

LEAD EXPOSURE RISK IN MOROCCO - AN OVERVIEW FROM RELIABLE DATA AND ONE HEALTH PERSPECTIVE



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ABSTRACT

Background: The One Health concept recognizes the relationship between health of people, animals and the environment there is an equilibrium among these relationships but many factors have changed these interactions. That imbalance is source of many health disasters like poisoning exposure of lead.

Objective: The aim of this review is to collect reliable and available data on lead poisoning in Morocco.

Methods : The review study conducted was focused mainly on lead poisoning the ways of exposure to lead, risk group and Human effects, describe some case study for environment and human conducted in Morocco and discuss current treatment, to end up with prevention and some implications from one health approach perspective.

Results : The sources of exposure to lead are numerous and affect more risk group such as children under 5 years, occupational exposure and pregnant women. The human health effects are not specific; it's depending on the duration of lead exposure, that making diagnosis difficult and underestimated. Humans are not alone in suffering from lead's effects; plants, air soil, and animals are also affected by their toxicity. Lead poisoning is entirely preventable. One health approach to prevention can be divided into individual measures, public health for risky groups, and environmental.

Conclusion: A sensitive environmental surveillance system is required to indicate early warning of lead contamination and install in the convenient time the response measures. In addition, efforts are to be made to raise clinician and biologist awareness of lead poisoning diagnosis to improve early diagnostic and treatment.

Keywords :

Lead poisoning,
exposure to lead,
risk group,
risk factor,
Human effects,
environmental risk

I. INTRODUCTION

The heavy metals lead, Cadmium and mercury, have no known benefits and can be harmful to ingest. These metals are common air pollutants, being emitted mainly as a result of various industrial activities. Although the atmospheric levels are low, they contribute to the deposition and build-up in soils. Heavy metals are persistent in the environment and are subject to bioaccumulation (1).

The heavy metal toxicity has been described throughout history. The doctors of Greece and ancient Rome already was diagnosed the symptoms of acute lead poisoning. "Lead poisoning" is classically defined as exposure to high levels of lead typically associated with severe health effects (2).

Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world. It is a cumulative toxicant that seriously affects the human health (3).

Lead poisoning was the first recognized occupational disease in France since 1919. World health organization has identified lead as one of ten chemicals of major public health concern, needing action by Member States to protect the health of workers, children and women of reproductive age.

Lead exposure is estimated to account for 143 000 deaths per year with the highest burden in developing regions (3) Also 88% of preschool children in the United States had high lead levels enough to cause serious health effects (4).

In Morocco, Lead poisoning is a complex Public health problem this is due to recent epidemiological knowledge also major endemic situation due to paint of old buildings, drinking contaminated water, have highlighted the risk. However, the lead poisoning is still underestimated. Moreover; there are few studies about it in my country.

The objective of this review is to collect reliable and available data on lead poisoning in Morocco (10).

Ethical Consideration: Not needed

Conflict of interest: None

II. MATERIALS AND METHODS

The review study conducted was focused mainly on lead poisoning the ways of exposure to lead, risk group and Human effects, describe some case study for environment and human conducted in Morocco and discuss current treatment, to end up with prevention and some implications from one health approach perspective.

The review targeted the most reliable and available data of lead poisoning in Morocco. Articles from Pubmed, google scholar, science direct and index medicus were searched using key words: "lead poisoning, poisoning exposure, exposure to lead, risk group, risk factor, Human effects, environmental risk". National reports, manuals, guidelines focused on lead poisoning were also searched.

All reliable documents were explored and a synthesis of the most relevant data was presented in the results part.

III. RESULTS AND DISCUSSION

Sources of exposure to lead

Lead is an environmental pollutant most studied and adverse health effects are known. It has long been regarded as a threat to the health of people living near mining industries and refineries.

Lead is persistent in the environment and causes the bioaccumulation in food-chains (5).

Bioaccumulation is phenomenon existing for heavy metals which results in a concentration of pollutant in the organism than in their habitat.

Important sources of environmental contamination include mining, smelting, printing, developing dental x-ray films, manufacturing and recycling lead activities, and, in some countries, the continued use of leaded paint and leaded gasoline. More than three quarters of global lead consumption is for the manufacture of lead-acid batteries for motor vehicles. Lead is, also used in many other products, for example pigments, solder, stained glass, crystal vessels, ammunition, ceramic glazes, water delivered through lead pipes, jewellery, children's toys and in some cosmetics and traditional medicines. (6).

In Morocco, more common ways of lead exposure could be causes such as using utensils of lead-based cooking, pottery, the use of medicines and cosmetics containing lead, like khôl, the existence of old pipes which can result in hazardous exposure levels of the drinking water. On the other hand, the presence of factories in industrial and craft activities, using the recycling lead an illegal way, is the one source of poisoning among residents near these factories, especially for children (7).

Risk group

Lead is a naturally occurring toxic metal found in the Earth's crust. It is a cumulative toxicant that affects multiple body systems, like the neurologic, hematologic, gastrointestinal, cardiovascular, and renal systems (3).

Children under 5years are particularly vulnerable to the neurotoxic effects of lead, and even low levels of exposure can cause serious and may be irreversible neurological damage like: Low intelligence quotient (IQ), Behavior problems, Hyperactivity and hearing problems (8). In rare cases, ingestion of lead can cause seizures, coma and death.

Pregnant women, Lead can cross the placental barrier exposing the fetus to reduced growth of the fetus and premature birth. During pregnancy, lead are released from bones who it's accumulate as maternal calcium and is used to help form the bones of the fetus if a woman does not have enough dietary calcium (9).

The adult, in occupational exposure is the main cause of Lead poisoning; people can be exposed when working in facilities that produce lead-containing products (10). Parents who are exposed to lead in the workplace can bring lead dust home on clothes or skin and expose their children (11).

Human Health effects and diagnosis of lead poisoning

Lead in the body is distributed to the brain, liver, kidney and bones. It is stored in the teeth and bones, where it accumulates over time.

Lead poisoning can cause different symptoms depending on the duration of lead exposure (12).

The main tool in diagnosing of lead poisoning is laboratory analysis of the blood lead levelbut symptoms are not specific, someone with elevated lead levels may have no symptoms (13).

a. Acute intoxication :Rare, it can only result from a massive ingestion it is manifested by an array of may cause gastrointestinal disturbances and convulsive encephalopathy, hemolysis, kidney and liver damage.(6)

b. Chronic lead poisoning can manifest by different symptoms like : Digestive symptoms like the "lead colic" which express a pseudo surgical abdominal pain, the lead encephalopathy is a acute manifestation of chronic lead intoxication with apathy, headache and convulsions, anemia, Chronic kidney failure, Cardiovascular effects, increased blood pressure and incidence of hypertension., bone and joint effects: In children, the radio opaque metaphyseal bands in the long bones to radiology and may cause an adult attacks of gout , reproductive problems like infertility , the organic derivates of Lead is carcinogenic substance to humans(the International Centre for Research on Cancer (IARC)) (6).

Case study environment and human lead poisoning situation in Morocco

Humans are not alone in suffering from lead's effects; plants, air soil, and animals are also affected by their toxicity (14).

SOIL functions are disturbed by lead intervention, especially near highways and farmlands where high concentrations may be present. Soil organisms too suffer from lead poisoning (15).

WATER: Lead concentrations in groundwater studied in most provinces of Morocco are substandard Moroccan drinking water and values generally do not exceed 6 µg/l for lead. However, a groundwater near industries has 25 µg/l (16).

AIR in occupational exposure: A study of the pottery workshops showed that the maximum content in lead atmospheric was 9 times higher than the accepted norm and that 80% of artisans had blood lead levels above the threshold limit permitted for occupationally exposed workers. Around 51.6% for artisans, blood lead levels exceeded the danger level (17).

Atmospheric Air: In 1996, the National Institute of Hygiene conducted an assessment of the air pollution lead at Rabat and Salé. These cities are subject two sources of lead pollution: the transport because of the use of leaded gasoline and craft pottery using powders containing high concentrations of lead.

Results of this study show that (18).

- The annual average concentration of atmospheric lead (1.12 µg/m³) exceeds the WHO norm.
- The highest average grade (1.4 µg/m³) was recorded in the month of December 1996 in the Oulja station, station where the activities are located craft of lead-based pottery.
- At the level of the urban area, the highest concentrations were measured during dense automobile traffic .

The impact of this pollution on the Oued Bouregreg (river between these 2 cities) is very worrying since lead contamination in the sediment level has a factor of concentration of 40 000 compared Oudaya (area away from pottery pollution) and at the level of marine organisms, including Lead levels are much higher than the literature data.

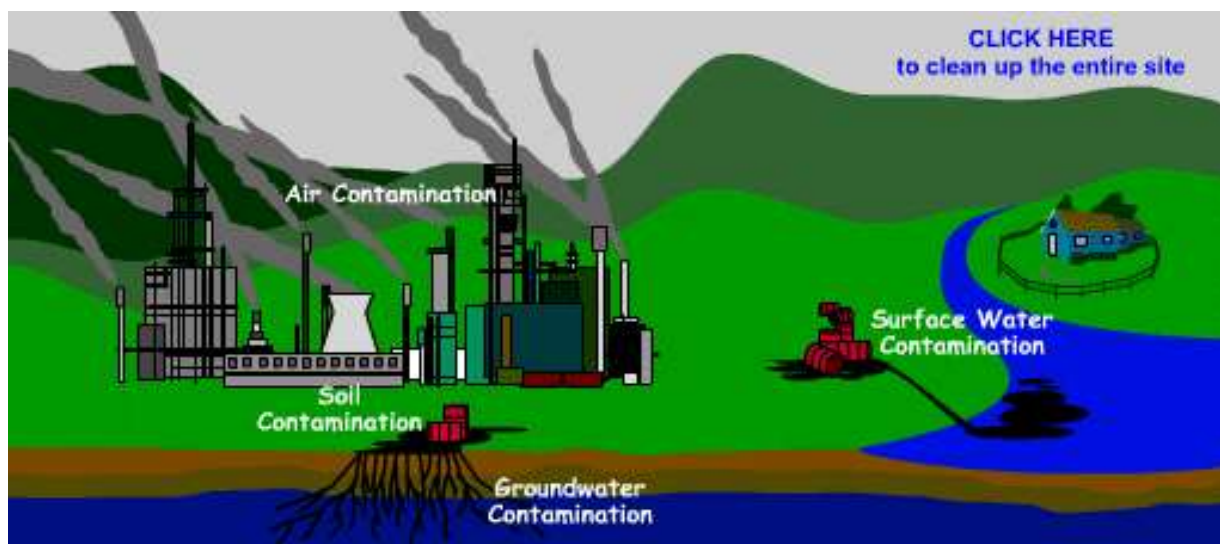


Figure-1. Infiltration of pollutants and Groundwater contamination (source: Website of United States Environmental Protection Agency) (9)

Human lead poisoning studies still are few in Morocco. The Moroccan Poison Control Centre conducted study among residents of the region of Rabat (Morocco) (19) and the results are:

- In a sample of 385 blood donors at the blood center Rabat, average blood lead level was 86.9 ± 42.2 µg / l.
- Blood lead the habitants of Rabat (93.6µg/l) was higher than people in other provinces (78,8µg l). This can be explained by the existence of a traffic density automobile, by the existence of water distribution lead lines or by urban activities.

One health perspectives and Prevention

Lead poisoning is entirely preventable (6). Prevention strategies can be divided into individual measures, public health for risky groups, and environmentalists.

Primary prevention: The most effective primary prevention is elimination of use and exposure to lead thanks to (6):

- Regulations to limit the amount of lead in paint, children's toys and phase out the use of lead additives motor fuels. In Morocco, producer and user of heavy metal, subject to international regulation, control the levels of these metals in the environment, in consumer products including drinking water and utensils manufacturing products (7)
- Eliminate the use of leaded solder in food and drink cans, as well as in water pipes.
- Eliminate the use of lead glazing for pottery and lead use in traditional medicines and cosmetics.
- Prevent exposure to lead from electronic waste, informal recycling lead and industrial waste by adopting hygiene measures.
- Prevent to human exposure in contaminated sites.
- Surveillance with monitor blood lead levels during occupational exposure, also in children and women of child-bearing age.
- Enhance the collection of data on lead in foodstuffs, and make this information publicly available so that appropriate action can be taken; identify foodstuffs with high lead content and use the information to support appropriate action.
- Educate the public regarding the dangers of misusing lead-containing products.
- Promote preventive and educational measures to protect children from lead in their environment

Secondary prevention: it is to treat the cases that people who have significantly high blood lead levels or who have symptoms of poisoning: The treatment proposed of lead poisoning associated (7):

- The identification of sources of lead (pb) and their eradication if possible;
- Lifestyle advice and change the behavior: hygienic measures (hand wash...), correct the phosphocalcium deficiency and anemia.
- Symptomatic treatment like dialysis, Antispasmodic therapy to treat lead colic and Zinc Intake;
- Decontamination: if oral ingestion.
- Specific treatment: chelation therapy is used in cases of acute lead poisoning (20), severe poisoning, and encephalopathy (21). The only chelator available in Morocco is DMSA (2, 3-dimercaptosuccinic acid succimer).

Third prevention: it is psychological and social support for victims of lead poisoning patients who developed irreversible complications like chronic renal failure or encephalopathy.

IV. CONCLUSION

The one health approach perspective is an integrated multisectorial management in close collaboration between environmentalist and public health.

A sensitive environmental surveillance system is required to indicate early warning of lead contamination and install in the convenient time the response measures. In addition, efforts are to be made to raise clinician and biologist awareness of lead poisoning diagnosis to improve early diagnostic and treatment.

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REFERENCES

- [1] **Fernando H. J. S, Klaić Z.B, McCulley J.L.** National Security and Human Health Implications of Climate Change. NATO Science for Peace and Security Series C: Environmental Security. 2012. ISBN: 978-94-007-2429-7 (Print) 978-94-007-2430-3 (Online).
- [2] **Grant, L.D.** Lead and compounds, In Lippmann, M. Environmental Toxicants: Human Exposures and Their Health Effects. 3rd edition. Wiley-Interscience. 2009. ISBN 0-471-79335-3.
- [3] **World Health Organization.** Lead poisoning and health. July 2016
<http://www.who.int/mediacentre/factsheets/fs379/en/>
- [4] **Center for Disease Control and Prevention CDC.** January 2017. Childhood Lead Poisoning <http://ephtracking.cdc.gov/showChildhoodLeadPoisoning.action>.
- [5] **World Health Organization.** Health risks of heavy metals from long-range transboundary air pollution. 2007. ISBN 978 92 890 7179 6
- [6] **World Health Organization.** EXPOSURE TO LEAD: A MAJOR PUBLIC HEALTH CONCERN World Health Organization 2010.
- [7] **Achour S., Iken I., Amarti A.** L'intoxication au plomb. Revue de toxicologie marocaine 2014. Centre Antipoison Morocco.
- [8] **Bellinger, D.C.** Very low lead exposures and children's neurodevelopment. Current Opinion in Pediatrics. 2008. 20 (2): 172–7
- [9] **US Environmental Protection Agency EPA,** 2016. <https://www.epa.gov/lead/learn-about-lead>
- [10] **Needleman H.** Lead poisoning. Annual Review of Medicine. DOI: 10.1146/annurev.med. 55.091902. 103653. February 2004. 55: 209–22
- [11] **Dart R. C, Hurlbut K. M, Boyer-Hassen L. V.** Lead. In: Dart RC. Medical Toxicology. 3rd edition. Philadelphia: Lippincott Williams & Wilkins; 2004:1426
- [12] **Kosnett M.J.** "Lead". In Brent, J. Critical Care Toxicology: Diagnosis and Management of the Critically Poisoned Patient. Gulf Professional Publishing. 2005.

- [13] **Myeyk M., Hryhorczuk D. and Amitai Y.**, Lead, In Erickson, TB; Ahrens, WR; Aks, S; Ling, L. Pediatric Toxicology: Diagnosis and Management of the Poisoned Child. McGraw-Hill Professional. 2005.
- [14] **Yu, M.H.** Soil and water pollution: Environmental metals and metalloids. Environmental Toxicology: Biological and Health Effects of Pollutants. CRC Press. 2005.
- [15] **Martinez C.E., Motto H.L.** Solubility of lead, zinc and copper added to mineral soils, Environmental Pollution, January 2000. 107 : 153-158
- [16] **Serghini A, Fekhaoui M, El Abidi A, Tahri L, Bouissi M, Zaid EL.** Contamination métallique des eaux souterraines de la ville de Mohammedia (Maroc). Cahier d'études et de recherches francophones/santé. 2003 ; 13 (3) :177-88.
- [17] **Laraqui CH., Caubet A., Laraqui O., Rahhali A., Curtes J.P., Verger C.** Etude des risques professionnels chez les potiers au Maroc. Cahiers d'études et de recherché francophones /Santé. 2000;10 (4)
- [18] **El Abidi A et all.** The impact of lead pollution on the environment of Rabat-Sale (Morocco). Annali di Chimica. 2000; 90: 695-702
- [19] **Khassouani CE, Soulaymani R, Allain P.** Etude de l'imprégnation saturnine des habitants de la région de Rabat (Maroc). Presse Med. 1997; 26:1714-16.
- [20] **Patrick, L.** Lead toxicity, a review of the literature. Part 1: Exposure, evaluation, and treatment. Alternative Medicine Review 2006. 11 (1): 2-22
- [21] **Olson, K.R. Poisoning. In McPhee, S.J.; Tierney, L.M.; Papadakis, M.A.** Current Medical Diagnosis and Treatment (46th edition). McGraw-Hill Professional. 2007.
