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Effect of intervention on knowledge of E- waste management amongst dental students: An institution based study

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Abstract: *Background:* The problem of E-waste has assumed great proportions and as a responsible member of the society, the dentist should be aware of the various aspects of E-waste. *Objectives:* The current study was proposed to assess the improvement in awareness of dental students regarding various aspects of e-waste hazards and management prior and subsequent to an educational intervention session on E waste. *Methods:* The study was carried amongst 100 first year dental students after prior administrative permission and consent from higher authorities. The knowledge regarding E-waste was assessed by a self-administered questionnaire before and after and educational intervention. After checking for completeness of data, the responses were entered and subjected to descriptive and inferential statistical analysis. *Results:* Majority 59 (62.1%) knew that improper E-waste disposal posed a serious threat to environment and this score further improved significantly to 90 (94.7%) after the educational intervention. There was a highly statistically significant increase in the knowledge ($p < 0.001$) in all aspects of E-waste after intervention as compared to pre intervention data. *Conclusion:* The budding dentist like the general populace has been known to access a variety of electrical and electronic items for convenience, recreation as well as study of latest developments in the medical field. The findings of this study have implications for medical education, service, public health administration and research.

Keywords: Awareness, Dental Students, E-Waste Management, E-waste, Intervention, Knowledge,

Introduction

E-waste or waste electrical and electronic equipment (WEEE) is any broken or unwanted electrical or electronic appliance. The problem of E-waste has assumed great proportions with an estimated 50 million ton of E-waste being produced globally per year [1]. The Indian market is flooded with massive volumes of electrical and electronic goods and gadgets, having tremendously high domestic demand. Consequently, the amount of E-waste being generated in the country is flourishing at an alarming rate, although the management practices and policy initiatives of the same are still in an elementary stage [2].

In addition, over the last few decades, India, along with other Asian and African countries, has become a major destination for E-waste exports from developed countries [2]. The end users of the electronic and electrical equipments are important stakeholders in the fight against this problem and awareness about E-wasteis an important tool to bring about social changes. The budding dentist like the general populace has access to a variety of electrical and electronic items to study latest developments in the medical field as well as for convenience and recreation.

As a responsible member of the society, the dentist should be aware of the various aspects of E-waste generation, its harmful consequences, methods of prevention and management. Therefore, the current study was proposed to assess the improvement in awareness of dental students regarding various aspects of e-waste hazards and management prior and subsequent to an educational intervention session on E waste. To the best of our knowledge no such study has been conducted in dental students from Health Institute in Western Maharashtra, India.

Material and Methods

An interventional study with before and after comparison group was carried amongst 100 first year dental students out selected by random sampling after prior administrative permission and consent from higher authorities. Before commencement of the study, all the participants were elaborately explained about the purpose, importance, and procedure of the study and assent was obtained from them after assuring anonymity and confidentiality.

The knowledge regarding E-waste was assessed by a self-administered questionnaire method for the baseline information. This was followed by an educational intervention of a power-point presentation to impart knowledge on e-waste causes, effects and management to all the participants. The post interventional evaluation was done by the same questionnaire after a gap of 2 weeks. After checking for completeness of data, the responses were entered and subjected to descriptive and inferential statistical analysis in MS Excel 2007. To test association between variables Chisquare test was applied. Of the 100 study subjects, 6 did not participate in the post test. So a total of 94 questionnaires were considered for analysis.

Results

The study sample (n= 96) consisted of 38 (40.425%) male & 56(59.575%) female students (Table 1).

Table-1: Distribution of study participants

Gender	Frequency	Percentage
Male	38	40.42
Female	56	59.57

Their average age was 18.6.years. When the reason for purchase of new gadget was assessed 39 (41.48%) of the participants identified desire for new technology as the main reason followed by 26 (27.65%) of the participants stating need for greater functionality as their reason for buying a new gadget (Table 2).

Table-2: Reason for purchase of new gadget

Reason	Male	Female	Total Number (%)
Physical damage	6	10	16 (17.02%)
Need for greater functionality	12	14	26 (27.65%)
Desire for new technology	16	23	39 (41.48%)
Any other	4	9	13 (13.82%)
Total	38	56	94

Regarding current practices regarding unused electronics a majority of responders 34 (36.17%) stated that they gave it to a personal contact while only 5 (5.31%) of the participants gave it to E-waste collector. Unfortunately 17(18.08%) participants threw the unused electronic items in trash and 4 (4.25%) participants even disposed the items by incineration. No significant gender association was seen regarding E-waste management, among males and female students, in the pretest (Table 3).

Table-3: Current practice regarding electronics that are no longer in use

Current practice	Male	Female	Total Number (%)
Kept at home	4	10	14 (14.89%)
Given to personal contact	14	20	34 (36.17%)
Exchanged with dealer/ shop person/etc	8	12	20 (21.27%)
Thrown in trash/ landfills	8	9	17(18.08%)
Given to E-waste collector	2	3	5 (5.31%)
Burning/ incineration	2	2	4 (4.25%)

Table-4: Awareness regarding E-waste among study subjects before and after educational intervention			
Variable	**Pre intervention(n=96) correct response n (%)**	**Post intervention(n=96) correct response n (%)**	**Chi- square p value**
Serious health risk/s associated with E-waste	29 (30.5)	93 (97.9)	93.81, p<0.0001
Current E-waste management policies in India	33 (34.7)	74 (77.9)	35.96, p<0.0001
Awareness of E-waste collection spots in the Campus	17 (17.9)	73 (76.8)	66.2, p<0.0001
Improper E-waste disposal a serious threat to environment	59 (62.1)	90 (94.7)	29.88, p<0.0001

Regarding awareness of currently followed E-waste policies in India as well as E-waste collection spots in campus the pre intervention scores were 33 (34.7%) and 17 (17.9%) respectively which after intervention increased to74 (77.9%) and73 (76.8%) respectively. Only 29 (30.5%) knew that there are serious health risks associated with E-waste and this score improved significantly to 93 (97.9%) after intervention. Majority 59 (62.1%) knew that improper E-waste disposal posed a serious threat to environment and this score further improved significantly to 90 (94.7%) after the educational intervention. There was a highly statistically significant increase in the knowledge ($p < 0.001$) in all aspects of E-waste after intervention as compared to pre intervention data (Table 4).

Discussion

In the modern world with its ever increasing achievements in the field of technology, the severely hazardous nature of E-waste is one of the most rapidly growing environmental problems. The main cause of this exponentially growing problem is the lack of awareness and attitude towards E waste. As a responsible member of the society a medical professional is expected to be aware of this modern hazard of improper E-waste management since it can have a serious impact of the community health and well being.

This study was carried out to assess the level of knowledge regarding the various aspects of E-waste, its causes and management. The study also assessed the impact of a simple educational intervention in helping to increase the awareness regarding the same in the dental college setting.

The most important aspect of E waste management is the awareness of the population regarding the severe implications on the health of the society. It is in this vein that at least initially, a high level of awareness of people is needed to address the problem of improper E-waste disposal. Though the initial level of awareness of E-waste associated health hazards was only was only 30.5% in our study, it increased to 97.9% post the educational intervention.

Similar findings were echoed by Bala S et al in their study when they found that there was no significant difference in the awareness on the subject of E-waste management in college students of professional and non-professional streams and all the students were equally unaware of proper E-waste management and its consequences [3].

Decreasing the rate at which electric and electronic items are discarded and reduction in generation of new E waste is a significant step in reducing the burden of e waste. In our study only 17.02% of the participants discarded the electronic or electrical item due to damage while a significant number of 27.65% and 41.48% gave the reason as need for greater functionality or desire for new technology respectively for disposal of the same. This is

similar to the findings of the interventional cross-sectional study conducted by Subhaprada CS et al in 2017 among 100 MBBS students in Andhra Pradesh where majority of their respondents indicated a desire for new technology as their primary motivation to purchase new electronic products [4].

Another significant aspect in E-waste management is the disposal of these unused household electric and electronic items. Electronic equipments contain many hazardous metallic contaminants such as lead, cadmium, and beryllium and brominated flame-retardants which on improper disposal enter biological systems via food, water, air, and soil leading to serious environmental and health implications for the general population [5].

Deniz PÖ et al found that 34.4% of the students in their study thought that electrical and electronic waste is disposed in landfills [6]. A better awareness was found in our study, where a fewer number 17(18.08%) of participants stated that their current practice regarding electronics that are no longer in use was by putting it in trash.

Only 14 (14.89%) participants kept their unused electrical items at home in our study. This was in contrast to the findings of Deniz PÖ et al where they found that among all of the students 51.3% of them did not know how to handle old and unusable electrical and electronic products and that's why they kept them at home[6]. In a similar study by Nath et al 77% of the respondents didn't know about the ways of disposing the e-waste and kept the unused items home [7].

In our study only 17.9% reported awareness of E-waste collection spots in the campus prior to intervention. Deniz PÖ et al in their study noted similar findings when only 27.3% among the 294 participants in their study reported that they saw recycling containers for electrical and electronic products in their neighbourhood [6]. In our study the awareness percentage increased to 76.8% after the educational intervention highlighting the importance of such timely measures in tackling this serious menace.

Regarding awareness of the Government policies on E-waste management, the awareness increased to 77.9% after the educational intervention. Thus there is a need for increased public awareness through health education on hazards and handling of e-waste management along with strict legislations by the government. Environmental protection will be possible only through awareness of the community. Therefore, environmental education should be provided extensively and which will hopefully contribute to the development of responsible behavioral patterns towards the environment.

Conclusion

The budding dentist like the general populace has been known to access a variety of electrical and electronic items for convenience, recreation as well as study of latest developments in the medical field. For a developing country like India, it is important that all health care providers have proper knowledge of handling e-waste for imbibing it in their personal and professional practice. This will help them to safeguard themselves as well carry out their contribution as a responsible citizen of the country. The findings of this study have implications for medical education, service, public health administration and research.

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