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Knowledge, Attitudes, and Practices Regarding the Use of Repeatedly Heated Cooking Oil for Frying in Egypt: A Cross-Sectional Survey

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A B S T R A C T

Background: Despite the known health risks associated with the reuse of repeatedly heated cooking oil (RHCO), limited research exists on the knowledge, attitudes, and practices of the Egyptian population regarding this issue. **Objective:** To assess RHCO knowledge, attitudes, and practices among Egyptian public. **Method:** A cross-sectional design was implemented using an online survey, which was distributed through social media. A total of 440 participants were recruited using a convenience sampling. Data on socio-demographic factors, knowledge, attitudes, and practices were collected using a validated questionnaire. **Results:** The average age of participants was 40.8±12.5 years. The majority were female (83.4%), married (75.3%), residing in urban areas (92%), and highly educated (88.4%). Most participants (82.5%) acknowledged that repeatedly heating cooking oil reduces its quality, with 88% aware of the associated health risks, including cancer and hypertension. While 90.4% supported reducing RHCO use, only 19.1% never reused oil, and practices varied widely. The attitude score was good in 45.5% of the participants, fair in 54.0%, and poor in 0.5%. Significant correlations were observed between attitude scores and socio-demographic factors, such as residence, education, and income. Additionally, gender, residence, and employment status significantly influenced oil reuse practices. **Conclusions:** Despite high awareness of the health risks of RHCO, a significant proportion of participants continued to reuse cooking oil for economic and practical reasons. A clear gap exists between knowledge and practice regarding RHCO use in Egypt. Public health interventions should increase awareness, particularly among lower-income and less-educated populations, and offer cost-effective alternatives.

INTRODUCTION

Reusing cooking oils for successive frying rounds is a widespread practice, both commercially and domestically, aimed at cost reduction.[1,2] However, subjecting oils to high temperatures (160˚–190˚C) over prolonged durations makes them vulnerable to thermal oxidation, hydrolysis, and polymerization. These processes may induce changes in fatty acid configuration from cis to trans isomers and the accelerated formation of oxidized and polymerized lipid species within the frying medium. Consequently, reheated oils exhibit altered characteristics, such as darkened color, increased

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Table 1: Socio-demographic characteristics of the study participants (n = 440)

	n	%
Age in years		
Mean ± SD	40.8 ± 12.5	
Range	18-80	
Gender		
Male	73	16.6
Female	367	83.4
Residence		
Urban	405	92.0
Rural	35	8.0
Educational level		
Illiterate	11	2.5
Basic education	12	2.7
Secondary education	28	6.4
University and postgraduate	389	88.4
Working status		
Working	256	58.2
Not working	50	11.4
Student	134	30.4
Marital status		
Married	331	75.3
Single	85	19.3
Widowed	12	2.7
Divorced	12	2.7
Family income per month (Egyptian Pound)		
< 2000	10	2.3
2000 - < 5000	68	15.5
5000 - <8000	53	12.0
8000 - < 10000	66	15.0
≥ 10000	243	55.2

Data were presented as number and percentages, unless mentioned otherwise. SD, standard deviation.

viscosity, foaming, and a reduced smoke point, rendering them unsuitable for consumption.[3]

Repeatedly heated cooking oil (RHCO) refers to using cooking oil multiple times for frying or other cooking methods, where the oil is subjected to heat and then allowed to cool before being reused.[4] The reheating of cooking oils may release various substances with potential mutagenic, carcinogenic, and genotoxic effects.[1,5] Several animal and human studies have underscored the adverse health outcomes associated with the consumption of RHCO, including cardiovascular diseases,[6,7] endothelial dysfunction,[8] elevated blood pressure,[9,10] hepatic toxicity,[2] elevated LDL and lipid peroxidation,[11] atherosclerosis,[12] and various cancers.[1,5,13]

Despite the known health risks associated with the use of RHCO, there exists a gap in understanding the knowledge, attitudes, and practices of the Egyptian population regarding this cooking habit. While studies have examined the effects of RHCO consumption on health outcomes, there is limited research focusing on public awareness and behaviors surrounding its use, with most studies targeting food outlet operators as their primary demographic.[15,16] A study conducted in Malaysia among night market food outlet operators showed that most respondents had a moderate or low level of knowledge regarding this issue, with most respondents (63.0%) admitting that they had used cooking oil repeatedly.[17] A study conducted in Pakistan found that despite most respondents being aware of the hazards of reused cooking oil, 42.9% reused the same cooking oil twice, and 57.1% mixed oils.[18]

The objective was to assess RHCO knowledge, attitudes, and practices among Egyptian public. This study addresses this gap by comprehensively assessing Egyptians' knowledge, attitudes, and practices concerning using RHCO for frying. By exploring these factors, we aimed to provide insights into public awareness of the health risks associated with RHCO and inform potential interventions to promote safer cooking practices and improve public health outcomes in Egypt. Through this examination, we can better understand the cultural and cooking practices surrounding frying oil usage and contribute to efforts to mitigate the health impacts of RHCO consumption within Egyptian society.

METHODS

The current study is an exploratory cross-sectional study conducted among a sample of the Egyptian population to assess their knowledge, attitudes, and practices toward RHCO usage. Data were collected over three months, from October 1, 2023, to December 31, 2023. The research was conducted following the Checklist for Reporting Results of Internet E-Surveys guidelines for the online survey and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement guidelines for reporting observational studies.[19,20] Target participants were chosen to meet the following criteria: (i) they must be Egyptian, (ii) they should be adults (18 years or older), and (iii) they needed to be willing to participate.

Sample size and sampling technique: The "self-selection web-based questionnaire" convenience sampling method was employed, with researchers distributing the questionnaire link via Facebook and

Table 2: Distribution of knowledge assessment items and knowledge scores regarding using repeatedly heated cooking oil for frying among study participants (n = 440)

	Correct answer	Incorrect answer/lack of knowledge
Knowledge items		
1. The quality of cooking oil remains the same regardless of how many times it is reused for frying.	363 (82.5%)	77 (17.5%)
2. Cooking oil can be used many times for frying and discarded only when it turns dark.	300 (68.2%)	140 (31.8%)
3. There will be a loss of nutrients in the repeatedly heated cooking oil used for frying.	307 (69.8%)	133 (30.2%)
4. The type of cooking oil does not influence the type of by-products produced by the RHCO.	235 (53.4%)	205 (46.6%)
5. Does RHCO for frying cause harmful health effects?	387 (88.0%)	53 (12.0%)
Knowledge score		
Poor knowledge		74 (16.8%)
Fair knowledge		96 (21.8%)
Good knowledge		270 (61.4%)

Data were presented as number and percentages. RHCO: repeatedly heated cooking oil.

WhatsApp, Egypt's most widely used social media platforms. The administrators of these groups were contacted to obtain permission to distribute the survey. The survey link was posted with a positive statement about its purpose and one of the researchers' contact details. The questionnaire was made publicly accessible, allowing anyone to participate.

OpenEpi was used to calculate the required sample size.[21] The sample size was calculated assuming that the prevalence of knowledge toward RHCO usage is 42.9%. [22] With a precision level of 5%, a 95% confidence interval, and 80% power, the minimum number of participants needed was 370. To account for the likelihood of nonresponse, an additional 20% was added, bringing the finalized sample size to an estimated total of 440.

Study tools: A Google Form was developed, and individuals were encouraged to complete and submit their responses. The survey included the following components: (1) Socio-demographic characteristics: age, sex, residence (rural or urban), occupation, education, marital status, family income, and the most frequently used type of cooking oil for frying. (2) Knowledge of study participants regarding repeated oil usage, assessed through five closed-ended questions with response options of yes, no, or do not know. (3) Attitudes of study participants toward repeated oil usage, evaluated using four closed-ended questions with response options of strongly agree, agree, neutral, disagree, or strongly disagree. (4) Practices related to repeated oil usage, assessed through seven questions. (5) Knowledge sources, evaluated based on various options, including scientific websites, colleagues and/or healthcare providers, television, radio, the internet, social media, newspapers, and others. Questions in these sections were sourced from existing literature.[22] The data collection instruments were tested on 10% of the total sample size beyond the actual sample. Necessary modifications were applied, such as deleting questions like "Did you use the oil frequently for cooking?" The questionnaire content was validated by four faculty members specializing in Public Health, and appropriate modifications were performed. A Cronbach's alpha reliability test was conducted for various sections of the questionnaire and the overall instrument, yielding the following values: knowledge section = 0.86, attitude section = 0.80, practice section = 0.77, and overall questionnaire = 0.75.

Statistical analysis: Data was entered using SPSS (statistical package for social sciences) version 28.0 (IBM, SPSS, USA). Categorical variables were expressed as proportions and percentages, and the chi-square test was applied. Quantitative variables were assessed for normality and expressed as mean and standard deviation. All tests were two-tailed, and a p-value < 0.05 was considered statistically significant. Regarding knowledge of repeatedly heated cooking oil, responses were scored as follows: "No" and "I do not know" = 0, "Yes" = 1. The total score was 6, with a possible range of 0–6.

Table 3: Distribution of attitude assessment items and attitude scores regarding using repeatedly heated cooking oil for frying among study participants (n = 440)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Attitude items					
1. Using RHCO to fry food is a good practice as it saves costs.	112 (25.5%)	139 (31.6%)	86 (19.5%)	76 (17.3%)	27 (6.1%)
2. The use of RHCO to fry food should be reduced.	2 (0.5%)	10 (2.3%)	30 (6.8%)	196 (44.5%)	202 (45.9%)
3. I am willing to pay more money purchasing cooking oil to avoid its repeated heating.	4 (0.9%)	49 (11.1%)	122 (27.7%)	158 (35.9%)	107 (24.3%)
4. More information about the health hazards of RHCO should be distributed.	0 (0.0%)	0 (0.0%)	18 (4.1%)	132 (30%)	290 (65.9%)
Attitude score					
Good attitude					200 (45.5%)
Fair attitude					238 (54.0%)
Poor attitude					2 (0.5%)

Data were presented as number and percentages. RHCO: repeatedly heated cooking oil.

Participants scoring between 5 and 6 (> 75%) were categorized as having "good" knowledge, those scoring 4 (> 50%) were classified as "fair," and those scoring 0–3 (< 50%) were deemed "poor."[23] For the attitude section, the highest score was 5 for "strongly agree" and 1 for "strongly disagree." The maximum total score was 20, ranging from 4-20. Participants scoring between 16 and 20 (> 75%) were categorized as having a "good" attitude, those scoring between 11 and 15 (> 50%) were classified as "fair," and those scoring 4-10 (< 50%) were identified as "poor."[23]

In the practice section, each participant was allowed to choose one answer for the first and second questions, which was presented as no (%). For methods used to maintain the quality of cooking oil, points were assigned as follows: "Never" = 0 and "Always" = 4. The total score was 20, with a possible range of 0-20. Participants scoring between 16 and 20 (> 75%) were categorized as frequent users demonstrating good practices, those scoring between 11 and 15 (> 50%) were classified as occasional users, and those scoring 0-10 (< 50%) were identified as rare users.[23] A higher score reflected better practice, while a lower score indicated poor practice.

RESULTS

A total of 440 participants were enrolled in this study. The participants' ages ranged from 18 to 80 years, with a mean age of 40.8 ± 12.5 years. The majority were female (367, 83.4%), residing in urban areas (405, 92%), married (331, 75.3%), and highly educated (389, 88.4%). More than half of the participants (256, 58.2%) were employed, and 243 (55.2%) had a monthly income exceeding 10,000 Egyptian pounds (Table 1). As shown in Figure 1, sunflower oil was the most used cooking oil for frying (218, 49.5%).

Regarding participants' knowledge of using RHCO for frying, the majority (362, 82.5%) disagreed that the quality of cooking oil remains unchanged regardless of reuse. More than two-thirds (300, 68.2%) rejected the notion that cooking oil can be reused for frying and discarded only when it turns dark. Additionally, 307 (69.8%) agreed that repeated frying oil heating leads to nutrient loss. More than half (235, 53.4%) recognized that the by-products generated from repeatedly heating cooking oil vary depending on the type of oil used. The majority (387, 88%) acknowledged the harmful health effects of using RHCO (Table 2).

As demonstrated in Figure 2, 258 (58.6%) and 114 (25.9%) associated RHCO with cancer and hypertension, respectively. Overall, nearly two-thirds of participants (270, 61.4%) had good knowledge, 96 (21.8%) had fair knowledge, and 74 (16.8%) had poor knowledge. Figure 3 presents the sources of knowledge about RHCO among participants, with the internet being the most frequently cited source (126, 28.6%).

Table 3 presents participants' attitudes and attitude scores regarding using RHCO for frying. More than half of the participants (251, 57.1%) did not consider using RHCO for frying food a good practice despite

Table 4: Distribution of practice assessment items and practice scores regarding using repeatedly heated cooking oil for frying among study participants (n = 440)

Practice items	Never	Sometimes	Usually	Always
1. Methods attempted in order to maintain the quality of cooking oil:				
Using fresh oil for frying every time	63 (14.3%)	179 (40.7%)	110 (25.0%)	88 (20.0%)
Maintaining a small flame while frying	106 (24.1%)	197 (44.8%)	105 (23.9%)	32 (7.3%)
Using stainless steel frying utensils	164 (37.3%)	105 (23.9%)	91 (20.7%)	80 (18.2%)
Storing oil in a stainless steel or glass container after usage	206 (46.8%)	102 (23.2%)	75 (17.0%)	57 (13.0%)
Filtering the oil to catch any food particles or foreign matter	127 (28.9%)	118 (26.8%)	96 (21.8%)	99 (22.5%)
2. How many times do you use the same cooking oil to fry food before discarding it?				
One-time				84 (19.1%)
Twice				179 (40.7%)
Three-times				114 (25.9%)
More than 3 times				40 (9.1%)
I continue to reuse it until the color of oil becomes dark, regardless of how many times				23 (5.2%)
3. What do you do with the remaining oil after frying?				
I dispose of it and use new oil next time				301 (68.4%)
I use it until it is finished from the frying pan				23 (5.2%)
I top up the remaining oil with fresh, unused oil				28 (6.4%)
I filter the remaining oil and top it up with fresh, unused oil				88 (20.0%)
Practice score				
Good practice				35 (8.0%)
Fair practice				195 (44.3%)
Bad practice				210 (47.7%)

Data were presented as number and percentages.

its cost-saving benefits, and 265 (60.2%) expressed a willingness to pay more for cooking oil to avoid repeated heating. The majority (398, 90.4%) believed that RHCO usage should be reduced, and 422 (95.9%) emphasized the need for greater dissemination of information about its health hazards. Overall, 200 (45.5%) had a good attitude score, 238 (54.0%) had a fair attitude, and only 2 (0.5%) had a poor attitude.

Regarding participants' practices, only 84 (19.1%) reported never reusing cooking oil. Among those who frequently reused cooking oil, 179 (40.7%) used it twice, 114 (25.9%) used it three times, 40 (9.1%) used it more than three times, and 23 (5.2%) continued using it until the oil turned dark, regardless of the number of times. About two-thirds of the participants (301, 68.4%) discarded the remaining oil after frying, 116 (26.4%) added fresh unused oil to the remaining oil, whether filtered or not, and 23 (5.2%) continued using it until it was entirely consumed in the frying pan. Participants employed various methods with different frequencies to maintain the quality of cooking oil. Based on the practice score, 210 (47.7%) were classified as poor users, 195 (44.3%) as fair users, and 35 (8%) as good users (Table 4).

No significant differences were observed between participants' knowledge scores and socio-demographic characteristics (Table 5). However, significant relationships were identified between participants' attitude scores and their residence, educational level, marital status, and family income (Table 6). Additionally, significant associations were found between participants' practice scores and their age, gender, and employment status (Table 7).

DISCUSSION

The present study revealed that although most participants had good knowledge regarding reusing RHCO and its potential health risks, their attitudes and practices were inconsistent. While most believed RHCO use should be reduced, only 19.1% reported never reusing cooking oil.

Table 5: Relationship between knowledge scores regarding using repeatedly heated cooking oil for frying and socio-demographic characteristics of the study participants

	Poor knowledge	Fair knowledge	Good knowledge	p-value
Gender				
Male	12 (16.4%)	13 (17.8%)	48 (65.8%)	0.557
Female	50 (14.1%)	83 (23.4%)	222 (62.5%)	
Residence				
Urban	54 (13.7%)	88 (22.3%)	252 (64.0%)	0.258
Rural	8 (23.5%)	8 (23.5%)	18 (52.9%)	
Working status				
Working	38 (15.1%)	58 (23.1%)	155 (61.8%)	0.896
Not working	5 (10.2%)	11 (22.4%)	33 (67.3%)	
Student	19 (14.8%)	27 (21.1%)	82 (64.1%)	
Educational level				
Illiterate	1 (9.1%)	3 (27.3%)	7 (63.6%)	0.328
Basic education	1 (9.1%)	2 (18.2%)	8 (72.7%)	
Secondary education	4 (16.7%)	10 (41.7%)	10 (41.7%)	
University and post-university	56 (14.7%)	81 (21.2%)	245 (64.1%)	
Marital status				
Married	48 (14.8%)	72 (22.2%)	204 (63.0%)	0.327
Single	10 (12.3%)	19 (23.5%)	52 (64.2%)	
Widowed	0 (0.0%)	4 (36.4%)	7 (63.6%)	
Divorced	4 (33.3%)	1 (8.3%)	7 (58.3%)	
Family income per month (Egyptian Pound)				
< 2000	2 (22.2%)	3 (33.3%)	4 (44.4%)	0.685
2000 - < 5000	9 (13.6%)	12 (18.2%)	45 (68.2%)	
5000 - < 8000	8 (15.1%)	15 (28.3%)	30 (56.6%)	
8000 - < 10000	9 (15.3%)	17 (28.8%)	33 (55.9%)	
≥ 10000	34 (14.1%)	49 (20.3%)	158 (65.6%)	

Data were presented as number and percentages.

Many participants reused oil multiple times, highlighting a gap between knowledge and behavior. Despite recognizing the associated health risks, they continued reusing oil for practical reasons, such as cost-saving.

These findings align with previous research. For example, a study by Abdullah et al.[22] assessed the awareness levels of Kuala Lumpur residents regarding RHCO use, revealing moderate overall awareness, with higher levels among individuals with more outstanding education and income. Similarly, Sivananthan et al.[24] found that many food outlet operators in Raub, Pahang, were unaware of RHCO's dangers despite a small, informed minority. These results underscore a recurring issue in research: awareness often does not translate into significant behavioral changes.[25,26]

In both this and comparative studies, cost and convenience drive the continued use of RHCO despite awareness of its associated health risks, such as cancer and cardiovascular diseases. Differences in knowledge and practices across socio-demographic groups, particularly in education and income, further reinforce this trend. Individuals with lower incomes or educational levels may prioritize cost-saving over health concerns, contributing to the knowledge-practice gap.

A significant portion of participants (57.1%) rejected the notion that RHCO use is cost-effective, and 60.2% expressed willingness to spend more on fresh oil to avoid reusing it, indicating a generally negative attitude toward RHCO use. Nevertheless, 80.9% of participants continued reusing oil, with 40.7% reusing it twice, highlighting the challenge of translating knowledge into behavior. This disconnect may stem from economic constraints, cultural norms, or limited alternatives for some households.[25]

The study found that attitudes were significantly influenced by factors such as residence, education, and income. Participants in urban areas with higher education and income tended to avoid RHCO reuse, suggesting that socioeconomic status shapes individuals' attitudes and practices. Those with greater resources are better positioned to refrain from reusing oil.

Table 6: Relationship between attitude scores regarding using repeatedly heated cooking oil for frying and socio-demographic characteristics of the study participants

	Poor attitude	Fair attitude	Good attitude	p-value
Gender				
Male	0 (0.0%)	36 (49.3%)	37 (50.7%)	0.524
Female	2 (0.5%)	202 (55.0%)	163 (44.4%)	
Residence				
Urban	2 (0.5%)	209 (51.6%)	194 (47.9%)	0.002*
Rural	0 (0.0%)	29 (82.9%)	6 (17.1%)	
Working status				
Working	2 (0.8%)	137 (53.5%)	117 (45.7%)	0.788
Not working	0 (0.0%)	26 (52.0%)	24 (48.0%)	
Student	0 (0.0%)	75 (56.0%)	59 (44.0%)	
Educational level				
Illiterate	0 (0.0%)	10 (90.9%)	1 (9.1%)	0.017*
Basic education	0 (0.0%)	11 (91.7%)	1 (8.3%)	
Secondary education	0 (0.0%)	18 (64.3%)	10 (35.7%)	
University and post-university	2 (0.5%)	199 (51.2%)	188 (48.3%)	
Marital status				
Married	1 (0.3%)	174 (52.6%)	156 (47.1%)	0.003*
Single	0 (0.0%)	52 (61.2%)	33 (38.8%)	
Widowed	0 (0.0%)	7 (58.3%)	5 (41.7%)	
Divorced	1 (8.3%)	5 (41.7%)	6 (50.0%)	
Family income per month (Egyptian Pound)				
< 2000	0 (0.0%)	7 (70.0%)	3 (30.0%)	0.006*
2000 - < 5000	0 (0.0%)	45 (66.2%)	23 (33.8%)	
5000 - < 8000	0 (0.0%)	29 (54.7%)	24 (45.3%)	
8000 - < 10000	2 (3.0%)	40 (60.6%)	24 (36.4%)	
≥ 10000	0 (0.0%)	117 (48.1%)	126 (51.9%)	

*Data were presented as number and percentages. *P-value < 0.05 is considered significant.*

A review by Nayak et al.[27] highlighted the widespread practice of reusing frying oil despite known health risks. In Malaysia, repeatedly heating cooking oil remains common, potentially leading to harmful lipid oxidation and cardiovascular issues. Public awareness of these risks is moderate to low, with many continuing the practice despite acknowledging its harm.[17,22] Education and income levels correlated with higher awareness, emphasizing the need for more aggressive public education campaigns to address RHCO use.

The study sample was predominantly female, highly educated, and residing in urban areas (92%), factors likely influencing the high levels of awareness and negative attitudes toward RHCO. The high education level of the participants may explain why 88% acknowledged the health hazards of RHCO use, as education often correlates with higher health literacy.[28] Additionally, urban residents may have better access to health information, contributing to the widespread awareness observed in the study.

Significant relationships were found between attitudes and factors such as residence, education, marital status, and income, while practice scores were associated with gender, residence, and employment status. These findings suggest that public health interventions should consider socio-demographic factors. Health campaigns aimed at reducing RHCO use could prioritize less-educated and rural populations with limited access to health information.[29]

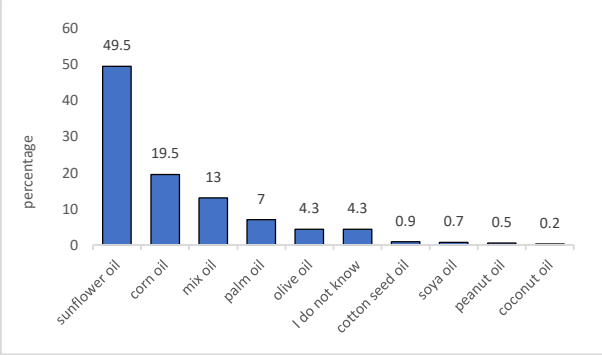

Figure 1. Distribution of different types of cooking oils used by study participants for frying (n = 440)

The internet emerged as the most common source of information on RHCO (28.6% of participants), highlighting the potential of digital platforms for

Table 7: Relationship between practice scores regarding methods employed to maintain the quality of cooking oil and socio-demographic characteristics of the study participants

	Poor practice	Fair practice	Good practice	p-value
Gender				
Male	8 (11.0%)	45 (61.6%)	20 (27.4%)	< 0.001*
Female	27 (7.4%)	150 (40.9%)	190 (51.8%)	
Residence				
Urban	35 (8.6%)	184 (45.4%)	186 (45.9%)	0.019*
Rural	0 (0.0%)	11 (31.4%)	24 (68.6%)	
Working status				
Working	15 (5.9%)	108 (42.2%)	133 (52.0%)	0.002*
Not working	6 (12.0%)	33 (66.0%)	11 (22.0%)	
Student	14 (10.4%)	54 (40.3%)	66 (49.3%)	
Educational level				
Illiterate	0 (0.0%)	3 (27.3%)	8 (72.7%)	0.126
Basic education	0 (0.0%)	5 (41.7%)	7 (58.3%)	
Secondary education	1 (3.6%)	8 (28.6%)	19 (67.9%)	
University and post-university	34 (8.7%)	179 (46.0%)	176 (45.2%)	
Marital status				
Married	27 (8.2%)	136 (41.1%)	168 (50.8%)	0.186
Single	8 (9.4%)	45 (52.9%)	32 (37.6%)	
Widowed	0 (0.0%)	6 (50.0%)	6 (50.0%)	
Divorced	0 (0.0%)	8 (66.7%)	4 (33.3%)	
Family income per month (Egyptian Pound)				
< 2000	1 (10.0%)	6 (60.0%)	3 (30.0%)	0.792
2000 - < 5000	4 (5.9%)	27 (39.7%)	37 (54.4%)	
5000 - < 8000	3 (5.7%)	26 (49.1%)	24 (45.3%)	
8000 - < 10000	5 (7.6%)	26 (39.4%)	35 (53.0%)	
≥ 10000	22 (9.1%)	110 (45.3%)	111 (45.7%)	

*Data were presented as number and percentages. *P-value < 0.05 is considered significant.*

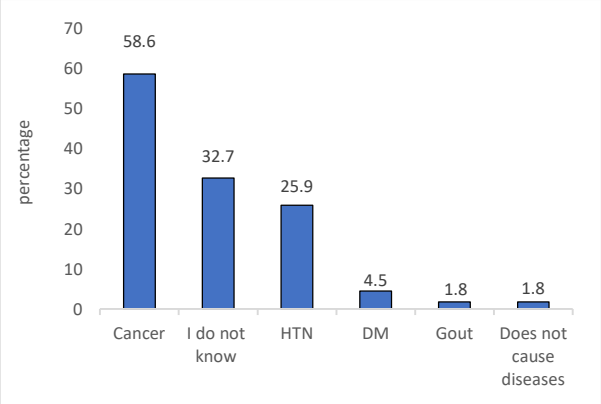

Figure 2. Participants' knowledge of diseases potentially associated with the consumption of repeatedly heated cooking oils

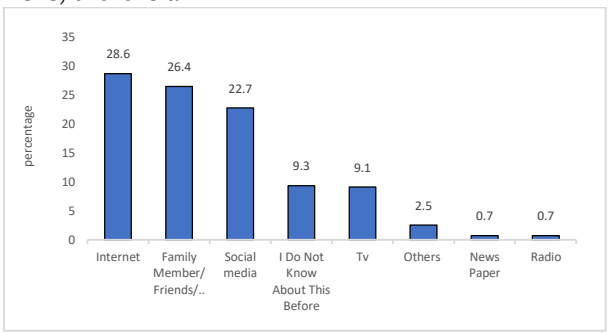

Figure 3. Primary sources of knowledge regarding using repeatedly heated cooking oils among the enrolled participants (n = 440)

apparent demand for expanded public health efforts in this area. Finally, the study underscores the need for better public practices regarding RHCO. Only 8% of health education campaigns. However, the effectiveness of these campaigns depends on the accuracy and accessibility of the information provided. Given that most participants expressed a need for more information about RHCO's health risks, there is an

participants were classified as good oil users, suggesting a need for education on proper oil handling and disposal methods. Given theassociations between practice scores and demographic factors such as age, gender, and employment status, public health strategies should consider these variables when designing interventions.

CONCLUSIONS

This study highlighted the gap between knowledge and practice regarding RHCO use. Despite widespread awareness of the health risks, many participants continue to reuse cooking oil for economic and practical reasons. Public health interventions should increase awareness of the importance of reducing RHCO usage, particularly among lower-income and less-educated populations while providing cost-effective alternatives. Further research should explore the impact of cultural and socioeconomic factors on RHCO reuse to tailor public health strategies to different communities better.

Ethical Considerations

Consent to participate was obtained from all participants. They were provided a detailed explanation of the study's objectives and the importance of completing the online form. Only individuals who explicitly consented were included in the study, while those who declined participation were excluded by submitting an empty form and selecting the option "Not willing to participate." The study obtained all required approvals from the Faculty of Medicine Research Ethics Committee at Suez University (Approval number: 152223).

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Conflict of Interest

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Author Contributions

Fatma M. Hassan: Idea, literature search, data collection and writing; Marwa R. Salem: literature search, data collection and writing; Mohamed N.S. Elgebely: literature search and data collection; Khaled A. Fouad: data collection. Yomna H.A. Abdel Halim: data collection; Mohamed M.M.K. Ahmed: data collection; Alaa H.E. Shaaban: data collection, statistical analysis and writing. All the authors approved the final version of the article to be published.

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