Original Research Article

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Self reported practice of e-waste disposal and awareness about its health hazards among people at various levels in selected urban slums of Bangalore: a cross sectional study

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ABSTRACT

Background: With advent of advancement in technologies and change in people's life style, the amount of E-waste (electronic waste) generated is increasing drastically every year, Mismanagement of these E-waste leads to diminishing natural resources, causing irreparable damage to the environment and health of the people. When it comes to the reduction, the onus is on both the consumer and the producer. Proper awareness on the health hazards and disposal practice of E waste plays a crucial role in curbing this problem. The objectives of the study were to assess the E-waste segregation and disposal practice at various levels and to assess the knowledge about Proper disposal and health hazards of E-waste.

Methods: A community based crossed sectional study was conducted among 120 randomly selected individuals (distribution, consumer and waste collection level) for a period of three months in the urban field practice area of Bangalore Medical College & Research Institute. Data regarding their knowledge and practice on E-waste disposal and its hazards has been collected using semi structured questionnaire and analysed using SPSS 23.0.

Results: Knowledge about disposal was found to be 20%, 15% and 5% respectively at distribution, consumer and waste collector levels. Only around 6% had practiced proper waste segregation. Knowledge pertaining to health hazards were found to be negligible.

Conclusions: With the increased burden the knowledge and practice were found to be highly inadequate. And it is a high time to intervene at the earliest by creating proper awareness and providing the requisite for proper disposal of E waste.

Keywords: E waste, Disposal practice, Health hazards, Knowledge

INTRODUCTION

E waste (electronic waste) is one of the fastest growing waste system globally. E-Waste is a term used to cover items of all types of electrical and electronic equipment (EEE) and its parts that have been discarded by the owner as waste without the intention of re-use. With advent of revolution in Information and technologies and with the easy availability of equipments, the way human organize their lives, economics, industries and institutions also

changed bring undoubtedly improved quality of life. But on contrary this spectacular development has lead to generation of enormous amount of E waste and other wastes from electrical equipments. This is growing at a very fast pace at a rate of 5% to 10% increase every year. About 40 million tonnes of E waste are being generated every year globally and its growing. The UNU ADDRESS project documents that e-waste volume placed on the market since 1990 has grown from 19.5 million tonnes to 57.4 million tonnes in 2010.

India with its rapid economic growth has promoted the import and also usage of various electrical and electronic equipments. Almost 2.7 million tonnes of E waste are generated annually in India. Mumbai leads the waste generation followed by Delhi and Bangalore. Bangalore with 40% of IT hub in India contributes to around 20,000 tonnes.³ The end life future of these equipments is becoming a major threat. The main sources of electronic waste in India are the government, public and private (industrial) sectors, which account for almost 70 per cent of total waste generation. Computer equipment accounts for almost 70% of e-waste material, followed by telecommunication equipment (12%),equipment (8%) and medical equipment (7%). Other equipment, including household e-crap account for the remaining 4%. ⁴ The contribution of individual households is relatively small at about 15 per cent; the rest being contributed by manufacturers. Though individual households are not large contributors to waste generated by computers, they consume large quantities of consumer durables and are, therefore, potential creators of waste. The discarding of waste is again left to the consumers who decide whether it has to be disposed off or can be recycled for use. At consumer level, majority store these equipments at home without knowing the appropriate disposal method or may sell it scrap dealers or exchange. 95% of these E wastes in India are disposed off through informal unorganized sector.4 However the volume of waste generated if not disposed properly not only creates waste management issues but due the presence of numerous chemicals and materials in the electronic products, they pose huge threat on both environment and health.

Hazardous chemicals found in e-waste include various heavy metals - mercury, cadmium, silver, gold, aluminium, mercury, lead, brominated flame retardant plastics (BFRs), etc., that can convert into dioxins and furans when burned at high temperatures, and polychlorinated biphenyls (PCBs). These toxic chemicals derived from these consumer goods has high capacity of accumulating in body, are carcinogenic, or are highly detrimental effect on various organs such the nervous system, kidney, bones, and reproductive and endocrine systems.⁵ And when it is disposed off improperly can have detrimental effect on other living systems and environment through contaminating the soil, air and water. 6 Without effective government regulation of the disposal of electronic consumer goods, and without public awareness of the inherent hazards, accumulation of such waste will have dire consequences for the human population. When it comes to volume reduction and waste management, the onus is on at all levels distribution level, consumer level and waste collector level. Hence a need of proper knowledge about E waste disposal and about its impact on plays a crucial role in managing saving the future generation and planet from the invisible threat.

Objectives

- 1. To assess the E-waste segregation and disposal practice at various level (distribution level, consumer level and waste collector level)
- 2. To assess the knowledge about Proper disposal and health hazards of E-waste.

METHODS

A cross sectional study was conducted among 120 randomly selected individuals (40 each at distribution level, consumer level and waste collector level) in the urban slums under urban field practice area of Bangalore Medical College and Research Institute (BMCRI), Bengaluru. There were around 12 slums under field practice area of BMCRI. All the waste collectors in the area which came up to 40 were included in the study. So equal number of individuals was chosen at distribution level and consumer level. At distribution level, there were around 400 electronic shops and in that 40 were chosen through systematic random sampling and equal number of consumers has been chosen from the general public who are residing at nearby to the distribution site by systemic random sampling technique. All those who aged 18 and above using at least one electronic equipment in home/office and consented to study were included in the study. After obtaining institutional ethical clearance data has been collected from all those who consented for the study for a period of 3 months from October 2016 to December 2016. Data regarding socio demographic profile, knowledge about E waste segregation and disposal practice and also the knowledge regarding E waste hazards were collected using a pre tested, validated, semi structured questionnaire through interview technique. Data were entered in Excel sheet and analysed using SPSS version 23.0. Descriptive statistics and chi square/ Fishers exact T test were used. P value <0.05 was considered significant for associations.

RESULTS

Of 120 respondents, 35% belongs to the age group of 35-39 years and 56.5% were Hindu by religion. Majority (70%) were literate (All were literate at distributor levels, 67.5% of consumers were literate and 42.5% were literate at waste collector level) and almost 38.2% belongs to upper middle class. Among them 56% were from nuclear family. The mostly frequently used electronic items were found to be mobiles, televisions, ceiling fans followed by refrigerators, MP3 players, head phones, etc. It was found that almost 80% of the respondents were familiar with the term E waste.

Regarding knowledge about segregation and disposal of E waste it was found that around 33.3% was aware about proper waste disposal and segregation methods (20% at distributor level, 15% at consumer level and 5% at waste

collector level). With respect to practice of E waste disposal, at distribution level it was found that around 12.5% disposes through formal sector. i.e., to E waste collectors and 15% send it for recycling as shown in Figure 1 and at consumer level though 15% had knowledge about E waste disposal methods it was found that none of them disposes through formal sector and majority disposes off through informal sector (80%) i.e.,

they disposes by selling to Scrap dealers and remaining 20% disposes off by mixing with regular household wastes as in Figure 2 and around 82.5% of waste collectors also disposes off through selling to scrap dealers and 17.5% by mixing with household waste (Figure 3). The major source of knowledge was found to be higher authorities or through pollution control board followed rarely by books.

Table 1: Relationship awareness and education with waste disposal practice at distribution level.

		Formal	Informal	Recycle	Household	Total (n=40)	P value
Awareness	Aware	5	0	3	0	8	P <0.001*
	Not aware	0	21	3	8	32	
Education	High	0	9	3	4	16	P =0.02* P <0.05
	Intermediate	0	8	0	4	12	
	Graduate	5	4	3	0	12	

^{*} Fishers exact test

Table 2: Relationship awareness and education with waste disposal practice at consumer level.

		Household	Scrap/resale	Total (n=40)	P value
A	Aware	0	6	6	P =0.236*
Awareness	Not aware	8	26	34	P =0.230*
	Illiterate	3	7	10	
	Primary	0	3	3	
Education	Middle	3	11	14	P =0.318*
Education	High	1	7	8	P =0.318*
	Intermediate	1	3	4	
	Graduate	0	1	1	

^{*} Fisher's exact T test.

Table 3: Relationship awareness and education with waste disposal practice at waste collector level.

		Household	Scrap/resale	Total (n=40)	P value	
Arriomanaga	Aware	0	2	2	0.046*	
Awareness	Not aware	7	31	38		
Education	Illiterate	4	13	17	0.594	
Education	literate (primary)	5	18	23	0.394	

^{*}Fischer's exact T test.

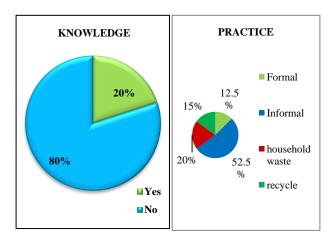


Figure 1: Knowledge and practice about E waste disposal at distribution level.

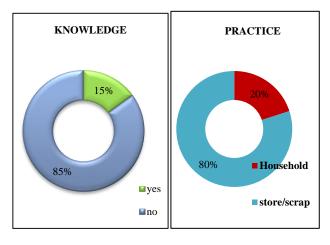


Figure 2: Knowledge and disposal practice about E waste at consumer level.

Only negligible percent (3.3%) of individuals were aware that improper disposal of E- waste is associated with hazards to health and environment. At distribution level 5% said its hazards to humans and 10% to environment and 5% said it's hazardous to both. For the same, at consumer level 5% said it's harmful to humans and 5% to environment and only one (2.5%) said it's harmful to both (Figure 4). And at waste collector level it was found to be negligible.

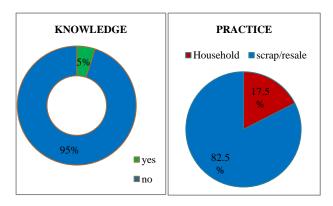


Figure 3: Knowledge and disposal practice about E waste at waste collector level.

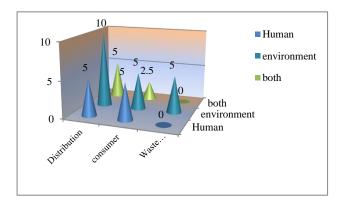


Figure 4: Knowledge about E waste hazards.

There was significant association between awareness and waste disposal methods at distributor level (p <0.001) and waste collector level (p =0.046) (Table 3) and also with waste disposal and education at distributor level (p =0.02) (Table 1). There was no significant difference in knowledge and practice between males and females and also with socioeconomic status.

The concept of waste minimization was completely neglected as nobody had proper knowledge regarding the actual management of E waste. However everyone felt government and local authority have significant role in this.

DISCUSSION

With increased volume of waste generation, management of the complex wastes (hazardous and general waste) by is a huge challenge as it often needs specialized, "hightech" equipments. But unfortunately, the use of these specialized methods is rare and where crude techniques are often used to extract precious materials or recycle parts for further use leading to localized pollution of environment and are health hazards for advanced life forms.

Huge number of E waste being generated every day, only around 10% were aware about the government policy for E waste segregation and disposal. This was less as compared to the study by Bhat et al in Pune in 2013 were around 17% were aware. With regard to waste disposal practice in our study among consumers though 15% had proper knowledge but practice was found to be poor as 80% dispose through selling to scrape dealers/resale and 20% disposes off through mixing with household wastes as against 57% disposed off through regular household waste in a similar study by Bhat et al in Pune. And only a small percent of waste (9.1%) was disposed off through formal sector (12.5% hands over to E waste collector and 15% for recycling at distribution level), against none at consumer and waste collector level. This was found to be lass as compared to 22% in a study by Junnaidah Ahmed Khalana among households in Malaysia through recycling and 61% through formal sector in a study in Ningbo by Pingsha Huang et al in China.^{8,9}

With regards to E waste hazards only around 3.3% were aware that it can be harmful to both humans and environment in our study as compared to around 80% in study by Bhat and 35% in a study by Shah in Gujarat in 2014. ^{5,7} In our study though one third had knowledge about disposal (33.3%), but when it comes to practice only around 11.6% were practicing the proper E waste disposal technique. i.e., disposal through formal sector. With this regard we could see huge knowledge practice gap at all three levels. There is a wide knowledge practice gap for which one of the reason being non accessibility and less awareness to the E waste collection services at consumer level and less awareness at waste collector level as none of the respondents were aware about E waste hotspots.

With regards to role of local authority and their satisfaction with current waste disposal methods, none were found to be satisfied.

CONCLUSION

At all three levels knowledge and practice about E waste disposal and the associated health hazards were found to be very less. This emphasis the need of creating proper awareness about the importance of E waste segregation and disposal methods to people at vary levels at to all age group so as to protect the future of the living from the threat of E waste hazards. And also the arrangement of E waste disposal bins at various sites and implementing strict legislative measures would be effective in bringing about change in current scenario.

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