Effect of Educational Program on Mothers' Knowledge and Practices regarding Health Hazards of Plastic Use in Domestic Purposes

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Abstract

Background: Plastic is used widely nowadays. It contains harmful compounds to human health. So, mothers have to be aware of these hazards. **Study aim:** Was to evaluate effect of educational program on mothers' knowledge & practices regarding health hazards of plastic use in domestic purposes. **Study design:** Quasi-experimental research design. **Study setting:** The largest Maternal and Child Health Care Centers at Tanta City (Medical center at Sigar & Dr. Mohamed Mashaly center at Saied Street). **Study subjects:** Convenience sample of 166 mothers attending the previous setting. **Study tools: Tool Ⅰ:** including 2 parts: **part (1):** Socio-demographic characteristics of mothers. **Part (2):** Knowledge of mothers regarding plastic usage and its health hazards. **Tool II:** Self-reported practices of mothers regarding plastic products use. **Results:** The program was effective and improved their knowledge & practices regarding health hazards of plastic use. For example, pre-program all of them gave incorrect and don't know answers regarding (health hazards of plastic use on women's health) and after program, more than half (60.2 %) of them had complete and correct answers. As well as, pre-program, most (98.2 %) of them had unsatisfactory practices regarding types of plastic products used and immediately after program, most (90.4 %) of them had satisfactory practices. **Conclusion:** There was significant improvement in their knowledge & practices about plastic usage and its health hazards. **Recommendation**: Ongoing educational programs should be undertaken to raise community awareness about health hazards of plastic use.

Keywords: Knowledge, practices of mothers, health hazards, plastic use, domestic purposes.

Introduction

Plastics are synthetic polymers made by chemical reactions that are not biodegradable. Food containers, water bottles, toys, clothes and other many items are made of plastic. Because plastic is strong, lightweight, inexpensive, flexible, and versatile, people are becoming more reliant on it these days. Many chemicals present in plastic, including phthalates, polyfluorinated compounds and bisphenol A, have serious effects on human health **(Adeniran & Shakantu, 2022; Govind & Nishitha, 2023)**.

In 2022, an astounding 400.3 million metric tons of plastic were produced worldwide. Over 350 million metric tons of plastic trashes are produced annually by humans. Egyptian plastic market is anticipated to expand at a 10% yearly rate over the next ten years, making Egypt Africa's biggest user of plastic. Thermosets and thermoplastics are two types of plastics. During heating cycles, thermosets do not melt or soften. Thus, even at high temperatures, the product's shape doesn't alter **(Alves, 2024; Garside, 2024)**.

In contrast, thermoplastics are materials that become soft and hard during heating and cooling cycles. They are categorized into seven types. Type 1 (polyethylene terephthalate) typically used to create various utensils and disposable water bottles. It is only intended to be used once **(Dodiuk, 2021; Kazemi, Kabir, & Fini, 2021)**.

The most widely used plastic in the world is type 2, or high-density polyethylene. It is used to make toys, different kinds of plastic bags, and a lot more. These products are thought to be safer for food and drink than type 1. The 'heat-resistant' polymer type 3 is polyvinyl chloride (PVC) **(Dodiuk, 2021; Kazemi et al., 2021)**.

Low-density polyethylene, or type 4, is used to make milk cartons and drinks as well as to package frozen items. This kind is safe to use on food and drink. Type 5 (polypropylene) is frequently used to package ketchup, yogurt, beverages, and many other items. One kind of plastic derived from petroleum is Type 6 (polystyrene). Polystyrene is a substance known to cause cancer in humans. All polymers are referred to as Type 7 (polycarbonate) plastics, with the exception of the ones listed. Because polycarbonate containers contain BPA, their use has significantly declined recently **(Dodiuk, 2021; Kazemi et al., 2021).** Plastics' monomeric components, such as bisphenol A (BPA), plasticizers or antimicrobial polycarbonate, may pose a risk to human health. Bisphenol A has been connected to a number of health concerns, including ovarian chromosomal damage, lower sperm production, early puberty, rapid immune system changes, cardiovascular disorders, and obesity. Certain harmful substances can injure fetuses and newborns by entering their bodies. During manufacturing of plastic items, many dangerous chemicals are discharged into atmosphere as carbon monoxide **(Proshad et al., 2018)**.

High concentrations of these gases in the air can lead to alteration in

immune system, respiratory and nervous system problems. Most plastics degrade slowly resulting in accumulation of plastic wastes in the environment. Plastic pollution has a major harmful impact on rivers, oceans, lands, and animals. Burning plastic releases a number of harmful and cancer-causing compounds into environment **(Govind & Nishitha, 2023).**

Both the environment and human health are severely harmed by plastics. Sustainable plastics production, usage, and disposal should be a priority for health authorities. Additionally, people must be informed about chemicals that present in plastic items. Nonetheless, community health nurses are crucial in informing people about dangers of plastic. Practical tasks, such as reducing the use of harmful items, reducing waste, and using other healthy alternatives, must be the main focus of educational programs **(El-shafei, Ahmed, Alaa El-Din, Lotfy, & El Hawy, 2021; Obebe & Adamu, 2020).**

Public health professionals and environmental protection organizations are crucial in preventing various risks and pollution levels. Educational efforts regarding negative plastic effects to environment and human health are crucial. Both the environment and human health will benefit from this. To give reliable knowledge, it is advised that waste management and plastic pollution programs be incorporated into all levels of schooling **(Hamza & Mahmoud, 2023).**

Community health education initiatives are a cost-effective and effective way to improve health in the community. The finest environment for health and health awareness is the community, where the nation develops and flourishes. The environment and human health are seriously threatened by plastic in a number of direct and indirect ways. Therefore, it is imperative that plastic waste and usage be decreased. Parents -especially mothers- need to be educated on harmful impacts of plastic use in order to help their children understand these issues (**Sarma & Gandhi, 2023**).

Mothers knew very little about the risks of plastic and plastic wastes, Community health nurses are hired to carry out or assist with every service provided to the community. Since education has the power to alter people's knowledge, attitudes, and behaviors, nurses educational role is crucial. In order to reduce these potential health risks in the future, it is imperative that plastic alternatives be promoted and plastic garbage disposed safely (**Abid et al., 2020; Sarma & Gandhi, 2023**).

Significance of the study: As the primary caregivers for their families and children, mothers serve as their children's first teachers. Alongside the rise in women's employment, long hours spent outside the home, and rising food prices, many mothers have a tendency to store a lot of their food in plastic containers and bags. Thus, the current study was intended to assess educational program effect on mothers' behavior and understanding

of health risks associated with plastic use.

Study aim: was to assess educational program impact on mothers' awareness and behavior about health risks associated with plastic using in home.

Subjects and method

Study design:

Quasi-experimental research design.

Study setting:

Medical center at Sigar & Dr. Mohamed Mashaly primary health care center at Saied Street at Tanta city.

Subjects:

Convenience sample of 166 mothers who attended the previous setting.

Tools of data collection:

Tool I: Knowledge of mothers about plastic usage and its health hazards: It was developed by researcher after reviewing related literature. It included two parts:

Part (1): Mothers socio-demographic characteristics: Included data about mothers' age, marital status, residence, educational level, occupation, income, family members' number and husband education & occupation.

Part (2): Knowledge of mothers about plastic usage and its health hazards: It was used to assess mothers' knowledge about health hazards of plastic use in domestic purposes before, immediately after and a month after program. It was created in Multiple Choice Questions (MCQ) form. It consisted of 14 items covering the following areas: characteristics of plastic, types of plastic products, composition of plastic tools, precautions that should be followed during plastic use, results of unsafe use of plastic products, health hazards from plastic use, environmental hazards regrading unsafe plastic products use and safe disposal of plastic wastes.

Total score for mothers' knowledge was (28) degrees and calculated as follow

- Complete & correct answer was given score two.
- Correct & incomplete answer was given score one.
- Incorrect & don't know answer was given score zero.
- These scores were summed up and total score was converted into a percent score.

Total score of mothers' knowledge was classified as follow

- **High knowledge level** ≥ 70 % of total score. (
- **Moderate knowledge level** 60 < 70 % of total score.
- **Low knowledge level** < 60% of total score.

Tool II: Self-reported practices of mothers regarding plastic products use: It was used to assess mothers' practices regarding plastic products use. It included the following parts: type, frequency of plastic products they use, safe and unsafe use of plastic products, alternatives for plastic use and safe plastic disposal.

Scoring system of mothers' practices was as follow

- Items reported to be done were given score one (1) & items not done were given score zero (0) regarding positive practices.
- Items reported to be done were given score one (1) & items not

done were given score zero (0) regarding negative practices.
- Scores were summed up and total score was converted into a percentage score.
- Higher score indicates a greater level of mothers' practices.

Total score for mothers' practices was (42) degrees and classified as follows
- **Satisfactory practices** ≥ 60 % of total score.
- **Unsatisfactory practices** < 60 % of total score.

Method

The study was conducted as follows

1. Administrative approval
- Official permission was obtained from the Dean of Faculty of Nursing and directed to responsible authorities (managers of selected MCH centers) to obtain approval and cooperation to conduct the study.
- Permission to collect data from the selected settings was obtained after informing MCH centers managers about study objectives.

2. Ethical and legal considerations
- Approval of Faculty of Nursing Scientific Research Ethical Committees was obtained to conduct study (code of ethics: 293-8-2023).
- Informed consent was taken from studied mothers after providing explanation about study purpose.
- Each participant was informed that she has right of withdrawal from study any time she wants.
- Study nature didn't cause any harm and/ or pain for entire sample.
- Privacy and confidentiality were put into consideration regarding collected data.

3. Tools development
- Study tools were developed based on literature reviewing.

4. Validity and reliability of study tools
- Study tools were tested for face and content validity by jury test of 5 experts in Community Health Nursing to evaluate individual items and entire instrument as being relevant and appropriate to test what it wanted to measure. Based on experts' opinion, questionnaire face validity was calculated and was 93% and content validity index of its items was 94% for knowledge questionnaire about plastic usage and its health hazards and 92% for practices questionnaire regarding plastic products use. **Total questionnaire content validity index was 93.24%**.
- The questionnaire was tested by pilot subjects to assess reliability, at first session for calculating Cronbach's Alpha which was 0.864 for knowledge questionnaire about plastic usage and its health hazards and 0.825 for practices questionnaire regarding plastic products use. **Total questionnaire Cronbach's Alpha was 0.873**.
- Significance was adopted at $p<0.05$ for interpretation of tests results.

5. Pilot study
- Pilot study on 10 % of the sample was done by researcher for testing tools clarity, applicability and to

identify obstacles that encountered during data collection and to determine length of time needed to collect data from each mother. Accordingly, necessary modifications were done. Those mothers were excluded from the study sample.

- The researcher met mothers at the educational kitchen as a suitable area in MCH centers to collect data.
- Data was collected by the researcher over five months starting from June 2024 to October 2024.

6. Actual study

- Educational program was carried out as the following phases:

I) Assessment phase

- During this phase the researcher used tool I part one & part two and tool II to assess mothers' knowledge & practices about health hazards of plastic use in domestic purposes through meeting them in MCH centers to collect baseline data as a pre-intervention assessment.

II) Planning phase

- The program was planned according to mothers' needs that determined by pre assessment phase and based on literature review. It included:

A. Formulating goal and setting objectives

- **The program goal**: was to enable mothers to be aware of health hazards of plastic use in domestic purposes and improve their practices of plastic use.
- **Specific objectives were formulated according to each session.**

B. Preparing contents: according to pre-determined needs of mothers and reviewing literatures to meet those needs.

C. Determine teaching methods and audiovisual aids used in the program

- Lectures and discussions were used as teaching methods.
- Teaching aids used were Power point presentation, pictures, videos and handout as (brochures & colored booklet).

III) Implementation phase

- The researcher met mothers in MCH centers according to the convenient date and time for mothers and researcher.
- The program was conducted to mothers by the researcher. Four sessions were provided for them according to their actual needs about health hazards of plastic use. The duration of each session was 45 minutes.

Session (1): Program orientation and expectation.

- This session aimed to orient mothers about the program, its importance, general aim, sessions, and objectives of each session and to assess expectations from each session.

Session (2): Plastics overview.

- This session aim was to give mothers overview of plastics (definition-prevalence (worldwide and in Egypt), characteristics of plastic and types of plastic

products used in domestic purposes).

Session (3): Composition of plastic tools.

- It aimed to inform them about composition of plastic tools & precautions that should be followed on using plastic products, results of false plastic products use, health and environmental hazards from plastic use.

Session (4): Practices regarding the use of plastic food containers.

- It aimed to educate mothers about safe & unsafe types of plastic products, alternatives for plastic, measures to reduce plastic wastes and safe plastic disposal.

IV) Evaluation phase

It aimed to evaluate the effectiveness of the program on knowledge & practices of mothers.

This phase was done three times:

- **Pre-test:** Before program implementation for mothers using (tool Ⅰ part one & part two and tool Ⅱ) of the study to assess their baseline data and practices of health hazards regarding plastic use in domestic purposes.
- **Immediately:** Immediately after program implementation using (Tool I part 2 and Tool II).
- **Post-test:** After a month of program implementation using (Tool I part 2 and Tool II).

Statistical analysis of data:

- Version 25 of IBM Corporation's Statistical Package for Social Science was used to code, enter, tabulate, and analyze the gathered data (IBM Corporation, Armonk, NY, USA). Range, mean and standard deviation were calculated for quantitative data. For qualitative data, which describe a categorical set of data by frequency, percentage of each category, comparison between two groups or more was done using Chi-square test (χ^2 test). For comparison between means of two groups of non-parametric data of independent samples, Z value of Mann-whitney test was used. Kruskal-Wallis (χ^2 value) was calculated to compare between more than two means of non-parametric data. Pearson's correlation coefficient (r) was used to evaluate correlation among variables.

Results

Table (I): Represents studied mothers' distribution regarding their knowledge about health hazards of plastic usage. It showed that there was significant improvement in studied mothers' knowledge about health hazards of plastic use. The differences observed among pre, immediate and after program were statistically significant ($P<0.001$). It was seen that, pre-program implementation all of the studied mothers gave incorrect and don't know answers regarding (health hazards of plastic use on women's health) and most (98.8 %) of them had incorrect and don't know answers regarding (health hazards of plastic use on foetal and child health). While immediately after program implementation, more than half (60.2 %) and about two-thirds (66.9%) of them had complete and correct

answers regarding the same items respectively.

Figure (1): Describes the mean total knowledge score of studied mothers regarding their total levels of knowledge about plastic usage and its health hazards throughout periods of study. It disclosed that there was significant improvement in studied mothers' knowledge about plastic usage and its health hazards immediately after and a month post program implementation, whereas the mean scores of their knowledge increased from (6.05±2.75) pre-program implementation to (26.15±1.73) immediately post-program and (25.92±1.89) a month after it. These differences were statistically significant (P<0.001).

Figure (2): Represents studied mothers' distribution regarding their source of knowledge about plastic usage and its health hazards. It conveyed that, more than two-thirds (69 %) of them social media served as their information source. and less than one-half (48 %) of them was from television. Furthermore, the least (5 %) of them got their information from educational programs in workplace.

Table (II): Represents studied mothers' distribution regarding frequency of using plastic products in domestic purposes. It illustrates that there was statistically significant improvement in mothers' practices regarding plastic products use in domestic purposes (P<0.001). As less than half (48,8 %) of them were always using plastic products in domestic purposes before program implementation, while half (50%) of them were usually using plastic products in domestic purposes immediately after implementation and more than half (51.8 %) of them were rarely using plastic products in domestic purposes one month after program implementation.

Figure (3): Represents distribution of studied mothers regarding their practices about plastic products use. It indicated that, there was significant improvement in practices of them throughout periods of study as (P<0.001). As pre-program implementation; all of them had unsatisfactory practices regarding frequency of using plastic products and using of alternatives for plastic products in domestic purposes respectively. Additionally, most (98.2 %) of them had unsatisfactory practices regarding types of plastic products used in domestic purposes and the majority (86.1%) of them had unsatisfactory practices regarding safe plastic disposal. Furthermore, immediately after program, all of them had satisfactory practices regarding frequency of using plastic products and most (90.4 %, 95.2 %, 99.4 %) of them had satisfactory practices regarding types, alternatives for plastic products used in domestic purposes and safe plastic disposal respectively.

Figure (4): Represent total score of practices of studied mothers about plastic products use throughout the periods of the study. It clarified that there was a significant improvement of their practices scores about plastic products use immediately after and a month post program, whereas the mean scores of their practices increased from (6.05±2.75) pre-

program to (26.15±1.73) immediately post-implementation and (25.92±1.89) a month post-implementation. These differences were statistically significant (P<0.001).

Table (IV): Represents relation between studied mothers' total practices score about plastic products use and their socio-demographic characteristics. It was found that there was statistically significant relationship among total practices scores of them and their age, level of education and occupation (P<0.001). In contrary, there was no correlation with other characteristics of them including their marital status, residence, husband level of education & occupation, income and family members' number.

Table (V): Represents correlation among studied mothers' total knowledge and practices scores regarding plastic usage and its health hazards. It showed that there was statistically significant positive correlation between total knowledge score of studied mothers and their total practices score regarding types of plastic products used in domestic purposes before, immediately after program and one month after it as (P<0.001).

Table (I): Distribution of studied mothers regarding their knowledge about health hazards of plastic usage.

Knowledge about health hazards of plastic usage	Response of studied mothers before and after program (N=166)						χ^2 test P value
	Before		Immediate after		Post-one month		
	N	%	N	%	N	%	
Health hazards of plastic use on human health							
– Incorrect & don't know answer	147	88.6	-	-	-	-	424.952
– Correct & incomplete answer	18	10.8	48	28.9	49	29.5	0.0001*
– Complete & correct answer	1	0.6	118	71.1	117	70.5	
Health hazards of plastic use on women's health							
– Incorrect & don't know answer	166	100	-	-	-	-	498.169
– Correct & incomplete answer	-	-	66	38.8	69	41.6	0.0001*
– Complete & correct answer	-	-	100	60.2	97	58.4	
Health hazards of plastic use on foetal and child health							
– Incorrect & don't know answer	164	98.8	3	1.8	-	-	475.946
– Correct & incomplete answer	1	0.6	52	31.3	52	31.3	0.0001*
– Complete & correct answer	1	0.6	111	66.9	144	68.7	
Health hazards from burning of plastic wastes							
– Incorrect & don't know answer	62	37.3	-	-	-	-	350.578
– Correct & incomplete answer	80	48.2	6	3.6	6	3.6	0.0001*
– Complete & correct answer	24	14.5	160	96.4	160	96.4	
Environmental hazards results from plastics							
– Incorrect & don't know answer	36	21.7	-	-	-	-	323.600
– Correct & incomplete answer	108	65.1	2	1.2	22	13.3	0.0001*
– Complete & correct answer	22	13.3	164	98.8	144	86.7	
Safe ways to get rid of and reduce plastic and its wastes							
– Incorrect & don't know answer	59	35.5	-	-	-	-	329.445
– Correct & incomplete answer	85	51.2	3	1.8	20	12.0	0.0001*
– Complete & correct answer	22	13.3	163	98.2	146	88.0	

***Statistically significant (P<0.05)**

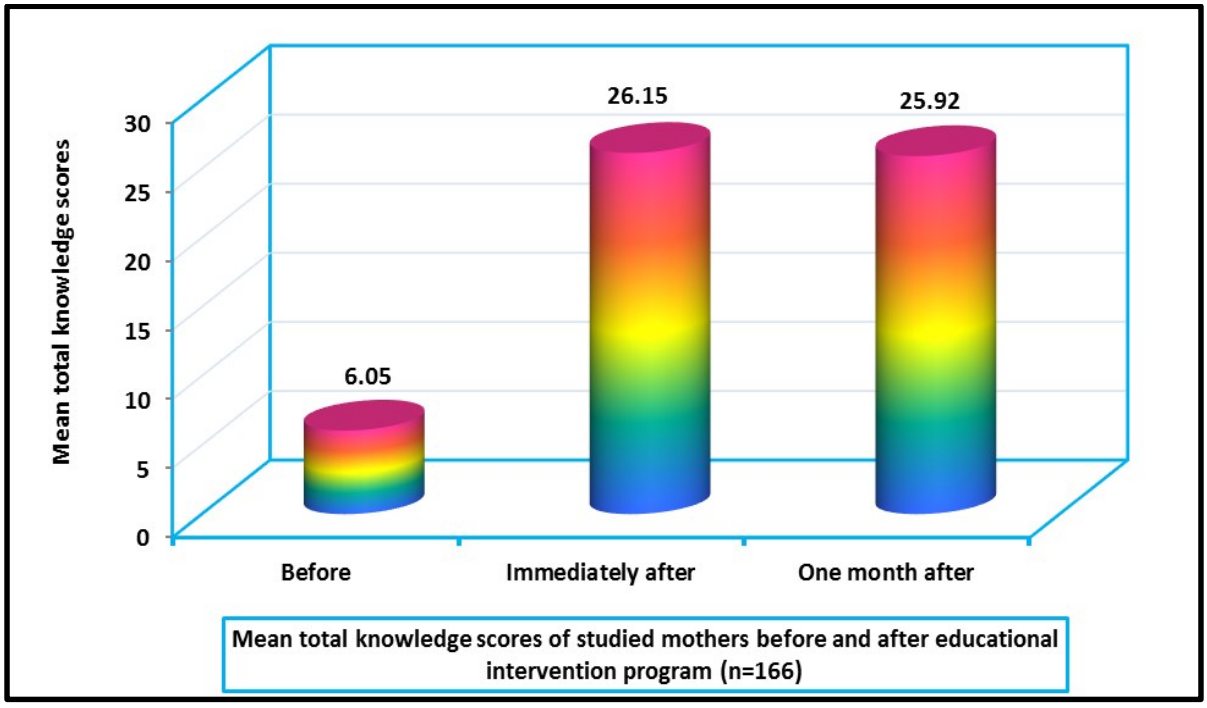

Figure (1): Mean total knowledge score of studied mothers about plastic usage and its health hazards before and after educational program.

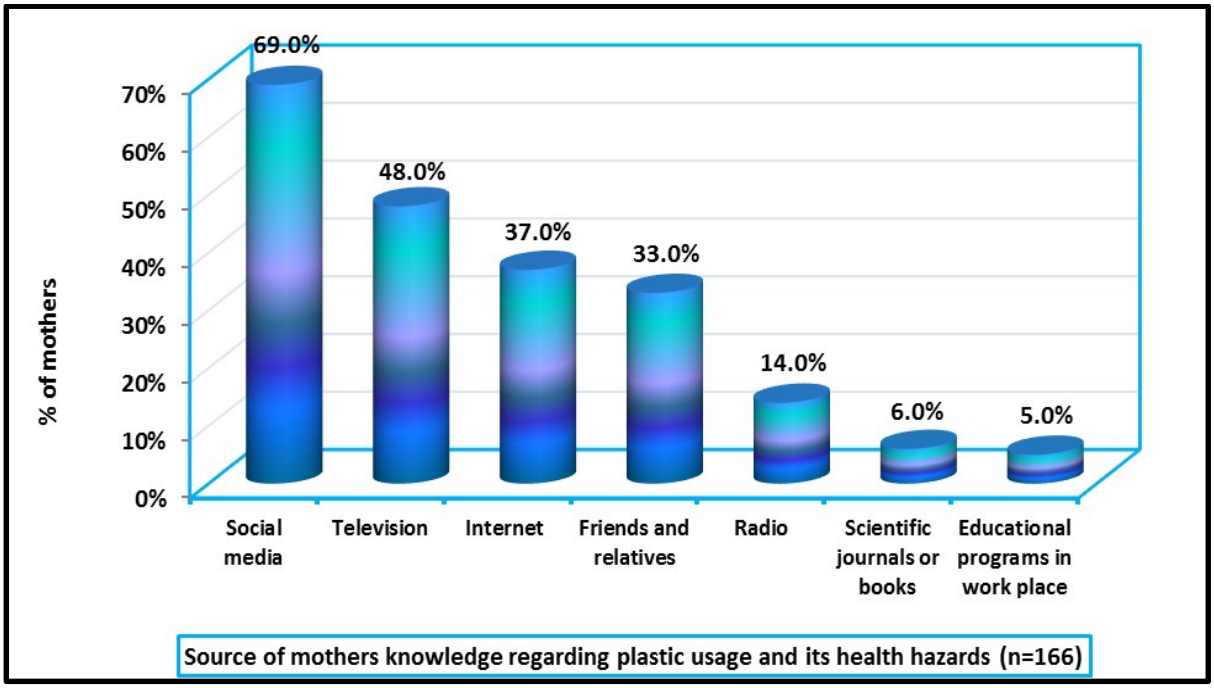

Figure (2): Studied mothers' distribution regarding source of knowledge about plastic usage and its health hazards.

Table (II): Distribution of studied mothers regarding frequency of using plastic products in domestic purposes.

Self-reported practices regarding frequency of using plastic products in domestic purposes	Self-reported practices of studied mothers before and after program (N=166)						χ^2 test	P value
	Before		Immediate after		Post-one month			
	N	%	N	%	N	%		
1-Always use plastic products.								
Done incorrectly	85	51.2	-	-	-	-	204.988	0.0001*
Done correctly	81	48.8	166	100	166	100		
2-Often use plastic products.								
Done incorrectly	92	55.4	-	-	-	-	225.695	0.0001*
Done correctly	74	44.6	166	100	166	100		
3-Usually use plastic products.								
Done incorrectly	155	93.4	83	50.0	75	45.2	100.176	0.0001*
Done correctly	11	6.6	83	50.0	91	54.8		
4-Rarely use plastic products.								
Done incorrectly	166	100	78	47.0	86	51.8	127.626	0.0001*
Done correctly	-	-	88	53.0	80	48.2		
5-Never use plastic products.								
Done incorrectly	166	100	5	3.0	5	3.0	455.557	0.0001*
Done correctly	-	-	161	97.0	161	97.0		

*Statistically significant (P<0.05)

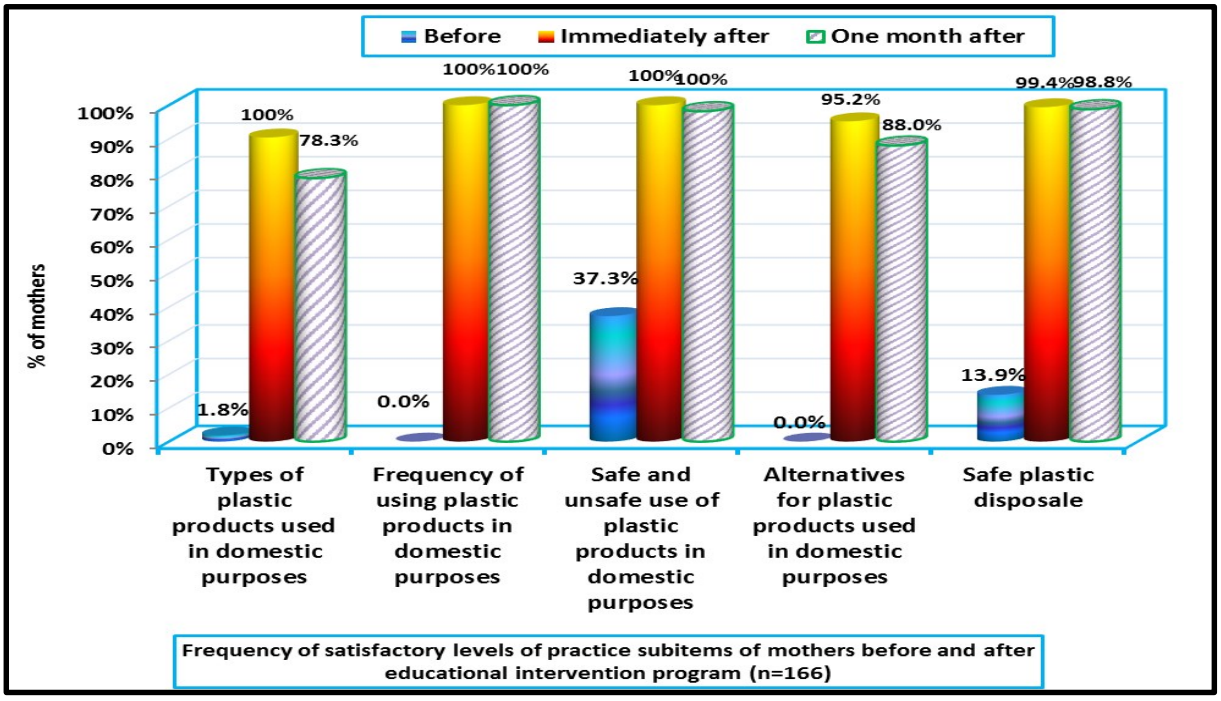

Figure (3): Distribution of studied mothers regarding their levels of practices regarding plastic usage and its health hazards.

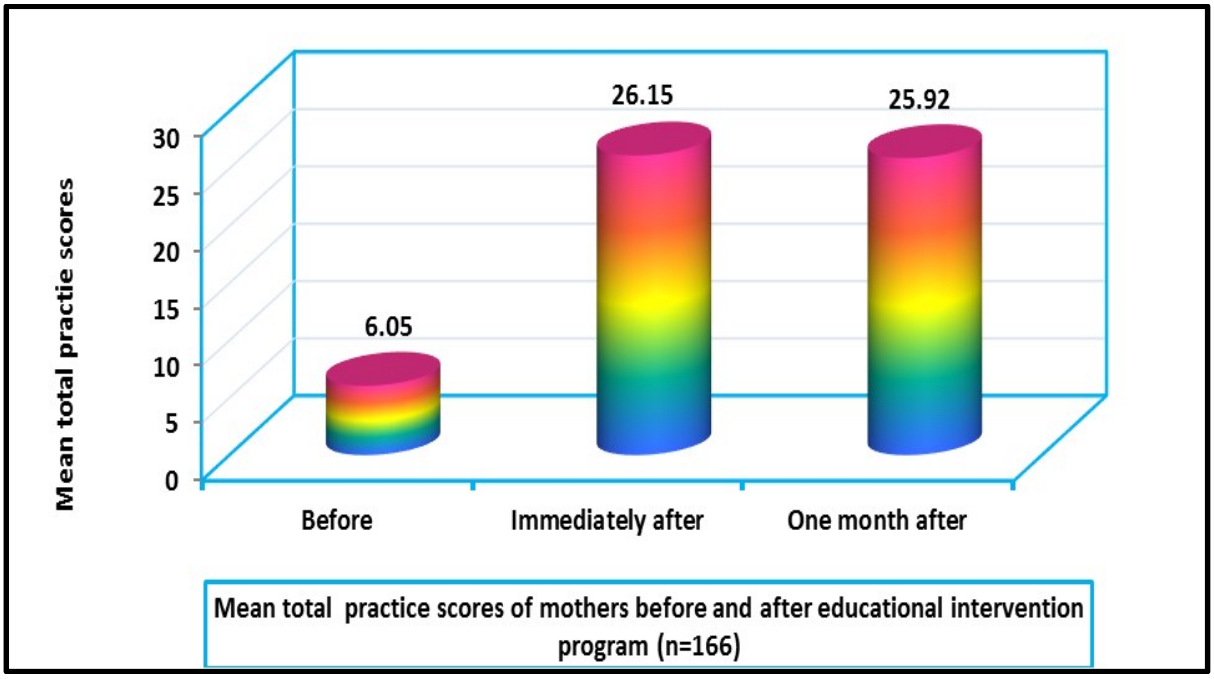

Figure (4): Total practices level of studied subjects about plastic use and its health hazards throughout study periods.

Table (III): Relation between total practice scores of studied mothers about plastic products use and their socio-demographic characteristics.

Socio-demographic characteristics	No.	Total practice scores of studied mothers before and after educational program (N=166)					
		Before		Immediate after		Post-one month	
		Mean±SD	Z or χ^2 P	Mean±SD	Z or χ^2 P	Mean±SD	Z or χ^2 P
Age years							
– ≤ 30	**71**	**12.37±3.64**	4.771	**31.84±3.37**	**6.835**	**32.07±2.42**	**5.997**
– >30 ≤ 40	**76**	**12.37±3.67**	0.092	**33.84±2.49**	**0.033***	**31.95±2.96**	**0.043***
– >40-53	**19**	**10.74±2.49**		**22.62±2.33**		**30.26±3.44**	
Marital status							
– Married	**156**	**12.17±3.61**	1.956	**33.47±2.62**	4.564	**31.77±2.88**	2.504
– Divorced	**8**	**13.00±3.02**	0.376	**34.87±2.62**	0.102	**32.87±2.17**	0.286
– Widow	**2**	**10.00±0.00**		**31.50±2.12**		**32.87±2.17**	
Residence							
– Urban	**105**	**12.00±3.68**	0.856	**33.50±2.67**	0.086	**31.86±2.94**	0.296
– Rural	**61**	**12.49±3.35**	0.393	**33.54±2.47**	0.931	**31.72±2.69**	0.767
Mother educational level							
– Illiterate	**1**	**11.00±0.00**	**16.093**	**31.00±0.00**	**12.238**	**31.00±0.00**	6.940
– Read & write	**7**	**10.28±1.25**	**0.003***	**30.86±1.21**	**0.016***	**30.00±0.85**	0.139
– Primary level	**30**	**10.63±3.77**		**33.50±2.27**		**32.00±2.61**	
– Secondary level	**64**	**11.97±3.35**		**33.36±2.92**		**31.51±3.17**	
– High level & post graduate	**64**	**13.34±3.52**		**34.01±2.33**		**32.22±2.69**	

Husband educational level							
– Illiterate	**5**	**11.20±2.77**	6.909	**35.40±1.67**	4.454	**33.40±3.35**	2.537
– Read & write	**21**	**11.24±3.58**	0.141	**33.05±3.34**	0.347	**31.67±3.44**	0.638
– Primary level	**71**	**11.80±3.03**		**33.39±2.23**		**31.62±2.54**	
– Secondary level	**68**	**12.93±4.04**		**33.66±2.75**		**31.93±3.00**	
– High level & post graduate	**1**	**13.00±0.00**		**33.00±0.00**		**32.00±0.00**	
Mother occupation							
– Not working	**90**	**11.38±3.34**	**3.033**	**33.17±2.82**	**4.052**	**31.49±3.06**	1.578
– Working	**76**	**13.13±3.61**	**0.002***	**33.93±2.25**	**0.044***	**32.18±2.53**	0.116
-If working mother, type of occupation	**(n=76)**						
– Employee	**13**	**14.23±3.65**	4.363	**34.23±2.71**	**10.210**	**33.15±3.08**	6.787
– Free business	**24**	**13.25±4.09**	0.359	**33.46±2.00**	**0.037***	**31.42±2.43**	0.148
– Clerical work	**7**	**11.57±3.10**		**34.71±1.70**		**32.86±2.54**	
– Farmer	**3**	**11.33±1.15**		**30.33±0.58**		**30.00±1.00**	
– Professional	**29**	**13..10±3.43**		**34.38±2.11**		**32.45±2.26**	
Husband occupation							
– Clerical work	**5**	**11.20±2.39**	2.720	**34.60±2.07**	7.585	**33.00±1.58**	5.796
– Craft works	**15**	**12.93±3.01**	0.606	**33.53±2.44**	0.108	**31.93±2.49**	0.215
– Employee	**81**	**12.04±3.88**		**33.60±2.75**		**31.96±3.04**	
– Farmer	**3**	**10.33±1.53**		**29.67±0.58**		**28.33±2.08**	
– Free business	**62**	**12.35±3.42**		**33.50±2.41**		**31.64±2.68**	
Income							
– Not enough	**22**	**11.86±3.95**	1.694	**32.59±2.79**	5.139	**30.81±2.67**	4.472
– Enough	**106**	**12.40±3.59**	0.429	**33.54±2.28**	0.077	**31.87±2.80**	0.107
– Enough and adequate	**38**	**11.74±3.28**		**34.00±3.18**		**32.21±2.99**	
No. of family members							
– 2 & 3	**37**	**11.89±3.39**	2.985	**33.65±2.71**	0.169	**32.16±2.67**	0.706
– 4 & 5	**120**	**12.07±3.49**	0.225	**33.47±2.55**	0.919	**31.70±2.86**	0.702
– 6 & 7	**9**	**14.89±4.46**		**33.67±2.96**		**31.78±3.42**	

***Statistically significant (P<0.05)**

Table (IV): Correlation between total knowledge scores and practice scores of studied mothers about plastic usage and its health hazards.

Practices regarding plastic products use	Total knowledge scores of studied mothers before and after program (N=166)					
	Before		Immediate after		One month after	
	R	P value	r	P value	r	P value
I-Types of plastic products used in domestic purposes	0.052	0.504	0.367	0.0001*	0.046	0.557
II-Frequency of using plastic products in domestic purposes	0.133	0.089	0.103	0.091	0.114	0.143
III-Safe and unsafe use of plastic products in domestic purposes	0.304	0.0001*	0.166	0.033*	0.511	0.0001*
IV-Alternatives for plastic products used in domestic purposes	0.143	0.065	0.118	0.129	0.025	0.745
V-Safe plastic disposal	0.0161	0.038*	0.243	0.001*	0.481	0.0001*
Total practice scores	0.204	0.008*	0.260	0.001*	0.181	0.020*

*Statistically significant (P<0.05)
r=Correlation Coefficient

Discussion

This issue is urgent due to plastic products use widespread and their negative effects on the environment and human health. According to the results of current research, all the studied mothers got incorrect & don't know answers regarding women's health risks from plastic use, while most of them had incorrect & don't know answers regarding foetal & child health hazards resulting from plastic using. As well as the majority of them had incorrect & don't know answers regarding human health hazards from plastic use generally **(Table I)**.

These findings concur with **(Kokilamma, Arundhathi, Sreelatha, & Rani, 2024),** who conducted assessment study of knowledge regarding health hazards of plastic in domestic use in India and found that about one half of studied participants had moderate knowledge regarding health hazards of plastic in domestic purposes. This is similar with **(Praveena, 2019),** who conducted a study to assess knowledge regarding health hazards of plastic in domestic use in India and found that almost two-thirds of studied women had moderate knowledge regarding health hazards of plastic in domestic use.

Furthermore, the present study demonstrates that more than half of studied subjects gave correct & incomplete answers regarding environmental hazards resulting from plastics **(Table Ⅰ)**. These results aligned with **(Ashmi, Amole, Yusuf,**

& Michael, 2022), who carried out a study to assess awareness of health and environmental hazards of plastic bag use and available substitutes among health workers and found that most of studied subjects were knowledgeable of harmful environmental effects of plastic bags.
Concerning to knowledge of studied mothers of plastic usage and its health hazards, the actual study illustrated that, before program implementation all of them had low knowledge with mean (6.05±2.75), while there was an amazing improvement in their knowledge immediately after program implementation as all of them got high knowledge level with mean (26.15±1.73) **(Figure Ⅰ)**. According to researcher point of view, this can be explained that almost three-quarters of them had postgraduate and secondary/high school degrees.
This outcome is consistent with **(Viji, Suja, Letha, & Christabel, 2023),** who carried out study to assess effect of video-assisted teaching program regarding hazards of plastics. The study reported that there was a significant effect of program as P<0.001. Conversely, the current research findings conflict with **(Upendra et al., 2020),** who conducted a study to assess knowledge of hazards of plastic use and found that more than one-third of studied participants had average knowledge regarding hazards of plastic use.
Individuals gain information from many different sources. These sources can vary from person to person.
Regarding source of knowledge of studied mothers of current study, it was found that more than two-thirds of them gained their information from social media **(Figure Ⅱ)**. As regard to researcher point of view, this might be because social media use has become a commonplace everyday activity in recent years. Social media is commonly utilized for a variety of reasons, including news and information access and social contact.
This outcome is consistent with **(Kokilamma et al., 2024),** who found that above half of studied subjects gained their knowledge from mass media.
Additionally, the actual study findings coincided with **(Hassan et al., 2023),** who applied study to assess knowledge, attitudes and practices of plastic use for food and drinks among sample of Egyptians and observed that the most common sources of knowledge of them were individual experiences, websites and social media while the least-reported source was parents. Frequency of using plastic products varies from place to another and from person to another. The mothers' frequency of using plastic products in domestic purposes can be changed if they become aware of hazards of using these products.
Concerning to frequency of using plastic products in domestic purposes, the present research states that there was statistically significant improvement in mothers' practices regarding plastic products used in domestic purposes as (P=0.001). As less than half of them were always using plastic products in domestic purposes before the program, while half of them were usually using plastic products in domestic purposes

immediately after it and more than half of them were rarely using plastic products in domestic purposes after one month of it **(Table II)**.

This outcome is comparable to that of **(Mahmoud, Kabbash, & El-kest 2023),** who established a study to assess educational program effect about hazards of plastic use on knowledge, attitude and practice of teachers and observed that there was statistically significant improvement in studied participants practices as P=0.001. As pre-program all of studied participants were using plastic products while more than half of them were using them after program.

Studied mothers socio-demographic characteristics must be kept in mind during program implementation. There are many items of them can affect mothers' levels of knowledge and practices. So that, the actual study reveals that range age of studied mothers' is (19-53) years with a mean of (32.43±6.28) and most of them were married. Also, more than half of them were residing rural areas and more than three-quarters had secondary/high and post graduate educational level. Furthermore, more than half of them were not working with enough income.

As well as, the results of the current research demonstrate that there was significant relation among studied mothers education and their total practices scores about plastic products use pre and immediately after program implementation, while there is no relation after it as (P=0.003 &0.016) respectively**.** This can prove the positive program effect on studied mothers' practices for all of them equally regardless their educational level **(Table III)**.

Additionally, the present study shows that there was statistically significant relation between occupation of studied mothers and their total practices scores about plastic products use only pre and immediately after program, while there is no relation after its implementation as (P=0.002 & 0.044) respectively **(Table III)**. This can be justified as studied mothers actually applied their knowledge in plastic use in domestic purposes regardless being working or not. As this indicate the positive effect of educational program on mothers' practices. However, there is no statistically significant difference between the occupation of mothers and the mean scores' practices.

These outcomes concur with (**Hamza et al., 2023),** who discovered that there was statistically significant relation among studied subjects age and their scores of practices of using plastics and its risks. However, it is on the contrary with them as they found that no relation between education and occupation of studied subjects and their practice of using plastics and its risks. Further, these findings match up with **(El-sayed, Marzouk, Mahmoud, & El Magrabi, 2019),** who found that there was statistically significant relation between mean scores' practice of mothers and their education regarding safe plastic containers uses as (P=0.039).

Conclusion:

The current study findings indicate that the program was successful in raising mothers' awareness of health

risks associated with using plastic in home.

Recommendations: With reference to current study outcomes, the following suggestions are proposed:

1. Continuous education and orientation programs should be established to raise community awareness of health hazards posed by plastic use.
2. Creation of brief and useful online guide for mothers that describes health hazards related to use of plastic and how to successfully avoid them.
3. Additional researches are required to investigate health and environmental hazards linked to plastic use.

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