Research Article

Knowledge, attitude, and practice of e-waste among medical students, Dharwad

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ABSTRACT

Background: Rapid industrialization has led to increase turn-over of electronic equipment's contributing for high e-waste burden globally. The hazardous substances present in the e-waste pose many health and environmental risk. Awareness plays an important role in proper disposal of e-waste. **Objective:** The objective of the study was to assess the knowledge, attitude, and practice on e-waste among medical students of Dharwad. **Materials and Methods:** A cross-sectional study was carried out from March to April 2019 among medical students of Shri Dharmasthala Manjunatheshwara College of Medical Sciences and Hospital. A pre-designed and pre-tested questionnaire was administered to MBBS students of all phases at single setting. Of 400 students 295 participated in the study. Data were entered in MS Excel 2017 and descriptive statistics such as frequencies and percentages were calculated. **Results:** Of 295 study subjects 162 (54.9%) were female and 133 (45.1%) were male. Two hundred thirty-three (81.18%) and 275 (95.82%) of study subjects knew about health and environmental risks associated with e-waste. Only 12 (4.18%) knew about the laws on e-waste. Majority 162 (56.44%) of the study subjects frequently replaced their electronic goods to keep up with technology. Two hundred eighty-one (97.91%) were willing to get more information on e-waste. Two hundred thirty-eight (53.60%) study subjects opined that lack of awareness is the reason for improper disposal of e-waste. **Conclusion:** Health education regarding e-waste is essential for health of the people and awareness on proper disposal of e-waste is essential for risk -free future which is the need of the hour.

KEY WORDS: Awareness; Electronic Waste; E-waste Disposal; Medical Students

INTRODUCTION

Changing lifestyle and industrialization have led to increase in use of electronic gadgets. Enhancement in the usage of electronic equipment along with shortened life of the product has contributed to a new waste called electronic waste, which is the fastest growing waste streams in the world.[1,2]

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According to Organization for Economic Co-operation and Development, e-waste is defined as "Any appliances using electric power supply that has reached its end of life.[1]"

It is estimated that more than 50 million tons of e-waste is generated globally every year. Electronic industry is the fastest growing industry in India. About 70% of the e-waste is contributed by 10 states in India, among which Maharashtra ranks the highest. Bengaluru stands third among all cities in generating e-waste in India.[1,3] India is a dumping center which receives e-waste from many developed countries. The e-waste in India is not segregated, collected, or processed correctly. However, most consumers are not aware of the proper disposal of the old product once they go for the updated versions.[4]

E-wastes contain hazardous substances such as heavy metals and organic pollutants which are toxic and potentially hazardous to environment and human health. There are numerous health problems associated with exposure to e-waste such as dysfunction of thyroid, altered lung functions, changes at cellular level, and unfavorable outcomes in pregnancy such as spontaneous abortions, stillbirths, and low birth weight.[5]

Handling of e-waste such as cathode ray tube, printed circuits, printers, and so on which contains heavy metals, hydrocarbons, and brominated substance can lead to various health disorders such as silicosis, endocrine disorders, motor neuropathy, and heavy metal poisoning.[6]

It is estimated that 75% of old electronic items are just kept at home due to ignorance of how to manage their disposal.[4] Consumers knowledge plays an important role in proper management of e-waste. The awareness of risk associated with improper e-waste disposal and its implications on health is necessary among medical students. Therefore, the present study aims to assess the knowledge, attitude, and practice on e-waste among medical students, who in future will come across the health conditions associated with e-waste in their practice. Therefore, the present study was conducted among medical students to assess their knowledge, attitude, and practice on e-waste and its disposal.

MATERIALS AND METHODS

This was a cross-sectional study carried out from March to April 2019 among MBBS students of Shri Dharmasthala Manjunatheshwara College of Medical Sciences and Hospital, Dharwad. All students from 1st year to final year were included in the study. Those students who were absent on the day of administering questionnaire, interns, and those not willing to participate were excluded from the study. After explaining the objectives of the study informed consent was taken from all the study subjects. The protocol was approved by institution ethics committee.

With the help of co-post graduates and staff, a pre-designed and pre-tested questionnaire was administered to all the students of different phases in different classrooms in a single setting. Questionnaire consisted of 4 parts. Part 1 had personal identification details; Part 2, 3, and 4 had questions on knowledge, attitude, and practice one-waste, respectively. Of 400 students, 295 participated in our study. After data collection, health education was provided for all the students on e-waste in successive sessions.

After checking for the completeness of data, the responses were entered and analyzed using Microsoft Excel 2017. Descriptive statistics such as frequencies and percentages were calculated.

RESULTS

The present study was conducted among 295 medical students consisted of 162 (54.9%) females and 133 (45.1%) males. Mean age was 19.98 years. Majority of the students were 2nd term. Eight students had not heard about the e-waste, hence the final sample size considered for the study was 287.

The study subjects' source of information on e-waste was internet 92 (33.52%) followed by news-paper 56 (19.55%). Majority of the study subjects were aware of the effect of e-waste on health 233 (81.18%) and environment 275 (95.82%), respectively, but only 13 (4.53%) and 6 (2.10%) were aware of the laws on e-waste and collecting centers nearby, respectively [Table 1]. When asked in detail about the effects of e-waste on health, multiple answers were given by study subjects. Majority of them told it causes damage to DNA and affects both physical and mental health [Figure 1].

Table 1: Awareness of e-waste among study subjects

Awareness questions	Options	Number (%) *n*=287
Awareness of the e-waste that is generated in India?	Yes	225 (78.39)
	No	62 (21.61)
Health risk due to e-waste	Yes	233 (81.18)
	No	54 (18.82)
Environmental risk due to e-waste	Yes	275 (95.82)
	No	12 (4.18)
Laws of e-waste	Yes	13 (04.53)
	No	274 (95.47)
E-waste collecting center near you	Yes	6 (2.10)
	No	83 (28.92)
	Don't know	198 (68.99)
Can e-waste be recycled?	Yes	250 (87.11)
	No	37 (12.89)
Management of e-waste	Landfill	44 (15.33)
	Recycle	184 (64.11)
	Burnt	13 (4.53)
	No idea	46 (16.03)

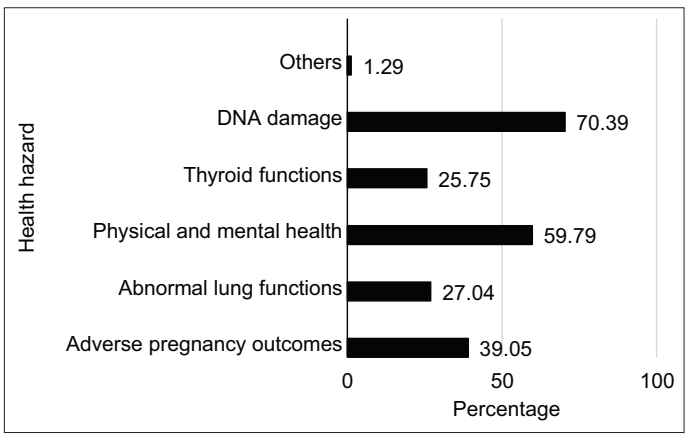

Figure 1: Knowledge of students on health hazards of e-waste (*n* = 287)

Around half of the students were not aware of the hazardous substances present in e-waste.

Lack of awareness 238 (82.92%) and non-availability of collection points 127 (44.25%) were the reasons given for improper disposal of e-waste. Two hundred forty (83.9%) were knowing about the e-waste disposal problem in India, 285 (99.3%) told that there is a need for awareness program on e-waste disposal [Table 2].

The electronic goods used by the majority of the study subjects were mobile 278 (96.86%) followed by ear phones 252 (87.8%). Radio 49 (17.07%) and MP3 player were used least among study subjects [Figure 2]. Majority of the study subjects 141 (49.13%) replaced electronic equipment only when needed, 24 (19%) of students replaced the electronic equipment's once in 2 years. When questioned about the reason for replacement, majority of them told it was due to non-working condition of the old equipment 162 (56.44%) and changing technology 106 (36.93%) followed by exchange offers 16 (5.57%). When asked how do they dispose of their e-waste, multiple answers were given by the study subjects. One hundred twelve (39.01%) answered that they get exchanged, 69 (24.08%) gave it to scrap dealers, 60 (21.02%) kept at home. and remaining told they would either throw or donate it.

Table 2: Attitude on e-waste among subjects

Attitude questions	Options	*n*=287 (%)
Is proper e-waste disposal a problem in India?	Yes	241 (83.97)
	No	46 (16.03)
Is there a need for awareness on collection and disposal of e-waste?	Yes	285 (99.30)
	No	02 (0.7)
Will you be committed to proper e-waste disposal if better informed?	Yes	283 (98.60)
	No	04 (1.39)
Are you willing to put some time to take your e-waste to recycler?	Yes	277 (96.51)
	No	10 (3.48)
Are you willing to get more information on e-waste management?	Yes	281 (97.91)
	No	06 (2.10)
Reason for improper disposal of e-waste? (Multiple choices were allowed)	Lack of awareness	238 (82.92)
	Time constraint	26 (9.05)
	Inconvenience	51 (17.42)
	No collection points	127 (44.25)
	Others	2 (0.69)

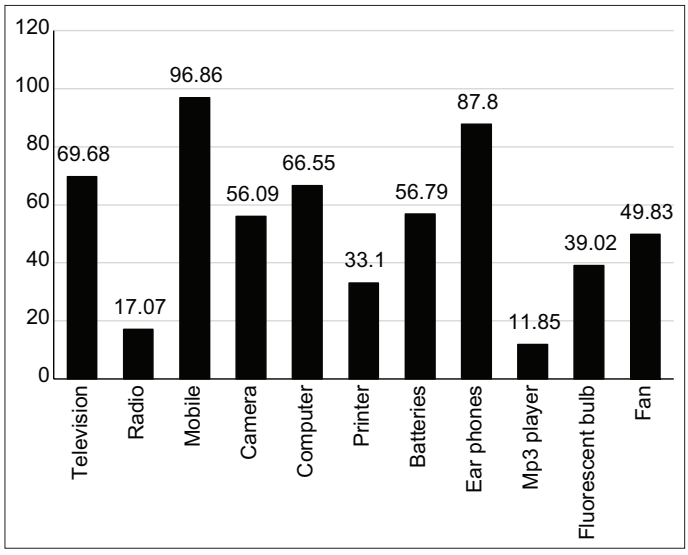

Figure 2: Devices currently used by the subjects (*n* = 287)

DISCUSSION

This study brings out the lack of adequate knowledge about e-waste and its proper disposal among the study subjects and the need to address this issue. In the present study, 97.29% of students considered unused electronics as a waste. About 81.18% and 95.8% of students were aware of the health and environmental hazards, respectively. Only 4.53% of the study participants were aware of laws on e-waste management. Almost all (98%) were willing to know about the proper disposal of e-waste. When questioned on how to handle e-waste, majority (39.01%) of them answered they would give it for exchange and 24.08% gave it to scrap.

Studies conducted in Maharashtra and Gujarat among general public showed that 58.5% and 35% were aware of the e-waste which is contrast to our study finding. The difference is may be due to the educational status of the study subjects chosen.[7,8] Around 90% of the study participants were not aware of the health and environmental hazards in a study done at Andhra Pradesh in 2014.[9] The relatively low level of awareness can be attributed to the study period, there is increasing awareness on risk associated with e-waste through media and other sources in recent times. Another study conducted in Kurnool among students showed that 9.3% of them were aware of the government policy on e-waste which is similar to our study finding.[4]

A study done in Turkey children showed that 45.2% of them would dispose e-waste by giving it to the recyclers and 23.6% would give it to junkyard.[10] Another study conducted in Uttarakhand among general public told that majority (65.7%) of them dispose mobile batteries and other e-waste by throwing in general waste and 23.8% gave it to scrap dealers.[11] The difference in practice with respect to different regions can be attributed to level of awareness on recycling methods, availability, and accessibility to safe disposal options. In the modern scenario, it is impossible to avoid electric and electronic goods. The consumer should be made aware of the hazards, proper, and safe disposal practices. It is important that the health-care provider and the general public should have proper knowledge about e-waste so as to prevent hazard from mismanagement.

The limitations of the study were non-assessment of awareness levels of study subjects after conducting the health education session. Providing details of the recycling centers and collection points nearby to the study participants would have helped them in proper disposal of their e-waste. The present study aimed to assess knowledge and impart awareness among medical students which can be further extended to general public, institutions, and electronic goods vendors.

Recommendations

Awareness of the proper disposal of e-waste is the need of the hour. Knowledge regarding e-waste should be imparted right from school in the curriculum, IEC, and through mass media. Periodic reinforcement is required to bring the knowledge in to practice. This facilitates dissemination of proper information regarding disposal of e-waste and protects every individual and community as a whole from e-waste hazards.

CONCLUSION

In the present study, the knowledge of medical students about risks associated with e-waste was satisfactory but the knowledge on disposal and laws was poor. Majority of the subjects frequently change their electronic goods but with poor disposal practices. It was noticed that the study subjects had a positive approach toward e-waste disposal

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