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E-WASTE AND HEALTH HAZARDS ON WORKERS

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ABSTRACT

The e-waste generated locally in the National Capital Region and imported from other places even from overseas has assumed such an enormous volume that the Government has planned to dispose of it. The e-waste has various toxic and carcinogenic gases, and heavy metals, which have grievous effects on the health of workers involved in the activity of recycling it unsafely and also populace of the locality. The problem has motivated the researcher to investigate the health impacts on workers and others involved in the recycling process of e-waste. The result of the study is very startling as more than 75 percent of persons involved in this activity suffer from one or other diseases which can directly be attributed to the result of unsafe recycling of e-waste. Insight into the health risk awareness levels of e-waste workers is important, as it may offer opportunities for better e-waste recycling management strategies to reduce the health effects of informal e-waste recycling. Therefore, this study assessed the knowledge, attitude, and practices associated with occupational health risk awareness of e-waste workers compared with a control group in the informal sector. A questionnaire was used to obtain information on socio-demographic backgrounds, occupational history, knowledge, attitude, and work practices. The three job designations had significantly different mean scores for knowledge, attitude, and practice, with the ones with the highest mean scores consistently having the highest mean scores. The health risk awareness level of the e-waste workers was significantly lower compared with their counterparts in the same informal sector. A positive correlation existed between the workers' knowledge and their attitudes and practices. Therefore, increasing the workers' knowledge may decrease risky practices.

Keywords: Informal Sector, Recycling Management, National Capital Region, Risk Awareness, E-waste strategies.

INTRODUCTION

In India, electronic waste quantity has become a major problem. The disposal of e-waste is an emerging global environmental and public health issue, as this waste has become the most rapidly growing segment of the formal municipal waste stream in the world. E-waste, also known as waste electrical and electronic equipment, is a term used to describe loosely discarded, surplus, obsolete, or broken electrical or electronic devices. Most discarded electronic items in India are stored in households because people do not know how to dispose of them.

This substantial generation of electronic waste is referred to as e-waste accompanied by the lack of stringent environmental laws and regulations for handling the hazardous e-waste has resulted in the cropping of the informal sectors. E-waste comprises electrical and electronic products that cannot continue for their original intended use and are directed for reuse, recycling, recovery, or disposal. It is one of the fastest-growing waste streams in India.

This ever-increasing waste is very complex in nature and is also a rich source of metals such as gold, silver, and copper, which can be recovered and brought back into the production cycle. So e-waste trade and recycling alliances employ many groups of people in India. The hazardous waste from the electronic sector poses a great threat to human civilization and it requires mutual coordination from all the people of society for its effective and efficient management.

Improper dismantling and processing of e-waste render it perilous to human health and our ecosystem. Therefore, the need for proper e-waste management has been realized. Reviewing the public health risks and strategies to improve these growing methods is necessary. The industrial revolution followed by urbanization has resulted in the massive generation of electronic waste. Electronic goods are discarded generally due to the following:

- Innovation in science and technology.
- Changes in the lifestyle of an individual.
- Nearing the end place of their intended usage.

The burden of E-Waste:

In India, solid waste management has become a complicated task with the emergence of e-waste. The total waste generated by broken down electronic and electrical equipment was estimated to be 1,46,000 tonnes for the year 2005, which is expected to exceed 8,00,000 tonnes by 2012. However, according to the Greenpeace Report, in 2007, India generated 3,80,000

tonnes of e-waste. Only 3% of this made it to the authorized recyclers' facilities. One of the reasons for this is that India has also become a dumping ground for many developed nations.¹

The Basel Action Network stated in a report that 50-80% of e-waste collected by the USA is exported to India, China, Pakistan, and several African countries. India is one of the world's fastest-growing economies, and the domestic demand for consumer durables has been increasing yearly. The e-waste has been identified as hazardous waste by the Basel Convention and developed a framework for the control of the transboundary movement of such waste.²

From 1998 to 2002, there was a 53% increase in the sales of domestic household appliances, both large and small³, worldwide. Another report estimated that in India, business and individual households make approximately 1.38 million personal computers every year, accelerating the rate of e-waste generation, which is around 10%, annually going to affect environmental health indicators.⁴

Children are often engaged by parents or caregivers in e-waste recycling because their small hands are more dexterous than those of adults. Other children live, go to school and play near e-waste recycling centers where high levels of toxic chemicals, mostly lead and mercury can damage their intellectual abilities. Children exposed to e-waste are particularly vulnerable to the toxic chemicals contained due to their smaller size, less developed organs, and rapid rate of growth and development. They absorb more pollutants relative to their size and are less able to metabolize or eradicate toxic substances from their bodies.

Children and Digital Dumpsites call for effective and binding action for exporters, importers, and governments to ensure environmentally sound e-waste and the health and safety of workers, their families, and communities, to monitor e-waste exposure and health outcomes, to facilitate better reuse of materials, and to encourage the manufacture of more durable electronic and electrical equipment.

This is a rising issue that many countries do not recognize yet as a health problem. Its impacts will devastate children and lay a heavy burden on the health sectors in the years to come.

Health Impacts:

Electronic equipment contains many hazardous metallic contaminants such as lead, cadmium, beryllium, and brominated flame-retardants.

The fraction including iron, copper, aluminum, gold, and other metals in e-waste is over 60%, while plastics account for about 30% and the hazardous pollutants comprise only about 3%. Of many toxic heavy metals, lead is the most widely used in electronic devices for various purposes, resulting in a variety of health hazards due to environmental contamination. Lead enters biological systems via food, water, air, and soil.

Children are particularly vulnerable to lead poisoning – more so than adults because they absorb more lead from their environment and their nervous system and blood get affected. It is found that the e-waste recycling activities had contributed to the blood lead levels in children living in China, which is one of the popular destinations of e-waste. This was because the processes and techniques used during the recycling activities were very primitive.

Various studies have reported the soaring levels of toxic heavy metals and organic contaminants in samples of dust, soil, river sediment, surface water, and groundwater in China. In the same areas, the residents had a high incidence of skin damage, headaches, chronic gastritis, and gastric ulcers.

These unorganized sectors will continue to use rudimentary processes and practices such as open burning, acid baths, and heating of circuit boards, resulting in the emissions and releases of toxic elements into the environment. The massive generation of e-waste on one side accompanied by the lack of stringent legal policies and environmental regulations for managing hazardous e-waste has resulted in the formation of several informal sectors.

Further, it was found that children's blood lead levels were higher than the mean level in China, and there was no significant difference between boys and girls. It was found that e-waste recycling operations were causing higher levels of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs) in the environment as well as in humans.

Body burdens of people in hair, human milk, and placenta from the e-waste processing site showed significantly higher levels of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs) than those from the non-processing site.

Workers, aiming to recover valuable materials such as copper and gold, are at risk of exposure to over 1000 harmful substances, including lead, mercury, nickel-brominated flame retardants, and Polycyclic Aromatic Hydrocarbons (PAHs). Other adverse child health impacts linked to e-waste include changes in lung function, respiratory and respiratory effects, DNA damage, impaired thyroid functions, and increased risk of some chronic diseases later in life.

There is data on the burdens of heavy metal exposure on the human body in India. A large number of workers including small children are exposed to different dismantling activities of e-waste. Although the findings of these studies cannot be generalized to India these are enough to alarm and strongly suggest to be replicating in occupational settings in India. There are no data available about the health implications of these workers.

They might be ruining their lives in the lack of appropriate knowledge. In another study from China, human scalp hair samples were collected to find out heavy metal exposure to workers from intense e-waste recycling sites. Higher concentrations of Lead, Copper, manganese, and Barium metals were found in the hair exposed as compared to the hair in the control group.

Current Status of E-Waste Management:

Laws on e-waste management:

1. Environment protection act,1986 (Latest amendment on Feb 22, 2022)
 - The environment protection act deals with the form of central and state governments that can enact legislation to safeguard the environment and people from exposure to the toxic hazards of e-waste. The new rules that are been designed to enable and re-use the components or materials from the waste electrical and electronic equipment and thus reduce the risk of the wrong disposal of hazardous waste in the environment. It also states that the consumers of electronic and electrical equipment shall ensure that the e-waste is generated by them through the collection center or dealer of the authorized producer and dismantler or researcher or the designated take-back service provider of the producer to authorized dismantler or recycler, while the toxic fumes reach into the environment and cause air pollution in the environment.
2. E-waste management act,2010 (Latest amendment on Mar 23, 2018)
 - According to E-waste management, wastes are substances or objects, which are disposed of or are intended to be disposed of, or required to be disposed of, by the provisions of national laws. The workers have low literacy and are unaware of the potential hazards arising out of e-waste. These workers are poor and they include women and children who are more vulnerable to the hazards of e-waste. People are required to discard these wastes properly as they pose a threat to the environment and society.
3. Atomic energy act,1962 (Latest amendment on Dec 23, 2015)
 - In this act, The e-waste and health hazards on workers bill were introduced to the constituent assembly legislative on atomic energy, which has concerned and wanted to prevent India from facing a third world war with nuclear arms and ammunition. The atomic energy would determine accumulations of atomic energy with the help of mineral survey sections to carry out the research work on nuclear power and energy. This act would control and regulate atomic energy and the advantages for the welfare of the people of the country along with facilitating progress and development.

For the recycling of e-waste, India heavily depends on the unorganized sector as only a handful of organized e-waste recycling facilities are available.

Over 95% of the e-waste is treated and processed in the majority of urban slums of the country, where untrained workers carry out dangerous procedures without personal protective equipment, which are detrimental to their health and the environment. Recycling and treatment facilities require a high initial investment, particularly those fitted with technologically advanced equipment and processes. For dismantling one computer piece, these workers only get Rs. 5 or 10. For such a small amount, workers ruin their lives.

Such backyard recyclers do not have wastewater treatment facilities, exhaust-waste gas treatment, or personal health protection equipment. Williams observed that despite significant attention from the media and the enactment of some national-level trade (most noticed in China and India), the problem is increasing.

Therefore, health risk assessments are also required for the analysis of the consequences and inappropriate management of end-of-life electronic waste in developing countries.

E-Waste Management Initiative:

In Environmental Protection Act 1986, the polluter pays the principle enacted to make the party responsible for producing pollution responsible for paying for the damage done to the natural environment. Polluter pays is also known as Extended Producer Responsibility (EPR).

Under the Environment Protection Act 1986, central and state governments can enact legislations to safeguard the environment and people from exposure to the toxic and hazardous Hazardous Waste Management and Handling Rules 2003 (Latest amendment on Oct 20, 2022) nature of waste. Any violation of the provision of this act or notified rules is liable for punishment. Such a penalty can be imposed on the violator if specific rules and regulations on e-waste are violated.

It aims to increase access to evidence knowledge and awareness of the health impacts of e-waste and to improve the health sector's capacity to manage and prevent risks, track progress, and promote e-waste policies that better protect child health and improve monitoring to exposure e-waste and the facilitating of interventions that protect public health. It comes together to increase collaboration, build partnerships, and more efficiently provide support to a member state to address the e-waste challenges to it.

Central Population Control Board of India is finalizing the set of rules and most recently issued a formal set of guidelines for proper and eco-friendly handling and disposal of electronic waste. The Ministry of Environment and Forests is now processing the rules framed by electronics equipment manufacturers with the help of NGOs.

According to the new guidelines Central Pollution Control Board issued in 2007, e-waste is included in the Municipal Solid Waste Management Rule, 2000 (Latest amendment on Sep 14, 2017).

Each manufacturer of a computer, music system, mobile phone, or any other electronic gadget will be personally responsible for the final safe disposal of the product when it becomes a piece of e-waste. Department of Information and Technology, Ministry of Communication and Information Technology, has also published and circulated a comprehensive technical guide on Environmental Management for Information Technology Industry in India. Demonstration projects have also been set up by the Department of Information and Technology at the Indian Telephone Industries for the recovery of copper from Printed Circuit Boards.

As an effort to make users aware of the recycling of e-waste, many electronic companies such as Apple, Dell, and HP have started various recycling schemes. Nokia India announced its recycling campaign for the Indian region. The program encouraged mobile phone users to dispose of their used handsets and accessories, irrespective of the brand, at any of the 1,300 green recycling bins put up across the priority dealers and care centers. Nokia is also planning to launch an electronic waste management program.

The Department of Environment, the Delhi government, has also decided to involve ragpickers in general waste management in the capital. These ragpickers will be trained, given uniforms, and ID cards, and hired to clean waste. The department also intends to involve eco-clubs, now running over 1,600 government and private schools in the Capital, in this initiative since these eco-clubs will interact with ragpickers of that particular area.

Research on E-Waste Management :

Many more environmental epidemic studies are required to assess the present status of the e-waste management system in India, to assess the e-waste quantities and exact amplitude of the problem in Indian cities, and to establish relationships with the informal recycling sectors. The valuable data will be generated by these studies would help in drafting an action plan for e-waste management. India should start a surveillance system for diseases and health consequences of e-waste.

The sustainability of e-waste management systems has to be ensured by improving the collection and recycling systems. It would be desirable to establish public-private partnerships in setting up buy-back or drop-off centers. Leaving advance recycling fees is another approach to ensure waste management sustainability.

Identifying the best way of e-waste management technology across the globe and adopting them successfully can be key to sustainable futuristic growth. With the reduction of hazardous substances in the electronic and electrical types of equipment and the promotion of their safer substitutes, many countries have adopted the Restriction of Hazardous Substances Regulations in manufacturing these items. More and more such less hazardous substitutes should be identified which can be used in electronic equipment

CONCLUSION

The problem of proper disposal and management of e-waste requires the government authorities to enact strict regulatory laws. The problem has been researched at an alarming stage and there should be proper guidelines the government must enact a regulatory body to ensure the proper implementation of such guidelines. The e-waste has to be disposed of properly else it will turn out into a menace of killing a lot of people and causing serious health problems to many others.

The hazardous nature of e-waste is one of the rapidly growing environmental problems of the world. The ever-increasing amount of e-waste associated with the lack of awareness and appropriate skills is deepening the problem. Many workers are involved in dismantling these electronic items for their livelihood, and their health is at risk. Therefore, there is an urgent need to plan a preventive strategy for the health hazards of e-waste handling among these workers in India.

Required information should be provided to these workers regarding the safe handling of e-waste and personal protection. For e-waste management many technical solutions are available, but to be adopted in the management system, prerequisite conditions such as legislation, collection system, logistics, and manpower should be prepared. This may require operational research and evaluation studies.