

Food Safety Knowledge and Practices of Catering Employees at Some Public Restaurants in Alexandria

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Received: 18 November, 2018

Revised: 16 December, 2018

Accepted: 23 December, 2018

ABSTRACT

The primary focus of the present study is to figure out the reflection of “knowledge, practices of food personnel” on the hygienic quality of some public restaurants’ products through conducting a microbiological assessment of ready to eat food products as an evidence of the hygienic quality in our restaurant segments. The present study encompassed (100) persons responsible for food handling in some traditional fast food restaurant located in Alexandria, Egypt. Questionnaire tool was used to evaluate the food workers (n = 100) knowledge and practices in respect to safe food procedures, whilst the food samples (n = 70) were examined for the overall microbial counting. The analysis of employee’s knowledge and practices revealed that the overall food safety knowledge level was low (mean score = $45.2 \pm 2.3\%$) and moderate level of food safety practices (mean score = $49.6 \pm 2.4\%$). It is noteworthy that the low knowledge level and moderate level of practices were mirrored in the microbial analysis of ready to eat food products, in which (n = 70) the examined food products had a total aerobic bacteria count ranged from 2.04 ± 0.09 log CFU/g to 4.26 ± 0.35 log CFU/g. The total coliforms bacteria count ranged from 0.66 ± 0.16 log CFU /g to 3.43 ± 0.23 log CFU /g. It was observed that ready to eat green salad has the highest bacteria count. The Salmonella count was detected in all samples except burger chicken and French fries. No total staphylococcus count from any of the food samples except green salads and burger meat.

Key words: food safety, knowledge, practices, food handler, microbial analysis, ready to eat food.

INTRODUCTION

Egypt is the first country in the Arab world in terms of food consumption, due to the increase growing of its population. As a result of the current economic changes in terms of inflation of the Egyptian currency and the increase in fuel prices, eating out has become very expensive, a large number of restaurants depended on the local products and offer authentic Egyptian cuisine (Fathy, 2017). Nielsen’s report (2018) revealed that, almost a quarter of Egyptian consumers use restaurants or meal delivery services.

Foodborne diseases are a highly public health concern and the main cause of global morbidity and mortality (WHO, 2015). According to the CDC, (2010) the definition of food-related illness outbreak is the incidence of two or more of analogous diseases as a result of consumption of a common type of food. As stated by Pal (2017), the number of people who enter hospitals or die due to food-related illness increases annually. As mentioned by

the world health organization review, nearly two million of deathly cases annually due to poisoning of food globally, particularly in undeveloped countries (WHO, 2016). Food borne illness includes a wide spectrum of illnesses due to the consumption of either polluted food with microorganisms /chemicals nor infectious or toxic food in nature (WHO, 2015, Ameme *et al.*, 2016).

The main causes of food born diseases (FBDs) are pathogenic microorganisms, including bacteria, viruses, parasites, fungi and prions (WHO, 2015 & 2016). The utmost common diseases in Egypt are schistosomiasis, diarrhea, hepatitis A and typhoid, through eating or drinking polluted food and water (Central Intelligent Agency, 2017).

The Second International Conference on Nutrition (ICN2, 2014), assured on the significance of food safety in fulfill better human health. Enhancing food safety is crucial in achieving sustainable development goals (WHO, 2014). Michaels *et al.* (2004) focused on food personnel role on keeping food safe and preventing food poisoning. They reported that

the transmission of the gastrointestinal infectious disease's agents is due to non-hygienic practices of food workers (Michael *et al.*, 2004). The most common poor food-related practices include contaminated raw food, insufficient cooking time or temperature, unsafe food sources, unsuitable cooling food temperature (Medeiros *et al.*, 2001).

All the aforementioned researches stressed on the importance of food handlers training to enhance their knowledge of food safety procedures and self-hygiene (Osaili *et al.*, 2013). The outbreak of food-related diseases is linked to unprofessional behaviour of food personnel although they acquiring the information and skills needed to maintain the safety of food (Angelillo *et al.*, 2000).

The CDC (2010) assured that, the professional competence of personnel, the implementation of the safety food programs and knowing food safety procedures is crucial in preventing food borne illness. The ethical responsibility of food service industry is to prevent food borne illness from happening (Cushman *et al.*, 2001). Arendt & Sneed (2008) found that managers surveillance is essential to ensure food employees adhere to safe food procedures and self-hygiene. The dominant factors of safe food are the information and knowledge and the competence of personnel (Ansari-Lari *et al.*, 2010). The explicit aims of the study were:

- 1- To recognize misconceptions in hygienic food information and practices in some public restaurants.
- 2- To assess the microbiological status of the most consuming meals in some popular restaurants in Alexandria city.

MATERIALS AND METHODS

The research had been conducted from July 2018 to September 2018, in ten public restaurants which are famous for preparing the most convenient, popular Egyptian sandwiches. These restaurants prepare fast sandwiches using the "cook, serve" technique, in which, sandwiches cooked daily in the restaurant, held on the room temperature and served to customers. The sandwiches were purchased in the form of ready to eat and packed in a plastic bag.

Subject's selection and recruitments

The introduced study comprises all the personnel who work in the restaurants' segment. There are 10 restaurants in Somuha district. The objectives and the action plan of the study have been de-

clared to the person in charge. Participants (100) had been chosen in a random way.

Data collection tool

The questionnaire was in Arabic dialect structured of 40 clauses, the demographic characteristics (5 clauses), knowledge of food safety (25 clauses), behaviour (22 clauses), self-practices (10 clauses), and safety training (4 clauses). The knowledge criteria were: individual hygiene, cross infection, sanitation, factors influence food safety and the indication of food-related diseases. The score that have been given for each question was (3) for the correct answer, (2) for I'm not sure and (1) for the false answer.

Food sampling and microbial assessment

The hygienic-based protocol of this research concentrated on ready to eat food. The samples of food were 70 (7 from each restaurant). The samples were in a plastic bag. They were collected and transported in an icebox to the laboratory within two h to be analyzed. The samples were meat burger, chicken burger, falafel, fowl, Egyptian Scrambled egg, French fries and green salads. Food samples were collected directly from restaurants. Ten from each sample suspension (10% w/v) was made using peptone water and 10-fold serial dilutions were made with peptone water (Xie *et al.*, 2011). Nutrient agar was used for total aerobes while violet red bile agar medium was used for coliform bacteria (Eaton *et al.*, 1998). Salmonella and Shigella (SS), agar and mannitol salt agar were used for *Salmonella* sp. and *Staphylococcus aureus* (Wehr & Frank, 2004, Knowles *et al.*, 2005) respectively. All plates were incubated at 37°C for 48 h in incubator. The expression of the quantities of colony forming units (CFU) are \log_{10} CFU per g.

Statistical analysis

All data were treated by using IBM SPSS software. Independent T- test was performed to inspect the presence of considerable differences about practices and knowledge of the employees towards food hygiene practices and knowledge. The results were viewed as statistically significant at $P < 0.05$.

RESULTS AND DISCUSSION

Demographic characteristics

Eating away from home becoming an upcom-

ing behaviour in our Arab societies in general and in Egypt in particular. The responsibility of food personnel is preparing food and serving it, therefore, their practices are critical in banning the spread up of the food-related infection (Sagoo *et al.*, 2003). for this reason, this research endeavoured to investigate the knowledge and practices of food personnel in regard to food safety and microbiological quality of some traditional Egyptian fast food restaurants. A questionnaire is an approach to the checking of some necessary information and practices such as the procedures of storage, accepting or declining food supplies, preventing contamination of food and self- hygiene.

The participants' demographic characteristics have been shown in Table (1). Percentages of male and female respondents were 92% and 8%, respectively. Approximately 82% of the respondents were from 30 - 40 years old and 20% were between 20-29 years old. About two third of the participants' experience (62%) were more than 5 years. The highest number of employees (68%) were specialized according to their education background. Most of the respondents (91 %) worked in the kitchen and in direct contact with food.

Table 1: Demographic characteristics of participants

Characteristics (n=100)	%	Median (Min. – Max.)	Mean ± SD.
Age (years)			
> 30	82%	27 (20 – 36)	27.3 ±4
< 30	18%		
Education statuses			
Specialize	68%		
Not specialized	32%		
Experience (years)			
> 5	62%	5 (1 – 8)	4.7 ± 1.6
< 5	38%		
Sex			
Male	92%		
Female	8%		
Occupation			
Processing in the kitchen	64%		
Serving meals& food handler	10%		
Hygiene responsible	11%		
Supervision of the kitchen	6%		
Supervision of the restaurants	9%		

Personnel knowledge of food safety practices

The results of the study revealed that the food personnel knowledge regarding food safety was below than average (mean = $45.2 \pm 2.3\%$), and the personnel practices were moderate regarding self- hygiene, food preparation, and cross-contamination prevention and sanitation (mean = $49.6 \pm 2.4\%$) (Table 2).

Table 2: Descriptive analysis of overall knowledge and practice (n = 100)

	Total Score	
	Median (Min. – Max.)	Mean ± SD.
Knowledge	46 (40 – 49)	45.2 ± 2.3
Practice	50 (42 – 53)	49.6 ± 2.4

At 95% confidence level, t test revealed a significant difference with the good food safety practices ($t = 0.952, 0.37$) and knowledge in 30 years old and older food personnel, those who have food science background ($t = -1.969, -1.23$), also with those who have five years' experience and more ($t = 1.507, 0.561$) and finally there was a significant difference between male food safety practices and knowledge ($t = -0.98, -3.6$) than females, respectively.

In general, the food handlers' knowledge levels were low, they demonstrated poor knowledge of food safety ($M= 45.2\pm 2.3\%$) regarding accept or decline canned food, storage food supplies, defrost food, causes of food contamination, deal with raw food, appropriate temperature to storage raw food. This finding is upheld by Italo *et al.* (2000), who observed a lower knowledge degree of their food handler sample. Another study on the factors that affect the knowledge and skills of employees found that there is a strong bond between education level and food safety training and the susceptibility of contamination of food (Saad *et al.*, 2013 & Pichler *et al.*, 2014). Nevertheless, ours did not mirror such a scenario. Although (68%) of the samples have food science background according to their education degrees. Their knowledge was poor and their safety practices were moderate.

Another aspect to put in consideration, the work experience had a significant and notable influence on the knowledge and competence of our participants regarding food safety (Table 3). Saad *et al.* (2013) also indicated the same observation. One of the highly important practices to prevent cross contamination and consequently decreases the foodborne illness incidences is the correct procedures of hand washing during handling food in any stage of food preparation. The present study revealed that 89 % of the sample were fully aware with the correct hand wash and drying procedures. Our finding was in agreement with Harrison *et al.*,

(2003). They assured on the importance of personal hygiene in reducing the transfer of pathogens from food handler to food.

Food safety training

Based upon the output for a paired t-test, with 95% confident, there were a significant differences of the good food safety knowledge and practices ($t = 0.305, 0.305$) of food personnel who were trained periodically, those who their workplace policy is announcing training topics to be chosen by the employees according to their needs ($t = 2.05, 0.126$), those who were trained in an ideal way ($t = 1.287, 5.11$), and those whose their workplace policy is to train everyone ($t = 1.81, 2.2$) respectively.

In the context of training, our findings proposed the importance of training on acquiring positive food safety knowledge, attitude and practices, offering training on periodical bases, using multiple techniques and strategies, using theoretical and practical methods and the provision of training for all employees whether they newcomers, experienced and even casual or temporary. This finding is further supported by Cunha *et al.* (2014). They revealed that effective training must encompass various techniques, to enhance the skills of food personnel. This finding also propped by Nieto-Montenegro *et al.* (2008), also Sufen *et al.* (2015) reported that training should be tailored to fit for both managers and subordinates.

Table 3: the overall % score of knowledge and practice and demographic characteristics (n = 100)

Overall % score	Practice		Knowledge	
	Mean \pm SD.	t (p)	Mean \pm SD.	t (p)
Age (years)				
≤ 30	83.2 \pm 9.6	0.952	80.4 \pm 9.7	0.371
> 30	85.4 \pm 5.5	(0.344)	81.3 \pm 7	(0.712)
Education statuses				
Specialized	82.4 \pm 9.9	- 1.969	79.8 \pm 9.7	- 1.230
Not specialized	86.1 \pm 6.3	(0.052)	82.3 \pm 8.1	(0.222)
Experience (years)				
≤ 5	82.5 \pm 9.9	1.507	80.2 \pm 10	0.561
> 5	85.3 \pm 7.2	(0.135)	81.3 \pm 7.9	(0.576)
Sex				
Male	83.5 \pm 9.4	- 0.983	80.2 \pm 9.5	- 3.692*
Female	84.7 \pm 2.4	(0.332)	85.5 \pm 3	(0.001*)

t: Student t-test p: p value for comparing between the different categories *: Significant at $P \leq 0.05$

Table 4: The overall total score knowledge and practice with training (n = 100)

Overall % score	Knowledge Mean ± SD	t (p)	Practices Mean± SD	t (p)
Training date				
Periodical manner	83.9 ± 3.5	0.305	85.6 ± 3.1	5.203*
Other	83.4 ± 10.4	(0.761)	78.7 ± 10.1	(<0.001*)
Training topics				
By announcement	87.7 ± 4.6	2.050*	80.8 ± 3.6	0.126
Other	82.8 ± 9.5	(0.043*)	80.6 ± 10	(0.900)
Training methods				
Ideal	85.2 ± 3.5	1.287	86.3 ± 2.7	5.106*
Other	83.3 ± 9.5	(0.206)	79.8 ± 9.5	(<0.001*)
Training segment				
All Employees	87.6 ± 6.3	1.812	85.4 ± 8.4	2.150*
Other	82.9 ± 9.3	(0.073)	79.8 ± 9.2	(0.034*)

t: Student t-test

p: p value for comparing between the different categories

*: Statistically significant at $P \leq 0.05$ **Microbial Assessment**

Seventy food samples of ready to eat food (green salads, chicken burger, meat burger, scrambled eggs, French fries, fowl and falafel) were analyzed microbiologically for total count bacteria and pathogenic bacteria. The total aerobic bacteria count ranged from 2.04 ± 0.09 log CFU/g to 4.26 ± 0.35 log CFU /g (Table 5). The coliform bacteria count ranged from 0.66 ± 0.16 log CFU /gram to 3.43 ± 0.23 log CFU /g (Table 5). It was observed that the highest bacterial count was in the green salads. The *Salmonella* count was detected in all samples except chicken burger and French fries (Table 5). All samples were free from staphylococcus except salads and meat burger.

The main point of conducting this research is to assess food personnel competence and skills through a microbial examination for some samples of food. The outcomes of our study were disappointed as some food samples had pathogenic counts exceed the benchmarks (Table 5). All food sample had *Salmonella* except chicken burger and French fries, while total staphylococcus count was found in salads and burger meat. Our results are in concurrence with Vecdet *et al.* (2014) who discovered an unacceptable level of microbes in their food samples. Another study by Peter & Kaazeem, (2016) revealed the presence of coliform bacteria within unacceptable microbiological limits which revealed the susceptibility of food infection. The presence of coliform bacteria is a strong evidence on the poor hygiene status or unqualified food personnel or both.

Table 5 Microbiology analysis of food samples

Food Samples	Total aerobes	Coliforms	<i>Salmonella sp.</i>	<i>Staphylococcus aureus</i>
Green salad	4.26 ± 0.35^a	3.43 ± 0.23^a	3.34 ± 0.47^a	2.1 ± 0.20^a
Chicken burger	2.04 ± 0.09^d	1.65 ± 0.10^c	ND	ND
Meat burger	2.77 ± 0.20^{bc}	3.22 ± 0.40^{ab}	1.51 ± 0.26^b	1.32 ± 0.22^b
Scrambled eggs	2.14 ± 0.14^d	2.8 ± 0.21^b	1.29 ± 0.07^b	ND
French fries	2.51 ± 0.3^c	1.82 ± 0.17^c	ND	ND
Fowl	2.40 ± 0.21^c	0.77 ± 0.12^d	1.1 ± 0.09^b	ND
Falafel	3.16 ± 0.12^b	0.66 ± 0.16^d	1.25 ± 0.12^b	ND

abcd Means in the same column followed by different superscript letters are significantly different ($P \leq 0.05$). (log CFU/g)

These findings raise many health apprehensions, as acquiring knowledge is important but the utilization of this knowledge into good practice is even more importance (Hui *et al.*, 2017). likewise, the results assured that the modest food safety practice by restaurant personnel samples were mirrored in the presence of bacteria in the food sample.

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معارف وممارسات العاملين ببعض المطاعم الشعبية بالإسكندرية عن سلامة الغذاء

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المحور الأساسي للدراسة الحالية هو اكتشاف مدى انعكاس «المعرفة والممارسات للعاملين في مجال الأغذية» على الجودة الصحية لبعض منتجات المطاعم التقليدية من خلال إجراء تقييم ميكروبيولوجي للمنتجات الغذائية الجاهزة للأكل كدليل على الجودة الصحية في المطاعم. شملت الدراسة الحالية (١٠٠) شخص مسؤول عن إعداد الطعام في بعض مطاعم الوجبات السريعة التقليدية في الإسكندرية. استخدمت أداة الاستبيان لتقييم معارف وممارسات العاملين في مجال الأغذية (عدد = ١٠٠) فيما يتعلق بإجراءات سلامة الأغذية؛ في حين تم فحص عينات الطعام (عدد = ٧٠) للعد الكلي الميكروبي. كشف تحليل معارف وممارسات العامل أن المستوى العام لمعارف السلامة الغذائية كان منخفضاً (المتوسط الحسابي = $٤٥,٢ \pm ٢,٣$ ٪) وكان مستوى ممارسات العاملين لإجراءات سلامة الأغذية متوسط (المتوسط الحسابي = $٤٩,٦ \pm ٢,٤$ ٪). من الجدير بالذكر أن انخفاض مستوى المعرفة والمستوى المعتدل للممارسات قد انعكس في التحليل الميكروبي للمنتجات الجاهزة للأكل، حيث (ن = ٧٠) تراوح العدد الكلي للميكروبات الهوائية للمنتجات الغذائية التي تم فحصها من ($٢,٠٤ \pm ٠,٠٩$ إلى $٤,٢٦ \pm ٠,٣٥$ لوغاريتم / مستعمرة / جرام). وتراوح العدد الكلي للبكتريا القولونية في الوجبات الجاهزة للأكل من ($٠,١٦ \pm ٠,٦٦$ إلى $٠,٢٣ \pm ٣,٤٣$ لوغاريتم / مستعمرة / جرام). وقد لوحظ أن السلطة الخضراء كانت الأعلى من حيث المحتوى الميكروبي بين جميع الوجبات. كذلك وجدت السالمونيلا في جميع الوجبات عدا برجر الدجاج والبطاطس المقلية. ولم يكن هناك عدد كلي من المكورات العنقودية في أي من عينات المنتجات باستثناء السلطة الخضراء وبرجر اللحم.