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Assessment of Knowledge Regarding Electronic Waste and Its Handling Practices

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ABSTRACT
Electronic waste is one of the major components of municipal waste stream which, not only continues to heap up in landfills but is also generating perilous toxic chemicals and gases. In addition to that, it poses a severe threat to mankind with a frightening effect on environment as well. Particularly in developing countries like India, E-waste generation is escalating at a frightening pace as currently they do not have the proper finances or resources to discard it properly. The worst part is, electronic waste affects children more severely than adults, and they are at a higher risk of developing health conditions as a result of exposure to e-waste. Unsafe disposal of e-waste is a rising and the environmental effects and human health hazards are very serious; a plan needs to be established to address this issue and avoid the consequences. Primarily, in place of eliminating the informal sector within developing countries, taking benefit of the collection network that the informal recycling sector has formed would be valuable. Lastly, manufacturers and producers need to become more involved by implementing more successful take-back systems for their electronic devices so that they will be recycled properly at formal facilities that will mitigate the negative environmental and health impacts.
Keywords: Electronic Waste, Handling practices

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INTRODUCTION

Over the last decades the world has been changed radically by electronic industry; completely captivated by technology i.e. electrical and electronic gadgets have become predominant of today's life around the planet. Without these products, contemporary life would not be possible in industrialized and industrializing countries. These products serve in such areas as medicine, education, health, food-supply, security, communication, mobility, environmental protection and culture. Many domestic usage devices like refrigerators, washing machines, mobile phones, personal computers, printers, toys and TVs are included in this.

Electronic waste contains a glut of toxic components including Mercury, Lead, Cadmium, Polybrominated Flame Retardants, Barium and Lithium which affect nearly every organ in the body. Even the plastic casings of electronic products consists of Polyvinyl Chloride. The health effects of these toxins on humans include birth defects, brain, heart, liver, kidney and skeletal system damage significantly affect the nervous and reproductive systems of the human body.

Many developed countries find it cheaper and more convenient to ship their e-waste to these developing countries, which only adds to the amount of e-waste undergoing unsafe disposal. Without proper disposal, chemicals such as lead, arsenic, chromium, and dioxins may leach into the environment, causing environmental degradation and pose a threat to humans and animals in the vicinity. According to 2012 figures, India alone generates about 8,00,000 tons of electronic scrap. Another study by UNEP reported that waste from computers alone in India would jump by 500%, while that from mobile phones would rise 18 times over 2007 figures by 2020 [2].

Heavy metals derived from electronic waste (e-waste), such as, lead (Pb), cadmium (Cd), chromium (Cr), manganese (Mn), nickel (Ni), mercury (Hg), arsenic (As), copper (Cu), zinc (Zn), aluminum (Al) and cobalt

(Co), differ in their chemical composition, reaction properties, distribution, metabolism, excretion and biological transmission. Our previous studies showed that heavy metal exposure have adverse effects on children's health including lower birth weight, lower anogenital distance, lower Apgar scores, lower current weight, lower lung function, lower hepatitis B surface antibody levels, higher prevalence of attention-deficit/hyperactivity disorder, and higher DNA and chromosome damage. Heavy metals influence a number of diverse systems and organs, resulting in both acute and chronic effects on children's health, ranging from minor upper respiratory irritation to chronic respiratory, cardiovascular, nervous, urinary and reproductive disease, as well as aggravation of pre-existing symptoms and disease.[3]

Lead is considered one of the major heavy metal contaminants during the process of e-waste recycling. Examination of the possible impact of the e-waste industry on the BLLs of children living in Guiyu revealed that Guiyu children had significantly higher BLLs than Chendian children. Of children tested in Guiyu, 81.8% had BLLs > 10 μg/dL, indicating a correlation between the BLLs in children and the numbers of e-waste workshops. [4]

OBJECTIVES OF THE STUDY:

1. Exploration of current practices of e-waste handlers regarding treatment and storage of e-waste in Udaipur city
2. Assessment of Knowledge of the e-waste handlers regarding chemical hazards of e-waste and its harm imposed on children

MATERIAL AND METHODS

The present study was conducted in Madri Industrial Area (MIA) of Udaipur city of Rajasthan state. To procure the sample, the Waste Handler's Association was contacted. After retrieving their details, it was found that 35 waste handlers were dealing with e-waste management. So these were contacted by the researcher to collect data for the present investigation. An exploratory research design was used by the researcher for this study.

RESULT AND DISCUSSION

Data gathered from the various sources were further processed in order to depict the real meaning of the research and to know the present scenario of e-waste in Madri industrial area, Udaipur. Present study was undertaken with the objectives to identify the threats of e-waste produced, practices followed by e-waste handlers to deal with e-waste, developing an intervention package and testing its efficacy.

Table 1.1 Distribution of respondents on the basis of Primary treatment of e-waste: n=35

S.No.	Items		Frequency	Percentage
1.	Classification of e-waste	Yes	10	28.6
		No	15	42.9
		Don't know	10	28.6
	Total		35	100
2.	Storage	without labeling	16	34.3
		With labeling	19	65.7
	Total		35	100
3.	Use of different color bins	Yes	10	28.6
		No	25	71.4
	Total		35	100

E-waste consists of many hazardous chemicals which can fatally harm the person coming in contact with the waste so, before treatment, the e-waste should be further classified and labeled into hazardous, moderately hazardous and non- hazardous waste. According to table 1.1, percent respondents were classifying the waste into categories while 28.6 per cent were completely ignoring this fact. On the other hand 28.6% respondents were unaware of this fact due to lack of knowledge. 65.7 per cent respondents were labeling the e-waste before storage while 34.3 per cent respondents were not even labeling the e-waste. Furthermore Before any kind of treatment the electronic waste should be kept in different colored boxes like red color bins which help us to differentiate among normal waste and e-waste. Here, only 28.6

per cent e-waste handlers were using different colored bins and 71.4% per cent were not using this technique. But opposite to that researcher found during data collection that no such bins were being used by maximum e-waste handlers.

Table 1.2: Distribution of respondents according to their Duration of Storage of e-waste n=35

S.No.	Duration	Frequency	Percentage
1.	>15 Days	7	20.0
2.	<15 Days	13	37.1
3.	1 month	11	31.4
4.	6 Month	4	11.4
	Total	35	100

For what time span they are keeping the e-waste stored is one major concern because, if kept for longer, e-waste can pose a threat so it should not be kept stored for more than a month. In this table 1.2 we can observe that 20 per cent respondents were keeping the waste for less than 15 days, 37.1 per cent respondents were keeping it for more than 15 days, 31.4 per cent were keeping it for a month and 11.4 per cent were keeping it for 6 months. Exposure of hazardous e-waste for a longer period from which harmful chemicals are discharged is very harmful for the environment. When asked about this, respondents looked less concerned as they disregarded the matter by saying that they don't have any other option.

Table 1.3 Distribution of respondents according to chemical hazards of e-waste management n=35

S. No.	Item		Frequency	percentage
	Electronic waste as a potent threat	Yes	14	40
		No	9	25.71
		Don't know	12	34.28
	Total		35	100
	Chemical hazards of e-waste harming the environment	Yes	10	28.57
		No	9	25.71
		Don't know	16	45.71
	Total		35	100

Electronic waste as a potent threat: E-waste comprises of a multitude of components with valuable materials but at the same time it also contains some toxic substances, which can have an adverse impact on human health and the environment. According to Table 1.3, when the respondents were asked about e-waste considered as a potent threat to the environment, 34.28 per cent people were unaware about this, only 40 per cent people agreed to this fact that e-waste can harm the humans and environment and 25.71 per cent people denied the fact.

Chemical hazards of e-waste harming the environment: E-waste-connected health risks may result from direct contact with harmful materials such as lead, cadmium, chromium, brominated flame retardants or polychlorinated biphenyls (PCBs), from inhalation of toxic fumes, as well as from accumulation of chemicals in soil, water and food leading to environmental degradation. Regarding the awareness about chemical hazards of e-waste, it was quite depressing as Table 1.3 indicates that only 28.57 per cent respondents were aware regarding hazardous nature of chemicals in e-waste damaging the environment while some of the respondents (25.71%) also thought that e-waste chemicals are not harmful for environment.

Table 1.4 Distribution of respondents according to harms imposed to the children imposed by e waste n=35

S.no.	Item		Frequency	Percentage
2.	Harms posed by e-waste on children	Yes	16	45.71
		No	19	54.28
	Total		**100**	**35**

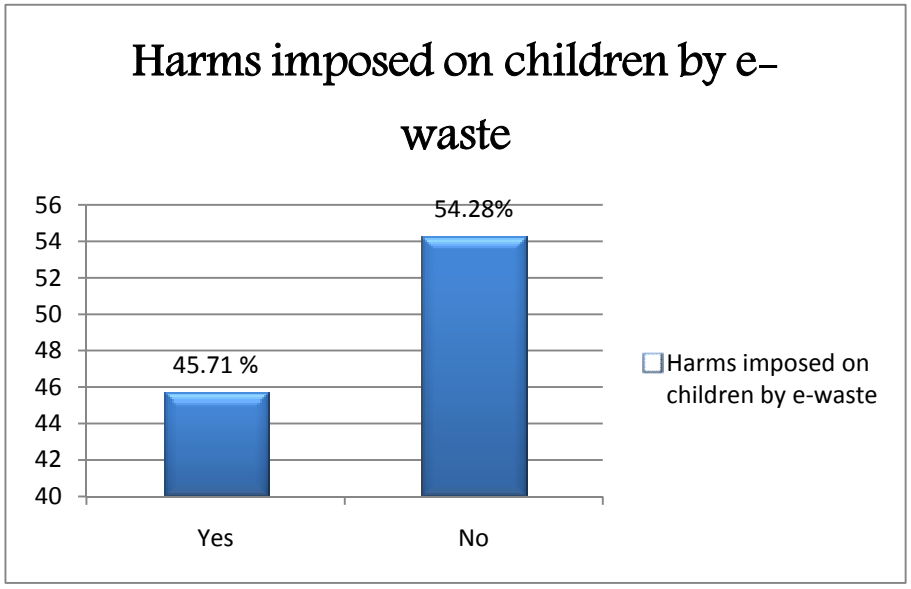

Figure 1 represents the percentage distribution of respondents according to harms to the children imposed by e-waste

Harms posed by e-waste on children: Riebel [1] quoted in "E-waste & children: how it is harming future generations" that e-waste consist of harmful chemicals like Lead, Arsenic and tonnes of toxic gases are released from it and Since children are still in their developing stages they are more susceptible to threats posed by crude e-waste processing activities, and may suffer from permanent disabilities like asthma, psychological and neurological damages and may even affect bone development. Cursory of Table 1.4 indicates that when people were asked about if coming in contact with e-waste can be harmful for the children, only less than half i.e. 45.71 per cent people knew about it, 54.28 per cent disagreed with this. It clearly signifies that people were not aware about the repercussions of mismanagement of e-waste upon children.

CONCLUSION

E-waste is considered dangerous as certain components of electronic products are hazardous. E-waste is of major concern due to several significant issues, including the increasing rate and volume of materials disposed to landfills, the toxicity of some of the materials present in this type of waste product, the variability in regulatory control on disposal methods, and relatively common practice of transferring E-waste components offshore to recycling facilities that may lack adequate quality control, environmental protection and safety standards. End-of-life electronics, otherwise known as e-waste has steadily become a visible threat to the environment. E-waste contain large amounts of heavy metals, and as the plastic burns, the children also breathe in highly carcinogenic fumes. The gadgets of the rich are poisoning the children of the poor. According to the 3R Principle – Reduce, Reuse, Recycle, recycling reduces waste going to final disposal, decreases consumption of natural resources and improves energy efficiency. Planned obsolescence is a silent cause responsible for increasing e-waste in the world as the electronic devices used by the people are becoming outdated and incompatible with each passing day. Systematic obsolescence, which is also known as built-in obsolescence, is deliberately induced by manufacturer to make a product obsolete by altering the system in which it is used in such a way as to make its continued utilization laborious. It is tough to effectively deal with e-waste management globally until a universally accepted definition of e-waste is framed.

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