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Evaluating Food Safety Knowledge among Food Handlers in the Food Retail Sector in Egypt

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ABSTRACT

Background: Food safety is an international major concern in all food establishments, such as grocery stores. Food retailers provide a significant service to the public. Food safety-related procedures, and practices grocery stores are critical in protecting public health. The Egyptian retail food industry is expanding in size and popularity. In 2021, the Egyptian food retail sector recorded sales of $31.3 billion. The knowledge, attitude, and practices of food handlers are the most important factors in ensuring food safety. However, there is a scarcity of studies conducted to evaluate these factors in Egypt.

Aim: The current study aimed to evaluate the level of food safety knowledge of food handlers at food retail sector in Egypt.

Methodology: A cross-sectional study was conducted among 262 food handlers in food retail stores in Egypt. Food handlers were investigated using a self-administrated questionnaire that covered three major topics concerning food safety knowledge.

Results: A major part of food handlers 82.4% were men while women were 17.6%. About 64% of food handlers had adequate knowledge of food safety, almost one third of food handlers (36%) had poor knowledge scores, and the knowledge score was (69% and 49%) about cleaning and temperature control, respectively.

1. Introduction

Instances of institutional food-borne illness outbreaks continue to hit the headlines in Egypt, demonstrating the failure of food handlers to follow safe practices when handling food or preparing it in general. The general principles of food safety require that every business operator along the food chain to ensure that food safety is maintained. All food businesses must adhere to these requirements. One of the most significant industries that directly deal with the various types of food is the retail industry. As is common knowledge, the human element is the most effacing element in the food safety Issue.

Everyone depends on retailers in some way, as they are all around us and provide us with essential necessities such as food, clothing, furniture, and entertainment. The brands of retailers are unavoidable, and everyone must interact with them (E-amir, 2005). However, in the last two decades, food retailers have become an increasingly prominent part of the urban food landscape, particularly in developing countries where supermarkets now play a significant role in food supply chains. Previously, large supermarkets, chain restaurants, cafes, and hotels were seen as key components of food distribution systems (Onzere, 2012), but their role has expanded in developing nations (Reardon, 2008).

Understanding food safety is critical in ensuring food safety in supermarkets (Kuo & Hsiao, 2020). Not properly trained food handlers significantly increase the risk of food-borne illness (Neal et al., 2012). Therefore, food handlers must possess the necessary skills and knowledge to guarantee food safety (Sani & Siow, 2014). Knowledge of proper cleaning, cooling, and separation of food when handling and preparing it can prevent food-borne illness complications (Brar, 2016). Even though food handlers have the training and expertise necessary to handle food safely, the majority of food poisoning cases are traced to human handling errors (Sani & Siow, 2014). Educating food handlers to prevent food-borne illness is a crucial goal for both industry and government (McIntyre et al., 2013). Therefore, understanding food safety among food handlers is crucial for enhancing food safety and hygiene procedures (Luu et al., 2017). Strict adherence to proper information can enhance the handling and safety of food (Sani & Siow, 2014).

2. Literature Review

Food has been one of the most crucial goods traded or sold globally since the beginning of time. Food retailers (supermarkets and food stores) and consumers are exposed to the same changes through the years following the trends. As consumers around the world continue to change, so will food retailers (Stanton, 2018). In most countries, consumers' behaviors have changed as food preparation at home has decreased and eating at various food outlets has increased. Furthermore, the rising consumer power of purchase has resulted in expanding the food service industry, where consumers spend millions of dollars eating out of the home (Taha et al., 2020a). Besides, consumers' lifestyles changed, and they became more prone to spend than save. The departments of grocery stores are increasingly cooking and serving ready-to-eat (RTE) foods and complete meals. The increase in take-home meals and convenience foods underlines the value of safe food handling in retail grocery stores to prevent food-borne illness (Robertson et al., 2013).

The number of traditional family-run stores in the Egyptian food retail industry is slowly reducing as the number of independent modern supermarkets and hypermarkets increases, which imported $3.2 billion in consumer- orientated product lines in 2020. This represents a 3% increase over $3.1 billion in imports in 2019. Traditional grocery stores remain the majority of the Egyptian retail food sector; however, supermarket chains, convenience stores, and online retail channels are increasing in number and becoming more popular. The positive effects of the market and rapid growth, as a result, attracted international businesses to enter the Egyptian market. Due to the abundance of shopping centers, which are popular with tourists, foreign businesses could find ideal retail locations with no or little risk (Al-habbal & Akingbe, 2021).

According to a report by GAIN in 2010, the retail industry in Egypt has experienced the impact of recent demand and supply trends. These include changes in consumer preferences among middle to upper-class Egyptians who now view traditional stores as irrelevant, as well as changes in retailers' approaches to staffing, cleanliness, product selection, and service philosophy. There has been a shift from being product-driven to becoming more customer-focused. Furthermore, the increase in the number of employed women and their purchasing power has increased the number of retail stores in specific locations (Wahieb, 2016).

Food safety is a shared responsibility that involves food producers, distributors, manufacturers, retailers, and regulators (FDA, 2023). The COVID-19 pandemic has brought attention to the weaknesses in our food systems and social inequalities that cause severe food insecurity and continued increases hunger in the world. Food is a necessary component of daily life, and managing its preparation is crucial to guarantee the food you serve is healthy to consume. The general public's awareness of food safety issues has only increased due to high-profile food-related incidents like those involving Salmonella and E. coli (Who, 2021).

New domestic products that offer a variety of flavor experiences at affordable prices are in high demand from consumers. Additionally, during the pandemic, consumers became accustomed to home-cooked food and experimented more with their culinary creations, sparked a desire for a variety of flavors and cuisine styles (Euromonitor, 2021). The call for high standards and good sanitation practices and knowledge have increased in response to the growing number of food poisoning outbreaks. With more people consuming meals outside the home and a wider variety of pre-prepared meals, the European Commission has recognized the need to contain these outbreaks (Przyrembel, 2020). The responsibility of preventing food contamination at every stage of production and distribution falls mainly on the shoulders of food handling personnel. Food hygiene involves a set of fundamental guidelines that aim to systematically control environmental conditions throughout the food production process, from packaging and delivery to preparation, storage, and serving, to ensure the safety and preservation quality of the food (Ifeadike et al., 2014).

Poor personal hygiene or cross-contamination can make food handlers' hands serve as vectors for the spread of food-borne illnesses. Evidence suggests that most outbreaks are due to poor food-handling procedures. Food-borne illness places a heavy financial and health burden on nations around the world. According to a report developed by the Interagency Food Safety Analytics Collaboration (IFSAC), an estimated 9 million Americans get sick from food-borne illness each year, 56,000 are hospitalized, and 1,300 are passed away as a result of known bacteria. These estimations aid in our comprehension of the magnitude of the public health issue. However,

to create effective preventative procedures, we must comprehend the specific meals that are causing the issue (CDC, 2022) . The health, hygiene and use of recommended safe food handling practices by food handlers are the main causes of the high prevalence of food-borne illness in these settings (Angelo et al., 2017). Food-borne illness source attribution and provide timely estimates of the food sources of the four-priority food-borne pathogens: Salmonella, Escherichia coli O157, Listeria monocytogenes, and Campylobacter (CDC, 2022).

Risk factors for food-borne illness include poor personal hygiene, cross-contamination, inadequate time/temperature management, and contaminated food (Brar, 2016). Research has shown that knowledge of hand hygiene and adherence to it do not always coincide, highlighting the need for greater emphasis on its importance. However, awareness of the importance of personal hygiene and adherence to personal hygiene practices immediately coincide with each other (Moreb et al., 2017). Food service workers face considerable hurdles due to insufficient understanding and practical implementation of food safety expertise. Furthermore, food handlers often lack knowledge regarding food contamination by microorganisms or chemicals and the necessary corrective actions, leading to dangerous food practices, food safety violations, and food-borne illnesses (Brar, 2016).

Constant monitoring and encouragement by on-site managers can help food handlers with sufficient expertise modify their habits more efficiently, as knowledge alone is sometimes insufficient. Managers' oversight and mentoring of employees can promote attitudes and behaviors that lead to better food safety practices (Vo et al., 2015). In addition to knowledge, understanding how it can improve practices and behavior and other socio-demographic and work-related factors is essential for proper food handling (Bou-Mitri et al., 2018). In Turkey, food operators' knowledge of food safety was found to be lacking, with an overall score of 43.4% for food safety knowledge. Trained food handlers had a higher overall score than unskilled food handlers (Baş et al., 2006).

Food consumed at retail foodservice businesses, in the commercial and non-commercial industries, continues to be a major source of food-borne disease outbreaks. Food-borne illnesses in retail food service operations are thought to cost consumers $6 billion annually in medical expenses and lost productivity. In food service operations, the U.S. Food and Drug Administration (FDA) identified the following three factors as the main causes of food-borne illnesses: Insufficient personal hygiene, cross-contamination, and time/temperature control are the primary three factors (Paez & Ortiz, 2011). Furthermore, Neal et al. (2012) showed that training employees in proper food handling techniques are one of the most crucial measures retail food establishments (RFEs) can enact to reduce the risk of food-borne illness (Ahmed & Taneepanichskul, 2008).

In developing countries, the lack of access to clean water and healthy food, along with poor government structure, ineffective regulatory systems, and insufficient education and training for food handlers, contribute to poor food handling and hygiene practices. This situation is further worsened by community-wide infectious diseases and unfavorable environmental conditions (Tegegne & Phyo, 2017). On the other hand, developed countries experience a significant number of food-borne illnesses, with approximately 47.8 million cases annually, caused by 31 pathogens and other unknown agents transmitted through food, leading to 127,839 hospitalizations

and 3037 fatalities (Taha et al., 2020). Therefore, there is a need for increased efforts to improve food safety practices in both developing and developed nations.

According to a report from the World Health Organization (WHO) in 2015, food-borne diseases are a significant public health problem in Egypt, with an estimated 25% of the population suffering from food poisoning each year. The report also states that the most reported food-borne diseases in Egypt include salmonellosis, hepatitis A, and typhoid fever. Additionally, a study published in the Journal of Food Protection in 2018 analyzed the incidence and causes of food-borne illness in Egypt between 2011 and 2016. The study found that the most common causes of food-borne illness in Egypt during that period were bacteria (such as Salmonella and Escherichia coli), followed by viruses (such as Norovirus and Hepatitis A). It should be noted that these statistics may not be completely up-to-date or comprehensive, as food-borne illness are often underreported in many countries, including Egypt. However, they do provide some insight into the scope of the problem and the most common types of food-borne illness in Egypt. Thus, this study will focus specifically on the knowledge of food safety among food retailers in Egypt. As food safety is a critical issue for both public health and the retail industry, understanding how food retailers in Egypt approach food safety is essential for identifying areas where improvements can be made and for ensuring that consumers have access to safe and high-quality food products.

This study aimed to evaluate food safety knowledge related to food safety in food retail sector in Egypt. The World Health Organization (WHO) has created five measures to guarantee food safety, which are: (1) maintaining hygiene; (2) keeping raw and cooked foods separate; (3) cooking food thoroughly; (4) keeping food at suitable temperatures; and (5) using safe water and raw materials. Adhering to these five steps is crucial for preventing food-borne diseases (World Health Organization, 2020) . The current study considered these five keys as a pillar of the food safety knowledge that food handler should have.

3. Methodology

With the intention of achieving research goals the methodological approach, conceptual framework, study design and data collection methods of the research was adapted. A cross-sectional quantitative approach was adapted among 262 food handlers in top ten food retail stores in Egypt. To obtain findings self-reported questionnaire was used to evaluate food safety knowledge level.

The questionnaire aim was to evaluate food handlers' knowledge related to food safety in their workplaces at food retail stores in Egypt. Furthermore, the received food safety training status and personal demographic information such as age, years of experience and education level were collected. In order to gather empirical data, a questionnaire was developed using previous research from 2000 to 2020 as a basis (e.g., Zain & Naing, 2002, Fawzi. & E. Shama., 2009 Tan et al., 2013, Sani & Siow, 2014, Tegegne & Phyo, 2017, Bou-Mitri et al., 2018).

Knowledge information is what people know or how well they understand something. The first part of the survey was the personal demographic information of the respondent (e.g., gender, age, and education level). The second part was to ask about food safety received training. It consisted of two multiple-choice statements. The final part of the survey was to access food handlers' food safety knowledge. It consisted of 20 statements each one had four possible answers

that were given as multiple choice answers to complete each statement. Furthermore, the 20 statements covered the WHO's five keys for safer food. The first seven statements were to evaluate hand hygiene knowledge (e.g., hand washing and gloves use). The eighth statement was about the difference between cleaning and sanitizing. The following two statements were about cross-contamination and separation. The statements from 11 to 16 were to evaluate temperature control knowledge (cooking temperature, reheating, holding cooked food, thawing, and refreezing foods). The last four statements were about the use of safe water and raw materials, meat and fish displayed in food retail stores. Printed (hand delivery) and internet-mediated questionnaires were used to collect data.

4. Results and discussion

In the present study, 400 hard copies were printed and handed over to food handlers or their supervisors in the workplace; the returned questionnaires were 294 copies, with about a 74% response rate. Response to the online questionnaire was only 42 responses. The total number of valid questionnaires was (n=262). Data analysis software SPSS 22 (Statistical Package for Social Science) and Excel for Windows were used to analyze and summarize the results statistically.

As shown in Table 1, most of the study's respondents were males, 216 (82.4%), while females were 46 (17.6 %). Regarding age, food handlers ranged from 26 to 35, were the highest at 108 (41.2 %) while the lower rate was above 55 years 4 (1.5%). In addition, respondents who hold a university degree were the majority, 112 (42.7%) high school/ general secondary education 109 (41.6%) uneducated 28 (10.7 %) while only5%)) of them doing postgraduate Studies.

Table (1) Food Handlers' Demographic Profile.

Variables		**Total**	
		Frequency	Percentage %
Gender	**Female**	46	17.6
	Male	216	82.4
	Total	262	100
Age	<25	56	21.4
	26-35	108	41.2
	36-45	75	28.6
	46-55	19	7.3
	>55	4	1.5
	Total	262	100
Level of Education	Uneducated	28	10.7
	high school	109	41.6
	University Education	112	42.7
	Postgraduate Studies	13	5
	Total	262	100
Current job title	Quality Monitor	3	1.1
	Branch General Manager	6	2.3
	Supervisor	37	14.1

	Sales Coordinator	64	24.4
	Chef	137	52.2
	Casher	15	5.7
	Total	262	100
Variables		**Total**	
		Frequency	**Percentage %**
Years of experience in food handling	<1 year	34	13
	1-5 years	90	34.4
	6-10 years	69	26.3
	11-15 years	35	13.4
	>15 years	34	13
	Total	262	100

The overall score of food handlers' food safety knowledge was 64 %, which is considered as good/ acceptable level. These results agree with other studies such as in Iran Ansari-Lari et al., (2010), and in Egypt Bassyouni et al., (2012) who finds that 90% of food handlers have good knowledge about food safety. On the contrary, other studies find a poor level of food handlers' knowledge, such as; Zain & Naing, (2002) and NN et al., (2007) , who found that almost half of food handlers 48.4% had poor knowledge. Baş et al. (2006) also found that the total food safety knowledge score was 43.4 % , which is considered a poor level; also in Turkey Tokuç et al., (2009) mentioned that food service staff in Edirne hospitals have insufficient knowledge regarding the basics of food hygiene.

Table (2) Food Handlers' Food Safety Knowledge

Keys	**Question**	**Answers**	**F**	**%**
Keep clean	washing hands before handling food …… the risk of contamination	not reduce	6	2.3
		reduce	226	86.3
		may reduce	29	11.1
		I do not know	1	.4
	Using gloves during work …… the risk of food contamination	not reduce	6	2.3
		reduce	224	85.5
		may reduce	32	12.2
		I do not know	-	-
	Raw chicken can only be handled with ……	bare hands	10	3.8
		gloves	209	79.8
		no difference	38	14.5
		I do not know	5	1.9
	Of the following, the most necessary case for you to wash your hands with hot water, soap and dry them with paper towels is	when you have time	33	12.6
		only when your hands are dirty	75	28.6
		after using toilet	153	58.4
		I do not know	1	.4
	For washing hands, food handler should take:	10s	28	10.7
		15-30s	179	68.3

		1-2m	48	18.3
		I do not know	7	2.7

Keys	Question	Answers	F	%
Keep clean	Of the following the correct way of hand washing is	running cold water, wipe dry	10	3.8
		running warm water, wipe dry	24	9.2
		Wet hands with running warm water, use soap and then wash with running warm water, wipe dry	226	86.3
		I do not know	2	.8
	Bacteria are normally found more on	different surfaces	126	48.1
		human skin and hair	79	30.2
		raw food	45	17.2
		I do not know	12	4.6
	Cleaning and sanitizing are different in:	Cleaning kills bacteria and sanitizing removes bacteria	38	14.5
		Cleaning removes bacteria and sanitizer kills bacteria	184	70.2
		There is no difference	31	11.8
		I do not know	9	3.4
Separate Row & Cooked	of following what leads to cross-contamination	Touching food without gloves	56	21.4
		Mixing cooked food with raw	124	47.3
		using expiry foods	65	24.8
		I do not know	17	6.5
	You cut meat on a chopping board and now you want to cut fruit. Of the following, which is the correct way?	Rinse the chopping board with hot water before cutting fruit	28	10.7
		Use the other side of the chopping board to cut fruit	57	21.8

		Use another chopping board to cut fruit	174	66.4
		I do not know	3	1.1

Keys	Question	Answers	F	%
Cook Thoroughly	The minimum cooking temperature needed for killing the majority of microorganisms is:	45 C measured on the surface of the food	37	14.1
		70 C measured at the center of the food	136	51.9
		100 C measured on the surface of the food	68	26.0
		I do not know	21	8.0
	Improper reheating of food is likely to contribute to food contamination	Yes	153	58.4
		No	18	6.9
		Maybe	68	26.0
		I do not know	23	8.8
Safe Temperature	The period that food can be at room temperature after cooking it and still be safe is:	Maximum 2h before storing it in the refrigerator	88	33.6
		until the food cools in order to avoid damaging the refrigerator	133	50.8
		at least 4h before storing it in the refrigerator	27	10.3
		I do not know	14	5.3
	The correct temperature for refrigerator is ……	1C	11	4.2
		1-5C	180	68.7
		6-10C	41	15.6
		I do not know	30	11.5
	The suitable temperature for most bacteria is	60C	58	22.1
		10-20C	64	24.4
		25-37C	89	34.0
		I do not know	51	19.5
	Thawing and refreezing frozen food causes of food poisoning	Yes	155	59.2
		No	21	8.0
		Maybe	77	29.4
		I do not know	9	3.4

Handwashing is a simple and effective way to reduce food contamination (Lues & Van Tonder, 2007). Approximately 86 % of food handlers know the rights answer to this question, “reduce”, while 11 % of them were not sure about the role of hand washing in reducing the risk of

contamination. 85.5% of food handlers know the correct answer that Using gloves during work reduce the risk of food contamination. Food handlers when asked about the safest way of handling raw chicken, most of them 79.8 % knew that "gloves" was the correct answer, while 3.8 % chose "bare hands" to handle raw chicken, 14.5% thought that there was "no difference" between gloves and bare hands. When asked about the sufficient time that a food handler should take to wash his/her hands, most respondents 68.3 % were "15-30s", "1-2m" 18.3 %, those who chose "10s" were 10.7 % of respondents.

This result agree with other similar studies, such as Green, (2008), who stated that 65.9% of employees who handle food wear gloves when appropriate and 95.1% of food business operators stated correctly that the same gloves could not be used to unpack raw vegetables and then to slice cold meat. Almost all food handlers were aware of the critical role of general sanitary measures in the workplace, such as washing hands, using gloves, caps and aprons and proper cleaning of the instruments (97.9%) correct answers for all questions (Ansari-Lari et al., 2010). Most respondents (93.3%) mentioned that they usually wash their hands with hot water and soap and dry them with paper towels when they change activities or use the toilet (Garayoa et al., 2011). Overall, food handlers have good knowledge of personal hygiene where (93.9%) answered correctly (Nee & Sani, 2011). Almost all of the food workers were aware of the critical role of general sanitary practices in the workplace, such as hand washing (97.6), using gloves (89.2%) and proper cleaning of the instruments (75.3%), while only (44%) of them agreed to wash utensils with detergent leaves them free of contamination,(54.8%) disagreed (Soares et al., 2012). More than 90% of the respondents answered the questions regarding cleaning agents and sanitization procedures, washing hands, and the use of proper clothing correctly (Abdul-Mutalib et al., 2012). Different studies reported varying results regarding food safety knowledge and practices among food handlers. For instance, Worsfold (2001) who found a lack of awareness of the importance of cleaning and disinfecting hand contact surfaces in Australia, with 13.9% of operators incorrectly stating that food handlers can directly touch ham with bare hands or not knowing. In Turkey, Baş et al. (2006) reported that food handlers' knowledge of personal hygiene was only 31.8%. Similarly, Kibret and Abera (2012) found that only 21.3% of establishments studied had good sanitary conditions. In Ireland, Moreb et al. (2017) reported that only 46.3% of participants knew to wash their hands with soap and warm water and then wipe them dry after handling raw meat, and the lowest knowledge was related to whether it is safe to handle food if gloves are worn.

Nearly half 47.3 % of food handlers stated that "Mixing cooked food with raw" could be led to cross-contamination, while 24.8 % chose "Using expiry foods" as a cause, "Touching food without gloves" 21.4 %. 66.4 % of food handlers correctly stated that "Use another chopping board to cut fruit" is the right action after cutting meat, whereas 21.8 % prefer to "Use the other side of the chopping board to cut fruit", 11.8 % "Rinse the chopping board with hot water before cutting fruit" or do not know.

Regarding cooking temperature knowledge, nearly half 51.9% correctly stated that "70C measured at the center of the food", 26 %, 14.1, stated "45C measured on the surface of the food", "100C measured on the surface of the food" respectively. About 58.4 % of the food respondents knew the risk related to improper reheating, while 26 % were unsure "maybe" and 15.7 % incorrectly answered this or did not know. Almost half 50.8 % of food handlers wrongly stated that cooked food can stay safe "until the food cools in order to avoid damaging the refrigerator";

only 33.7 % knew the correct answer "Maximum 2h before storing it in the refrigerator" 10.3% and 5.3% stated that food could still safe "at least 4h before storing it in the refrigerator" or "did not know respectively. Only 34.0% of food handlers knew that bacteria are growth rapidly at body temperature "25-37C", 24.4% thought that "10-20C" was the correct answer also22.1 % stated that "60C" is the most suitable temperature for most bacteria to growth, while 19.5 % did not know.

Similarly, in In Turkey, food handlers knowledge score of cross-contamination was (53.4) (Baş et al., 2006). While in Iran Most (99.1%) of the respondents knew that raw foods should be kept separate from cooked foods (Askarian et al., 2004). In Australia 88.0% of operators stated that the same equipment cannot be used to prepare raw meat and raw vegetables that are going to be cooked together while 11.2% of operators stated that the same equipment can be used to prepare raw meat and raw vegetables that are going to be cooked together (which is the most appropriate answer and can indicate a strong food safety knowledge base), " (Green, 2008). The majority of respondents (95%) knew that raw and cooked food should be separated (Faour-Klingbeil et al., 2015). Good percentage of the employees answered correctly about cross-contamination (63.4%) (Al-Shabib et al., 2016). A very low percentage of respondents would keep vegetable salads on the wrong shelf in the refrigerator and would keep vegetable salads on the lower shelf when raw meat or chicken present in the middle shelf (Taha et al., 2020b).

On the other hand other studies has different results such as, in Australia also 10.7% of operators stated that raw vegetables can be stored above uncovered cooked food (which is the incorrect answer), or did not know (Green, 2008) .Only (44.6%) of the respondents knew the answer for questions about cross-contamination (Sani & Siow, 2014). More than half of the respondents failed to recognize that disease causing microorganisms could get into food through working surfaces and cooking utensils (Kunadu et al., 2016). About half of the respondents (52.5%) knew the correct procedures of cleaning and sanitizing food contact surfaces by washing it with soap and water then use disinfectant. However, 5.3, 21.4, and 45.4% of respondents believed that cleaning contaminated food contact surfaces with strong disinfectant, wipe it with disinfectant then rinse with water and dry it, and remove food leftover with a piece of cloth, then wipe it with disinfectant, are effective ways to eliminate contamination, respectively (Taha et al., 2020b).

Almost all 71.8 % of the respondents were aware that "boiling water" reduces the risk of disease, while 19.8 % thought that turning water into ice is the correct answer. About 71 % of the food handlers knew the correct way of displaying raw frozen meat in "freezers". 22.5 %, 3.4 % chose "chillers" and "room temperature" respectively which are wrong answers, 2.7 % did not know the answers. About 85.9 % of food handlers knew that fresh fish should be displayed in "ice", meanwhile, 14 % of the choses wrong answers or did not know. 74 % of food handlers agreed not to use milk after one day of its expiration date, while 17.2 % "should taste it first" before using it, 5.7% disagree that using milk one day after its due date poses risks to health and 3.1% did not know.

A study conducted by Fawzi and E. Shama Mona (2009) in Egypt revealed that a significant proportion of respondents (77.4%) were aware that raw food of animal origin should be kept in chillers, frozen food should be kept in freezers (68.5%), fresh fish should be kept in ice (72.6%),

and that grossly unspoiled food can cause food poisoning (62.2%). In another study by Garayoa et al. (2011), almost all food handlers were found to know the correct answer to the question of "what must be taken into account when preparing vegetables that will be eaten raw?" (98.1%), which is to disinfect them by adding an appropriate amount of bleach to the water. The majority of respondents (66.1%) knew that the correct way to wash vegetables and fruits is to wash them with running cold water, according to Moreb et al. (2017). In a study by Luo et al. (2019), the correct response rates for the question "what does shelf life mean for prepackaged foods?" were 11.2%, 25.0%, and 29.8% among nursing, education, and medical students, respectively.

5. Conclusions

Food safety is a critical issue in Egypt and the whole world. Yet knowledge regarding food safety in food retail sector is not known and the current study aimed to evaluate this level. A cross-sectional quantities approach was made to achieve this target using a self-administrated questionnaire. The total number of food handlers' responds were 262 (n=262). The questionnaire covered the five keys of safer food training program of the WHO. The statistical analysis finds that the overall score of food safety knowledge is 64% which is good but not very high. Approximately 86 % of food handlers knows that washing hands before handling food reduce the risk of contamination, while only 58% knows that the most necessary case to wash hands with hot water, soap and dry them with paper towels is after using toilet.

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