

The Application of HACCP Control Program in Shawerma Restaurants in Jordan

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Abstract: This study investigated whether Shawerma Restaurants in Jordan apply HACCP control Program. A questionnaire of 37 questions was prepared and 250 copies were distributed to different Shawerma restaurants. The questionnaires were directed to the managers of these restaurants. Chi-square test and t-test were used to analyze the responses of 218 managers. The results indicated a statistically significant commitment of Jordanian Shawerma restaurants to most of the HACCP principles. Overall, Shawerma restaurants were found to have qualified fridges, efficient heat treatment, adequate cleaning & sterilization of preparing & serving stuff, observance of hygiene levels and good handling of raw & cooked food. However, some rules were violated regarding the isolation of Shawerma spit from external environment and the period it takes to prepare Shawerma. The study recommended governments in Jordan to ensure the application of strict food safety rules in food restaurants.

Key words: HACCP Control Program • Shawerma Restaurants • Questionnaire • Statistical Analysis • Jordan

INTRODUCTION

Shawerma is a traditional Arab food that represents meat like lamb, chicken, turkey, beef, veal, or mixed meats grilled on a spit and cut off into small pieces for serving in a sandwich with some vegetables and mayonnaise mostly [1]. It is considered as one of the well known fast food like Falafel, burger and pizza [2]. Ready to eat food has been implicated in cases of food poisoning or gastroenteritis in human beings [3]. The safety of this dish should be confirmed during the stages of supplying its raw products, storage of them, its preparation and serving. In Jordan, many poisoning cases happened and the government closed around 600 Shawerma restaurants in 2007. Recently, in 2015 a Shawerma restaurant was closed in Maadaba because of poisoning of 25 cases [4]. Food safety has become a common concern worldwide, making public health agencies and governments in several countries look for more efficient ways to monitor production chains [5]. The hazard analysis and critical control points (HACCP) system is widely recognized as a management tool capable of ensuring food safety. The keyword of the system is “prevention” [6], by means of the identification of possible contaminations before they occur and of the definition of control measures to maximize food safety in every step of the process [7, 8]. Compared with traditional methods of inspection and

quality control based on the analysis of finished products, HACCP facilitates a stricter control of contaminations [9, 10]. HACCP provides a framework for establishments to conduct science-based process controls that can be validated as effective in eliminating, preventing, or reducing to an acceptable level of the food safety hazards that are reasonably likely to occur in an official establishment’s particular production processes. Under the HACCP regulatory system, establishments assume full responsibility for producing products that are safe for consumers. The National Advisory Committee on Microbiological Criteria for Food (NACMCF) working group created guidelines and redefined the seven basic principles of HACCP as an effective and rational means of assuring food safety from harvest to consumption. The seven principles of HACCP, which encompass a systematic approach to the identification, prevention and control of food safety hazards, include [11, 12],

- Conduct a Hazard Analysis
- Determine Critical Control Points
- Establish Critical Limits
- Establish Monitoring Procedures
- Establish Corrective Actions
- Establish Recordkeeping and Documentation Procedures
- Establish Verification Procedures

HACCP can be applied throughout the food chain from primary production to final consumption and its implementation should be guided by scientific evidence of risks to human health. For all types of food business, management awareness and commitment is necessary for implementation of an effective HACCP system. The effectiveness will also rely upon management and employees having the appropriate HACCP knowledge and skills [13]. This study investigated whether Jordanian Showerma restaurants applies the HACCP principles.

[14] studied the molecular level of different strains of *Salmonella spp.* and *Escherichia coli* that were isolated from Showerma and another meat-based fast food called "Lahm-bi-Ajeenin" in Lebanon. The results showed that the tested foods were contaminated with *Salmonella paratyphi* (serogroup A) and *ShigaToxin* (Stx)-producing *E. coli* (STX-EC). [15] examined the quality and safety of liver and kofta sandwiches in Egypt. They found, based on the microbiological Guidelines for Ready-to-eat Food by Centre for Food Safety, the level of contaminations was within acceptable microbiological limits for 80% of liver sandwiches; while approximately half of kofta sandwiches were of unsatisfactory microbiological quality due to high bacteria counts. The presence of *E. coli* in some ready-to-eat food samples indicated that street foods are highly unsafe and unfit for human consumption. [16] examined the bacterial contamination of fifty random samples of Showerma Sandwiches were collected from different fast food restaurants in Misurata City, Libya. The results of this investigation indicated that some of the ready to eat food samples collected from different fast food restaurants in Misurata were of poor sanitary quality and may pose a considerable risk to human health.

[17] aimed to determine the effect of application of the hazard analysis and critical control point (HACCP) system on the quality of fresh meat slaughtered in Egyptian abattoirs especially on counts and incidence of some indicator microorganisms and isolation of pathogenic ones. They examined 200 meat samples for the color, odor and consistency before and after application of the HACCP system. The study concluded that the application of HACCP system in slaughter houses under Egyptian conditions improved the meat quality through improving the sensory characters of the meat as color, consistency and odor as well as decreasing the number of samples showing bacterial contamination that was indicated by decreasing the levels of Total Bacterial Counts, *E. coli* counts and Staphylococcal counts. Moreover, it was noticed that the previously mentioned bacterial counts were found to be matched with Egyptian standards of beef meat after application of HACCP. Therefore, this study was mainly aimed to investigate the application of HACCP principals in Showerma restaurants in Jordan.

MATERIALS AND METHODS

Data and Methodology: To achieve the study goals a questionnaire was prepared and 250 copies were distributed to the managers of Showerma restaurants in Irbid, a northern city in Jordan. We got back the answers of 218 respondents with a response rate of 87.2%. Table 1 shows the questionnaire of the study. It consists of four parts with a total of 37 questions. Part 1 asks whether HACCP principles are applied in supplying of raw products of Showerma. Part 2 asks about the storage

Table 1: The questionnaire of the study.

Do Showerma Restaurants in Jordan apply HACCP control Program?

This questionnaire is designed to investigate whether Jordanian Showerma restaurants apply the HACCP principles in the different stages of supplying, storage, preparation and serving of Showerma. Information collected from each questionnaire will be used for academic purposes only and the responses will be treated with utmost confidentiality.

Please circle your answer

Part One: The Supplying Process

1. Do you ensure that the room temperature of the supplying vehicle ranges from (2-6°C)?
Yes No
 2. Do you ensure that the temperature of the fresh meat supplied is less than 4°C?
Yes No
 3. Do you ensure that the temperature of the frozen meat supplied is less than -18°C?
Yes No
 4. Do you ensure that the transportation license of the supplying vehicle is valid?
Yes No
 5. Do you ensure that the supplying vehicle is clean?
Yes No
 6. Do you ensure the personal hygiene of the workers involved in the supplying process?
Yes No
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Table 1: Continued

7.	Do you check the expiration date of the raw products?
	Yes No
8.	Do you concern of the color and smell of the meat and chicken supplied?
	Yes No
9.	Do you ensure that the place where you receive the supplied products is clean?
	Yes No

Part Two: The Storage Process

1.	Do you ensure that the raw meat and chicken are directly put in the fridge when you receive them from the supplier?
	Yes No
2.	Do you ensure that the fridge temperature of the frozen meat and chicken is less than -18°C?
	Yes No
3.	Do you ensure that the fridge temperature is less than 6°C for fresh meat and chicken?
	Yes No
4.	Do you ensure that each supplied product is stored alone in a specific fridge?
	Yes No
5.	Do you have a spare fridge in case of urgent damage of any fridge in use?
	Yes No
6.	Do you ensure that the thermometer in each fridge is valid?
	Yes No

Part Three: Preparation Process

1.	Do you ensure that the workers clean and sterilize tables before preparing Shawerma?
	Yes No
2.	Do you ensure that the room temperature where Shawerma is prepared does not exceed 15°C?
	Yes No
3.	Do you ensure that the daily quantity of frozen meat and chicken is totally used and not refrozen?
	Yes No
4.	Do you ensure that the workers clean well and sterilize the preparation tools (like knives) before using them?
	Yes No
5.	Do you ensure that the preparation process does not continue for more than half an hour and thereafter the prepared food is returned to the fridge?
	Yes No
6.	Do you ensure that the temperature of the fridge in which prepared food is stored does not exceed 7°C?
	Yes No
7.	Do you ensure that a plate is put under the Shawerma spit in the fridge?
	Yes No
8.	Do you ensure that the Shawerma spit width ranges between 20 and 40 cm?
	Yes No
9.	Do you ensure that the Shawerma is cooked at 70 °C or more?
	Yes No
10.	Do you ensure that the residuals of Shawerma and other foods are not used or sold in the second day of preparation?
	Yes No
11.	Do you ensure that the spit and the plate of Shawerma are made from stainless steel?
	Yes No

Part Four: The Serving Process

1.	Do you ensure that workers split the well-cooked pieces of Shawerma only and leave the pieces which are not well cooked yet?
	Yes No
2.	Do you ensure that salads and mayonnaise are stored in a specific fridge at a temperature of 8°C?
	Yes No
3.	Do you ensure that the Shawerma spit is put in an isolated place from the external environment?
	Yes No
4.	Do you use pasteurized mayonnaise?
	Yes No
5.	Do you use fresh mayonnaise?
	Yes No
6.	Do you use fresh bread?
	Yes No

Table 1: Continued

7.	Do you care about the color and smell of the ingredients of the Shawerma sandwiches?
	Yes No
8.	Do you ensure that all the serving tools including knives, plates, spoons and polyester cans are all clean and sterilized?
	Yes No
9.	Do you use fresh fruits and vegetables?
	Yes No
10.	Do you ensure that all your workers wear gloves?
	Yes No
11.	Do you ensure that your service tools are made from stainless steel?
	Yes No

Many Thanks

of the ingredients. Part 3 focuses on whether the main safety rules of HACCP are considered in the preparation steps of Shawerma and Part 4 examines the major hygiene and safety rules of HACCP in the serving process of Shawerma.

RESULTS AND DISCUSSION

Table 2 reports the frequencies of the respondents' answers of part one of the questionnaire and their correspondent t-test and chi-square values. The results indicated that Shawerma restaurants in Jordan do not follow all the HACCP rules during the supplying process of Shawerma contents. 100% of the managers check the expiration date of the supplied products and 90.8% of them concern about the color and smell of these raw products. Both percentages are statistically significant according to both the t-test and chi-square test. On the other hand, only 15% of the Shawerma restaurant managers check the room temperature of supplying vehicle, 6% ensure that the transportation license of the supplying vehicle is valid and 8% ensure that the vehicle is clean. The results also showed that 70.2 and 64.2% check the temperature of the fresh and frozen meat supplied, respectively. Both percentages are statistically significant. Finally, 52.3% of the managers showed a statistically significant concern of the personal hygiene of the workers involved in supplying process and 61.9% of them ensure that the place where they receive the supplied products is clean.

Table 3 reports the frequencies of the respondents' answers of part two of the questionnaire and their correspondent t-test and chi-square values. The results showed that Jordanian Shawerma restaurants follow most of the HACCP rules in the storage process of Shawerma raw contents. 98.6% of the managers ensure that the raw meat and chicken are directly put in the fridge when they receive them from the supplier, 81.7% of them ensure that

the thermometers in the fridges are valid, 73.9% have a spare fridge in case of urgent damage of any fridge in use, 72.9% ensure that each supplied product is stored alone in a specific fridge and 53.2% make sure that the fridge temperature is less than 6°C for fresh meat and chicken. All these percentages are statistically significant according to the t-test and chi-square test. However, the results showed that only 10.1% of the Shawerma restaurant managers check the fridge temperature for the frozen meat.

Table 4 reports the frequencies of the respondents' answers of part three of the questionnaire and their correspondent t-test and chi-square values. The results showed that 97.2% of the managers of Jordanian Shawerma restaurants ensure that the workers clean and sterilize tables before preparing Shawerma. About 96.3% of them make sure that the workers clean well and sterilize the preparation tools (like knives) before using them and 91.3% make certain that the spit and the plate of Shawerma are made from stainless steel. The three frequencies are highly significant according to the t-test and Chi-square test. In contrast, only 10.1% of the managers ensure that the room temperature where Shawerma is prepared does not exceed 15°C and 40.8% make sure that the preparation process does not continue for more than half an hour and thereafter the prepared food is returned to the fridge. The results also showed that 86.2% of the managers of Shawerma restaurants check the temperature of the fridge in which prepared food is put. About 84.4% of them ensure that the residuals of Shawerma and other foods are not used or sold in the second day of preparation, 82.1% ensure that a plate is put under the Shawerma spit in the fridge, 78.4% ensure that the Shawerma spit width ranges between 20 and 40 cm, 72.9% make sure that the Shawerma is cooked at 70°C or more and 78% ensure that the daily quantity of frozen meat and chicken is totally used and not refrozen. All these percentages are statistically significant.

Table 2: The results of analysis of part one questions

Question 1		Frequency	Percent	Chi-Square	T-test
Question 1	Yes	33	15.1	0.4351	0.3274
	No	185	84.9		
Question 2	Yes	153	70.2	21.4837*	9.6912*
	No	65	29.8		
Question 3	Yes	140	64.2	17.9952*	8.5478*
	No	78	35.8		
Question 4	Yes	13	6.0	0.1284	0.1497
	No	205	94.0		
Question 5	Yes	80	36.7	1.0257*	0.8864*
	No	138	63.3		
Question 6	Yes	114	52.3	10.2418*	2.1152*
	No	104	47.7		
Question 7	Yes	218	100	51.1856*	14.4198*
	No	0	0.0		
Question 8	Yes	198	90.8	41.4291*	13.4138*
	No	20	9.2		
Question 9	Yes	135	61.9	15.2248*	8.0784*
	No	83	38.1		

* denotes statistical significance at a critical level of 5% ($p \leq 5\%$).

Table 3: The results of analysis of Part Two questions.

Question 1		Frequency	Percent	Chi-Square	T-test
Question 1	Yes	215	98.6	50.2157*	13.9129*
	No	3	1.4		
Question 2	Yes	22	10.1	0.1561	0.2467
	No	196	89.9		
Question 3	Yes	116	53.2	10.9655*	2.3241*
	No	102	46.8		
Question 4	Yes	159	72.9	23.7924*	9.8451*
	No	59	27.1		
Question 5	Yes	161	73.9	25.1637*	9.9123*
	No	57	26.1		
Question 6	Yes	178	81.7	31.2167*	10.5842*
	No	40	18.3		

* denotes statistical significance at a critical level of 5% ($p \leq 5\%$).

Table 4: The results of analysis of Part Three questions.

Question 1		Frequency	Percent	Chi-Square	T-test
Question 1	Yes	212	97.2	50.0147*	13.6458*
	No	6	2.8		
Question 2	Yes	22	10.1	0.1561	0.2467
	No	196	89.9		
Question 3	Yes	170	78.0	28.5631*	10.1342*
	No	48	22.0		
Question 4	Yes	210	96.3	49.6248*	13.4967*
	No	8	3.7		
Question 5	Yes	89	40.8	1.6543	1.2487
	No	129	59.2		
Question 6	Yes	188	86.2	37.5284*	11.5681*
	No	30	13.8		
Question 7	Yes	179	82.1	31.9167*	11.2178*
	No	39	17.9		
Question 8	Yes	171	78.4	28.8934*	10.5384*
	No	47	21.6		
Question 9	Yes	159	72.9	23.7924*	9.8451*
	No	59	27.1		
Question 10	Yes	184	84.4	35.1423*	11.1426*
	No	34	15.6		
Question 11	Yes	199	91.3	43.5274*	12.9674*
	No	19	8.7		

* denotes statistical significance at a critical level of 5% ($p \leq 5\%$).

Table 5 reports the frequencies of the respondents' answers of part four of the questionnaire and their correspondent t-test and chi-square values. 95% of the Shawerma restaurant managers in Jordan care about the color and smell of the ingredients of the Shawerma sandwiches. About 94% of them use fresh bread, 91.3% ensure that the serving tools including knife, plates, spoons and polyester cans are all clean and sterilized, 88.5% ensure that these service tools are made from stainless steel and 87.2% ensure that all your workers wear gloves. All these percentages are highly significant. On the contrary, only 9.6% of the managers ensure that the Shawerma spit is put in an isolated place from the external environment and 49.1% use pasteurized mayonnaise. The results also showed that 73.9% of the managers ensure that workers split the well-cooked pieces of Shawerma only and leave the pieces which are not well cooked yet.

Table 5: The results of analysis of Part Four questions

Question 1		Frequency	Percent	Chi-Square	T-test
Question 1	Yes	161	73.9	25.1637*	9.9123*
	No	57	26.1		
Question 2	Yes	177	81.2	30.9954*	10.1147*
	No	41	18.8		
Question 3	Yes	21	9.6	0.1523	0.2265
	No	197	90.4		
Question 4	Yes	107	49.1	2.8572	1.6441*
	No	111	50.9		
Question 5	Yes	115	52.8	10.7541*	2.1241*
	No	103	47.2		
Question 6	Yes	205	94.0	46.8627*	13.2379*
	No	13	6.0		
Question 7	Yes	207	95.0	48.3674*	13.4217*
	No	11	5.0		
Question 8	Yes	199	91.3	43.5274*	12.9674*
	No	19	8.7		
Question 9	Yes	177	81.2	30.9954*	10.1147*
	No	41	18.8		
Question 10	Yes	190	87.2	38.4621*	11.6672*
	No	28	12.8		
Question 11	Yes	193	88.5	39.8147*	11.9751*
	No	25	11.5		

* denotes statistical significance at a critical level of 5% ($p \leq 5\%$)

Overall, the results of the study indicated that Shawerma restaurants in Jordan follow most but not all of the HACCP control program principals in the supplying, storage, preparation and serving processes of Shawerma. These results are consistent with [17] who found that bacterial counts of beef meat matched with Egyptian standards after application of HACCP. On the other hand, [18] evaluated the application of Hazard Analysis Critical Control Point (HACCP) practice to the milk production and marketing chain in Tanzania. Using a survey, their results revealed that it requires involvement of actors at all levels, from producers to processors, animal health service providers, regulators, retailers and consumers. Information, Education and Communication (IEC) combined with improved diagnosis and testing at different

levels along the milk production and marketing chain should further contribute to the reduction of risk hazards. The study emphasized the need for the implementation of HACCP program in Shawerma restaurants in Jordan.

CONCLUSIONS

This study examined the application of HACCP in the supplying, storage, preparation and serving processes of Shawerma sandwiches in the Jordanian Shawerma restaurants. Using a survey consisting of 37 questions, the results indicated that most but not all the HACCP control program principals are applied. In general, Shawerma restaurants were found to have qualified fridges, efficient heat treatment, adequate cleaning & sterilization of preparing and serving stuff, observance of hygiene levels and good handling of raw and cooked food. On the other hand, some important food safety issues were missed, for example, Shawerma spit is not ensured to be isolated from the external environment. Moreover, only few restaurant managers check the room temperature where Shawerma is prepared and make sure that the preparation process does not continue for more than half an hour. Overall, this study recommends the public health agencies and government in Jordan to ensure the application of strict food safety rules in restaurants.

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