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Review Article

**EFFECTS OF HEAVY METALS POISONING DURING
PREGNANCY****Prof J.S Venkatesh¹, Mr Vinuth Ckikkamath², Vamshi D^{3*}, Varsha K^{4*}, Jahangir Alom^{5*}**¹Professor ,S.C.S College of Pharmacy,Harapanahalli.²Lecturer ,S.C.S College of Pharmacy,Harapanahalli.³⁻⁵Pharm D Interns,S.C.S College of Pharmacy ,Harapanahalli.**Article Received:** November 2022 **Accepted:** December 2022 **Published:** January 2023**Abstract**

Heavy metals and its salt form are important group of pollutants found in the environment. Heavy metals in less quantity act as nutrition to the body if it exceeds that it becomes fatal. During pregnancy it is very much necessary to concentrate on diet. Because good diet is necessary to maintain good health of body as well as mother. These heavy metal mainly enters to the body through ingestion ,may be through water and food. In this review adverse effects caused by mercury, lead, arsenic, cadmium is discussed. This review paper provide an view on toxic effects on pregnant women and newly born baby by heavy metals. It is used to get awareness regarding heavy metal poisoning.

Key words: Heavy metal poisoning, chelation therapy, reproductive system.

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INTRODUCTION:

Heavy metals are defined as any metallic elements that has a excessive density and is toxic at lower concentration.¹ Heavy metals such as lead,arsenic,copper,mercury which is particularly effects reproductive system and in particular poisonous to growing fetus.These heavy metals cannot be filtered by using placenta.² Hence these heavy metals fetus.Ladies who comes in contact with these toxic metals can be infertile because it causes hormonal imbalance..This review paper provides an outline regarding poisonous impact of heavy metals at some stage in pregnancy and to newly born baby .The primary objective is to bring an awareness to the women to be detoxifying before conception.³

Arsenic:It is one of the heavy metal that is grayish in color which isn't toxic always because it is not soluble in water hence it is not absorbed by alimentary canal. Arsenic will be continously changes to arsenious oxide and are highly poisonous.Exposure to the arsenic from the environment by the usage of fertilizer to agricultural areas.¹Arsenic may also enter the human body by drinking well or river or pond water,where these fertilizers are used in nearby agricultural field. Our diet not only gets contaminated with Arsenic by agricultural field;it also gets contaminated by electronic manufacturers those who use heavy metals in the work.Arsenic mainly affects the women who are pregnant with impaired sugar metabolism and gestational diabetes.Chronic exposure to the Arsenic from the drinking water causes feotal death and also pregnant women may face mental retardation or it causes disability in New born baby.

Lead:Lead is one of the heavy metal found in the environment. Sometimes water gets contaminated with Lead when water is supplied with Lead coated pipes .The soluble compounds of Lead are poisonous. Heavy metals enters to the body by breathing or inhalation, ingestion, by the way of absorption via skin or by any mucous membrane.³.When a pregnant women gets toxic by lead it causes miscarriage, premature birth,low birth weight, reduce fetus brain development, growth gets retarded. Lead causes health issues in everyone but infant and new born baby faces severe toxicity and serious health issues like poor learning ability due to impaired brain development.³

Copper: Copper is one of the heavy metal, when copper is in its metallic form it is not poisonous. When copper is in it's salt form, it is poisonous. Some of the salt of copper are blue vitriol and sub acetate.

Site of action of copper is enzyme. It's main action is inhibition of enzymes.⁴ Our body gets copper through the diet, mainly vegetarian diet and it can also be found in water because of copper plumbing. Many more than one vitamin contain rather excessive dose of copper. Women are more prone to copper toxicity because estrogen facilitates the copper retention in the body, hence it leads to copper toxicity; mainly infertility caused by copper toxicity.⁵

Mercury: It is a heavy metal and is also referred as quick silver. Mercury in its metallic form is not poisonous,Mercury in its vapourized form it is highly poisonous. The two types of Mercury that are elemental mercury ant methyl mercury that mainly impaired health conditions of pregnant women. Elemental mercury is used in dental field, it is used for dental filling;during this elemental mercury releases mercury vapoures where there is a chance of inhaling it and is highly poisonous. Methyl mercury is found in natural water sources where fishes are found.Mercury toxicity mainly affects Central nervous system. Hence it mainly causes learning disability, infertility, prematurity and miscarriage. Zinc is essential in maintaining good level of progesterone and estrogen level Mercury effects the level of Zinc in the body leads to low libido and premenstrual syndrome and also infertility. Premenstrual syndrome and infertility are common in young ladies. If mercury is transferred to child by breast milk it decreases learning ability.

Cadmium:Scientist are having a guess that Cadmium may also cause risk in pregnancy. Some of the study proved that Cadmium damages placenta. It is mainly used for commercial purposes like soldering, painting, welding.Women who are working in these area has to take proper care. Pregnant women should be away from fungicide, certain fabric dye,fertilizers. Cadmium in small concentration produce adverse effects like abortion and low birth weight.

General symptoms

Heavy metal poisoning shows symptoms like chronic pain in muscles and tendons,general illness, irritation, state of confusion, forgetfulness(brain fog),candida,diarrhea, mood swing, migraine, dizziness, numbness, heart burn, constipation, bloating electrifying feeling throughout the body,nervous system malfunctions.

Effects of metallic poisons on new born baby

Arsenic: low IQ level, low birth weight.

Lead: effect on neurodevelopment, miscarriage, effect IQ level, decreased fetal growth.⁶

Copper: Miscarriage, muscle weakness.⁷

Mercury: Effects on Central nervous system, decreased mental growth.⁸

Cadmium: low IQ level, renal problems, decreased growth.

Iron: Preterm birth⁹, maternal high blood pressure, low birth weight.¹⁰

Specific Heavy Metal Toxicity Testing

Urine analysis: Urine analysis is a chain of assessments that used for evaluating urine sample. These screening are used for finding abnormalities and for finding presence of protein, glucose traces in the urine, for screening kidney function, metabolism conditions. During the urine analysis the test considers urine color, odor, pH level, appearance. In the routine medical examinations, urine analysis is also a part. Urine analysis is conducted to that patient who is having symptoms like painful micturition, urinary tract infection, hematuria, chronic kidney disease, pregnant condition.¹¹

Major metabolic factors associated with environment pollutants

Lead: Major route of entry of lead into the body is through ingestion and inhalation and the accumulation of lead in the body takes place in kidney, liver, bone. It gets excreted through urine. Biological half life of lead is twenty years.¹²

Mercury: Enters body through ingestion in gastrointestinal absorption accumulation takes place in brain, liver, kidney, and gets excreted through feces and biological half life of mercury is seventy years.¹³

Cadmium: Enters body through ingestion and inhalation and gets accumulated in kidney and liver and metabolism by kidney. Biological half life of cadmium is more than 10 years.¹⁴

Arsenic: Enters body through ingestion and gets accumulated in keratinous tissue. Biological half life of arsenic is 10-30 years.¹⁵

Urine Elemental Testing: To check the presence of toxic elements, post provocation testing is suggested. This test involves collecting of urine first and then administration of complexing agent that involves in exchanging tissue pool. Unprovoked urinary level of crucial elements are sodium, potassium, calcium, magnesium are the signs of renal losing condition and provide early warning of renal disorder. Along with urine elemental testing, may loading test are also conducted. Increased urinary levels of elements that are having attraction towards chelating agents can provide crucial data as to the efficacy of the provocation. Examinations done using urine sample

are used to indicate nutritional element status. Urine analysis provides information regarding potential toxic elements such as cadmium, nickel, aluminium, lead, mercury and also urine analysis will provide renal reabsorption of essential elements like potassium, sodium, calcium, magnesium. Administration of chelating agent is done orally. Administration of chelating agent takes few seconds. After this procedure urine sample will be collected within six to twenty four hours according to doctor's guidelines. This test is simple and no side effects. If any contamination takes place during collection of urine may alter the findings. After collecting specimen it should be immediately transported to the laboratory for accurate outcomes. In case couldn't process then samples should be refrigerated for time being. If any positive results seen then the tests should be repeated.¹¹

Treatment

Chelation therapy: Heavy metal poisoning can be treated with Chelation therapy. In chelating therapy EDTA is used.¹⁷ EDTA is a chemical that binds heavy metals like mercury, lead, arsenic. The word chelation has come from Greek. Chelation therapy by using EDTA is approved by US (FDA).¹⁸ Heavy metals cannot be metabolized by human body.¹⁹ Hence the concentration of heavy metals in the body goes on building up to toxic level and alter normal body function. (13) EDTA binds with heavy metal in the body and hence reduce blood heavy metal concentration to facilitate excretion of heavy metals from the body. Another mechanism of action of EDTA is helping in reduction of the calcium concentration in blood stream hence reduces blockade formation in the arteries.²⁰

CONCLUSION:

Heavy metals that are mentioned above are poisonous in nature that is harmful for the ladies who are pregnant and the fetus in the womb.²¹ Heavy metals such as mercury, copper, arsenic, lead all these heavy metals affect reproductive system and it is also harmful to the fetus because all these heavy metals cannot be filtered by the placenta hence heavy metals reaches fetus and gets deposited.²² Every mother expect their baby to be healthy; for achieving this mother have to concentrate on her diet.²³ Heavy metals enter body through inhalation or ingestion. Hence pregnant women have to avoid metallic food and take nutritious food.²⁴ In this review paper we can find the symptoms that occur due to heavy metal poisoning and test conducted to detect heavy metal poisoning.²⁵ Some instrumental methods are found for detecting heavy metals.²⁶ Consumption of

heavy metals causes serious issues. Therefore precaution should be taken by the pregnant women and have to stay away from heavy metal to prevent complications of the new born baby.²⁶

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