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AWARENESS OF E-WASTE AMONG EDUCATED ADULT URBAN INHABITANTS

Community Medicine

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ABSTRACT

This cross-sectional descriptive study was conducted by convenience sampling on 599 respondents - 279 (46.57%) females and 320 (53.43%) males - to determine their level of awareness regarding e-waste. A pre-tested and pre-validated questionnaire was administered via Google forms to persons aged 18+ years, of either gender, who had passed 12th Standard or equivalent examination and were residents of a metropolitan city in India. The mean age for females was 22.29 +/- 4.84 years while that for males was 22.91 +/- 6.45 years, without significant gender difference (Z=1.340; p=0.180). Males outnumbered females in age groups of 18-20 years and 26+ years, while females exceeded males in the age group of 21-25 years

The results of the study revealed excellent level of awareness about e-waste, which ought to be utilized to inculcate the concept of reuse, repair and recycle of electronic products at the community level.

KEYWORDS

Awareness, E-waste, Urban inhabitants

INTRODUCTION

The electronics industry is among the world's fastest growing manufacturing industry, characterized by rapid growth combined with rapid product obsolescence due to the arrival of up-to-the-minute technologies. Discarded electronic products are also the fastest growing source of anxiety in the world. Factors determining the obsolescence rate of products include a nation's population, its economic growth, market penetration and rate of upgrade of technology. [1]

In 1989, The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, (usually known as the "Basel Convention"), was promulgated to prevent the transfer of hazardous waste from developed to less developed countries. The Mobile Phone Partnership Initiative (MPPI) was adopted by the Basel Convention in 2002. In 2006, the Basel Convention adopted the Nairobi Declaration, which mandated implementation of environmentally sound management of e-waste. [2] In India, in the aftermath of the Bhopal Gas Tragedy, an umbrella legislation called the Environment Protection Act (EPA) was promulgated in 1986, which defined "hazardous substance" as "any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plant, micro-organism, property or the environment." The Hazardous Waste (Management and Handling) Rules 1989, framed by the Government of India under the provisions of EPA, 1986, became the first set of comprehensive Rules to deal with hazardous wastes. [2] In 2011, the Ministry of Environment, Forests and Climate Change (MoEFCC) of the Government of India notified the Electronic waste (Management and Handling) Rules under section 6 of EPA, 1986, to ensure the safe and environment friendly management, transport, storage, recycling of e-waste and also to reduce the usage of hazardous substances during manufacture of electrical and electronic equipments. The e-waste rules were revised in 2016 and again in 2018 to accelerate efficient management of e-waste. Other laws that indirectly deal with e-waste are The Air (Prevention and Control of Pollution) Act, 1981 and The Water (Prevention and Control of Pollution) Act, 1974. Sections 268, 269, 270, 277, 278, 284 and 290 of the Indian Penal Code that deal with offences relating to public health and safety are, to an extent, also applicable to e-wastes. In comparison to Indian laws, South African laws to tackle environmental degradation seem to be more comprehensive and the punishment for violation of the law is harsher and more stringent than it is in India. [2]

In general, e-wastes include a wide range of electrical/electronic products from simple devices to complex goods that are disposed of by end users. E-wastes contain both toxic and valuable materials. [3] Components of e-waste include lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, brominated flame retardants, [4] precious metals (silver, gold, platinum, palladium), [5] rare earth metals, ferrous and non-ferrous metals (copper and aluminum), [5] plastic, wood and glass. [6] As per Indian Government rules, e-waste includes electrical and electronic equipment, either in whole or in part, which is discarded as waste by the consumer or bulk consumer and the ones which are rejected by the processes such as, manufacturing, refurbishment, and repair. [7] Categorization of e-waste is complicated because of multiple definitions of e-waste. The Waste Electrical and Electronic Directive of the European Union [8] uses 10 categories while the Indian rules [7] define only two categories.

Management of e-wastes comprises e-waste collection, storage, treatment and disposal in a safe manner so as to prevent health and environmental hazards to humans, livestock and the environment. [9] Waste cannot be completely eradicated; it can only be reduced and controlled through proper awareness and practice concerning waste management. [10] Prolonged exposure to the hazardous materials in e-wastes has adverse birth consequences, [11] cancer, neurologic damage, and diseases of the thyroid, lungs, liver, and kidneys.

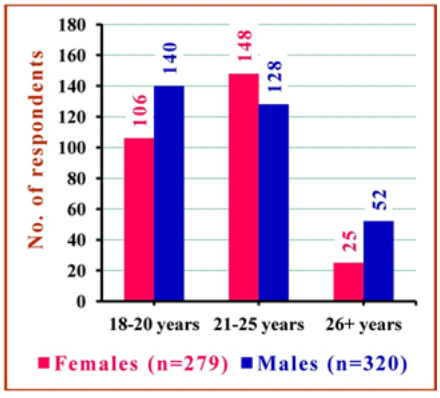
The objective of this study was to determine the level of awareness regarding e-waste among educated adult urban inhabitants in a metropolitan city.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted by convenience sampling by administering a pre-tested and pre-validated questionnaire via Google forms to persons aged 18+ years, of either gender, who had passed 12th Standard or equivalent examination and were residents of a metropolitan city in India. Informed consent was taken on the Google forms. The data were adapted to Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, WA, USA) and analyzed using SPSS statistical software Windows Version 25.0 (IBM Corporation, Armonk, NY, USA). The percentage of responses and the standard error of difference between two sample proportions were calculated. For continuous data, the standard error of difference between two means was calculated. 95% Confidence interval (CI) was stated as: [Mean-(1.96)*Standard Error)] - [Mean+(1.96)* Standard Error)]. The statistical significance was determined at $p<0.05$.

RESULTS AND DISCUSSION

Out of 599 respondents, 279 (46.57%) were females and 320 (53.43%) were males. The mean age for females was 22.29 +/- 4.84 years (95% CI: 21.72 – 22.86 years) while that for males was 22.91 +/- 6.45 years (95% CI: 22.21 – 23.62 years). The gender difference in mean age was not significant (Z=1.340; p=0.180). Males outnumbered females in age groups of 18-20 years and 26+ years, while females exceeded males in the age group of 21-25 years (Fig-1).



The gender differences in responses are outlined in Table-1. 24 (08.60%) females and 83 (25.94%) males used electronic gadgets for 1-2 years only, exhibiting significant gender difference (Z=5.525; p<0.0001) while 213 (76.34%) females and 179 (55.94%) males used electronic gadgets till they get damaged, also exhibiting significant gender difference (Z=5.238; p<0.0001). A significantly higher (Z=4.438; p<0.0001) proportion of females (93.91%) knew about presence of mercury, lead, etc., in e-waste as compared to males (81.88%). On the other hand, a significantly lower (Z=4.401; p<0.0001) proportion of females (8.96%) knew that unused electronic products should be treated as e-waste, as compared to males (22.19%).

Table-1: Gender differences in responses

Topic	Females (n=279)	Males (n=320)	Z value	'p' value
Functioning gadget which is not in use is exchanged	96 (34.41%)	88 (27.50%)	1.828	0.067
Functioning gadget which is not in use is given to someone else	16 (05.73%)	39 (12.19%)	2.728	0.006 *
Cost is deciding factor for repairing a gadget	210 (75.27%)	198 (61.88%)	3.508	0.0004 *
Not much knowledge of electronic components	105 (37.63%)	73 (22.81%)	3.959	0.0008 *
Knows of informal services for collecting e-waste	73 (26.16%)	101 (31.56%)	1.451	0.147
Do not know of any services for collecting e-waste	180 (64.52%)	190 (59.38%)	1.291	0.197
No knowledge of e-waste management policy in India	194 (69.53%)	201 (62.81%)	1.731	0.083
Knowledge of risks & hazards due to e-waste	146 (52.33%)	176 (55.00%)	0.653	0.515
Non-specific awareness of e-waste hazards	79 (28.32%)	63 (19.69%)	2.476	0.013 *

Z=Standard error of difference between two proportions; *Significant

257 out of 279 (92.11%) females and 299 out of 320 (93.43%) males were aware of the term “e-waste”, without significant gender difference. In a Pune-based study, 90% of respondents were familiar with the term “e-waste” while 10% were unaware of this term. [12] The level of awareness was not related to the level of education in the present study. Paradoxically, the same study [12] from Pune found that the awareness level regarding e-waste was lower amongst graduates (86%) as compared to that amongst undergraduates (95%).

CONCLUSION

Though the study is based on convenience sampling, it has a large sample size. The results of the study reveal excellent level of awareness about e-waste. The level of awareness should be utilized at the community level to inculcate the concept of reuse, repair and recycle and to visualize present-day electronic products as double-edge swords since they are a potential source of precious metals as well as environmental and health hazards.

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