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Original Article

Health Awareness Package to Enhance Family Knowledge and Healthy Practices Regarding Household Waste Management

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ABSTRACT

Background: The proper management of household waste is a significant public health issue within the community and is intricately connected to the everyday lives of individuals. Residents can play a crucial role in overseeing the effective management of household waste. **The aim of study:** is to evaluate the effect of health awareness package on families' knowledge and practices regarding household waste management. **Design:** Quasi-experimental design; one group pre-posttest. **Setting:** El-Sheikh Makram Village, Sohag governorate. **Sample**: A simple random sample included 110 families representing 2% of Overall Village families. **Tools**: two tools were utilized in the current study;**tool I**:a structured interview questionnaire encompassed four parts; Part 1: Families' Socio-demographics, Part 2: Families' home assessment sheet, Part 3: Families' knowledge assessment, and Part 4: Families' Health awareness assessment. **Tool II:** Families' health awareness Likert scale. **Results:** the families' satisfactory knowledge, reported practices, and heightened awareness regarding household waste management were improved from (28%, 29.1%, 13.9% pre to 85.5%, 90%, 82.8% respectively) post health awareness package implementation with high statistical significance at (P<0.000). Additionally, a strong positive correlation, with high statistical significance at (P<0.000), was identified between the total knowledge, reported practices, and awareness levels of families. **Conclusion:** health awareness package improved the families' knowledge, reported practices, and awareness regarding household waste management. **Recommendations:** implementing continuous and targeted health awareness initiatives, coupled with community participation and media engagement, to the improvement of household waste management and the overall well-being of the community.

Keywords: Family Knowledge, Health Awareness Package, Healthy Practices & Household Waste Management.

Introduction

Currently, the world is faced with critical environmental issues, with solid waste being a prominent concern. In Egypt, household waste management stands out as a significant challenge in environmental governance. This issue stems from various factors, including rapid population growth, increased economic activities, industrialization, urbanization, low awareness levels, high rates of illiteracy, unregulated slum

areas, absence of clear policies, diverse waste sources and components, inadequacies in existing devices for traditional waste collection and disposal systems, individual and institutional behaviors, shortages in human and financial resources, and a shortage of suitable landfill sites for final waste disposal **(Nassar et al., 2023; Egyptian Environmental Affairs Agency (EEAA), 2019; Ministry of Environment, 2016).**

Household waste management refers to the segment of waste generated by households, presenting challenges in disposal due to its composition of hazardous, combustible, corrosive, explosive, flammable, toxic, ignitable, or reactive elements. These characteristics pose risks to both human health and the environment, given the biochemical nature of the waste **(Gutberlet & Uddin, 2017).** Household wastes encompass all waste materials originating from human and animal activities. Within the realm of solid waste management, key components include food wastes, paper, plastic, textiles, metals, and glass, mainly sourced from residential areas **(Fadhullah et al., 2022).**

Globally, the annual generation of municipal solid waste exceeds two billion tons, with at least 33% of it not undergoing environmentally safe management practices. In Egypt, estimates from **WMRA, (2020) and Momodu et al., (2019)** indicate that the country produces approximately 22 million tons of solid waste each year, translating to about 50,000 to 60,000 tons per day. Since 2000, Egypt has witnessed a more than 36% increase in municipal solid waste, primarily attributed to population density growth. Despite this, the total recovery rate remains at a mere 11.5%, and over 80% of the collected municipal solid waste remains not recycled **(Elmasry et al., 2022; Bain, 2020).**

Household wastes can be classified into various categories, including biodegradable waste (such as paper, green waste, cooking waste, and meals), recyclable wastes (e.g., cardboard, glass, bottles, jars, tin, aluminum, foil, metals, plastics, batteries, clothing, tires, and fabrics), electrical and electronic wastes (e.g., electrical appliances, light bulbs, washing machines, televisions, computers, screens, cell phones, alarm clocks, and watches), inert wastes (e.g., waste from building demolition, dirt, rocks, and debris), composite wastes (e.g., waste clothing and plastic toys), and chemically hazardous wastes (including most paints, household cleaners, tires, batteries, and light bulbs). Additionally, toxic wastes encompass pesticides, herbicides, fungicides, and biomedical waste, such as expired drugs **(Kumar et al., 2019).**

Improper household waste management poses significant health and environmental risks, jeopardizing the attainment of sustainable development goals **(Elmasry et al., 2022).** This mismanagement can mar the natural beauty of landscapes, leading to air, water, and soil pollution, unpleasant odors, and fire hazards. Moreover, it impacts waterways, causes siltation in reservoirs, reduces agricultural production, and contributes to the deterioration of structures and the depreciation of land value **(Almasi et al., 2019).**

Household waste also exerts adverse effects on community health, giving rise to physical, biological, non-communicable, psychosocial, and ergonomic health risks **(Aminuddin & Rahman, 2015)**. Contaminated soil, water, and air create breeding grounds for biological vectors like flies, rodents, and insects, leading to diseases such as diarrhea, dysentery, gastrointestinal problems, worm infections, food poisoning, dengue fever, cholera, leptospirosis, and bacterial infections. Additionally, exposure to these vectors can cause irritation of the skin, nose, and eyes, as well as respiratory symptoms.

A clean and healthy environment is integral to improving human health and enhancing the quality of life **(Shahzadi et al., 2020).** Raising awareness is crucial for effective household waste management practices, especially in developing countries where many people lack interest in environmental issues. Implementing health awareness packages and educating families about proper waste management can significantly enhance their practices.

Waste management education and awareness strategies, including mass media, television, radio, and social media, play a pivotal role in emphasizing practices and awareness related to household waste management. Public education, the provision of municipal waste bins, and waste collection by private contractors are vital in preventing the exposure of the public in municipalities to diseases **(Yukalang et al., 2018; Bautista, 2019).**

Families play a crucial role in safeguarding the environment and communities by managing waste hazards through effective planning. The separation of household hazardous wastes at the source of production can reduce leachate production. People's knowledge levels and cultural backgrounds significantly influence household waste management.

Community and environmental health nurses play a vital role in community participation and education, contributing to improved solid waste management and health outcomes. They can enhance knowledge and awareness about the causes and consequences of waste problems, as well as promote potential solutions and the benefits of waste reduction, reuse, and recycling **(Dlamini et al., 2019).**

Significance of the study:

The success of solid waste management anywhere could be hindered by the widespread lack of environmental awareness among the population. This may be exacerbated by various interconnected factors, including ineffective policies and regulations **(EEAA, 2019).** Additionally, the societal roles remained unclear due to high levels of unemployment and poverty, coupled with a lack of explicit messages providing incentives for environmental protection. Responding to environmental concerns is deemed challenging for individuals facing social and economic pressures.

Household wastes pose substantial health and environmental risks due to hazardous components, which may exhibit characteristics such as ignitability, corrosiveness, reactivity, and toxicity. This can result in health issues such as skin, eye, or

throat irritation, headaches, and even cancer **(CPHEEO, 2020).**

The waste problem in Egypt is attributed to various factors, including rapid population growth, increased economic activity, industrialization, urbanization, lack of awareness, illiteracy, and unregulated slum areas. The government needs to address these issues through unconventional solutions to avoid, reduce, reuse, and recycle waste **(EEAA, 2019; Ministry of Environment, 2016).**

In Egypt, the lack of clearly defined strategies for efficient household waste management poses serious environmental risks to communities and drains a significant portion of the local economy. Therefore, it is imperative to conduct a study titled "Health Awareness Package" aimed at enhancing family knowledge and promoting healthy practices related to household waste management.

Aim of the study

This study aimed to evaluate the effect of health awareness package on families' knowledge and practices regarding household waste management through the following:

1) Assessing families' knowledge regarding household waste management.

(2) Assessing families' practices regarding the healthy management of household waste.

(3) Designing and implementing a health awareness package to enhance family knowledge and healthy practices regarding household waste management.

(4) Evaluating the effect of the health awareness program on family's Knowledge and health practices regarding household waste management.

Research hypothesis:

H: The health awareness package will improve family knowledge and healthy practices regarding household waste management.

Subject and methods

Design of the research

The study employed a quasi-experimental design (one group pre-posttest).

Setting

The study was conducted in El-Sheikh Makram in the Sohag governorate, a rural area located in the Sohag governorate. The collaboration with zonal data and local non-governmental organizations in the region suggests a multi-stakeholder approach to the research. El-Sheikh Makram is described as a village with a substantial population, estimated to be around 6,700 families. This setting was selected because of its characteristics; firstly, its community characteristics, as a rural area, this village may have unique characteristics, challenges, and opportunities related to household waste management, which the study aimed to address. Secondly, the population size indicated a significant sample size for the study.

Sampling technique

The sampling technique employed in this study was a simple random sample. The rural area selected for the study, El-Sheikh Makram in Sohag governorate, has approximately 6,700 families. A total of 2% of the families, equivalent to 134

families, were recruited for the study. Out of this, 110 families constituted the actual sample, and 24 were excluded as a pilot sample. The pilot sample comprised all available families at the time of the study and those who agreed to participate.

Every family in the specified settings had an equal chance of being **included** in the study, based on **the following criteria:**

Acceptance to participate in the study.

Family members are older than 18 years.

The sample size was determined using the formula N= (Z^2 * P * (1-P))/e^2 (Thrusfield, 2005), where:

- Z is the value from the standard normal distribution corresponding to the desired confidence level (Z=1.96 for a 95% confidence interval).
- P is the expected true proportion.
- E is the desired precision (half of the desired confidence interval width).

With the specified inputs, the final study sample size needed was determined to be 110 families.

Instruments

Tool I: A Structured interview questionnaire. It was developed by the researchers in Arabic language after reviewing the related literature. The questionnaire was divided into the following four parts:

Part I: Families' Socio-demographics. This Part included data such as; age, gender, level of education, family type, family income, and crowding index.

Part II: Families' home assessment sheet. This Part included an assessment to measure the characteristics of a home environment as regards: family disposed of household waste; causes of accumulation of household waste, out rubbish dustbin, causes of throwing rubbish out, site of keeping daily waste, waste collector, how many times normally get rid of waste, the distance between home and rubbish collection place.

Scoring system:

Scores for the household waste home assessment were conducted by assigning a score of "1" for each affirmative response (yes) and a score of "0" for negative responses (no). The overall score for evaluating home health was determined based on the percentage of positive responses. A home was considered healthy if the score was ≥ 60%, while homes scoring less than 60% were classified as unhealthy.

Part III: Families' knowledge assessment. This Part focused on evaluating families' knowledge through the Health Awareness Package. It encompassed various aspects such as; concepts related to household waste (4 items); comprehension of household waste management (4 items), identification of the causes leading to the accumulation of household waste (6 items); classification of waste products (16 items); familiarity with methods of household waste management (6 items), awareness of the effects of household waste products on family health (14 items), recognition of family roles in maintaining a healthy home environment (8 items), and identification of sources of information (4 items).

Scoring system: For the knowledge items, a complete correct response scored two, an

incomplete correct response scored one, and an incorrect response scored zero. The scores for each item were summed up, resulting in a total score of 62 = 100%, which was categorized as follows: ≥70% was considered satisfactory, and <70% was considered unsatisfactory**.**

Part IV: Families' Health Awareness Assessment. This part was utilized to measure family-reported practices concerning household waste management. It covered various aspects, including general practices for the disposal of household waste (14 items), disposal of organic waste (4 items), disposal of inorganic waste (4 items), disposal of hazardous waste (2 items), and disposal of electronic waste (2 items).

Scoring system: Families' responses were conducted using a 5-point Likert scale, ranging from 1 = never to 5 = always. The total score ranged from 14 to 70 and subsequently was converted into a percentage and categorized as; satisfactory ≥60% and unsatisfactory < 60%.

Tool II: Families awareness likert scale regarding household waste management. The tool was adopted from **Abolucion (2012)** which contains 20 statements related to various aspects of household waste management.

Scoring system: The respondents were asked to express their awareness levels for each statement using a likert scale: aware (scored 3), not so aware (scored 2), and not aware (scored 1). The total awareness score for each participant was calculated by summing up the scores across all statements and categorized into three levels: High awareness: Total score > 70, moderate awareness: Total score between 60 and 70, and low awareness: Total score < 60.

Validity

The validity of the tools was verified by five experts, including three from the Community Health Nursing faculty and two from Environmental and Community Medicine at the Faculty of Medicine, Sohag University. These experts assessed the instruments for content accuracy.

Reliability

The internal consistency of the instruments used in the study was examined through a reliability test. Internal consistency assesses the degree to which all questionnaire items measure the same concept or construct. Cronbach's alpha coefficient was calculated to evaluate the reliability of the multi-item measures. The accepted value of Cronbach's alpha coefficient is 0.89, while the items in the current study demonstrated reliability at 0.718.

Ethical considerations

The study adhered to ethical guidelines by obtaining necessary approvals from the ethical committee and administrative authority of the local governorate region. Written consent was obtained from all study participants after clearly explaining the study's objectives. The researchers ensured complete privacy and confidentiality of participant information. Participants were given the freedom to participate or withdraw from the study at any point.

Operational design

A pilot study involving 2% of the total number of families (22 families) was conducted to

assess the clarity, objectivity, and feasibility of the study tools, as well as to estimate the time required for data collection. Families involved in the pilot study were excluded from the main study sample following necessary modifications.

Fieldwork:

Field Work - Pre-Test Phase: During the pre-test phase, a questionnaire was administered to 110 families who agreed to participate in the study. The questionnaire aimed to establish baseline information on the impact of the health awareness package in enhancing family knowledge and healthy practices related to household waste management. The researcher conducted door-to-door visits for questionnaire completion. Each questionnaire took approximately one hour, and data collection was finalized within one month, specifically in January 2023, before the implementation of the health awareness package.

Implementation Phase: The health awareness package program was implemented for families residing in El-Sheikh Makram, Sohag governorate. Families gathered in private halls over a six-month period from January to the end of June 2023.

Evaluation Phase: Following the completion of the health awareness program, the evaluation of families was conducted in July 2023 using the same research tools. The study was structured into three phases: preparatory, implementation, and evaluation.

Program development phases: The program was designed by the researcher based on study tool results.

- A review of recent national and international literature on the health management of household waste was conducted.
- The program content was revised and validated by experts in the Faculty of Nursing, at Sohag University.

Development and implementation phase:

General objective:

At the end of this health awareness package implementation, the families' knowledge and healthy practices regarding household waste management will be improved.

The health awareness package included the following:

- Theoretical sessions covered topics such as the meaning of household waste products, household waste management, classification of waste products, and the effects of household waste on family health.
- Practical sessions focusing on family health practices, family roles in a healthy home environment, family practices related to waste collection and disposal, and raising family awareness about household waste management.

Teaching methods and materials:

- Discussion, demonstration, re-demonstration, and group discussion.
- Teaching aids included posters, an Arabic booklet, PowerPoint presentations, videos using a laptop, and a booklet tailored to the family's educational level and needs.

Program implementation phase

- Orientation session on program objectives.

- Data collection (pre-test) was conducted over one month, with an average time of 30–45 minutes per family.
- Implementation of the health awareness package program spanned seven months, with sessions held 2 days per week (Saturday and Tuesday).
- The program included 2 theory sessions and 5 practical sessions.
- Various educational methods and media were used, along with a guiding booklet based on family needs.

Evaluation phase

Evaluation is conducted immediately after completing the program using the same tools as the pre-packaged program.

Statistical analysis

Data entry in Epi-info version 6.04; statistical analysis in SPSS version 22.0. Quality control at coding and data entry stages. Descriptive statistics were used for presenting data (frequencies and percentages for qualitative variables). Qualitative variables were compared using the $\chi 2$ test and r test. Significance is considered as not significant if P value > 0.05, significant if P value < 0.05, and highly significant if P value < 0.001.

Results of the research

Table (1) shows that 35.5% of families aged between 30≤40 with a mean of 31±6.37. 68.2% of them were female; regarding educational level, 40.9% of them had basic education. 64.5% of them were extended families. 82.7% of them reported not enough monthly income and 61.8% were among the overcrowding index.

Table (2) shows that The majority of families (92.7%) disposed of their household waste, 68.2% of families acknowledged causes of waste accumulation, (98.2%) of families reported throwing rubbish outside the dustbin, The most common reasons include the litter length of the dustbin, the spread of rubbish around the dustbin, and the presence of animals, (60.9%) of families reported keeping their daily waste on-site, (50.9%) reported that waste collectors come to take their waste, (52.7%), of families dispose of waste daily followed by those who dispose of waste after two days (31.8%), and (68.2%) have a collection point within 10 to <50 meters.

Figure (1) illustrates that 79.1% of families' homes were unhealthy while 20.9% of them were healthy in the preprogram phase.

Table (3) reveals that there was a highly statistically significant difference in families' knowledge regarding household waste management items post-awareness package implementation compared to pre at (p < .0000).

Figure (2) illustrates that 40.9% of studied families reported that their sources of information were television and radio, 22.7% of them were from relatives, and 23.7% & 12.7% were from neighbors & social media respectively.

Figure (3) illustrates that the total satisfactory families' knowledge score regarding household waste management had improved from 28% pre to 85.5% post awareness package implementation, with a highly statistically significant difference (p < .0000).

Figure (4) illustrates that the total satisfactory reported practice score of families regarding household waste management had improved from 29.1% pre to 90% post awareness package implementation, with a highly statistically significant difference at (p < .0000).

Table (4) reveals that there was a highly statistically significant difference (p< .0000) in

families' awareness regarding household waste management items post awareness package compared to pre implementation except for local authorities' role, and household waste recycling.

Figure 5 shows that the total families' awareness regarding household waste management had improved from 13.9% in pre health awareness package to 82.8% in post health awareness package with a highly statistical significant difference at ($p < 0.000$).

Table 5 reflects a highly positive correlation between the post health awareness package total families' knowledge, reported score level and total awareness (r=.899, r=.944 & 844) at $p < 0.001$, but there was no relation through the pre health awareness package.

Table 1 Studied families' socio demographic characteristics (n= 110)

Items	No	%
Age:		
< 20	17	15.5
20 ≤ 30	32	29.0
30 ≤ 40	39	35.5
>40	22	20
Mean ±SD 31±6.37		
Gender :		
Male	35	30.8
Female	65	68.2
Level of Education		
Not read and write	36	32.7
basic education	45	40.9
Secondary	18	16.4
High education	11	10.0
Family type		
Nuclear	39	35.5
Extended	71	64.5
Income/ month		
Enough	19	17.3
Not enough	91	82.7
Crowding index		
Overcrowding (more than 1.8 persons per room)	68	61.8
Medium crowding (between 1.5 and 1.7 persons per room)	28	25.5
Acceptable crowding (less than 1.5 persons perroom)	14	12.7

Table 2 Families' household waste disposal practices and factors influencing waste management (n = 110).

Items	Yes		No	
	No	%	No	%
Families disposed of household waste	102	92.7	8	7.3
Causes of accumulation of household waste	75	68.2	35	31.8
Family throw rubbish out dustbin	108	98.2	2	1.8
Causes of throwing rubbish out of dustbin (n=108)				
Litter length of the dustbin	10	9.3	98	90.7
- The spread of rubbish around the dustbin	92	85.2	16	14.8
The presence of animals such as dogs and cats	6	5.5	102	94.5
Site of keeping the daily waste?	43	39.1	67	60.9
The waste collector comes and takes it	56	50.9	54	49.1
How many times normally get rid of the waste?				
Daily	58	52.7	52	47.3
After 2days	35	31.8	75	68.2
3 days and more	17	15.5	93	84.5
Distance between home and rubbish collection place:				
- 10 to <50 m	75	68.2	35	31.8
- 50 to <100 m	11	10.0	99	90.0
- >100 m	24	21.8	86	78.2

Number not mutually exclusive

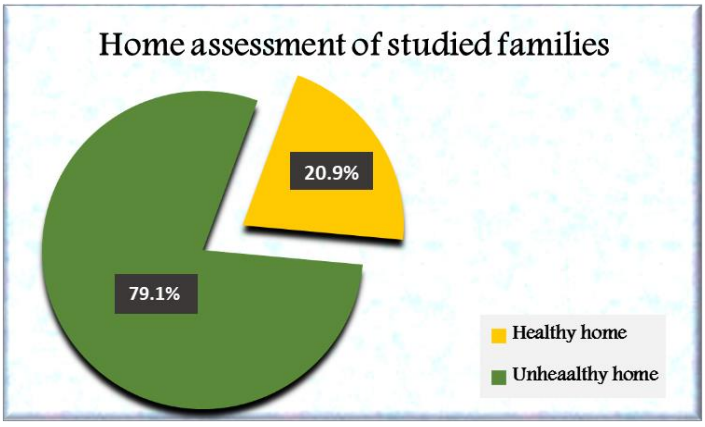


Figure (1): Studied families' home assessment (n=110).

Table 3 Distribution of studied families regarding their knowledge about household waste management pre and post-health awareness package (n=110).

Items	Pre		Post		Statistical test	
	N	%	N	%	χ^2	Sig
Meaning of household waste						
Complete correct answer	21	19.1	91	82.7	89.105	.0000**
Incomplete correct answer	73	66.4	16	14.6		
Incorrect	16	14.5	3	2.7		
Meaning of household waste management						
Complete correct answer	11	10.0	84	76.4	111.767	.0000**
Incomplete correct answer	32	29.1	21	19.1		
Incorrect	67	60.9	5	4.5		
Causes of accumulation of household waste						
Complete correct answer	9	8.2	81	73.6	110.577	.0000**
Incomplete correct answer	41	37.3	26	23.7		
Incorrect	60	54.5	3	2.7		
Classification of waste product						
1- **Disposal of organic waste:**						
Complete correct answer	0	0.0	74	67.3	128.959	.0000**
Incomplete correct answer	25	22.7	24	21.8		
Incorrect	85	77.3	12	10.9		
2- **Disposal of inorganic waste:**						
Complete correct answer	0	0.0	71	64.5	136.571	.0000**
Incomplete correct answer	22	20.0	30	27.3		
Incorrect	88	80.0	9	8.2		
3- **Disposal of hazardous waste:**						
Complete correct answer	2	98.6	74	67.3	139.657	.0000**
Incomplete correct answer	14	1.4	26	23.6		
Incorrect	94	0	10	9.1		
4- **Disposal of electronic waste:**						
Complete correct answer	1	0.9	79	71.8	135.526	.0000**
Incomplete correct answer	32	29.1	24	21.8		
Incorrect	77	70.0	7	6.4		
Methods of household waste management						
Complete correct answer	13	11.8	87	79.1	123.453	.0000**
Incomplete correct answer	29	26.4	23	20.9		
Incorrect	68	61.8	0	0.0		
Effect of the household waste product on family health						
Complete correct answer	26	23.6	91	82.7	90.880	.0000**
Incomplete correct answer	33	30.0	19	17.3		
Incorrect	51	46.4	0	0.0		
Family roles in a healthy home environment						
Complete correct answer	22	20.0	98	89.1	110.606	.0000**
Incomplete correct answer	43	39.1	12	10.9		
Incorrect	45	40.9	0	0.0		

*P value :< 0.001 Significant: **highly significant

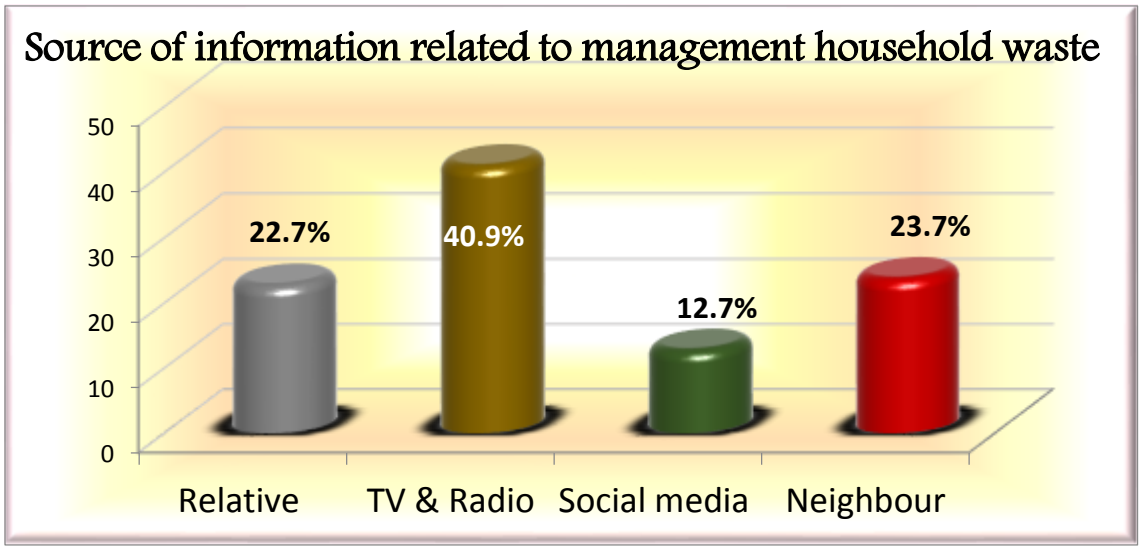
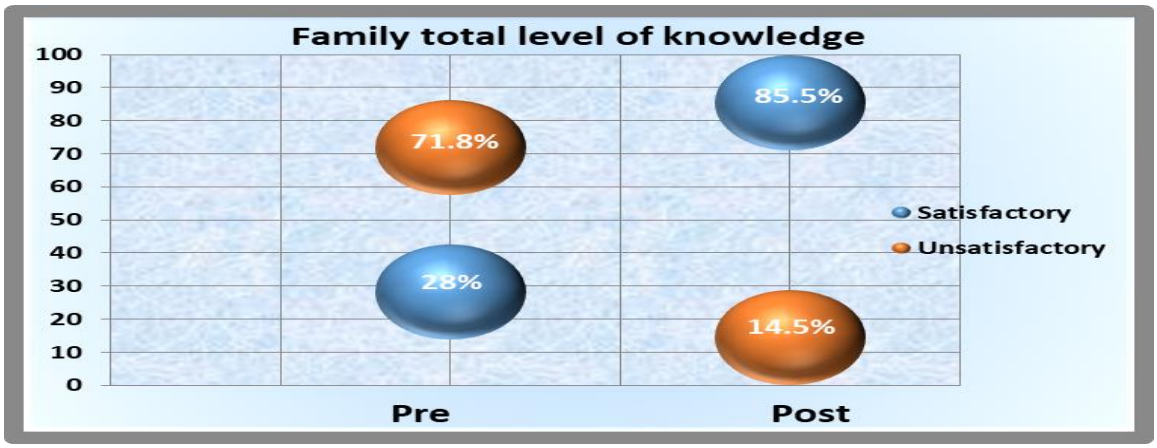
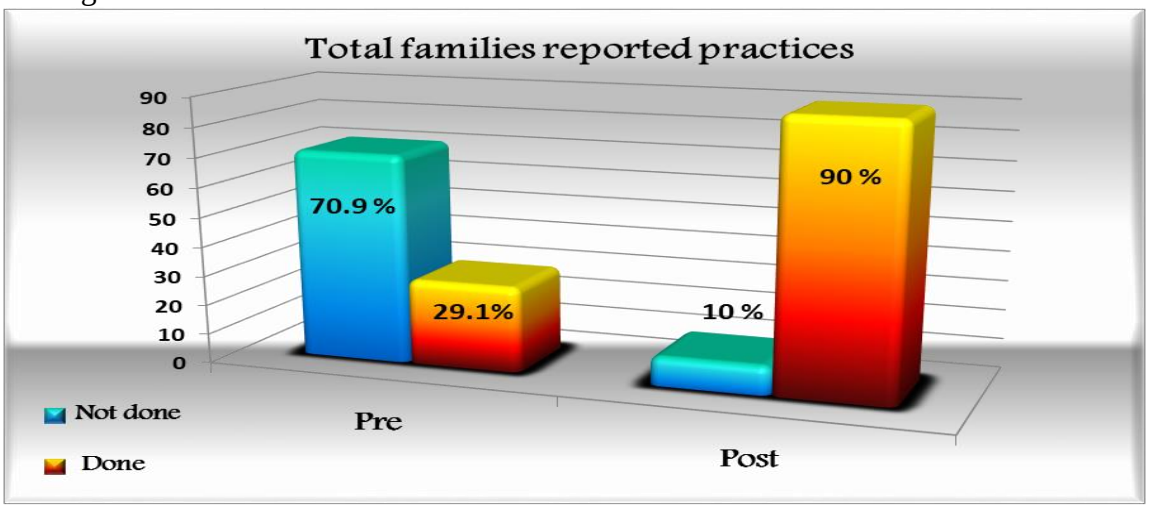


Figure 2 Distribution of the studied families according to their sources of information related to household waste management (n=110).



χ2= 73.531 P .0000 Significance: **Statistical significant difference

Figure 3 Distribution of families' total level of knowledge regarding household waste management



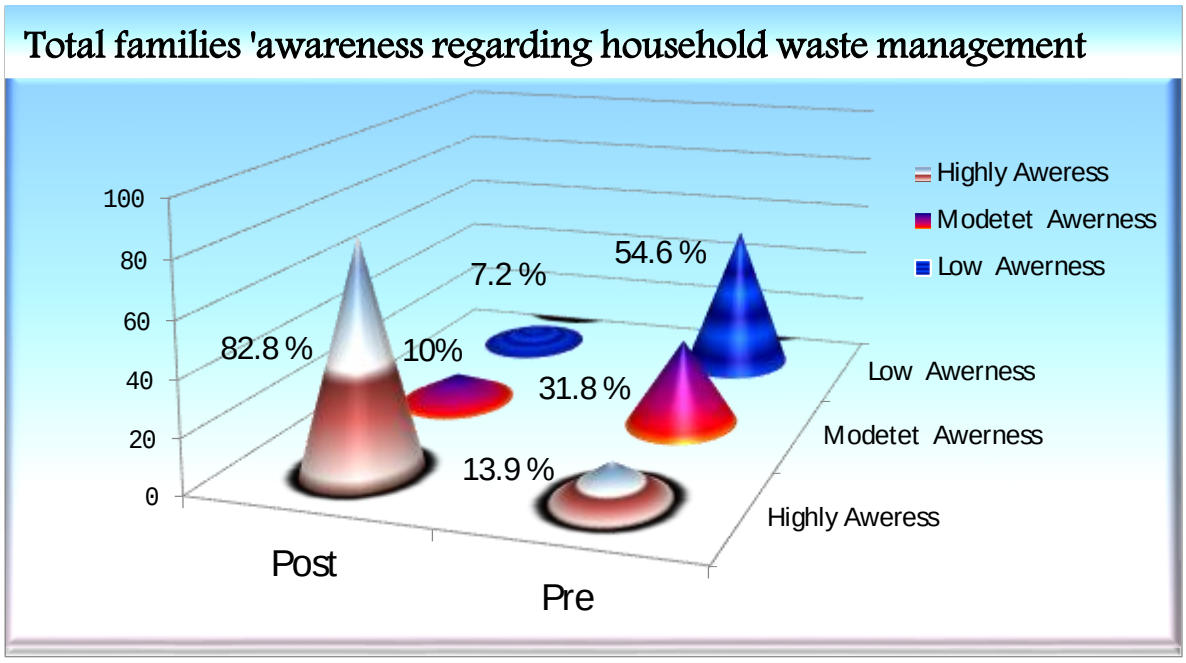
χ2 84.705 P .0000 Significance: **Statistical significant difference

Figure 4 Distribution of studied families' total reported practices regarding household waste management pre and post health awareness package.

Table 4 Distribution of families' awareness regarding household waste management pre and post health awareness package (n=110).

Items	Pre		Post		Statistical test	
	N	%	N	%	χ^2	Sig
Household waste management committee is needed in the community						
Aware	16	14.5	87	79.1	101.758	.0000**
Not so aware	35	31.8	18	16.4		
Not aware	59	53.7	5	4.5		
Everybody has to know about household waste management						
Aware	22	20.0	94	85.5	94.552	.0000**
Not so aware	57	51.8	10	9.1		
Not aware	31	28.2	6	5.4		
Local authorities have no role to play in household waste management						
Aware	15	13.6	14	12.7	0.194	0.9075
Not so aware	21	19.1	19	17.3		
Not aware	74	67.3	77	70.0		
Respiratory distress, diarrhea, and many other diseases arise due to improper waste management						
Aware	22	20.0	92	83.6	99.488	.0000**
Not so aware	26	26.6	15	13.7		
Not aware	62	56.4	3	2.7		
Household waste can't be reused or recycled						
Aware	9	8.2	73	66.4	2.960	0.2276
Not so aware	28	25.5	21	19.1		
Not aware	73	66.3	16	14.5		
Everybody awarded electronic household waste management						
Aware	18	16.4	90	81.8	99.571	.0000**
Not so aware	31	28.2	14	12.7		
Not aware	61	55.4	6	5.5		
Waste disposal in open places will be harmful to human health						
Aware	15	13.7	89	80.8	112.146	.0000**
Not so aware	20	18 .2	15	13.7		
Not aware	75	68.1	6	5.5		
Community people are awarded of any legislation that governs household waste management						
Aware	13	11.8	93	84.5	137.457	.0000**
Not so aware	17	15.5	16	14.5		
Not aware	80	72.7	1	1.0		
All streets should be clean and free of waste						
Aware	11	10.0	88	80.0	115.914	.0000**
Not so aware	19	17.3	12	10.9		
Not aware	80	72.7	10	9.1		
Incineration is an effective disposal mechanism for household waste management						
Aware	12	10.9	100	90.9	147.248	.0000**
Not so aware	18	16.4	8	7.3		
Not aware	80	72.7	2	1.8		
Delay in household waste disposal causes many difficulties						
Aware	11	10.0	99	90.0	154.326	.0000**
Not so aware	16	14.5	11	10.0		
Not aware	83	75.5	0	0.0		
I am always concerned about collecting and disposing of household waste						
Aware	13	11.8	98	89.1	132.495	.0000**
Not so aware	17	15.5	10	9.1		
Not aware	80	72.7	2	1.8		

Significance: **Statistical significant difference



$\chi 2$= 121.149 p .0000** Significance: **Statistical significant difference

Figure 5 Distribution of families' total awareness level regarding household waste management pre and post health awareness package

Table 5 Correlation between families' knowledge, practices, and awareness regarding household waste management pre and post health awareness package (n=110)

Items		Pre			Post		
		Total knowledge	**Total practices**	**Total awareness**	**Total knowledge**	**Total practices**	**Total awareness**
Total knowledge	r		.034	.575		.887	.723
	p-value		.421	.461		.00**	.00**
Total practices	r	0.076		.524	.899		.844
	p-value	.426		.062	.00**		.00**
Total awareness	r	.059	.032		.863	.944	
	p-value	.586	.452		.00**	.00**	

Correlation is highly significant at p<0.001** r-Pearson Correlation Coefficient.

Discussion

Household waste management is a global concern, gaining increasing attention due to its impact on health and the environment. Improper waste management poses health risks to families and communities, particularly in developing countries where education and awareness about effective waste management practices are lacking **(Mostafa et al., 2019)**.

The study found that more than two-thirds of waste managers at the household level were female, aligning with research indicating that females often show greater enthusiasm in addressing environmental issues **Boldero et al., (2021)** who conducted a study entitled "Gender patterns in environmental consciousness among community people" in Australia and denoted that females demonstrated the great enthusiasm dealing with the environmental issues. The mean age of individuals under study was 31±6.37 and this finding is congruent with **Otunaiya et al., (2019)** in a study entitled "Economics of horizontal integration in Poultry industry" in Nigeria which concluded that the highest percentage of the participant sample were aged from thirty-one to forty years with a mean age was 32.69 years which indicates that the population of the study area is quite young and active in their places.

From the researchers' point of view; the young age of the study population suggests an active community. However, a significant portion had limited education and insufficient income, consistent with findings in other areas facing similar challenges **(Ibrahim et al., 2023)**.

Additionally, it was noted that less than half of the families in the study had not received basic education, indicating that individuals in these households were generally literate and had undergone some form of educational attainment. This observation aligns with the findings of a study conducted by **Nwelue et al., (2018)** titled "Household waste generation, disposal, and management on people's health in Metropolis of IMO State, Nigeria." The study concluded that education is beneficial for individuals as it fosters the adoption of innovative practices.

Approximately more than two-thirds of the surveyed families were residing in extended family setups and overcrowded areas, and a majority of them reported insufficient monthly income. These findings align with those of **Ibrahim et al., (2023)**, who conducted a study titled "Family health practices regarding household waste management in El-Zawia El-Hamra District" in Egypt. The study reported that nearly three-quarters of the families studied were living in extended family arrangements characterized by overcrowding and inadequate income, possibly attributed to unemployment among the surveyed families.

Concerning the assessment of the households, the current study discovered that three-quarters of the surveyed families had contributing factors to the accumulation of household waste. The majority of them disposed of rubbish by throwing it out and around the dustbin. This observation aligns with the findings of **Yukalang et al., (2018),** who reported that over one-third of households disposed of their household waste in streets, holes, and roads. The researcher suggests that this lack of

cooperation among families and neglect by officials in the neighborhood contribute to an unhealthy environment and an increased risk of diseases.

The study findings indicated a notable increase in families' knowledge following the implementation of the health awareness package, with a highly statistically significant difference ($p < .0000$) between families' knowledge before and after the program. This improvement encompassed various aspects, including the meaning of household waste, its management, causes of accumulation, classification of waste products, methods of waste management, the effects of waste on family health, and family roles in maintaining a healthy home environment. From the researchers' point of view; this underlines the effectiveness of the health awareness package which may be attributed to its clear and simple content that is tailored to the needs of the families and is directly relevant to their living conditions.

The findings of this study aligned with the results reported by **Ali et al., (2019)** in a study conducted in Iran titled "Assessment of the knowledge, attitude, and practice of the community people towards reducing, recycling, and reusing of municipal waste." Ali et al. similarly observed a significant improvement in participants' knowledge after the intervention program, with high statistical significance across all assessed items. This consistency in results suggests that well-designed intervention programs, such as health awareness packages, can effectively enhance knowledge levels among community members regarding waste management practices.

Concerning the sources of information, the study findings denoted that less than half of the studied families obtain their information from television and radio aligns with the findings of **Hamed et al., (2017)**, who conducted a study in Iran titled "Municipal waste characterization and its assessment for potential compost production." In Hamed's study, approximately half of the participants considered training courses and workshops through mass media, national televisions, radio, and websites as the best option for raising awareness about the hazards of waste and its management, leading to an elevation in people's knowledge.

The researcher in the current study suggests that the limited reliance on television and radio as information sources among the studied families could be attributed to increased and overloaded duties, which may decrease the time available for obtaining information about household waste management. Additionally, factors such as a lack of resources and limited training opportunities for families may contribute to this pattern.

The current study's findings on the total families' knowledge regarding household waste management, both pre and post the health awareness package application, revealed a notable improvement. Initially, more than one-quarter of the studied families had unsatisfactory knowledge, which subsequently transformed into the majority having satisfactory knowledge after the educational intervention. The researcher suggests that this positive shift may be attributed to the effectiveness of the health awareness package focused on household management, as it

successfully enhanced the families' knowledge regarding the proper management of household waste.

This observation aligned with the study conducted by **Mahmady, (2020)** on "Factors influencing attitude, safety behavior, and knowledge regarding household waste management" in Guinea. Mahmady reported a highly statistically significant difference between participants' knowledge levels about household waste and its management before and after program implementation. From the researcher's perspective, the study underscores the necessity of implementing educational programs aimed at elevating the knowledge levels of families regarding household waste management, as this can potentially lead to positive changes in their behavior towards dealing with household waste.

The present study's examination of families' reported practices regarding household waste and its management revealed highly statistically significant differences between pre- and post-implementation of the health awareness package. Specifically, significant improvements were noted in the disposal of various types of household waste, including organic, inorganic, hazardous, and electronic wastes. This aligned with findings from **Hakim et al., (2018)**, who studied "Knowledge, attitudes and practices of health-care personnel towards waste disposal management at Ain Shams University Hospitals" in Egypt. Their research reported increased awareness among participants about the importance of safe waste disposal, the responsibility of teamwork in waste disposal, and the financial burden associated with disposal.

From the researchers' perspective, the positive changes observed in families' reported practices suggest the effectiveness of the health awareness package in improving household waste management. Therefore, it is emphasized that impoverished areas require comprehensive programs, educational instructions, and guidance to enhance waste management practices and contribute to the overall well-being of the communities.

The current study's assessment of the total score of families' reported practices regarding household waste management indicated a significant increase from less than one-third pre-awareness package to the majority of studied families post-implementation, with a highly statistically significant difference ($p < 0.0000$). This finding aligned with the research of **Zafar, (2018)**, who conducted a study on environmental awareness in Arab countries, specifically addressing garbage issues in Cairo, the Middle East, recycling waste collection, and waste disposal. Zafar reported a significant improvement in community performance after the implementation of a learning program.

Furthermore, the situation is consistent with the information provided by the **Arab Republic of Egypt (ARE) in 2020**, which highlighted the relatively unclear institutional framework for the household waste sector. This sector involves various stakeholders, such as governmental authorities, informal waste collectors, the private sector, and waste management and recycling

companies. The study underscores the importance of effective waste management practices and the need for clear guidelines and collaboration among different entities for the betterment of waste management systems.

The current study indicated an improvement in various aspects of families' awareness regarding household waste management after the implementation of the health awareness package. The study revealed an increased awareness among families about the need for a household waste management committee in the community. This emphasizes the importance of local initiatives and community involvement in waste management.

Additionally, families showed improved awareness regarding the connection between poor waste management practices and the increased prevalence of endemic diseases. This underscores the importance of proper waste disposal methods in maintaining public health.

There was a positive change in families' awareness about the importance of disposing of waste in closed places. This reflects an understanding of the potential environmental and health hazards associated with open disposal.

Families demonstrated an increased awareness of the importance of maintaining clean streets and roads. This suggests a growing sense of responsibility towards the local environment.

Families expressed a heightened awareness of the necessity for timely collection and disposal of household waste. This is crucial for preventing the accumulation of waste and minimizing its impact on health and the environment.

These findings aligned with the insights provided by **Nassar et al. (2023)**, emphasizing the need for improved waste management practices in Egypt. The study recognizes the challenges in the existing waste management systems, especially in rural areas, and emphasizes the role of community awareness programs in addressing these challenges. Overall, the positive changes in families' awareness levels suggest that the health awareness package was effective in enhancing their understanding of household waste management and its implications for the community.

The study's findings underscore the importance of health awareness programs in improving families' knowledge, reported practices, and overall awareness regarding household waste management. The study observed a significant elevation in the total awareness scores of families regarding household waste and its management after the implementation of the health awareness package. This improvement signifies the effectiveness of the educational intervention in enhancing families' understanding of proper waste management practices.

These findings aligned with the findings of **Al-Emad, (2019)** in Yemen, highlighting poor awareness among waste workers regarding medical waste handling. Additionally, **Dahlin et al. (2017)** reported similar results, emphasizing the importance of awareness programs in enhancing knowledge about waste disposal and related legislation.

The positive correlation observed between families' knowledge, reported practices and total

awareness post-health awareness package emphasizes the interconnectedness of these factors. This correlation suggests that as families' knowledge increases, their reported practices and overall awareness also improve.

The study reinforces the Ministry of Environment's (Egypt, 2018) assertion that improper handling and management of household waste can lead to the spread of diseases and environmental health problems. The lack of public awareness is identified as a contributing factor to these issues.

From researchers' point of view, based on these study's findings, recommendations include greater community participation, continuous health awareness programs, and the utilization of mass media for education. These initiatives aim to empower communities with the knowledge and practices necessary for effective household waste management. As the positive outcomes of the health awareness package highlight the potential for educational interventions to bring about positive changes in families' behaviors and attitudes towards household waste management, ultimately contributing to improved public health and environmental conditions.

Conclusion

This study affirmed the positive role of health awareness initiatives in promoting responsible and informed practices among families regarding household waste management. The positive correlation between the pre/post-program families' total knowledge, total reported practices and their awareness indicates that addressing knowledge gaps and fostering awareness can contribute to meaningful changes in reported practices, ultimately enhancing public health and environmental conditions.

Recommendations

Based on the results of the present study and the research hypothesis, the following recommendations are suggested:

- Encourage increased involvement of local communities in waste management efforts.
- Emphasize the significance of public awareness and education in upgrading household waste practices.
- Acknowledge that while public participation is crucial, the government plays a central role in organizing and facilitating awareness programs.
- Implement ongoing health awareness packages specifically tailored for families.
- Focus on educating households about appropriate waste disposal practices, and addressing the root causes of poor living environments.
- Leverage media platforms, especially television, as a highly effective means of disseminating information and influencing practices.
- Highlight the role of households in reducing adverse effects on human health and controlling environmental pollution.

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Conflict of interest

The authors declare no conflicts of interest. This manuscript is not under consideration by another journal and has not been published or presented elsewhere in part or in its entirety except Research Square of a preprint.

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