



Effect of E-waste on Human Health : A Review

Dr. Aruna Tribhuvan Pawar

Assistant Professor, Department of Biological Sciences, Smt. Vatsalabai Naik Mahila Mahavidyalaya, Pusad,
Maharashtra, India

ABSTRACT

More and more states are trying to keep electronic waste out of their community landfills by requiring them to be recycled instead. New York in 2015 made it illegal to leave computers and other electronics for curbside trash pickup.

Electronic industry is the world's largest innovative and fastest growing industry. Although this development has helped the human race, mismanagement has led to the new problems of contamination, pollution and hazardous effect on human health.

E-waste recycling activities are conducted in internal settings with very few controls protections and frequently performed by women and children. Solid waste Management which is already a mammoth task in India and in becoming more and more complicated by the invasion of e-waste, particularly computer waste. The Hazardous Content of These E-Waste materials pose a threat to human health and environment too. This article highlights the hazardous of e-waste on human health.

E-waste contains many hazardous metals such Cadmium Beryllium, copper, aluminum, Lead, Mercury, Arsenic, etc. here we are going to discuss effect of lead, mercury and Arsenic on Human Health.

Keywords : E-Waste, Health, Hazards, Lead, Mercury and Arsenic.

Introduction

World's Biggest Challenge is management of e-waste. Which arise from a lack of technical Skills, Poor Infrastructure, inadequate financial Support, and inactive community engagement. Electronic industry is the world targeted, innovative and fastest growing industry during the last century which radically changed the people's lifestyle. Although Technology helped human race, but mismanagement has led to a new problem of contamination, pollution and hazardous effect on human health.

Almost all used electronic items are considered as e-waste. Such as discarded cell, phones, camera, CD player, TV's, Radios, Drills, Fax Machines, Photocopiers, Printers, Toners, ink cartridges, Clocks, CRT monitors, Electronic Solders, Computers Mother Boards, Keyboards, Industrial and household electronic machinery such as Oven, Fridge, Sewing and Washing Machines, Fan, Air Conditioners, Grinder's, Iron Heater, Military and laboratory requirements etc. In most of the above-mentioned electronic waste contains many hazardous metals That affected human health & environment. An estimate 65 million Tons of e-waste was Created Globally in

2017, due to the great expenses of proper disassembly and disposal of e-waste. In frequently Shipped to developing Countries.

When it is Disassembled & Recycled in informal settings with very few protections & frequently Performed by women & Children's Hence, They Got Exposed to There Hazardous e-waste.

In 2012, the U.S. alone generated more e-waste per resident than other nation; more than 5 million Tons of electronic equipment in the approximately 74 pounds of e-waste per person.

Different types of anthropic activities such as mining, smelting & different kind of industrial wastes are the mean sources of he any metals.

Material and Method

For this Paper Review of Literature and systematically searched electronic database, WHO reports Research Papers and associated other reading material references in concern to e-waste and hazardous effect on human health were studied in detail. The effect of e- waste are discussed in present paper.

Discussion

According to the report, Asia generated the greatest volume of e-waste in 2019. Some 24.9 Mt. following by the Americans 13.1 Mt. & 0.7 Mt. respectively.

E-waste is a health and environmental hazard containing toxic additive and hazardous Substances such as mercury lead Arsenic, cadmium etc. which damages the human brain, Organs, etc. Immune system & co-ordination system If there's one kay reason as to why there's been such a surge of interest in e-waste recycling it could be summed up in two words "Environment protection and

Health " When e-waste is exposed to the heat toxic chemicals are released Into the air damaging the atmosphere & is one of the biggest challenges. Those toxic materials can then seep into the ground water affecting both land & sea animals.

There have even been studies done that indicates a link between e-waste in landfills and possible threats to human health including Serious respiratory issues, renal failure, lungs, brain & Immune damage. The journal 'Environmental Research Letters' has reported that researchers took air samples from a large e-waste dismantling area in China and large e- waste determined that these products had a negative impact on human lung cells due to inhale contaminated air. A study of 300 school children near Dandora, Nairobi found that half the children had tested positive for respiratory problems and 30% had blood abnormalities.

Effect of lead on Human Health: -

Lead exposure can have serious consequences for the health of children. At high levels, of exposure lead attacks the brain and central nervous system, causing Coma, Convulsions and even death. Children who Survive severe lead poisoning may be left with intellectual disability and behavioral disorders. Lead is now known to produce a spectrum of injury across multiple body systems. In particular, lead can affect children's brain development.

Lead exposure also causes anemia, hypertension, renal impairment, immunotoxicity and toxicity to the reproductive organs.

According to WHO report as of July 2021, leaded fuel for cars and lorries is no longer sold anywhere in world. Once lead enters the body, it is distributed to organs such as the brains, Kidney, liver & bones. The body stores lead in the teeth & bones where it accumulates over time & later released into the blood.

Excessive exposure of the human body to lead results in disturbance of body function, which can be neurological, cardiovascular, hematologic, and reproductive. Blood containing high level of lead causes inadequate functioning of the central nervous system (CNS) and consequently lead to encephalopathy and edema that mainly affects the cerebellum. (Pal M, Sachdevam, et al. 2015) & (Rao JV, Vengamma B, et al.2014)

In pregnant women, high amount of lead in the body can cause miscarriage. Prolonged lead exposure was found to decrease potency of males (Amadi CN, et al.2017 & Vigehm, Smith Dr.et al.2011)

Wherever contamination is feasible, regular checkup and lead levels of blood have to be set [10] (Wani AL, Ara A, et al.2015)

Sources & routes of exposure: - People can become exposed to lead through occupational & environmental sources. This mainly results from:

In halation of lead particles generated by burning materials containing lead ex: - Smelting, Recycling, Stripping leaded point & using aviation fuel.

Ingestion of lead contaminated dust, water (leaded pipes) & food (from lead – glazed or lead – soldered containers.)

An excellent approach to Larsen the lead toxicity is to suggest people about CDC guidelines and by creating awareness about lead poisoning.

Every parent should frequently wash their children's hands and parent children from placing their hands in mouth habitually.

It is suggested that every family should use cold water because hot water contains high amount of lead [10].

Vit. 'C' has antioxidant properties, which is capable of removing radicals & alleviating oxidative stress. Therefore, the physician should suggest that taking Vit. 'C' containing food in the diet regularly because they minimize lead toxicity easily. (Gupta S.et 2014)

A chelation therapy is for removal of lead from the body. Lead chelating agent has more attraction towards lead than calcium & is excreted in Urine.

(Ferreira's - Martinez R, Esteban – Gomez D, et al. 2011)

I. Effect of Mercury

Mercury has no positive role in the human body & very difficult to determine. Its present environment in several different forms which are toxic to human health. Mercury in human body is a free radical that can cause depletion of glutathione (GSH) and hoarding of H₂O₂ leading to shorten the age of erythrocytes and cause hemolysis. Approximately 90% of organic form can be absorbed by the intestinal wall while inorganic forms are only 10%

Mercury is also easily bound by sulfhydryl groups where in the group is able to inhibit their function of enzymes that are important for metabolism in the body (Dewi N. R. et al 2013)

Exposure to mercury can have very varied effect depending on the level and durational of exposure, age & health status & individuals (Afriza D.et al,2013) Furthermore, it may cause biochemical damage to tissue and genes through various mechanism such as interfering with intercellular calcium homeostasis, disruption on

membrane potential, Change on protein Synthesis, inhabiting enzyme and disruption of amino acid pathways in the central nervous system. (Bjorklund G. et al;2017) processor will be exposed to mercury vapor through inhalation. Mercury evaporation occurs in the process of spawning. Mercury vapors inhaled 80% will be absorbed into the lungs, which then can penetrate the blood barrier of the brain and placenta and disturbed throughout the body. (Bjorklund.G,et al 2017,Bjorklund D. et al 2018 & Zulaikhah S.T, et al. 2015)

Mercury is still a big problem that requires action for proper control in many developing countries. Many effects must be made to reduce emissions & prevention of exposure (Genchi G. et al. 2017) The main on health is neurotoxicity & Kidney failure.

Sources & route of exposure

E-waste contributes substances to the environment through improper disposal to fluorescent tubes, tilt switchers, older Computers, flat screen monitor, batteries and even paints. Most of the living organisms can be exposed to mercury through contact with exposed substances, earthworms in soil O2 seafoods and dental amalgam.

Mercury salts have immunomodulatory and allergen properties. Mercury contamination occurs through ingestion i.e., food, drinks, breathing & skin contact, Organic mercury is found in various sources such as fish, poultry, insecticides, fungicides, pesticides and vaccines containing thimerosal (crowe W. et al. 2017)

Effect of Arsenic

Arsenic in the body is fairly constant but widely distributed in organs such as skin, lungs, liver & kidney (Hong et al 2014)

Arsenic has been associated with persuading a variety of complications in body organ systems, integumentary nervous, respiratory, cardiovascular, hematopoietic, immune, endocrine, hepatic, renal, reproductive system and development. Strikingly, arsenic has been able to induce epigenetic changes (in vivo) and genetic mutations (a leading cause of cancer) in the body. Brain is key target organ of arsenic toxicity affecting learning and concentration due to its ability of crossing blood brain barrier easily (Mundey et al 2013)

Arsenic is a metalloid ubiquitously available in the earth's environment & considered to be a globally health risk factor. Essentially arsenic concentrates in earth's crust, bedrocks and leaches gradually into the drinking water (Vahter,2008).

Being a metalloid, arsenic exists in various allotropic forms such as elemental, sulfide and Carbonate forms (Henk,2009)

Low doses and long term exposures of arsenic leads to a range of medical complications termed as "Arenicolids" (McCarty et al, 2011) Arsenic are distributed in all parts of brain however highest accumulation was observed in hypophysis (Sanchez- Pena et al,2010). Arsenic is capable of including a range of autoimmune diseases including diabetes, atherosclerosis & non-melanoma. Skin Cancer (Banerjee et al,2009)

Source and route of exposure

Ingestion and inhalation skin eye contact & injection routes of exposure to arsenic. Inorganic arsenic compounds are found in soils, sediments and groundwater. Organic arsenic compounds are found mainly in fish & shellfish.

Naturally arsenic is present at high levels in the groundwater & highly toxic in its inorganic arsenic form. During recycling processes of e-waste in organic arsenic can be released the amount of e-waste generated worldwide has risen from 33.8 million metric tons in 2010, 44.7 mt. in 2016 (Balde, et.al 2017)

Recycling activities of: e-waste such as batteries, printed circuit boards, Cathode ray tubes, flat screens, LED light, Semiconductors and electrical solders release many hazardous Substances like lead, cadmium, mercury & arsenic.

Conclusion

1. As technology improves & each device is up graded with additional features the older versions become obsolete.
2. When you purchase a new product, do some research and look for products that have longer lifespans.
3. Educate yourself and help others i.e., public awareness & limit your electronics gadget and devices.
4. look for an environmentally friendly labelled product.
5. Children are our future and it helps if we can enculcate eco-friendly ideas to them at young age and save their life and mother earth.

II. REFERENCES

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