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To study the views of doctors on heavy metal poisoning in Mumbai.

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### Abstract:

**Aims and objectives:** To study the views of Doctors on heavy metal poisoning in Mumbai

**Material and methods:** Heavy metals, like arsenic, lead, mercury, and others, are all around us. They're in the ground we walk on, in the water we drink, and in the products we use every day. But high levels of most heavy metals can make you sick. While our bodies need small amounts of some heavy metals — such as zinc, copper, chromium, iron, and manganese — toxic amounts are harmful. If our body's soft tissues accumulate too much of heavy metals, the resulting poisoning can cause serious damage. Though there is variety of medical uses of heavy metals, still each metal has its own side effects which disturb human health. We have to use solid evidence that demonstrates the safety, efficacy, and effectiveness of specific alternative medicine. Also We have to study General biocompatibility (how metals react with human tissue) and Immunological biocompatibility (The adverse reaction due to an immunological or allergic type response from metals). For the better study of heavy metal toxicity, we have carried out survey taking opinions of Doctors in Mumbai and Thane region.

**Observations:** Commonly found views are : In most of the medicines Doctors identify Lead as poisonous, Most of the metal poisoning cases occur accidentally, *Ayurvedic* medicines should be standardized by *Ayurvedic* parameters so that metals will not be in free form & never cause toxicity, use of herbal preparations is the alternative to medicines containing metals. **Conclusion:** From the survey of heavy metal poisoning we conclude that there are herbal drugs which function as the alternative solutions for the use of heavy metals, Other medicines can be used after the proper detoxification of heavy metals.

## INTRODUCTION:

Heavy metal poisoning is the accumulation of heavy metals, in toxic amounts, in the soft tissues of the body. Symptoms and physical findings associated with heavy metal poisoning vary according to the metal accumulated. Many of the heavy metals, such as zinc, copper, chromium, iron and manganese, are essential to body function in very small amounts. But, if these metals accumulate in the body in concentrations sufficient to cause poisoning, then serious damage may occur. The heavy metals most commonly associated with poisoning of humans are lead, mercury, arsenic and cadmium. Heavy metal poisoning may occur as a result of industrial exposure, air or water pollution, foods, medicines, improperly coated food containers, or the ingestion of lead-based paints. Heavy metal poisoning can affect males and females in equal numbers, depending on exposure. Outbreaks of this type of poisoning have occurred in the United States during the past several years from imported plates and cookware that were not properly coated to prevent heavy metals from contaminating food.<sup>1</sup>

Heavy metals can enter the body through the skin, or by inhalation or ingestion. Toxicity can result from sudden, severe exposure or from chronic exposure over time. Symptoms can vary depending on the metal involved, the amount absorbed, and the age of the person exposed. In the United States, lead poisoning most often affects children between one and three years old. Lead poisoning affects adults less often than children. In the last 20 years, statistics show the number of children with potentially harmful blood lead levels has dropped 85 percent. Mercury poisoning is unusual in children. There have been large outbreaks in Australia and France of bismuth poisoning.<sup>2</sup>

Nausea, vomiting, *diarrhea*, and abdominal pain are common symptoms of acute metal ingestion. Chronic exposure may cause various symptoms resulting from damage to body, and may increase the risk of treatment depend on the circumstances of the exposure.

This Research (Survey) helps us better to understand the condition and can lead to advances in diagnosis, treatment & prevention.

## Material and methods:

### Materials -

### Metal poisoning:

### General biocompatibility–

On this most basic level, we have to look at how the material reacts generally with human tissue. In other words, how toxic the material is at a cellular level. Does it poison cells? This toxicity tends to be an inherent property of the material, and all people will react to it in a similar manner. Using a toxic material such as mercury or nickel would always be a mistake.

### Immunological biocompatibility–

This level looks at materials from a standpoint of how an individual reacts to the material. The problem is analogous to what happens when someone with an allergy to mushrooms consumes an edible mushroom. The adverse reaction is due to an immunological or allergic type response based on the patient's biochemical makeup. A test like the Clifford Materials Reactivity Test measures how antibodies in the blood react with the material (or, more accurately, its corrosion by-products).<sup>3</sup>

## Uses of heavy metals -

### Dental use:

Nickel is used to prepare braces. Amalgam, iron oxides, aluminum oxides, barium in tooth filling. Gold crowns. Galloy (silver and tin).<sup>4</sup>

### OTHER MEDICAL USES

1. HgCl is used as bactericidal.
2. Silver salts as germicide.
3. Bismuth is used to treat a range of ailments. Most commonly, bismuth is used to help protect against gastric ulcers, as well as hydration therapies for young children suffering from severe diarrhoea. Although bismuth has been shown to be exceedingly useful in these capacities it has also been blamed for encephalopathy in adults.
4. Gold Salts and Rheumatoid Arthritis.
5. Silver filings as a blood purifier, for offensive breath, and for palpitations of the heart
6. The Role of Zinc in Ischemia.

## SIGNS AND SYMPTOMS OF HEAVY METAL POISONING -

The symptoms of heavy metal poisoning vary according to which type of metal overexposure is involved. Some specific examples are:

### 1) COPPER

- i) Nervous system dysfunction.
- ii) Anemia.
- iii) Infertility or premenstrual syndrome.
- iv) Wilson's disease.<sup>5</sup>

### 2) MERCURY (1 to 4 gm)

Symptoms of mercury poisoning include fatigue, depression, sluggishness (*lethargy*), irritability, and headaches. Respiratory symptoms associated with inhalation to mercury vapors include coughing, breathlessness (*dyspnoea*), tightness or burning pain in the chest, and/or respiratory distress.

There may be behavioural and neurological changes associated with overexposure to mercury poisoning, such as excitability and quick-tempered behavior, lack of concentration, and loss of memory. Shock and permanent brain damage may also be result from mercury poisoning. Some affected individuals experience mental confusion.

In some cases of chronic exposure to inorganic mercury a personality disorder known as erythrim or mad hatter syndrome may occur.<sup>6</sup> Symptoms associated with mad hatter syndrome include memory loss, excessive shyness, abnormal excitability, and/or insomnia. This syndrome was described in workers with occupational exposure to mercury in the felt-hat industry.

### 3) LEAD (20 to 30gm)

Lead overexposure may cause children to be less playful, clumsier, irritable, and sluggish (*lethargic*). In some cases, symptoms include headaches, vomiting, abdominal pain, lack of appetite (*anorexia*), constipation, slurred speech (*dysarthria*), changes in kidney function, unusually high amounts of protein in the blood (*hyperproteinemia*), and unusually pale skin (*pallor*) resulting from a low level of iron in the red blood cells (*anemia*). Neurological symptoms associated with lead overexposure include

an impaired ability to coordinate voluntary movements (ataxia), brain damage (encephalopathy), seizures, convulsions, swelling of the optic nerve (*papilledema*), and/or impaired consciousness.<sup>7</sup> Some affected children experience learning or behavioural problems such as mental retardation and selective deficits in language, cognitive function, balance, behaviour, and school performance. In some cases, symptoms may be life-threatening.

In adults, overexposure to lead may cause high blood pressure and damage to the reproductive organs. Additional symptoms may include fever, headaches, fatigue, sluggishness (lethargy), vomiting, loss of appetite (anorexia), abdominal pain, constipation, joint pain, loss of recently acquired skills, in coordination, listlessness, difficulty sleeping (insomnia), irritability, altered consciousness, hallucinations, and/or seizures.

#### **4) ARSENIC (0.2 gm)**

Overexposure may cause headaches, drowsiness, confusion, seizures, and life-threatening complications. Neurological symptoms include brain damage (encephalopathy), nerve disease of the extremities (peripheral neuropathy), *pericapillary hemorrhages* within the white matter, and loss or deficiency of the fatty coverings (myelin) around these nerve fibers (*demyelination*). Gastrointestinal symptoms include a flu-like illness (gastroenteritis) that is characterized by vomiting; abdominal pain; fever; and *diarrhea*, which, in some cases, may be bloody. In cases of chronic poisoning, weakness, muscle aches, chills, and fever may develop.<sup>8</sup>

#### **5) CADMIUM**

*Itia-itia* disease (ouch-ouch).<sup>9</sup>

#### **6) MANGANESE:**

Manganism is a neurodegenerative disorder resulting from chronic exposure to abnormally high levels of the essential element manganese.

#### **7) BISMUTH:**

Overexposure to bismuth may cause extreme drowsiness (somnolence) and neurologic disturbances such as confusion, difficulty in concentration, hallucinations, delusions, myoclonic jerks, tremors, seizures, an impaired ability to coordinate voluntary movements (ataxia), and/or inability to stand or walk.

#### **8) NICKEL:**

Nickel in braces can hamper immunity. Some cases of overexposure to nickel have been associated with an increased risk of lung cancer.

#### **9) GOLD:**

Overexposure to gold (as in treatment of rheumatoid arthritis) may cause skin rashes; bone marrow depression; stomach and intestinal bleeding; headaches; vomiting; focal or generalized continuous fine vibrating muscle movements (*myokymia*); and yellowing of the skin, mucous membranes, and whites of the eyes (jaundice).<sup>10</sup>

#### **10) SELENIUM:**

Overexposure to selenium may cause irritation of the respiratory system, gastrointestinal tract, and eyes; inflammation of the liver; loss of hair (alopecia); loss of skin colour

(*depigmentation*); and peripheral nerve damage.

### 11) TIN:

Overexposure to tin may damage the nervous system and cause psychomotor disturbances including tremor, convulsions, hallucinations, and psychotic behavior.<sup>11</sup>

### 12) ALLUMINIUM:

*Aluminium* containers used in the manufacture and processing of some foods, cosmetics and medicines, and also for water purification. Overexposure to *aluminium* may cause brain damage (encephalopathy).

### 13) COBALT :

Cobalt, used in making jet engines, may cause nausea, vomiting, lack of appetite (anorexia), ear ringing (tinnitus), nerve damage, respiratory diseases, an unusually large thyroid gland (goiter), and/or heart and/or kidney damage.

### 14) THALLIUM:

Symptoms associated with thallium poisoning include extreme drowsiness (somnolence), nausea, vomiting, abdominal pain, and bloody vomiting (*hematemesis*). Some affected individuals may experience the loss of most or all of their scalp hair (alopecia); rapidly progressive and painful sensory *polyneuropathy*; motor neuropathy; cranial nerve palsies; seizures; impaired ability to coordinate voluntary movements (*cerebellar* ataxia); and/or mental retardation.<sup>12</sup>

**CAUSES:** Heavy metal poisoning is a result of the toxic accumulation of certain metals. Such metals compete with and replace certain essential minerals in the

course of which any of several of the body's organ systems may be affected.

Lead poisoning may be caused by exposure (e.g. chewing or ingestion) to deteriorating lead paint in older houses. Occupational exposure to lead in painting, smelting, firearms instruction, automotive repair, brass or cooper foundries, printing, battery manufacturing, mining, brass foundry, gasoline, glass, and bridge, tunnel and elevated highway construction may also occur.<sup>13</sup> Another cause of lead poisoning is through the contamination of water from lead pipes. Additional causes of lead poisoning include calcium products, progressive hair dyes, *kajal*, *surma*, kohl, and foreign digestive remedies.

Mercury poisoning may be caused by exposure to large amounts of mercury in the manufacturing of thermometers, mirrors, incandescent lights, x-ray machines, and vacuum pumps. Another cause of mercury poisoning is contaminated water and fish. Children often are exposed to mercury through paint, calomel, teething powder, and mercuric fungicide used in washing diapers. The additional causes of mercury poisoning are exposure to mercury in thermometers, dental amalgams, and some batteries.

Arsenic poisoning may be caused by medications including Fowler's solution (*potassium arsenite*) and some topical creams used in the treatment of some skin conditions. Ingestion of herbicides, insecticides, pesticides, fungicides, or *rodenticides* containing arsenic may cause arsenic poisoning.<sup>14</sup> Occupational exposure to arsenic in the manufacture of paints, enamels, glass, and metals may cause arsenic poisoning. Other forms of occupational exposure



include galvanizing, soldering, etching, lead plating, smelting, and wood preserving. Arsenic is also found in contaminated water, seafood, and algae.

Cadmium poisoning may be caused by ingestion of food (e.g. grains, cereals, and leafy vegetables) and cigarette smoke.<sup>15</sup> Occupational exposure to cadmium in metal plating, battery, and plastics industries may also occur.

Manganese poisoning may be caused by chronic inhalation and ingestion of manganese particles. Occupational exposure to manganese in mining and separating manganese ore may also occur.

Phosphorus poisoning may be caused by insecticides such as tetra ethyl pyrophosphate.

Thallium poisoning may be caused by ingestion of *rodenticides* containing thallium. Thallium in pesticides, insecticides, metal alloys, and fireworks can be absorbed through skin as well as through ingestion and inhalation.

## MODERN APPROACH -

Since salts are in ionic form they are harmful.

The Dietary Supplement Health and Education Act passed in 1994 restricted the Food and Drug Administration's (FDA's) control over dietary supplements, leading to enormous growth in their promotion of adulteration.

(1) Between 1990 and 1997, use of herbal remedies increased 380% in the United States.<sup>16</sup>

(2) Data from a 1998-1999 survey estimated that 14% of US adults took

herbal supplements and appr. 1 in 5 adults taking prescription medications also used an herbal or dietary supplement. In less than a decade, the dietary supplement industry has assumed a substantial proportion of the health market, grossing nearly \$18 billion in 2001.<sup>17</sup>

Be aware that *Ayurvedic* products do not undergo FDA review. In accordance with current law, FDA does not evaluate these products before they are marketed. This means their safety, quality, and effectiveness cannot be assured by FDA.

Certain populations, including children, are particularly at risk for the toxic effects of heavy metals.

Use caution when buying medical products on the Internet. FDA urges consumers to beware of unregulated Internet drug sellers. Many of their products could pose direct or serious indirect health issues, or could contain toxic substances.

Tell your health care professional about all alternative products. Some herbs, minerals, and metals can interact with each other and with conventional medications.

There is no alternative medicine. There is only scientifically proven, evidence-based medicine supported by solid data, or there is unproven medicine, for which scientific evidence is lacking. Whether a therapeutic practice is "Eastern" or "Western", is unconventional or mainstream, or involves mind-body techniques or molecular genetics is largely irrelevant.

In the US and throughout the world, most alternative therapies have not been evaluated using rigorously

conducted scientific tests of efficacy based on accepted rules of evidence. The lack of properly designed and conducted randomized trials is a major deficiency... However, some advocates of alternative medicine argue that many alternative therapies cannot be subjected to the standard scientific method, and thus instead must rely on anecdotes, beliefs, theories, testimonials, and opinions to support effectiveness and justify continued use.

Until solid evidence is available that demonstrates the safety, efficacy, and effectiveness of specific alternative medicine interventions, uncritical acceptance of untested and unproven alternative medicine therapies must stop. Alternative therapies that have been shown to be of no benefit (aside from possible placebo effects) or that cause harm should be abandoned immediately.

Physicians, insurance plans, medical centers and hospitals, managed care organizations, and government policy-makers should base decisions regarding incorporation of and payments for alternative medicine therapies on evidence-based research and objective cost-effectiveness analyses rather than on consumer interest, market-demand or competition, well-publicized anecdotal reports, or political pressures from well-organized and influential interest groups.

### AYURVEDIC APPROACH -

Following concerns about metal toxicity:

The Government of India ruled that *ayurvedic* products must specify their metallic content directly on the labels of the product. The harmful effects of the samples are attributed in part to the adulterated raw material and lack of

workers trained in traditional medicine. In a letter to the Indian Academy of Sciences, director of the Interdisciplinary School of Health Sciences, University of Pune, *Bhushan Patwardhan* stated that the metal adulteration is due to contamination and carelessness during the much faster modern manufacturing processes, and does not occur with traditional methods of preparation.<sup>18</sup>

### METHODS -

- For the toxicity of heavy metal poisoning we carried out the survey of doctors in Mumbai and thane region. The findings are as follows.

### QUESTIONNAIRE:

- Name:
- Qualification:
- Profession:
- Experience:

Kindly Tick The Following:

1. Which metal do you identify in medicine as poisonous?  
a. Mercury, b. Lead, c. Copper  
d. Iron
2. Do you use heavy metals in your prescription?  
a. Yes, b. No
3. Which medicine you feel is most poisonous in terms of metal content?  
a. Zinc as vitamin b. *bruhatvaat chintamani* c. *somal kalpa* d. *samirpannag*.
4. What do you generally identify as the symptoms of metal poisoning?  
a. Vomiting b. Diarrhea c. *hepatotoxicity* d. CNS symptoms.
5. How do you generally identify use of metal as poisoning?  
a. Suicidal b. Accidental

- c. Homicidal d. Addictive
6. What immediate treatment do you follow upon metal poisoning?
- a. Penicillamine b. Ferric oxide  
c. BAL d. EDTA
7. Do you support the use of metals in medicine in appropriate circumstances?
- a. Yes b. No
8. What are your views on use of metals in Ayurveda?
- a. Should be banned b. Should be approved by apex body of ayurvedic institution.  
c. Should be available only upon Dr's prescription note.
9. What do you prescribe as an alternative to metals?
- a. \_\_\_\_\_
10. Which laws helps to ceases the use of metal in medicine?
- a. \_\_\_\_\_  
b. Don't know.

## RESULT -

From the survey of Doctors (Ayurvedic and Allopathic), we got the following information regarding heavy metal poisoning.

1. Most of the Doctors find Lead and Mercury as poisonous in medicines.

2. Around half of the percentage of Ayurvedic Doctors use *Rasakalpas* containing metals (after purification) in their prescription.
3. Among the Ayurvedic medicines *Somal kalpas* are poisonous in terms of metal content.
4. Commonly found symptoms of metal poisoning are vomiting and *hepatotoxicity*.
5. Most of the times metal poisoning occur via Accidental route.
6. In metal poisoning cases immediate treatment is given by the use of Penicillamine and EDTA said by 36% Doctors. Around 27 % Doctors use BAL as antidote in metal poisoning.
7. Most of the Doctors support use of metal in medicines after purification.
8. Majority of Doctors say that Ayurvedic medicines containing metals should be approved by apex body of Ayurvedic institution.
9. Most of the Ayurvedic Doctors accept herbal preparations as alternative to metals, some identify purification whereas some accept *bhasmikaran* as alternative to metals.
10. No one knows laws which help to ceases the use of metal in poisoning.

## OBSERVATIONS:

Question No.	Question	Answer by Doctors
1	Most poisonous metal in medicine	45% Lead and 35% Mercury
2	Use of heavy metals in prescription	54% yes
3	Most poisonous medicine in terms of metal content	<i>Somal kalpas</i>
4	Generally identified symptoms of metal poisoning	Vomiting & <i>Hepatotoxicity</i> around 35%
5	Generally identified use of metal as poisoning	Accidental 89%
6	Immediate treatment which follow upon	Penicillamine & EDTA 37%



	metal poisoning	
7	Support the use of metals in medicine in appropriate circumstances?	Yes but after purification
8	Views on use of metals in <i>Ayurveda</i>	Should be approved by apex body of <i>Ayurvedic</i> institution.
9	Alternative to metals?	Herbal preparations 45%

## DISCUSSION -

Heavy Metal toxicity or metal poisoning is the toxic effect of certain metals in certain forms and doses on life. Some metals are toxic when they form poisonous soluble compounds. Certain metals have no biological role, i.e. are not essential minerals, or are toxic when in a certain form

Certain populations, including children, are particularly at risk for the toxic effects of heavy metals. *Ayurvedic* products do not undergo FDA review. In accordance with current law, FDA does not evaluate these products before they are marketed. This means their safety, quality, and effectiveness cannot be assured by FDA.

These medicines should be standardized by *ayurvedic* parameters and not modern parameters. For e. g. Poison of snake is used as medicine in *Ayurveda*. Toxicity can occur when metals are used in free form, but by classical *ayurvedic* methods medicines never contain metal in free form. They are Used only after undergoing karmas like *shodhan*, *maran*, *jarana*, etc. Tests are done for ensuring its efficacy n safety. Metal analyzers are used for fast and reliable identification. ICP-spectrometer is used for analyzing any impurity.

These medicines should be standardized by *ayurvedic* parameters and not modern parameters. For e.g. Modern use titanium oxides for coating tablets and capsules.

We can use apparatus of heavy metals for preparing medicines. e. g. crude aconite is an extremely lethal substance, yet *Ayurveda* looks upon it as therapeutic entity. Crude aconite is always processed, i.e. it undergoes '*samskaras*' before being utilized in the *ayurvedic* formulations. This study was undertaken in mice, to ascertain whether "processed" aconite is less toxic as compared to the crude or unprocessed one. It was seen that crude aconite was significantly toxic to mice (100% mortality at a dose of 2.6 mg/mouse) whereas the fully processed aconite was absolutely non-toxic (no mortality at a dose even 8 times as high as that of crude aconite). Further, all the steps in the processing were essential for complete detoxification.

Also we can use herbal preparations as alternative to such medicines containing metals.

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