

REVIEW ON HEAVY METAL TOXICITY MODERN AND AYURVEDIC ASPECT**Dr. Vd. Jaiprakash S. Ukey***

Assistant Professor, Dept. of Agadtantra M. S. Ayurved Medical College Gondia.

***Corresponding Author: Dr. Vd. Jaiprakash S. Ukey**

Assistant Professor, Dept. of Agadtantra M. S. Ayurved Medical College Gondia.

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ABSTRACT

Heavy metals are nothing but naturally occurring elements having high atomic weight and density and are toxic in low concentration. The most commonly found heavy metals include arsenic, cadmium, chromium, copper, lead, nickel and zinc. These metals get accumulated in body through food, water chemicals present in industries etc. Metal poisoning mostly occurs due to occupational exposure, accidents and environmental factors. Metal toxicity mostly depends upon the absorbed dose, the route of exposure, i.e. acute and chronic. Heavy metal toxicity proved to be a major threat and there are several health risks that are associated with it. Some of the metals, such as aluminium, can be removed through elimination process, while some metals get deposited in the body producing acute and chronic symptoms. Various public health measures undertaken for control, prevention and treatment of metal toxicity occurring at various levels, such as occupational exposure, accidents and environmental factors.

KEYWORDS; Heavy metals, metal toxicity.**INTRODUCTION**

Heavy metals enter the surroundings by natural means and through human activities. These heavy metals contamination mainly occurs due to food, water fertilizers etc. The most common heavy metals include arsenic, cadmium, mercury, copper, lead. In small amounts they are valuable for maintaining good health but in larger dose they become toxic. Heavy metal toxicity damage the functioning of the kidney, liver, brain, lungs, blood composition and other important organs. Long-term exposure of these heavy metals can lead to gradually progressing physical, muscular, and neurological degenerative processes that imitate diseases such as multiple sclerosis, muscular dystrophy, Parkinson's disease and Alzheimer disease. Long term exposure of some of these heavy metals and their compounds may even result in cancer.

MATERIAL AND METHOD**Heavy Metals Exposure^[1]**

- Contamination of heavy metals mostly occurs due to industrial emissions, harvesting process, transportation, irrigation with contaminated water.
- Small amount of heavy metals exposure occurs through food, air, water and commercial products. The accumulation of these heavy metals causes severe damage.

Factors Responsible For Toxicity Of Heavy Metals

1. Total dose absorbed

2. Exposure was acute or chronic

3. Age of person

Example, young children are more susceptible to the exposure of lead as compared to adults

4. Route of exposure

Elemental mercury is inert in gastrointestinal tract and poorly absorbed through skin, whereas inhaled or injected elemental mercury may have disastrous effects.

Acute Effect of Heavy Metals

CNS: dMS: periph neuropathies in hours to days

CV: Response to volume loss, congestive CM, dysrhythmia

Renal: ATN, Proteinuria, aminoaciduria

GI: Nausea/vomiting/diarrhea

Hair/nail/skin changes: lag days-wks behind acute exposure

Chronic Effects of Heavy Metals

CNS/PNS: predominate

Renal: CRI/CRF

Heme: cytopenias, anemias

Skin: Rashes, coloured lines on nails/gums

Sources and toxic effects of heavy metals.^[2]

Metal	Sources	Toxic effects
Mercury	Coal power plant, electrical equipment, pesticides, cosmetics, mining, paper and pulp, cement	- Minimata disease - Mercury vapours causes asthma, bronchitis, temporary respiratory problems - Memory problems, fatigue, hairloss, headache
Lead	Paper dyeing, coal, mining, petrochemicals, automobiles	- Mental retardation, learning disability - Acute exposure causes headache, abdominal pain, fatigue, arthritis, vertigo - Chronic exposure causes psychosis, paralysis, brain and kidney damage, muscular weakness and even death
Cadmium	Ceramics, toys, coal, nuclear and coal power plant	- Itai Itai disease - Osteoporosis, vomiting, diarrhea, fragile bones, formation of renal stones, kidney damage, lung damage
Zinc	Pharmaceuticals, phosphate fertilizer, distillery	- Fever
Uranium	Mining	- cancer
Chromium	Thermal power plant, mining fertilizers, leather, textile photography	- Bronchial asthma, allergies - Ulcers on nasal septum
Arsenic	Fungicides, pesticides, metal smelters	- Dermatitis, bronchitis - Lung cancer, skin pigmentation and keratosis - Neurological problems, hypertension, cardiovascular disease, piking sensation on legs and hands
Copper	Dental amalgams, intrauterine devices, birth control pills, pesticides, occupational exposures	- Hypothyroidism, kidney and liver dysfunction, cancer, arthritis, hairloss, allergies heart attacks
Aluminium	Tap water, baking powder, bleached flour, aluminium containing drugs, water, food, antacids	- Parkinson's disease, hypoparathyroidism, contact dermatitis, Alzheimer disease, - Adverse effects on nervous system causing brain damage, loss of coordination, loss of memory

Tests to identify heavy metal poisoning^[3]

- Kidney function tests
- Urine analysis
- Liver function studies
- Hair analysis
- Electrocardiograms
- X-rays
- Fingernail analysis

Treatment for heavy metal poisoning^[4]

- Chelation Therapy
- Chelating agent is nothing but chemical compound or drug molecule which is capable of forming a heterocyclic ring with a metal ion as its closing member.

Common Antidotes

Poison	Antidotes
Lead	Calcium disodium edetate Dimercapto succinic acid
Iron	Deferoxamine Deferiprone
Arsenic	Dimercaprol
Mercury	Dimercaprol
Gold	Dimercaprol
Cyanide	Sodium thiosulfate Amyl nitrite pearls Sodium nitrite
Copper	Penicillamine

Ayurvedic Concept

- Most of the metal poisoning occurs accidentally. Some of the Ayurvedic medicines such as rasaushadhis mostly contain metals such as arsenic, mercury, lead etc. Ayurvedic medicines should be standardized by ayurvedic parameters so that metals will not be in free form and will never cause toxicity.
- Before the preparation of medicines the shodhana purification of these metals is very essential. Otherwise the consumption of the medicines of which shodhan procedure is not done causes various diseases.

- Overdose of rasaushadhis are also responsible for various systemic disorders.

Some of the ayurvedic medicines containing metals.

Metals	Ayurvedic Formulations
Parad (mercury)	Makardhwaj, sameerpannag, mallasindur, lohaparpati, rasaparpati
Nag (Lead)	Tralokyachintamaniras, jwarariras, manikyaras, yogeshwarras, mahanilkantharas
Vanga (Tin)	Induvati, kanchanabhraras, talkeshwarras, nityanandaras, laxmivilasras, mehakesariras, aamvatgajsinha modak, mohadadhiras
Tamra (copper)	Arogyavardhinivati, laxmivilasras, aamvateshwarras, kanchanabhraras, tamreshwarras
Tutha (Blue vitriol)	Kanaksundarras, agnikumarloha, jatyadighrut, jatyaditail, tralokyachintamaniras, mahajwarankushras, mhamrutunjayras
Gauripashaan (Arsenic)	Mallasindur, vadvanalras, ardhavabhedharyog, sameerpannagras, suchikabharanras
Hartal (Yellow arsenic)	Rasmanikya, sameerpannag, kasturibhairav ras, talsindur, talakbhasma, nityanandaras
Manshila	Tralokyachintamaniras, manshiladighrut, mrutsanjivani, shwaskutharras, manshiladyavarti

Toxic symptoms

Mercury Toxic Symptoms^[5]

- Nasabhangha
- Dantapatan
- Netra and mukhagatroga
- Visarpa
- Twachavaivarnya
- Pakshaghat
- Bhagandar
- Kushtha
- Updansha

Naag Toxic Symptoms^[6]

- Prameha
- Kshay
- Kamala

Vanga Toxic Symptoms^[7]

- Kushtha
- Gulma
- Kandu
- Prameha
- Vatvyadhi
- Shoth
- Saad
- Bhagandar

Tamra (copper) Toxic Symptoms^[8]

- Murcha
- Bhrama
- Kushtha
- Aruchi
- Chittasantaap
- Kaanti, bal, virya hani
- Kleda

Tutha (Blue vitriol)^[9]

- Vaman
- Bhrama

Gauripashaan (Arsenic)^[10]

- Consumption of 1 ratti somal causes death

Hartal (Yellow arsenic)^[11]

- Rasagraha
- Anaaha
- Hraddaaha
- Aamlavaman
- Pitharidravitruti

Manshila (Realgar)^[12]

- Malavishthambha
- Mutravrodh
- Mutrakrucha
- Balanash

Treatment

Mercury poisoning

- Triphala kwath gandush
- Mahagandhakrasayan
- Sarivadyasav

Nag poisoning

- Suvarnabhasma 1/8 ratti
- Haritaki churna 1 masha

Vanga (Tin) poisoning

- Meshshringi churna + sugar

Tamra (copper) poisoning

- Dhanyak kwath + sugar

Tuth (blue vitriol)

- Jambir ras
- Lajamanda

Gauripashaan (arsenic)

- Shatputi abhrakbhasma
- Krishnasasharpa+ Navneet+ sugar
- Karvellak swaras + ghrit/ sugar

Hartal (yellow arsenic)

- Shodhan karma with vaman or virechana procedure
- Ankot+shirish+ priyangu + lodhra +Tagar churna + honey +ghrit

DISCUSSION

Heavy metal toxicity is the toxic or poisonous effect of metals in certain forms and doses. Certain population including children are at risk for the toxic effects of heavy metals. Heavy metals enter the surroundings by natural means and through human activities. These heavy metals get deposited in body and damage the functioning of the kidney, liver, brain, lungs, blood composition and other important organs. Some of the ayurvedic formulations containing metals if before consumption is not properly purified causes various type of disorders. Overdose of these medications may be harmful and produces side effects. People should be aware of these heavy metal toxicity its prevention, control and treatment. In modern method chelation therapy and antidotes are used whereas in Ayurveda shodhana procedures along with the prativisha should be used for treatment.

CONCLUSION

This review focus on certain heavy metals such as mercury, cadmium, aluminium, arsenic etc. Due to exposure of these metals they get accumulated in body by various means and causes various side effects and systemic damages also the treatment of heavy metal poisoning done by chelating therapy and by the use of antidotes. Whereas in ayurved granth also these heavy metal toxicity is described and their treatment by shodhan procedure and the use of prativisha. As various ayurvedic medicine is prepared by the metals, shodhan and maran procedure is used before preparation. If ashodhit metals are used they produced toxic symptoms. So, this review focus on heavy metal toxicity, exposure and treatment both modern and ayurvedic views.

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