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Metallic Toxicity in Ayurveda Medicines

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ABSTRACT: Ayurveda is a form of traditional medicine originating in India. It uses a combination of remedies and lifestyle modification to treat disease and maintain health. Heavy metals found in Ayurvedic remedies include lead, arsenic, and mercury etc. [1] During the traditional preparation of Bhasma the metal is "purified-out" through multiple cooling and heating cycles and by addition of specific "mineral herbs." In modern formulation of medicines, the concentration of heavy metals may be excessive because poor quality control allows for contamination, adulteration, or improper purification. In trace amount it cannot cause any harm but if we take it for long term or as chronic exposure, it can cause many problems in body even death also can be occurred by store in our body parts. As we know Indian people believes in ayurvedic more than allopathy medicine, so I collected the samples of medicines for examination of ayurvedic medicine which is taken majorly. We examine it for identify their properties and detection of heavy metals by some chemical methods and instrumentation method.[2]

INTRODUCTION

Mostly found in the eastern nations of India, Sri Lanka, Bangladesh, Pakistan, Burma, Bhutan, Tibet, and Mongolia,

Ayurveda is a traditional medical system. Minerals, metals, and a variety of herbal and animal ingredients can all be found in Ayurvedic remedies. Both traditional medicine practitioners and Ayurvedic medicine adherents bring these traditional medicines to western nations. Certain Ayurvedic treatments contain metals and minerals in the form of powdered ash, which is created by repeatedly burning metals like gold, lead, mercury, copper, arsenic, etc. at a controlled temperature. Ayurveda is very ancient method of medication used in our country. There are lots of people who trust the ayurvedic medicine or homeopathic medicine as they called it ''Desi Dwai''. Some patients use it as a chronic exposure which can cause more problems in their body. But they never think about it, according to them this medicine is not like a allopathy medicine, there is not any harmful or any issue create by these. But everything has their nature and time to take. There is time of taken for ayurvedic or homeopathic medicine like some medicine we can take only with milk, some medicine we can take with empty stomach only etc. So, wrong way of taking medicine can also cause side effects or any problem in body. Long time exposure or chronic exposure of these medicines also cause problems in body even death can also occur. Because these medicines have some number of heavy metals in it, which never cause any issue in acute exposure but in chronic exposure it can cause many health problems even death also. There formulation is based on herbal products only but some have heavy metals in low amount. These components are used purposefully because, according to Ayurvedic tradition, heavy metals may help the human body regain its normal function and good health. Here is a survey question that we used and that was approved or chosen by three pharmacology department experts.

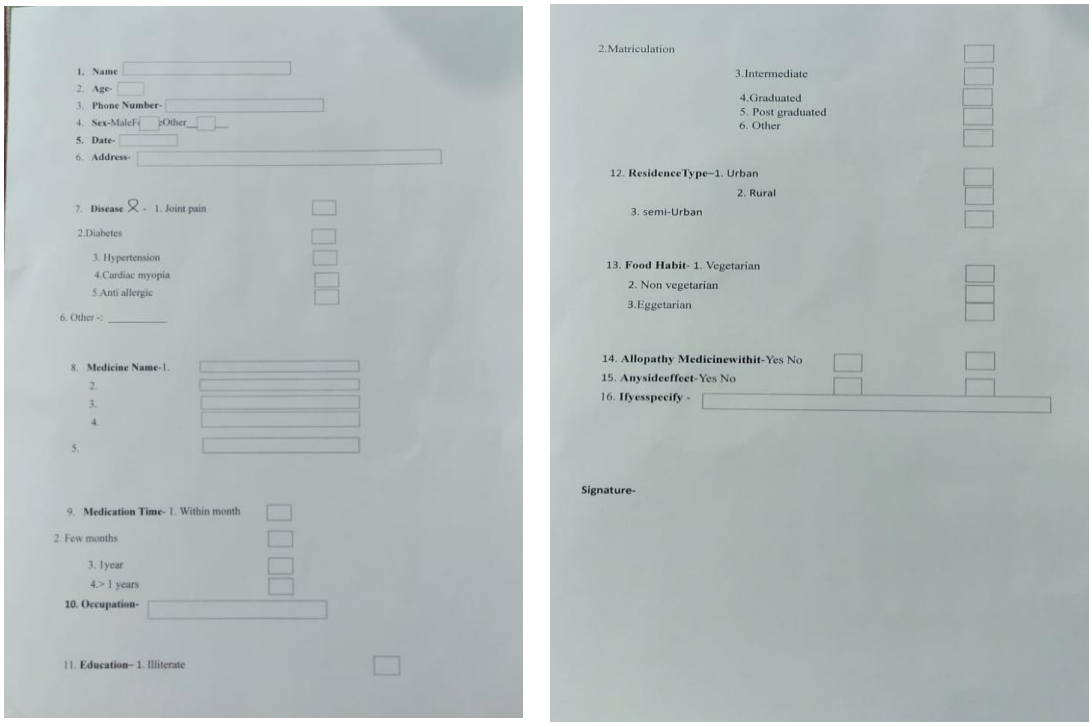

Fig.1 Questionary sample

METHOD AND MATERIALS

We collected the data of patients who take the ayurvedic medicines or homeopathic medicines from a place of Haryana because in Haryana people believe in ayurvedic medicine more than allopathy by survey and questionaries. We collected data of 100 patients with different problems or disease. We collected some personal information of them such as time of medicine from when she or he started the medicine for treatment, their food habits, residence type, education, occupation and any allopathy medicine he or she is taking with these medicines or not. So, there are some common and major disease are mentioned according to our survey with percentage of patients in the form of pie chart.

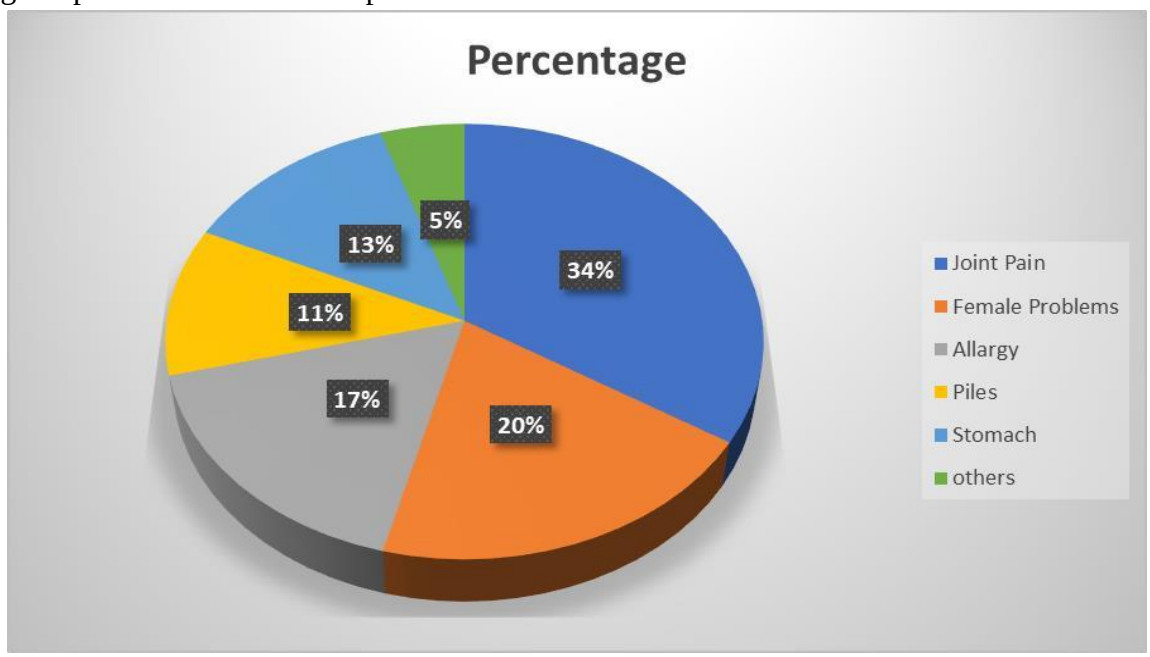

Fig.2 Percentage of patients with respect to diseases mentioned above in chart

For this disease there are few drugs given by doctor for treatment such as Puga Khanda, Candana Sava, Abhyarishta , Yogaraja Guggulu, Lohasava , Smriti Sagar rasa, Dashmularishta , Mulzyme etc. These medicines are giving for mostly body pain, joint pain, weakness, white discharge in females , period irregular cervical pain etc.

Abhyarishta – used for fatty liver, constipation and bloating of stomach , and it helps in treat piles also.

Yogaraja Guggulu- it mainly used for treatment of joint pains, body pain ,muscle problems, nerves issues, paralysis , urine infection etc. but it have side effects also.

Lohasava- it mainly used for patients of aneamia, to form iron in their body , and work as a booster power in body.

Smriti Rasa- used for brain related problems like epilepsy, memory loss , anxiety, depression etc.

Dashmularishta- used for join pains , white discharge in females , for skin [face] problem also

Candanasava- for stomach problems such as stomachache, uterinary infection, stone etc.

Fig.3 Drugs mainly given by doctor

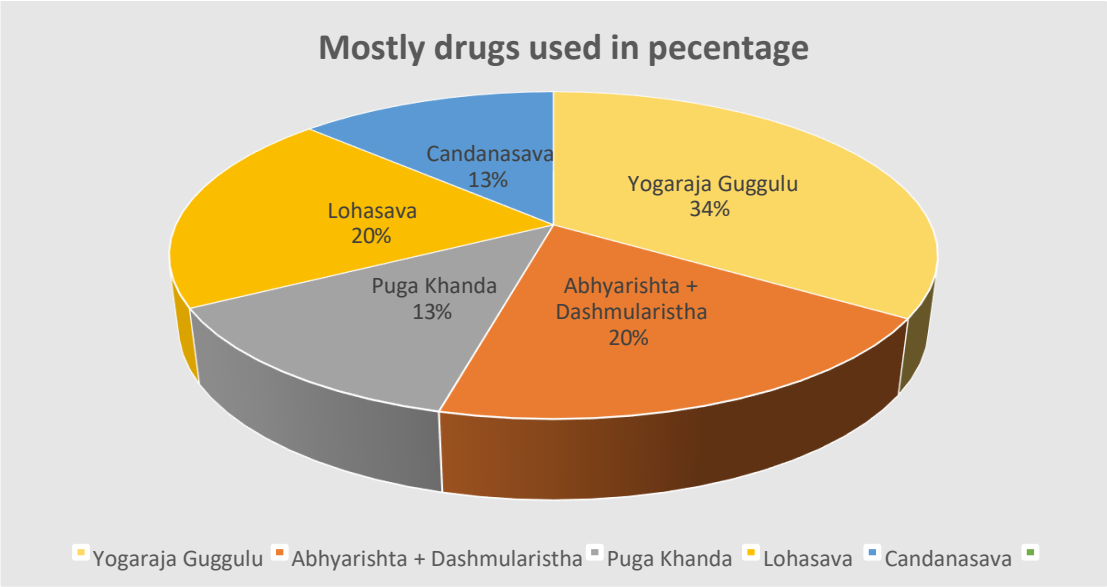

Fig.4 use of drugs in percent

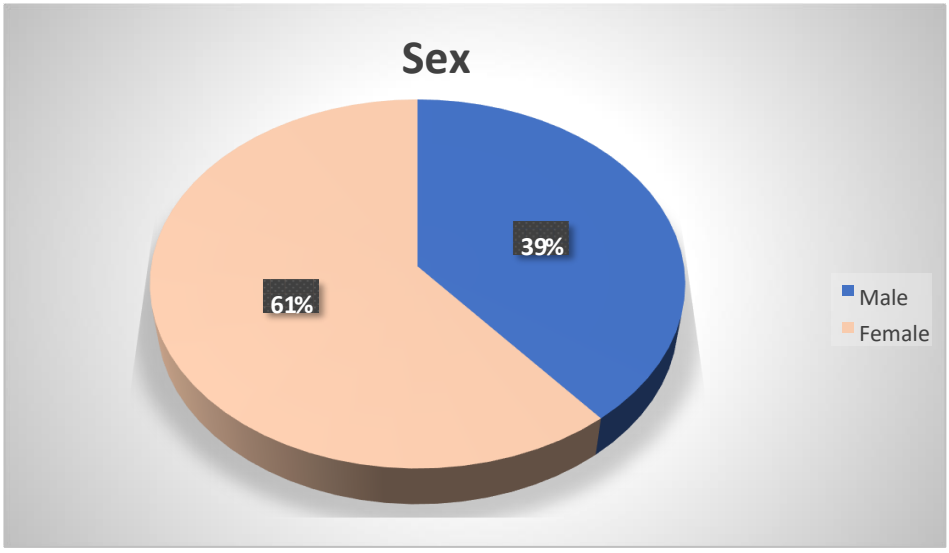

Fig.5 Sex Ratio of Patients

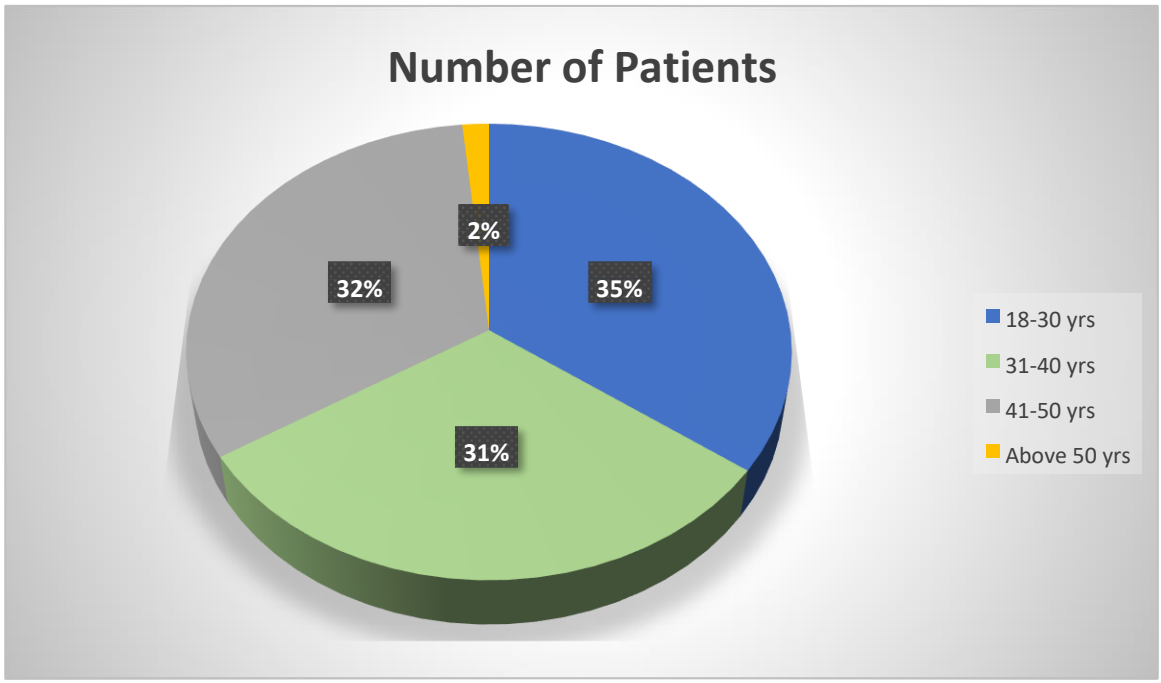

Fig.6 Number of patients with age group

As we observed that Yograj guggul medicine is taken majorly by patients for joint pains, body pain, muscle problems, nerves issues, paralysis, urine infection etc. So, we selected this medicine for examination. We collected different brands of this medicine one from hospital and other were procured from the local market from the registered Ayurvedic Pharmacy. We named them Brand A, Brand B and Brand C.

Ingredients of Yograj guggulu:

Procurement of Samples: In the current study, the following commercially available Yogaraj Guggulu Vati formulations were used. A, B, and C are brands. Every brand of Yogaraj Guggulu Vati was purchased from the authorised Ayurvedic pharmacy located in the area nearby hospitals.

Organoleptic Evaluation: All of the drug's organoleptic characteristics, including colour and aroma, were measured in accordance with standard procedure and recorded.

Pharmaceutical Evaluation: In accordance with conventional procedures, pharmaceutical parameters such as weight variation, thickness, diameter, hardness, friability, and disintegration time were measured.

Weight Variation Determination: Twenty tablets were weighed and the average weight of the tablets was calculated. Then the average weight was compared to the weight of each tablet.

Measurement of Thickness and Diameter: Each crown tablet's diameter and thickness were measured using a Digital Vernier calliper, which provides accurate measurements and information on tablet variance.

Determination of Hardness: Using tablet hardness testers made by Pfizer or Monsanto, one may determine how hard a tablet is. We used a Monsanto hardness tester.

Determination of Disintegration Time: One tablet was put in each tube for the disintegration test, and the basket rack was set up in a one-litre beaker of water that was 37±2°C. The guided disc was positioned above each tablet. The pills must dissolve and all particles must flow through the 10-mesh screen within the allotted time in order to meet USP criteria. Any residue that is left over must have a soft bulk without a core that is noticeably firm. Unless otherwise specified in the monograph, the disintegration time for five Ayurvedic tablets should not exceed fifteen minutes.[6]

ANALYSIS

Determination of Heavy Metals (Lead and Cadmium) Method (Direct Calibration Method):

To cover the range suggested by the instrument manufacturer, three reference solutions of the element under analysis with different concentrations were created. The appropriate reagents were produced with the respective reagents and added separately to the test solution. Each reference solution and the blank solution's absorbance were measured independently, and the results were noted. Using the average of three measurements for each concentration on the ordinate and corresponding concentration on the abscissa, a calibration curve was created. The monograph's instructions were followed to prepare a test solution of the material under examination. The concentration was adjusted to fall within the range of the reference solution. The absorbance was measured three times, the data were recorded, and the average was calculated. The calibration curve's mean value was interpolated to determine the element's concentration.[6]

Formation of Lead Standard Solution: Lead standard solutions were prepared using stock solution [1000 ppm]. The concentrations used to create the standard solutions were 2, 4, 6, 8, and 10 ppm. A hollow cathode lamp was used as a light source and an atomic absorption spectrophotometer was used to measure the absorption of a standard solution at 217 nm.[6]

Formation of Cadmium Standard Solution: The stock solution [1000 ppm] was used to create standard cadmium solutions. The concentrations of the standard solutions were 0.2, 0.4, 0.6, 0.8, and 1.0 ppm. A hollow cathode lamp was used as a light source and an atomic absorption spectrophotometer was used to measure the absorption of a standard solution at 228.8 nm.[6]

Preparation of Test Solution: 0.5 g of the substance being examined coarse powder in a Casparian flask after carefully weighing it. Next, put a tiny hopper on top of the flask, add 10 ml of the 4:1 nitric acid (HNO3) and perchloric acid (HCIO4) combination, let it macerate overnight, and then heat it on an electric hot plate until it slakes. Add additional of the mentioned mixture if it is brownish-black in colour, and keep heating it until the solution becomes translucent and clear The slaked solution should then become clear and colourless or slightly yellow, and the temperature should be raised and maintained until the white smoke has subsided. After cooling, transfer it to a 50 ml volumetric flask, rinse the container with 2% nitric acid solution (HNO3), transfer the washing solution to the same flask, dilute it with the same solvent to the volume, and shake well. The reagent blank solution can be prepared concurrently by following the previous stages.[6]

Determination: Add 1 ml of solution containing 0.2% Mg (NO3)2 and 1% NH4 H2PO4 after precisely measuring 1 ml of the test solution and the corresponding reagent blank solution, respectively. To measure the absorbance, pipette precisely 10– 20 µl after giving it a good shake.[6]

Sample Analysis: An Atomic Absorption Spectrophotometer for Lead and Cadmium was used to analyse the digested samples. The instrumental conditions for Lead analysis are depicted in Table.

Tablet 3: Instrumental Conditions for Analysis of Lead and Cadmium:

Instrumental Conditions	LEAD	CADMIUM
Wavelength [nm]	217.005	220.8
Slit width [nm]	1.0	0.5
Light Source	Hollow cathode lamp	Hollow cathode lamp
Flame type	Dicarbon gas [C2]	H2 air/Dicarbon gas [C2]
Current	10	4
AAS Technique	Flame	Flame

We select AAS instrumentation for the detection of Lead in Ayurvedic medicine as a sample in Yograj Guggulu. Atomic absorption spectrophotometer instrument generally contains the following basic components: The light source

Chopper

Absorption cell

Monochromator

Detector

Readout system

Hollow cathode lamp:

the hollow cathodes lamp is a great light source. In a glass cylinder that is either filled with argon or neon, the anode and cathode are sealed. Fused to the end of the cylinder is a window that is transparent to the radiation emitted. The anode is typically a thick wire made of nickel or tungsten.

It provides an illustration of the emission process. A portion of the filled gas atoms are ionised when an electrical potential is applied between the anode and the cathode. The process known as sputtering occurs when the positively charged ions speed through the electrical field, colliding with the negatively charged cathode to dislodge individual metal atoms. Then, when spewed metal atoms collide with gas lons, they are excited to emit.

The lifespan of hollow cathode lamps is limited. Sputtering may cause some of the metal atoms near the cathode to be removed and deposited elsewhere while the lamp is in use. Lamps for volatile metals, like cadmium, arsenic, and selenium, deteriorate more quickly because the cathode vaporises quickly while in use. One of the main reasons for this kind of lamp failure is the atoms from the fill gas adsorbing onto the inside surface of the lamp housing.

Electrodeless discharge lamps (EDLs) are an additional type of light source. Better spectral output, increased longevity, increased precision, and lowered detection limits are all provided by EDLs. Within a quartz bulb is sealed a small amount of the element or salt of the element for which the source is to be used. This bulb is inserted into a ceramic cylinder that has a coil of radio frequency generator antenna on it. The coupled energy will evaporate and excite the atoms inside the bulb to emit their distinctive spectrum when a R field with enough power is applied. Aluminium, antimony, arsenic, bismuth, cadmium, caesium, germanium, mercury,

potassium, phosphorus, rubidium, selenium, tellurium, thallium, tin, titanium, etc. can all be illuminated with electrodeless discharge lamps. For these components, hollow cathode lamps are also available.[3]

RESULT

Table 4: Results for Pharmaceutical examination of different brands of Yogaraj Guggulu Vati:

SR.NO.	PROPERTIES	SAMPLE 1	SAMPLE 2	SAMPLE 3	STANDARD
1.	Weight Variation	Failed	Passed	Passed	----
2.	Thickness	4.82±0.23	4.55±0.057	6.50±0.082	----
3.	Diameter	9.66±0.02	8.12±0.074	10.86±0.02	
4.	Hardness	3.83±0.289	13.83±0.289	1.67±0.289	
5.	Disintegration Time	55 minutes	57 minutes	53 minutes	1 hour

Table 5: Heavy metal estimation in the Ayurvedic formulation, Yograj Guggulu by AAS:

SR.NO.	PROPERTIES	SAMPLE 1	SAMPLE 2	SAMPLE 3	STANDARD
	Heavy metals concentration in ppm	4.20 µg/g	0.98 µg/g	4.48 µg/g	
1.	Lead	1.928	3.729	3.677	10 ppm
2.	Cadmium	0.185	0.277	0.245	0.3 ppm

Table 5: Results for Organoleptic identification of different brands of Yogaraj Guggulu Vati:

SR.NO.	PROPERTIES	SAMPLE 1	SAMPLE 2	SAMPLE 3	STANDARD
1.	Form of medicine	Solid	Solid	Solid	
2.	Colour	Blackish Brown	Dark Brown	Greyish Brown	Dark Brown
3.	Colour	Characteristic	Characteristic	Characteristic	Spicy Pleasant

TOXICITY OF LEAD:

Sign and Symptoms

- Pallor in the face, especially around the mouth, is one of the first and most reliable symptoms.
- Anaemia
- In 50–70% of cases, the gums exhibit a lead line, a stippled blue line known as the Burtonian line.
- In 85% of instances, constipation and colic affect the intestines, ureters, uterus, and blood vessels.
- Less than 10% of people have lead palsy, which can include cramping, numbness, hyperaesthesia, and tremors.
- In nearly all cases of plumbism, encephalopathy is present. It is frequently linked to tetraethyl lead in children. Vomiting, sleeplessness, restlessness, delirium, coma, and death are some of the symptoms.
- Lead induces arterial constriction in the kidneys and cardiovascular system, which results in hypertension and irreversible arteriolar degeneration.

- Abortion, menstrual irregularities, sterility in both sexes, and reproductive system [5]

TOXICITY OF CADMIUM:

Sign and Symptoms

- Pneumonitis and emphysema from acute inhalation of cd fume
- Renal damage
- Skeletal deformities caused by disturbance of calcium and phosphorus metabolism
- Itai - Itai disease caused by it which is very painful[5]

TREATMENT:

- BAL and calcium disodium versenate, or DMSA, in combination;
- Demulcents;
- Gastric lavage using a 1% solution of sodium or magnesium sulphate
- During a gastric lavage, a large bore orogastric tube is inserted into the patient's stomach. After confirming that the tube is positioned correctly, measured amounts of fluid—usually body-temperature-warmed water or normal saline—are added and then aspirated. The procedure is repeated until a predefined volume has been used or until the returning fluid seems clear. [5].

POSTMORTEM APPEARANCES:

- Congested, degraded, and patchy, the stomach-gastric mucosa has greyish white deposits on it.
- Black faeces matter may be seen in the large intestine.
- Degeneration of the renal tubules.[5]

CONCLUSION

According to this paper, there are many patients of joint pain who are taking ayurveda meditation in India. Mainly are of age group between 40-50 years people. Yogaraja Guggulu is a mostly given by doctor in which heavy metals are present which can harm a body of patient if he or she takes it as chronic exposure. According to my study Lead and cadmium heavy metal is present in sample Yograj Guggulu in more amount than as prescribed by WHO. Every tablet had a pH that was greater above the recommended levels. Both the hardness and disintegration time of Brand B's tablets were significantly higher than those of the other two, measuring 13.83 ± 0.289 and 85 minutes, respectively. Additionally, Sample A's tablets did not pass the weight variation test. The current study's findings conclusively show that formulation preparation is inconsistent. Less similarity between formulations is shown by organoleptic evaluation; data from physicochemical examination indicates that all formulations have significant variations in quality parameters, some of which even deviate from the standard values specified in several pharmacopoeias. As a result, each of these elements influences how effective different drug formulations are.

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