iranian children and pregnant women which should be taken into account of authorities. We recommend identifying sources, eliminate or control sources, and monitor environmental exposures and hazards to prevent lead poisoning.

F. Blood testing in National Health Surveys

National Health Survey	Non-Communicable Diseases Risk-Factors Surveillance	Source
Purpose	Determining the prevalence of the non-communicable diseases risk factors that can be interfered such as smoking, unhealthy diets, physical inactivity, high blood pressure, excess weight and obesity, high blood sugar and high blood fat, and their distribution by age and gender.	Atlas of Non-Communicable Diseases Risk-Factors Surveillance in the Islamic Republic of Iran , STEPs 2016
Sample size	All the Iranian population aged 18 and over.	
Blood sample testing	Biochemical tests including measurement of biological factors of blood and urine.	
Latest round	2016	
Next round	-	