Mothers' Knowledge and Practices regarding Safe Disposal of Electronic Waste

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Abstract

Background: Electronic wastes have potential hazards due to their composition which cause systemic diseases in the body. Mothers play a pivotal role in safe handling and disposal to protect health of the community members from bad effect of electronic waste. **Aim:** Assess the mothers' knowledge and practices regarding safe disposal of electronic waste. **Design**: A descriptive research design. **Setting:** Two Maternal and Child Health Care Centers (MCH) in Tanta city. **Subjects:** A sample of (650 mothers) was selected randomly from the previously mentioned settings. **Tools: Tool (I): Part (1):** Mothers socio-demographic data. **Part (2):** Knowledge of mothers, includes: General information about electronic waste, its risks, safe disposal and recycling. **Tool (II):** Self-reported practices of mothers regarding electronic waste management, contained 26 statements include: practices that mothers follow to deal with and to dispose of electronic waste. **Results:** There were 84.9% and 97.2% of mothers had low level of knowledge regarding safe disposal and recycling of electronic waste total score. Moreover, 94.2% and 99.7% of mothers had unsatisfactory practices regarding practices that mothers follow to deal with and to dispose of electronic waste. **Conclusion:** Majority of studied mothers had low level of knowledge as well as, unsatisfactory level of practice. There was a significant positive correlation between studied mothers' total score of knowledge and their total score of practices regarding safe disposal of electronic waste. **Recommendations**: health authorities should plan and develope health classes for all mothers to increase their knowledge and enhance their practices regarding safe disposal of electronic waste.

Keywords: Electronic waste, Knowledge, Practice, Safe disposal.

Introduction

Electronic waste refers to various electronic equipment, from computer-related and telecommunications equipment, household appliances, lighting and hospital equipment that discarded without any intention of reuse **Srivastav et al., (2023).** Electronic waste is a growing problem globally as technology continues to advance and more electronic devices produced and discarded. According to the Global electronic waste Monitor 2020 report, approximately 53.6 million metric tons of electronic waste generated worldwide in 2019 **(Moossa, Qiblawey, Nasser, Al-Ghouti & Benamor, 2023).**

Electronic waste contains more than 1,000 different substances such as lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, and flame-retardants that create dioxins emissions when burned. Toxins arising from electronic waste found to cause brain damage, birth defects, allergic reactions, and cancer. Presence of hazardous materials such as lead, nickel and brominated flame-retardants increases the complexity of electronic waste treatment **(Malhotra & Jain, 2023).**

Informal recycling of electronic waste toxic leachates flow into the environment, contaminating potable water sources and poisoning vegetables and fruits in the surrounding dumpsites and landfills. In addition, communities engaged in informal electronic waste management exposed to diseases such as blood disorders, congenital disabilities, nausea, asthma, lung diseases and depressed immune systems (**Maphosa & Mashau, 2023).**

Poor handling, recycling, and disposal of electronic waste can cause severe impacts on public health and the environment **(Mane, Patil, Durgawale & Kakade, 2019).** The biggest challenge with managing electronic waste is the lack of regulation as illegal and informal workers recycle electronic waste using rudimentary tools to disassemble electronic equipment and often burn components to extract valuable materials. Burning and incineration release hazardous pollutants, causing environmental risks and health hazards **(Rajesh, Kanakadhurga & Prabaharan, 2022).**

Community health nurses play a vital role in protecting the health of individuals and communities affected by electronic waste. The community health nurses help mitigate the negative impacts of electronic waste on public health through raising the public awareness about the importance of safe disposal of

electronic waste and empower individuals to take action to protect their health and their environment. Also, they provide education conducting assessments, advocating for policy changes, and collaborating with others (**Ali & Akalu, 2022; Singhal, Lyngdoh, Prabhakaran, 2021).**

Significance of the study

Electronic waste's informal processing and disposal have raised critical concerns related to human and environmental health worldwide. Inadequacy of policies, deficient budgets, and unsatisfactory public awareness towards waste management are some key factors behind this situation. Therefore, lack of awareness and absence of strong regulatory policy are giving rise to future challenge to public health **(Ali & Akalu, 2022)**. So, the community health nurses should play essential role in promoting safe electronic waste disposal practices and protecting public health from the hazards of electronic waste.

Aim of this study:

Assess the mothers' knowledge and practices regarding safe disposal of electronic waste.

Research question:

What are the levels of mothers' knowledge and practices regarding safe disposal of electronic waste?

Subjects and method:

Study Design

A descriptive study design was used.

Setting

The study was carried out at the two largest Maternal and Child Health Care Canters (MCH) in Tanta city, which named as (medical center at Sigar and Dr. Mohamed Mashaly primary health care center at Saied Street, which affiliated to Ministry of Health and Population)

Subjects: A sample of 650 mothers were selected randomly from the previously mentioned settings according to number of mothers attending to each setting.

Tools of data collection: The data was collected by using the following tools.

Tool (I): Knowledge of mothers regarding electronic waste:-

It was developed by the researcher based on the literatures review **(Mane, Patil, Durgawale & Kakade, 2019; Azlan, Razak & Indiran, 2021; Ali & Akalu, 2022; Almulhim, 2022).** It comprised two parts as follows:

Part (1): Socio-demographic data of the mothers:

This part was used to collect data about mothers' general characteristics included; age, residence, educational level, family income, occupation and number of family member.

Part (2): Knowledge of mothers regarding electronic waste disposal: This part was used to assess knowledge of mothers about electronic waste disposal, which included the following sections:

a) Information about electronic waste included (10 items)
b) Risks of electronic waste included (4 items)
c) Safe disposal of electronic waste included two parts, first part included (9 items), second part included (11 items)
d) Electronic waste recycling included two parts, first part included (8 items), second part included (1 item)

The total score of knowledge was calculated and converted into percent score as follows:

- **High level of knowledge** ≥ 75% of the total score.
- **Moderate level of knowledge** 60 < 75% of the total score.
- **Low level of knowledge** < 60 % of the total score.

Tool (II): Self-reported practices of mothers regarding electronic waste management: It was developed by the researcher after reviewing the recent related literatures **(Mane, et al., 2019; Arpitha & Patil, 2020; Hamzah, Yahya & Shafie, 2020).** It was used to assess mothers' general practices for disposal of electronic waste which contained 26 statements as follow:

- Practices that mothers follow to deal with electronic waste included 9 statements.
- Practices that mothers follow to dispose of electronic waste included 17 statements.

The total score for level of practice was calculated as follows:

- **Satisfactory practices** ≥ 70% of the total score.
- **Unsatisfactory practices** 60 < 70% of the total score.

Method

1. **Administrative approval:** An official permission was sent by Dean of the Faculty of Nursing to the Directorate of Health Affairs Gharbiya Governorate and the directors of Maternal and Child Health Centers of the selected settings requesting their assistance and consent for data collection.
2. **Ethical and legal considerations:**

- An approval of the Scientific Research Ethical Committee was obtained to conduct the study (**code (294-9-2023).**
- Informed consent was taken from every participant after explanation the purpose of the study.
- The participant has the right to withdrawal at any time during the data collection period.
- The researcher ensured that the nature of the study didn't cause any harm or pain for the entire sample.

Privacy and confidentiality of the collected data were taken into consideration.

3. **Tools' development:** Tools **(I&II)** were developed by the researcher after reviewing the recent related literatures and was translated into Arabic language to suit the level of understanding of the mothers.

- **Validity:** The study tools were tested for construct and content validity by jury of five experts in the field of Community Health Nursing, corrections and modifications were done accordingly.
- **Reliability*:*** the study tools were tested by using Cronbach's Alpha test. They were (0.833, 0.825 and 0.620) respectively for all the study tools, knowledge part and practice part.

4. **A pilot study** was conducted on 10% of the total sample (65 mothers) to test the clarity and applicability of the developed tools.
5. **The actual study:**

- Data collection was conducted in a period of six months ranged from the beginning of April 2024 to the end of September 2024.
- The researcher attended at the previously mentioned settings at the morning shift from 9.00 A.M. to 1 P.M four days/week as follows; (two days from medical center at Sigar and two days a week from Dr. Mohamed Mashaly primary health care center at Saied Street) until the predetermined sample size obtained.
- The data was collected individually through face-to-face interview with each mother.
- The averaged time spent for collect the data from each mother was 15-20 minutes and the number of mothers taken each day were range from 6-8 mothers.

Statistical analysis:

- The collected data were organized, tabulated and statistically analyzed using statistical package for social studies (SPSS) version 23.
- For quantitative data, the mean, standard deviation and range were calculated for quantitative data. One sample t test was used.
- For categorical variables numbers and percent were calculated. Comparison was done using chi-square test (x2). Pearson's correlation coefficient (r) was used to identify correlation between variables.
- A significance was adopted at $P<0.05$ for interpretation of results of tests of significance.
- Highly significant was adopted at $P<0.01$ for interpretation of results of tests of significance.

Results

Table (1): It shows that; age of studied mothers ranged between 19 –

60 years old with mean 36.23 ± 8.823 years. More than two thirds (69.2%) of them aged from 19-40 years and 30.8% of them their age was ranged from 41-60 years. Concerning studied mother's educational level, it was reported that the highest percentage were secondary education general/ technical and university education (44.5 % and 26.9%) respectively. Concerning the studied mothers place of residence, it was noted that more than two-thirds (65.4%) of them were from rural region and one-third (34.6%) of them were from urban region.

It was also observed that less than two thirds (62.6%) of them had enough income. Also, the number of family member of studied mothers ranged between 2-10 members with mean 4.29 ± 1.227 members, more than two-thirds (68.9%) of them between 4-6 members and more than one quarter (27.6%) of them between 2-3 members.

Figure (1): It reveals that, the total level of knowledge of studied mothers, it ranged between 0 – 110 with a mean 44.37 ± 19.485. The majority (90.0**%**) of studied mothers had low level of knowledge regarding electronic waste compared to only 9.4 **%** and 0.6 **%** of them had moderate and high level of knowledge regarding safe disposal of electronic waste respectively. The difference was highly statistically significant p = 0.001.

Table (2): The table clarifies that, the majority of (93.2 % and 97.2%) of studied mothers had low level of knowledge regarding risks of electronic waste total score and recycling of electronic waste total score respectively. Also, three quarters (75%) of them had low level of knowledge regarding information about electronic waste total score. Moreover, more than four fifths (84.9%) of the studied mothers had low level of knowledge regarding safe disposal of electronic waste total score. On the other hand, minority (6.2% and 4.5%) of them had high level of knowledge regarding information about electronic waste total score and safe disposal of electronic waste total score.

Figure (2): Illustrates the distribution of the studied mothers according to their total levels of reported practices regarding electronic wastes. It reveals that; the total levels of practices of studied mothers; it ranged between 1-21 with a mean score of their practice was 6.61 ± 2.80. The majority (99.7%) of studied mothers had unsatisfactory practices, compared to only 0.3% of them had satisfactory practices. The difference was a highly statistically significance (p = 0.001).

Table (3): Shows the distribution of the studied mothers according to their levels of practices sub-scales and total levels of practices about electronic wastes. It represents that majority (94.2% and 99.7%) of studied mothers had unsatisfactory level of practices regarding practices of mothers in dealing with electronic wastes and practices of mothers in disposing of electronic waste respectively.

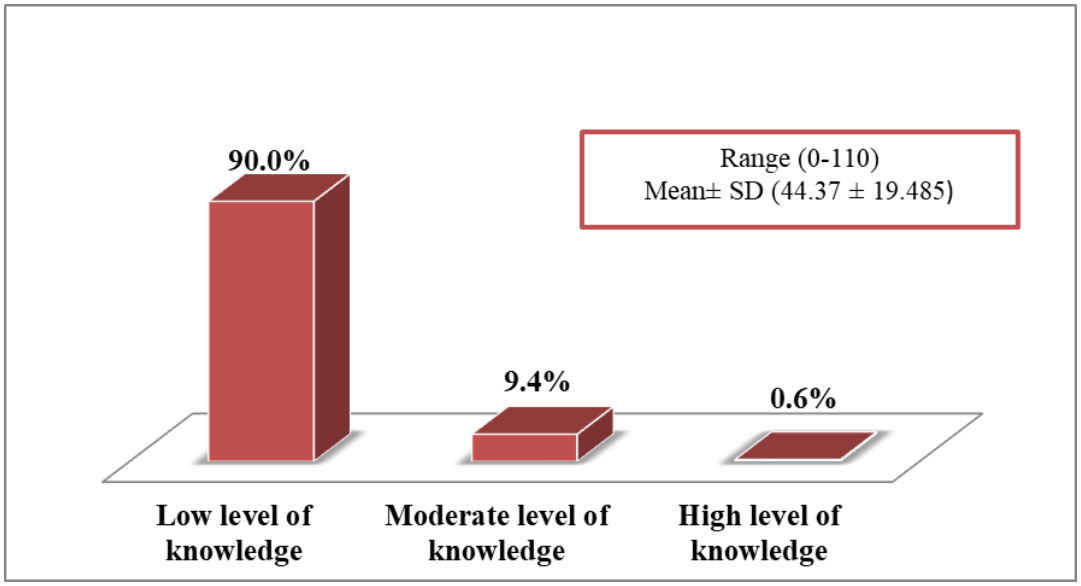
Table (4): The table reveals that there was a highly statistically significant relation between the studied mothers' total score level of knowledge and the education level, income and occupation (P= 0.001). Also, there was a statistically significant relation between the studied mothers' total score level of knowledge and their age (p= 0.013). On the other hand, there were no a statistically significant relation between the studied mothers' place of residence and number of family member and their total score of knowledge (p= 0.697 & 0.599) respectively.

Table (5): The table demonstrates that, there was a significant relationship between the studied mother's total score level of practices and their place of residence (P= 0.052). Conversely, there were no statistically significant relation between the studied mother's total levels of reported practices and their age, education level, income, occupation and number of family member.

Table (6): Represent correlation between age, number of family members, total knowledge score and total practice score. It illustrates that there was a statistically significant positive correlation between the studied mothers' total practices score and their total knowledge score where r=0.400 and P=0.001. The table shows that there was a statistically significant negative correlation between the studied mothers' total knowledge score, the total practices score and their age, where (r= -0.075- and -0.167- p= 0.055 and 0.001) respectively. Moreover, there was a statistically significant negative correlation between the studied mother's total knowledge score, total practices score and the number of family, where (r= -0.013- and -0.042- p= 0.740 and 0.283) respectively.

Table (1): Distribution of the studied mothers according to their socio-demographic characteristics.

Socio-demographic characteristics	The studied mother (n= 650)	
	No	%
Age		
- 19-40	450	69.2
- 41-60	200	30.8
Range	19 – 60	
Mean ± SD	36.23 ± 8.823	
Mother's educational level		
- Illiterate	60	9.2
- Basic education	92	14.2
- Secondary education general/technical	289	44.5
- University education	175	26.9
- Post university education	34	5.2
Place of residence		
- Rural	425	65.4
- Urban	225	34.6
Income		
- Not enough	182	28.0
- Enough	407	62.6
- Enough and saved	61	9.4
Occupation		
- Working	332	51.1
- Housewife	318	48.9
Number of family member		
- 2-3	179	27.6
- 4-6	448	68.9
- More than 6	23	3.5
Range	2 – 10	
Mean ± SD	4.29 ± 1.227	

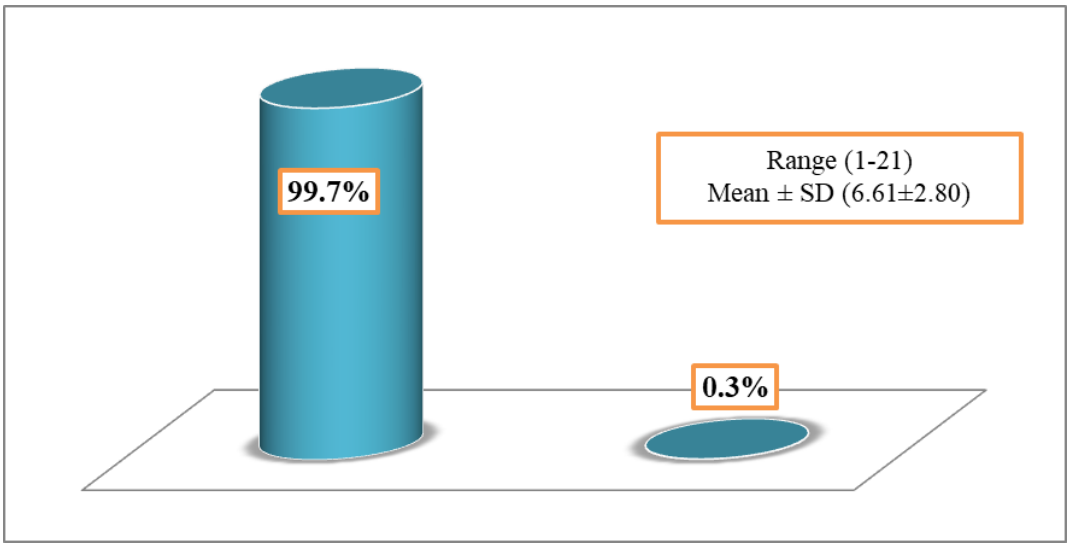


Total levels of knowledge of the studied mothers about electronic wastes

Figure (1): Total levels of knowledge of the studied mothers about electronic wastes

Table (2): Distribution of the studied mothers according to their levels of knowledge sub-scales about electronic wastes.

levels of knowledge sub-scales about electronic wastes	The studied mothers (n=650)					
	Levels of knowledge					
	Low level of knowledge		Moderate level of knowledge		High level of knowledge	
	no	%	no	%	no	%
- Information about electronic waste total score	493	75.8	117	18.0	40	6.2
- Risks of electronic waste total score	606	93.2	30	4.6	14	2.2
- Safe disposal of electronic waste total score	552	84.9	69	10.6	29	4.5
- Recycling of electronic waste total score	632	97.2	14	2.2	4	0.6



Total levels of practices of studied mothers regarding electronic wastes.

Figure (2): Total levels of practices of studied mothers regarding electronic wastes.

Table (3): Distribution of the studied mothers according to their levels of practices sub-scales about electronic waste.

Levels of practices sub-scales and total levels of practices about electronic waste.	The studied mothers (n=650)			
	Levels of Practices			
	Unsatisfactory practices		Satisfactory practices	
	no	%	no	%
- Practices that mothers follow to deal with electronic wastes	612	94.2	38	5.8
- Practices that mothers follow to dispose of electronic waste	648	99.7	2	0.3

Table (4): Relation between socio-demographic characteristics of the studied mothers and their total levels of knowledge about electronic wastes.

Socio-demographic characteristics	The studied mothers (n= 650)						x^2 p
	levels of knowledge						
	Low level of knowledge (n=585)		Moderate level of knowledge (n=61)		High level of knowledge (n=4)		
	no	%	no	%	no	%	
Age							
- 19-40	396	88.0	52	11.6	2	0.4	8.689
- 41-60	189	94.5	9	4.5	2	1.0	0.013*
Mother's educational level							76.268
- Illiterate	60	100.0	0	0.0	0	0.0	0.001**
- Basic education	91	98.9	0	0.0	1	1.1	
- Secondary education general/technical	272	94.1	16	5.5	1	0.3	
- University education	139	79.4	36	20.6	0	0.0	
- Post university education	23	67.6	9	26.5	2	5.9	
Place of residence							0.723
- Rural	385	90.6	38	8.9	2	0.5	0.697
- Urban	200	88.9	23	10.2	2	0.9	
Income							18.079
- Not enough	174	95.6	8	4.4	0	0.0	0.001**
- Enough	363	89.2	40	9.8	4	1.0	
- Enough and saved	48	78.7	13	21.3	0	0.0	
Occupation							13.876
- Working	285	85.8	45	13.6	2	0.6	0.001**
- Housewife	300	94.3	16	5.0	2	0.6	
Number of family member							2.756
- 2-3	156	87.2	21	11.7	2	1.1	0.599
- 4-6	408	91.1	38	8.5	2	0.4	
- More than 6	21	91.3	2	8.7	0	0.0	

$p<0.05$* significant $p<0.01$** highly significant

Table (5): Relation between socio-demographic characteristics of the studied mothers and their total levels of reported practices about electronic wastes.

Socio-demographic characteristics	The studied mothers (n= 650)				x^2 p
	level of practices				
	Unsatisfactory practices (n=648)		Satisfactory practices (n= 2)		
	no	%	no	%	
Age					0.892
- 19-40	448	99.6	2	0.4	0.345
- 41-60	200	100.0	0	0.0	
Mother's educational level					0.985
- Illiterate	60	100.0	0	0.0	0.912
- Basic education	92	100.0	0	0.0	
- Secondary education general/technical	288	99.7	1	0.3	
- University education	174	99.4	1	0.6	
- Post university education	34	100.0	0	0.0	
Place of residence					3.789
- Rural	425	100.0	0	0.0	0.052
- Urban	223	99.1	2	0.9	
Income					1.198
- Not enough	182	100.0	0	0.0	0.549
- Enough	405	99.5	2	0.5	
- Enough and saved	61	100.0	0	0.0	
Occupation					2.094
- Working	332	100.0	0	0.0	0.148
- Housewife	316	99.4	2	0.6	
Number of family member					0.905
- 2-3	179	100.0	0	0.0	0.636
- 4-6	446	99.6	2	0.4	
- More than 6	23	100.0	0	0.0	

$p<0.05$* significant $p<0.01$** highly significant

Table (6): Correlation between age, number of family members, total knowledge score and total Practice score.

Variables	Age	Number of family	Total knowledge score
Age	**r p**	**r p**	**r p**
	-	-	-
Number of family	0.291 - 0.000**	-	-
Total knowledge score	-0.075- 0.055	-0.013- 0.740	-
Total practice score	-0.167- 0.001**	-0.042- 0.283	0.400 - 0.001**

**Correlation is significant at the 0.01 level (2-tailed)

Discussion

Improvements in lifestyle and progressive evolution in technology, the use of electronics and electrical appliances in day-to-day life make the electrical and electronics equipment become an essential and integrated part of our daily life that we cannot imagine our life without it. Electronic gadgets or electrical appliances have become indispensable in everyday lives, which have resulted in an exponential demand for electronic equipment and a significant increase in the rate of electronic waste generation **(Li, Zeng & Li, 2023).**

Generally, the present study results reveal that, the majority of studied mothers had low level of knowledge regarding electronic waste, with mean ± SD 44.37 ± 19.485 and range 0 – 110 **(Figure 1).** This result was attributed to that, the mothers not give attention accessing information about electronic wastes and awareness campaigns or environmental education might not be emphasized about electronic waste which, leading to a general lack of knowledge about this problem. Additionally, half of studied mothers were worked **(Table 1)**, and electronic waste might not be a priority for them, as they are often more focused on their family, work and daily responsibilities.

This result was consistent with the findings of a study conducted by **Nuwematsiko et al., (2021),** who assessed the knowledge, perceptions, and practices of electronic waste management among consumers in Kampala, Uganda, who reported that, two thirds (67.0%) of the study subjects had low level of knowledge regarding electronic waste. As well

as this finding was consistent with the study results that carried out by **Almulhim, (2022),** who assessed household's awareness and participation in sustainable electronic waste management practices in Saudi Arabia, concluded that, more than two thirds (69.0%) of the study subjects had low level of knowledge regarding electronic waste. On the other hand, this finding not harmony with **Nisha, Shajil, Dutta, & Jain, (2022),** who assessed consumer awareness and perceptions about e-waste management in semi-urban area of Northern Tamil Nadu, reported that, three quarters (76.0%) of the study subjects had high level of knowledge. This difference may be attributed to greater exposure to technology and higher levels of formal education, which can lead to an improved understanding of electronic waste issues. Furthermore, individuals engaged in occupations requiring technical skills or professional expertise are more likely to exhibit a higher level of awareness regarding electronic waste.

Regarding to Information about electronic waste, the present study findings show that, three quarters of studied mothers had low level of knowledge regarding information about electronic waste **(Table 2),** this could be due to that, more than two fifths of studied mothers were from rural area **(Table1),** where adverse environmental, social, and economic conditions profoundly influence their daily lives and priority, such challenges frequently lead to limited access to educational opportunities and informational resources, thereby constraining their awareness and comprehension of electronic waste management.

The current study results are in agreement with the study conducted by **Prakash, Manasi, & Bino, (2022)**, who assessed knowledge, attitude, and practices on e-waste management among general public in Tamil Nadu, India, revealed that, more than three quarters (79.4%) of the study participants were unaware of the local legislation regarding e-waste. Also, nearly three fifths (59.0%) of them were unaware of the meaning of electronic waste. As well, the current study results are supported by the results of the Egyptian study conducted by **El-Zaki & Al-Aswad, (2023)**, who assessed e-waste management and its role in achieving sustainable development for the Egyptian family in light of Egypt's Vision 2030, who reported that, there was a general lack of awareness among the study subjects regarding the dangers of e-waste. Also, the study found that,

participation in e-waste awareness programs among the surveyed mothers was minimal.

Otherwise, the current study results are disagreed with **Azman, Abdullah, Ibrahim, Mohd Amin, & Mohd Lud, (2020),** who assessed e-waste management awareness among young adults in Malaysia, reported that, the majority of the study subjects were aware of electronic waste. Also, almost all of them were ready to attend awareness program on electronic waste. This difference might be due to the presence and effectiveness of local awareness campaigns, which play a critical role in shaping public knowledge of electronic waste. These campaigns often lead to a substantial interest among individuals in acquiring more detailed information and practical guidance on responsible e-waste management.

As regarding to risks of electronic waste, the findings of the current study reveal that, the majority of the studied mothers had low level of knowledge regarding risks of electronic waste (**Table 2).** These results might be attributed to absence of clear and standardized guidelines that contain essential information about the risks associated with electronic waste. Also, lack of information about possible sources of knowledge that mothers need to improve their understanding of electronic waste hazards.

The current study findings are supported by a study result that conducted in Ethiopia by **Ali & Akalu, (2022)**, who found that, less than two thirds (63.0%) of the study subjects gave correct incomplete answer about the risks of electronic wastes.

Regarding to safe disposal of electronic waste, the current study findings show that, more than four fifths of the studied mothers had low level of knowledge regarding safe disposal of electronic waste (**Table 2),** This could be due to that, many mothers tend to rely on their personal experiences and informal sources of information, such as family and friends rather than formal educational programs. This informal knowledge transfer, while helpful in some areas, often lacks accuracy and depth, further widening the knowledge gap regarding proper electronic waste disposal practices. The findings of the current study are in the same line with a study done in Saudi Arabia conducted by **Almulhim et al., (2022),** which illustrated that, more than two thirds (69.8%) of the study subjects lacked knowledge about proper disposal practices and related environmental policies. Also, a study done by

Rajasekar & Murugan, (2022), who assessed awareness and disposal practices of e-waste among households in semi-urban areas of northern Tamil Nadu, India, which reported that, more than one third (36.1%) of the participants were unaware of available options for disposing of electronic waste.

In contrast, **Kumar & Prabu, (2022),** who assessed awareness on e-waste management among semi urban households in Northern Tamil Nadu, which revealed that; majority (95.4%) of the study subjects knew about handling electronic waste before disposal, such as reusing or donating. It may be due to that, a large proportion of the participants collectively acknowledged the hazardous nature of electronic waste and identified specific electronic devices as potential sources of environmental harm. This recognition suggests a conscious understanding of the environmental impacts of improper electronic waste disposal. Notably, some participants had received information about electronic waste through media campaigns and community discussions, which likely played a significant role in shaping their awareness.

In relation to recycling of electronic waste, the current study findings illustrate that, the majority of studied mothers had low level of knowledge regarding recycling of electronic waste (**Table 2),** this result could be due to that, lack of convenient disposal facilities and insufficient infrastructure, which hinders the mothers from properly recycling electronic waste at the household level. Furthermore, the absence of accessible collection centres and the limited knowledge about available recycling options.

The current study results are compatible with **Ramzan, Afzal, & Ramzan, (2019),** who assessed young consumers' awareness and participation in sustainable e-waste management practices, who revealed that, more than four fifths (81.0%) of the study subjects possessed either no or minimal knowledge about e-waste recycling practices and half of them didn't know the formal way to collect electronic wastes. Furthermore, the current study result was supported by the study conducted in Ethiopia by **Ali & Akalu, (2022),** who reported that, nearly half (48.8%) of the study subjects didn't know about the presence of recyclable precious metal in electronic wastes.

Otherwise, the current study results were disagreed with **Islam, Huda & Rahman, (2025),** who carried out a study aimed to understanding young consumers' e-waste recycling

behaviour in Bangladesh, who found that there was a substantial portion of the consumers actively participated in electronic waste recycling initiatives. It might be due to the accessibility and convenience of recycling facilities, along with the availability of comprehensive information regarding recycling options, significantly enhanced consumers intentions to engage in electronic waste recycling. Furthermore, the consumers demonstrated strong motivation driven by potential economic benefits, including monetary incentives and discounts on new electronic products, which encouraged their active participation in electronic waste recycling programs.

Concerning total score level of practices of the studied mothers regarding electronic wastes, the current study reveals that, the majority of studied mothers had unsatisfactory total score level of practice regarding electronic wastes, with mean ± SD 6.61 ± 2.800 and range 1 – 21 **(Figure 2)**. As, the majority of studied mothers had unsatisfactory level of practices regarding practices of mothers in dealing with electronic wastes and practices of mothers in disposing of electronic waste **(Table 3).**

These results can be attributed to the limited knowledge of electronic waste among most of the studied mothers, which in turn contributes to their low level of engagement in proper electronic waste management practices. Furthermore, when individuals have lack of essential information about the risks and correct disposal methods, become less motivated to participate in recycling or safe disposal practices.

These current findings are similar with the study done in Bangladesh conducted by **Rahman, Kabir, Sultana, Uddin, & Alam, (2024),** who assessed occupational practices and knowledge among informal e-waste workers, reported that, more than two thirds (70.0%) showed low engagement in safe disposal practices and nearly two thirds (65.0%) of participants keep old electronics at home instead of disposing of them properly. Also, the study findings were in accordance with the study conducted in Nigeria by **Yusuf, Ali, & Kodiya, (2024),** reported that, more than four fifths (82.4%) of the study subjects didn't wear personal protective equipment.

Concerning relationship between sociodemographic characteristics of studied mothers and their total level of knowledge about electronic wastes, the current study findings shows that, there was a

statistically significant relation between the studied mother's total score level of knowledge and their level of education and the income (P= 0.001) **(Table 4)**, From the researcher point of view, the finding of the current study suggests that, as the income and education may influence mothers' knowledge, they are not the sole determinants for knowledge level. As, there was a low proportion of knowledgeable mothers, even among those with higher education and socioeconomic status, which may be attributed to the lack of targeted awareness campaigns, limited integration of electronic waste topics into mainstream education or health communication, and insufficient access to reliable information sources.

These study findings are agreed with the study conducted by **Hamzah, Yahya, & Shafie, (2020)**, who assessed knowledge, attitude, and practices on e-waste recycling among public in Port Dickson, Prtanika, who mentioned that; there was a highly statistically significant relation between total knowledge of studied subject and their demographic characteristics related to educational level. Also, **Zainal, Hashim, & Yusof, (2022),** who assessed knowledge of e-waste recycling among communities in Selangor, Malaysia, found that, educational attainment, occupation, and income significantly influenced understanding of electronic waste recycling, as respondents with higher education, private sector employment, and higher income had better understanding.

As regard to relationship between socio-demographic characteristics of the studied mothers and their total levels of reported practices about electronic wastes, the current study findings shows that, there was a significant relationship between the studied mother's total score level of practice and their place of residence (P= 0.052) **(Table 5)**. From the researcher point of view, the finding of the current study suggests that, urban residents typically have better access to electronic waste collection centers and recycling services, which significantly encourages proper disposal practices. In Egypt, such facilities and organized programs are predominantly located in major governorates or large cities like Cairo and Alexandria. Conversely, rural areas and smaller villages often lack these essential services, leading to limited opportunities for mothers to engage in appropriate electronic waste management practice. This disparity in access contributes to the observed differences in electronic

waste disposal behaviors between urban and rural populations.

These findings were supported by a study done by **Zhang, Luo, & Zhang, (2024),** who conducted a comparative study of factors influencing residents' waste sorting behavior in urban and rural areas of China, found that, urban residents exhibited better waste sorting practices than their rural counterparts. This difference was attributed to factors such as higher personal norms and the effectiveness of policy restraints in urban areas.

The current study results illustrate that, there was a statistically significant positive correlation between the studied mothers' total practices score and their total knowledge score (r=0.400 and P=0.001). As, the mothers with higher levels of knowledge about electronic waste more likely to adopt appropriate and environmentally responsible practices **(Table 6).** This result might be due to the fact that indicate presence of knowledge has a direct influence on mothers' practices, as once individuals acquire accurate information, begin to feel a greater sense of personal responsibility for their actions, knowing the potential environmental and health consequences of improper electronic waste disposal or create a psychological sense of accountability, which motivates individuals to act more cautiously and responsibly. This explains the strong association observed in the current study between knowledge and practice levels related to electronic waste management.

This study finding was supported by **Ibrahim, Abd Ellatef, & Mohamed, (2019),** who investigated family health practices regarding household waste management in El-Zawia El-Hamra, who concluded that, there was a statistically significant correlation between total knowledge level and practice level among the study subjects.

Conclusion

Based on the findings of the present study, it can be concluded that; the majority of studied mothers had low level of knowledge about electronic waste and unsatisfactory level of practice regarding safe disposal of electronic waste. Also**,** there was a highly significant relationship between the studied mothers' total knowledge score and their reported practices in dealing with electronic wastes.

Recommendations

Educational campaign in both rural and urban health units should be available for mothers focus on their role in safe disposal of electronic waste to enhance their knowledge,

practice as well as take their responsibility regarding it.

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