Research Article

Survey of the Application of the Hazard Analysis and Critical Control Points (HACCP) in Some Food Organizations

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ABSTRACT

Background: Hotel industry is basically hospitality process, which in turn are closely linked to food safety for guests, who represent the consumers. It has been estimated that each year 1.8 million people die as a result of diarrheal diseases and most of these cases can be attributed to contaminated food or water, since more than 200 known diseases are transmitted through food. Hazard Analysis and Critical Control Points (HACCP) is now recognized as a systematic and preventive approach for identifying and controlling hazards in the food chain. It is a preventive risk management approach that has been extensively used by food industries to increase product safety and protect public health.

Objectives: This study was undertaken to evaluate the extent of verification of the application of HACCP in some food industry companies which can provide hotel establishments in Egypt its needs from different products.

Methods: The study relied on the descriptive analytical method depending on the nature of the study, which provides descriptive approach to find out how to verify the application of HACCP in many food industry companies that can provide institutions of hotel in Egypt its needs of different products and also considered this research analytical through statistical analysis.

Results: Hazards analysis & preventive measures had the highest impact on the application of HACCP, followed by the impact of verifications procedures. Correlations between various categories and questions among categories were found statistically significant, and differed as positive / negative from low to strong.

Conclusion: The present study proved that all food industry companies, which were represented in the community of the sample, were highly qualified for HACCP application.

Key words: *Hazard Analysis, preventive measures, CCPs, corrective actions, monitoring and verification procedures, documentation and record keeping and internal audit.*

INTRODUCTION

Hotel industry is basically hospitality process, which in turn are closely linked to food safety for guests, who represent the consumers. Consumers nowadays manifest a lot of interest surrounding the quality of food. At the same time, they spend a lot of energy to be informed with respect to the food they consume.[1] Unsafe food has been a human health problem since history was first recorded, and many food safety problems encountered today are not new.[2] In the hotel industry there are more than one kitchen, the professional kitchen should contain many sections such as Hot-foods section, Garde-manger section, Bakery section, Banquet section, Short-order section & Beverage section. Each section consists of several stations such as Salad greens cleaning, Salad preparation, Cold

foods preparation, Sandwich station and Showpiece preparation in Garde-manger section. So, we are facing food and food ingredients which come from different sources, which decrease the transparency of food supply chain. Food regulations, such as HACCP, Good Manufacturing Practice (GMP), or Good Hygiene Practice (GHP), aim to guarantee a certain level of quality.[1]Although governments all over the world are doing their best to improve the safety of the food supply, the occurrence of food borne disease remains a significant health issue in both developed and developing countries. It has been estimated that each year 1.8 million people die as a result of diarrheal diseases and most of these cases can be attributed to contaminated food or water [2], since more than 200 known diseases are transmitted through food.[3] So it is important to understand that proper food preparation can prevent most foodborne diseases [2], since the food and food ingredients which represent the main supply for hospitality industry come from food industry companies.

Hazard Analysis and Critical Control Points (HACCP) is now recognized as a systematic and preventive approach for identifying and controlling hazards in the food chain [4], it is a preventive risk management approach that has been extensively used by food industries to increase product safety and protect public health.[5] HACCP has been adapted to all stages of the food chain, and is now widely used in dairy and meat processing, and in retail and catering.[6,7]

The concept of HACCP has been used and actively promoted by the food industry for over 20 years, and has been accepted nationally and internationally as a powerful tool for ensuring food quality and safety. HACCP is a logical, structured approach to the analysis and control of the potential hazard points in a food operation.[8]The Hazard Analysis and Critical Control Point (HACCP) system is a management tool for a preventive food safety program, ranged from primary producer to final consumer.[9]It is used to assess hazards, estimate risks and establish specific control measures that emphasize prevention and control to ensure the food safety, that has the capability of accommodating change, improvements in processing procedure and technological developments related to the products.[10] It was until 1988 that food manufacturers – other than the canning industries– became interested in applying HACCP system, when

HACCP began to be viewed as a method for the prevention of contaminants in food products.[11] Companies are becoming increasingly aware that they must develop safety assurance plans to address the potential hazards that may be associated with their products, and how are marked and used by the consumer.[12] It is known that any manufacturer (or seller) is responsible for the well-being of the people who consume its products. That responsibility is commensurate with the manufacturer's ability to predict and avoid harmful consequence in a reasonable manner; he is required to do what he reasonably can to prevent injury from occurring.[13, 14]

Food processing companies, which can provide for hotel establishments its needs from different products, include all types of food industries. Of these industries, the industry of oils and soaps, biscuits, canning, frozen products such as frozen vegetables, half-fried potatoes, jam, juice, cheese products, dairy products, meat products, baking products, pickles, mills and food crops for the export of citrus fruits.

The aim of the present research was to study the extent of verification of the application of HACCP in some food industry companies which can provide hotel establishments in Egypt its needs from different products.

METHODS

Study Setting and Design

Twenty five food industry companies were chosen to examine the extent of application verification of the HACCP system**.** These companies were divided into three main categories**:** public companies, private and Joint-stock companies that varies in number
of production lines and production line type.

The questionnaire was distributed on 25 food industry companies. We received responses from 23 which represent 92% of the total sample. The analysis of the response rate was found valid for only 21 companies, which represents 84% of the total sample.

The study was conducted in the period from October 2010 to March 2012.A descriptive approach was used to find out how to verify the application of HACCP in many food industry companies that can supply needs of different products for hotel institutions in Egypt.

The impact of different variables and the correlation between the independent variables

was investigated with a special emphasis on the quality and strength of these relations with rooting theoretical study of material through the collection of scientific theory, through books, theses, research papers, and field work.

Twenty five food industry companies were chosen to verify and examine the extent of application of the HACCP system, which covers many branches of food industries such as canned vegetables, jam, juices, tomato sauce, half-fried frozen potatoes, oils, butter margarine, baking products, pickled food, ground grains baked and stored in sacks**.** In addition to sorting, purging and waxing citrus in the citrus export terminals companies**.** These companies were divided into three main categories**:** public companies, private and Joint-stock companies that varies in type and number of production lines. Number of production lines varied between one to seven production lines. The nature of each production line varied from jam, juices, and tomato sauce to frozen products.

Data Collection

Questionnaires were designed depending on the frame of reference and previous studies. In the beginning we started by exploratory visit for all companies and the questionnaire has been sent by e-mail for some food industry companies, food safety team leaders through company chiefs, since it was difficult to access them directly. The food safety team comprised the production engineer, quality control engineer and at least one administrative representative, and in some companies; at least one sales, purchases and legal representative.

Questionnaire has been designed to answer research questions. A cover letter was contained in the first page describing the goal or purpose of the search. The questionnaire included 129 questions to evaluate possibility to apply the HACCP system in some of food industry companies. The response measurements whereby scale of acceptable and unacceptable. Several themes were tested**:** management assurance, is in (11) phrase, training is in (7), product specification is in (11), process flow diagram is in (10), hazards analysis and preventive measures is in (14), critical control points – CCP'S is in (5), critical limits is in (5), monitoring procedures is in (8), verification procedures is in (13), documentation and record keeping is in (13), complaint is in (6), corrective actions is in (7), recall is in (9) and internal audit and consists of (10)

questions. The questionnaire was distributed on (25) food industry companies, where we got responses from (23) which represent 92% of the total sample. Only 21companies were only valid for the analysis of the response rate, thus represented 84% of the total sample (25 companies).

Statistical analysis

We analyzed the extent of variation in the application of HACCP in some food organizations for each themes, first for all the companies under study as a whole, when classified as a Joint-stock, Private and Public sector companies. Correlations between different themes and variables were studied and each other's and some questions and each other's**.** After data collection, careful data revision was considered after revised, data sheets were coded and fed to statistical software SPSS version 16 (Statistical Package for Social Science version 16). A score of one was given for acceptable result and score of zero for unacceptable result. The given graphs were constructed using Microsoft excel software. All statistical analysis was done using two tailed tests and alpha error of 0.05. P value less than or equal to 0.05 was set as a level of statistical significant. Descriptive data were analyzed using means and standard deviation, percent to describe the scale and categorical data, respectively while median was used for skewed data. For categorical data, Pearson's chi square test, Mont Carlo exact test and Fishers exact test were used. Correlations were used to test the nature and strength of relation between two quantitative/ordinal variables. The spearman correlation coefficient (rho) is expressed as the Pearson co efficient. The sign of the coefficient indicates the nature of relation (positive/negative) while the value indicates the strength of relation as follow: Weak correlation for rho less than (0.25), intermediate correlation for rho of value between (0.25-0.74) and strong correlation for values between (0.75-0.99).T-test compares the actual difference between two means in relation to the variation in the data (expressed as the standard deviation of the difference between the means).

RESULTS

The data of Table (1) represent minimum, maximum, mean, SD and ranking of different categories as whole of the checklist for the HACCP questionnaire. Hazards analysis & preventive measures had the highest impact on the application

of HACCP as, the recorded arithmetic average was (14.10), and then verifications procedures that recorded arithmetic average of (12.33). verifications procedures had followed by product specifications, management assurance, internal audit, process flow diagram, documentations & record keeping, recall, monitoring procedures, corrective actions, training and complaint that recorded arithmetic average of (10.81, 10.48, 9.81, 9.76, 8.95, 7.72, 7.24, 6.81, 6.48 and 5.36) respectively. Critical limits and critical control points recorded the Lowest values of the average arithmetic (4.81 and 3.86) respectively.

Table 1: Minimum, Maximum, Mean , SD and Ranking of various categories

Different Axes	Minimum	Maximum	Mean	SD	Ranking
Management assurance	9.00	11.00	10.48	0.68	4
Training	5.00	7.00	6.48	0.60	11
Product specifications	10.00	11.00	10.81	0.40	3
Process flow diagram	9.00	10.00	9.76	0.44	6
Hazards analysis & preventive measures	13.00	15.00	14.10	0.83	1
Critical control points	3.00	5.00	3.86	1.01	14
Critical limits	4.00	5.00	4.81	0.40	13
Monitoring procedures	5.00	8.00	7.24	1.00	9
Verifications procedures	11.00	13.00	12.33	0.58	2
Documentations & Record keeping	8.00	10.00	8.95	0.74	7
Complaint	4.00	6.00	5.36	0.72	12
Corrective actions	6.00	7.00	6.81	0.40	10
Recall	6.20	9.00	7.72	0.98	8
Internal audit	9.00	10.00	9.81	0.40	5

By comparing the effect of the extent of verification of HACCP in the joint-stock, private and public sector companies, the results presented in table (2) showed that, hazards analysis &preventive measures had the highest impact on the application of HACCP recorded as the arithmetic average of (13.00), (14.12), (14.33), for the joint-stock, private and public sector companies respectively. The verification procedures corded an average arithmetic of (12:00),(12:35), (12.33), followed by product specification that recorded arithmetic average of (10.00), (10.53) and (10.33) respectively. While critical limits recorded the lower values of the average arithmetic, which was (5.00), (4.82) (4.67), respectively and critical control points recorded the lowest values of the average arithmetic of (3.00), (3.94) and (3.67), respectively.

Table 2: Mean, SD & Ranking of Various categories for Joint-stock, Private & Public sector companies

Various categories	Company								
	Joint-stock company			Private			Public		
	Mean	SD	Ranking	Mean	SD	Ranking	Mean	SD	Ranking
Management assurance	10.00	.	4	10.53	0.72	4	10.33	0.58	4
Training	6.00	.	11	6.65	0.48	11	5.67	0.58	12
Product specifications	11.00	.	3	10.82	0.39	3	10.67	0.58	3
Process flow diagram	10.00	.	5	9.71	0.47	6	10.00	0.00	5
Hazards analysis & preventive measures	13.00	.	1	14.12	0.86	1	14.33	0.58	1
Critical control points	3.00	.	14	3.94	1.03	14	3.67	1.15	14
Critical limits	5.00	.	13	4.82	0.39	13	4.67	0.58	13
Monitoring procedures	8.00	.	8	7.12	1.05	8	7.67	0.58	8
Verifications procedures	12.00	.	2	12.35	0.61	2	12.33	0.58	2
Documentations & Record keeping	9.00	.	7	8.94	0.83	7	9.00	0.00	7
Complaint	5.10	.	12	5.32	0.76	12	5.70	0.52	11
Corrective actions	7.00	.	10	6.82	0.39	10	6.67	0.58	10
Recall	7.00	.	9	7.94	0.96	9	6.73	0.46	9
Internal audit	9.00	.	6	9.88	0.33	5	9.67	0.58	6

The data shown in table (3) represent the mean & SD of the different check points. The highest mean (1.2857) was observed for appointed a HACCP team leader in the management assurance category, while the lowest mean (0.7143) was noticed for the hazards been specifically identified by chemical hazards in the hazards analysis and preventive measures category. The lowest mean (0.3810) was observed for the CCP's identified by the correct use of CCP determination tree and all necessary CCP's in Critical Control Points since they had the same SD (0.49761).

Finally, as shown in table (3) the highest mean (1.2857) was for appointed a HACCP team leader in the management assurance category, while the lowest mean was for (0.3810) the CCP'S identified by the correct use of CCP determination tree and all necessary CCP'S in critical control points – CCP'S for all our study questions. Thus served an essential role.

P-value is compared to the value of allowable error (complementary of confidence percentage) with take in mind if it is one tail (sig1- tailed) or two tails. In this study the calculation had been carried on the basis of two tail from two sides, that is means that to compare with (0.05). The questions that had significance are considered necessary to ask, thus had significant role in the research.

All questions were found to have high significance. It means that all questions hada significance role in the present work. This means that all questions were essential to be included in the data collection questionnaire (table 4).

Likewise, the data in table (4) represent T test and Significance of different check points among various categories, since the questions that had significance are what is necessary to ask these questions that had significant role in the research. Because all questions had a test value less than (0.05), they were found significant.

Table 3: Mean and SD of check points among various categories

CHECK POINTS	Mean	SD
MANAGEMENT ASSURANCE		
food safety policy	0.9524	0.21822
HACCP plan been developed	0.8095	0.40237
HACCP team been formed	0.9524	0.21822
appointed a HACCP team leader	1.2857	1.55380
define the responsibility and authority of HACCP team members	0.9524	0.21822
the decision making leverage of the HACCP team leader	0.9524	0.21822
TRAINING		
Training plan	0.9524	0.21822
Kind of source has been used for training	0.8571	0.35857
Verify the effectiveness of training	0.8095	0.40237
PRODUCT SPECIFICATION		
The specification include labelling instruction	0.9524	0.21822
The specification include the method of distribution	0.9524	0.21822
The specification include the length of shelf life	0.9524	0.21822
The specification include the intended use	0.9048	0.30079
PROCESS FLOW DIAGRAM		
The HACCP team get notified of changes to the process /product parameters	0.9524	0.21822
Any changes were discussed with HACCP team before implementation	0.9524	0.21822
Rework opportunities & have the organisation been included	0.9048	0.30079
HAZARDS ANALYSIS & PREVENTIVE MEASURES (HAPMs)		
The hazards been specifically identified by physical hazards	0.8571	0.35857
The hazards been specifically identified by chemical hazards	0.7143	0.46291
Information sources were utilized	0.9524	0.21822
All preventive measures in place at the plant level	0.9524	0.21822
CRITICAL CONTROL POINTS (CCPs)		
The CCP's identified by the correct use of CCP determination tree	0.3810	0.49761
The CCP's identified by identify all necessary CCP's	0.3810	0.49761
CRITICAL LIMIT (CLs)		
The differentiate between the critical limits from operational limits	0.8095	0.40237
MONITORING PROCEDURES (MPs)		
The status of monitoring equipment	0.9048	0.30079
The sampling plans statistically valid	0.7143	0.46291

Table 3: Cont.

Have the organisation defined identification of product to ensure the product can be traced if deviation occurs?	0.9524	0.21822
Any actions taken when deviation occurred	0.9524	0.21822
Monitoring personnel well trained ,qualified, & their deputies clearly defined	0.8571	0.35857
Monitoring results been recorded on daily basis & signed respectively	0.8571	0.35857
VERIFICATION PROCEDURES (VPs)		
Training of personnel responsible for verification	0.8571	0.35857
Evaluation of consumer complaints	0.9524	0.21822
The information on the HACCP control chart up to date	0.7143	0.46291
A regular review of results of sanitation control procedures	0.9048	0.30079
the data from verification being used to improve the system	0.9524	0.21822
DOCUMENTATION AND RECORD KEEPING		
Document been properly approved by authorised personnel before issue	0.8571	0.35857
Control the update and issue of documentation	0.8571	0.35857
obtaining related codes, standards, legislation and regulation to the food product	0.9524	0.21822
Control the change of document	0.7619	0.43644
All documents accurate and current	0.9048	0.30079
The records accessible	0.9524	0.21822
Identify HACCP records clearly by unique reference numbers	0.8571	0.35857
The documentation and record control system been set up in consideration of the size & nature of the organization	0.7619	0.43644
COMPLAINT		
Define the responsibility and authority	0.9048	0.30079
The complaints occur before	0.8571	0.35857
Actions have the organisation taken when it occurred	0.9524	0.21822
Utilize these complaints for verification of the system	0.9048	0.30079
CORRECTIVE ACTIONS		
Evidence to demonstrate that effective corrective actions are taken in the event of a CCP deviation	0.9524	0.21822
Dispose of the affected products	0.9524	0.21822
Record corrective action	0.9048	0.30079
Verify the effectiveness the corrective action	0.9048	0.30079
RECALL		
Products need to recall	0.9524	0.21822
It occur before	0.6190	0.49761
The concerned products	0.6667	0.48305
Ensure all affected product to be identified & recalled	0.9524	0.21822
INTERNAL AUDIT		
The sources used	0.9048	0.30079
The audit data utilised for improvement of the HACCP system	0.9524	0.21822
Results been documented	0.9524	0.21822

Table 4: T test and Significance of different check points among various categories

CHECK POINTS	Test Value = 0		
	t	df	Sig. (2-tailed)
1-Management assurance			
Food safety policy	20.000	20	0.000
HACCP plan	9.220	20	0.000
HACCP team	20.000	20	0.000
HACCP team leader	3.792	20	0.001
Responsibility & authority of HACCP team	20.000	20	0.000
Decision making of HACCP team leader	20.000	20	0.000
2-Training			
Training plan	20.000	20	0.000
Kind of source used for training	10.954	20	0.000
Effectiveness of training	9.220	20	0.000

Table 4:Cont.

3-Product specifications (PS) Specifications include :			
-labeling instruction	20.000	20	0.000
- Distribution method	20.000	20	0.000
-Shelf life length	20.000	20	0.000
-Intended use	13.784	20	0.000
4-PROCESS FLOW DIAGRAM			
HACCP team notified changes to process or product parameters	20.000	20	0.000
Discussion changes with HACCP team before implementation	20.000	20	0.000
Rework opportunities	13.784	20	0.000
5-Hazards analysis & preventive measures			
Hazards identified by Physical hazards	10.954	20	0.000
Hazards identified by Chemical hazards	7.071	20	0.000
Utilization Information sources			
Preventive measures at the plant level	20.000	20	0.000
6-CRITICAL CONTROL POINTS			
CCP's identified by all necessary CCP's	3.508	20	0.002
Hazards are not controlled over CCP's addressed	3.508	20	0.002
7-CRITICAL LIMITS			
Differentiate between the CLs from operational limits	9.220	20	0.000
8-MONITORING PROCEDURES			
Status of monitoring equipment	13.784	20	0.000
Sampling plans statistically valid	7.071	20	0.000
Product identification by organization to ensure if can be traced if deviation occurs	20.000	20	0.000
Any actions taken when deviation occurred	20.000	20	0.000
Monitoring personnel well trained , qualified, & their deputies clearly defined	10.954	20	0.000
Monitoring results been recorded on daily basis and signed respectively	10.954	20	0.000
Status of monitoring equipment	13.784	20	0.000
Sampling plans statistically valid	7.071	20	0.000
9-VERIFICATION PROCEDURES			
Training of personnel responsible for verification	10.954	20	0.000
Evaluation of consumer complaints	20.000	20	0.000
Update information on the HACCP control chart	7.071	20	0.000
A regular review of results of sanitation control procedures	13.784	20	0.000
The data from verification being used to improve the system	20.000	20	0.000
10-DOCUMENTATION AND RECORD KEEPING			
Document been properly approved by authorised personnel before issue	10.954	20	0.000
Control the update and issue of documentation	10.954	20	0.000
Obtaining related codes, standards, legislation and regulation to the food product	20.000	20	0.000
Control the change of document	8.000	20	0.000
All documents accurate and current	13.784	20	0.000
The records accessible	20.000	20	0.000
Identify HACCP records clearly by unique reference numbers	10.954	20	0.000
The documentation and record control system been set up in consideration of the size and nature of the organization	8.000	20	0.000
11- Complaint			
Define the responsibility and authority	13.784	20	0.000
The complaints occur before	10.954	20	0.000
Actions have the organization taken when it occurred	20.000	20	0.000
Utilize these complaints for verification of the system	13.784	20	0.000

Table 4:Cont.

12-CORRECTIVE ACTIONS			
Evidence to demonstrate that effective corrective actions are taken in the event of a CCP deviation	20.000	20	0.000
Dispose of the affected products	20.000	20	0.000
Record corrective action and	13.784	20	0.000
13-RECALL			
Products need to recall	20.000	20	0.000
It occur before	5.701	20	0.000
The concerned products	6.325	20	0.000
Ensure all affected product to be identified and recalled	20.000	20	0.000
14-INTERNAL AUDIT			
The sources used	13.784	20	0.000
The audit data utilised for improvement of the HACCP system	20.000	20	0.000
Results been documented	20.000	20	0.000

Categories (the groups of the questions) in table (5), showed also statistical significance.

Table 5: **T test &Significance of all categories (groups)**

Various categories	Test Value = 0		
	t	**df**	**Sig. (2-tailed)**
Management assurance	28.426	20	0.000
Training	44.978	20	0.000
Product specifications	83.002	20	0.000
Process flow diagram	111.719	20	0.000
Hazards analysis & preventive measures	102.655	20	0.000
Critical control points	17.322	20	0.000
Critical limits	54.775	20	0.000
Monitoring procedures	33.328	20	0.000
Verifications procedures	96.230	20	0.000
Documentations & Record keeping	70.995	20	0.000
Complaint	34.796	20	0.000
Corrective actions	77.553	20	0.000
Recall	40.429	20	0.000
Internal audit	111.719	20	0.000

Table (6) represents non parametric correlations between some categories. It is evident that the management assurance had an intermediate positive correlation with critical limits and low positive correlation with hazard analysis and preventive measures, while negative correlation was found with each of critical control points and monitoring procedures (-0.187, -0.102) respectively. Also, moderate positive correlation was found between process flow diagram and critical control points (0.258), while low positive correlation was noticed between process flow diagram and each of hazards analysis & preventive measures, critical limits and monitoring procedures, (0.66), (0.014) and (0.137) respectively. Correlations between hazards analysis & preventive measures was medium positive correlation with critical control points and low positive correlation with each of verifications procedures and monitoring procedures, while it medium negative correlation found between hazards analysis & preventive measures and critical limits. The data represent also, the correlations between complaints and both of corrective actions and recall. A low positive correlation was found with corrective actions (0.011) medium negative correlation with recall (-0.273).

Table 6: Non parametric correlations between some categories

		Monitoring procedures	Documentations & Record keeping	Complaint	Recall	Internal audit	Sanitation control procedures
Product specifications	Pearson Correlation			0.513(*)			
	Sig. (2-tailed)			0.017			
Documentations & Record keeping	Pearson Correlation	0.554(**)			-0.604(**)		
	Sig. (2-tailed)	0.009			0.004		
Recall	Pearson Correlation		-0.604(**)				
	Sig. (2-tailed)		0.004				
Internal audit	Pearson Correlation						0.669(**)
	Sig. (2-tailed)						0.001
Sanitation control procedures	Pearson Correlation					0.669(**)	
	Sig. (2-tailed)					0.001	
Product specifications	Pearson Correlation			0.513(*)			
	Sig. (2-tailed)			0.017			
Documentations & Record keeping	Pearson Correlation	0.554(**)			-0.604(**)		
	Sig. (2-tailed)	0.009			0.004		
Recall	Pearson Correlation		-0.604(**)				
	Sig. (2-tailed)		0.004				
Internal audit	Pearson Correlation						0.669(**)
	Sig. (2-tailed)						0.001
Sanitation control procedures	Pearson Correlation					0.669(**)	
	Sig. (2-tailed)					0.001	

The data presented in table (7) reveal a significance correlation between complaint group and the category of product specifications {0.513(*)}, in addition to a strong positive correlation between documentations & record keeping group and monitoring procedures {0.554(**)}, which reflect very significance correlation. A remarkable very significance (positive strong) correlation was found between Internal audit and sanitation control procedures {0.669(**)}. Moreover, there is strong negative between documentations & record keeping group and recall group {-0.604(**)}.
The HACCP plan had developed i) a low negative correlation with any actions taken when deviation occurred (-0.108) and with monitoring results been recorded on daily basis and signed respectively (-0.198) as shown in table (8). ii) a medium negative correlation with control the change of document (-0.271) and weak negative correlation with the accessible records, iii) an intermediate positive correlation with an evidence to demonstrate that effective corrective actions are taken in the event of a CCP deviation (0.461) and on the contrary had shown a weak negative correlation with record corrective action (-0.157), iv) a low negative correlation with results been documented in the same table.

Table 7: Matrix correlation and significance between some categories (groups)

Various groups	Management assurance		Process flow diagram		Hazards analysis & preventive measures		Complaint	
	r	p	r	p	r	p	r	p
Hazards analysis & preventive measures	0.181	0.432	0.066	0.777				
Critical control points	-0.187	0.418	0.258	0.258	0.371	0.097		
Critical limits	0.348	0.122	0.014	0.953	-0.255	0.264		
Monitoring procedures	-0.102	0.66	0.137	0.554	0.054	0.817		
Verifications Procedures					0.101	0.663		
Corrective Actions							0.011	0.963
Recall							-0.273	0.231

It was found in management assurance category that it is divided into 3 main groups where (82%) of the sample represent two readings by 9.5%, and the score(91%) represent five readings by 23.8%, while the full approval represent 14 readings by 66.7%. Also, in the same table, by studying the results in the training category, it is found to be divided into 3 main groups where the score (57%) represent one reading by 4.8%, and the response (71%) represent five readings by 23.8 % , while the score (86%) repeated fifteen readings which represent 71.4 %. The results of the monitoring procedures showed that it can be divided into 4 main groups where the score (63%) represent one reading by 4.8%, and the score (75%) was repeated five readings by 23.8%, while the score (88%) repeatedthree readings by 14.3 %, inaddition the full approval score represent nine readings by 57.1%.

Table 8: Non parametric correlations between HACCP plan and each of some of check points in some of different categories of study

Different Axes		CHECK POINTS		HACCP plan been developed
Spearman's rho	Monitoring Procedures	Any actions taken when deviation occurred	Correlation Coefficient	-0.108
			Sig. (2-tailed)	0.640
			N	21
		monitoring results been recorded on daily basis and signed respectively	Correlation Coefficient	-0.198
			Sig. (2-tailed)	0.390
			N	21
	Documentation and Record Keeping	Control the change of document	Correlation Coefficient	-0.271
			Sig. (2-tailed)	0.234
			N	21
		The records accessible	Correlation Coefficient	-0.157
			Sig. (2-tailed)	0.496
			N	21
	Corrective Actions	Evidence to demonstrate that effective corrective actions are taken in the event of a CCP deviation	Correlation Coefficient	0.461
			Sig. (2-tailed)	0.035
			N	21
		Record corrective action	Correlation Coefficient	-0.157
			Sig. (2-tailed)	0.496
			N	21
	Internal Audit	Results been documented	Correlation Coefficient	-0.108
			Sig. (2-tailed)	0.640
			N	21

The data in table (9) represent the frequency and percent of various categories.

By studying the results of the documentations & record keeping, it was found to be divided into 3 main groups where the score (85%) represent seven readings by 33.3%, and the response (92%)

represent nine readings by 42.9%, while the full   approval score represent five readings by 23.8%.

Table 9: Frequency (scores) and Percent of various categories (groups)

		Frequency	Percent	Valid Percent	Cumulative Percent
Management assurance					
Valid	0.82	2	9.5	9.5	9.5
	0.91	5	23.8	23.8	33.3
	1.00	14	66.7	66.7	100.0
	Total	21	100.0	100.0	
Training					
Valid	0.57	1	4.8	4.8	4.8
	0.71	5	23.8	23.8	28.6
	0.86	15	71.4	71.4	100.0
	Total	21	100.0	100.0	
Product specifications					
Valid	0.73	1	4.8	4.8	4.8
	0.82	3	14.3	14.3	19.0
	0.91	17	81.0	81.0	100.0
	Total	21	100.0	100.0	
Process flow diagram					
	0.90	4	19.0	19.0	19.0
	1.00	17	81.0	81.0	100.0
	Total	21	100.0	100.0	
Hazards analysis preventive measures					
	0.86	1	4.8	4.8	4.8
	0.93	9	42.9	42.9	47.6
	1.00	11	52.4	52.4	100.0
	Total	21	100.0	100.0	
Critical control points					
	0.60	13	61.9	61.9	61.9
	1.00	8	38.1	38.1	100.0
	Total	21	100.0	100.0	
Critical limits					
	0.80	4	19.0	19.0	19.0
	1.00	17	81.0	81.0	100.0
	Total	21	100.0	100.0	
Monitoring procedures					
	0.63	1	4.8	4.8	4.8
	0.75	5	23.8	23.8	28.6
	0.88	3	14.3	14.3	42.9
	1.00	12	57.1	57.1	100.0
	Total	21	100.0	100.0	
Verifications procedures					
	0.85	1	4.8	4.8	4.8
	0.92	11	52.4	52.4	57.1
	1.00	9	42.9	42.9	100.0
	Total	21	100.0	100.0	
Documentations & Record keeping (DRK)					
Valid	0.85	7	33.3	33.3	33.3
	0.92	9	42.9	42.9	76.2
	1.00	5	23.8	23.8	100.0
	Total	21	100.0	100.0	
Complaint (Comp.)					
Valid	0.67	3	14.3	14.3	14.3
	0.83	2	9.5	9.5	23.8
	1.00	16	76.2	76.2	100.0
	Total	21	100.0	100.0	

Table 9: Cont.

Corrective actions (CAs),					
Valid	0.86	4	19.0	19.0	19.0
	1.00	17	81.0	81.0	100.0
	Total	21	100.0	100.0	
Recall (Rec.)					
Valid	0.78	7	33.3	33.3	33.3
	0.89	3	14.3	14.3	47.6
	1.00	11	52.4	52.4	100.0
	Total	21	100.0	100.0	
Internal audit (Inter. Aud.)					
Valid	0.90	4	19.0	19.0	19.0
	1.00	17	81.0	81.0	100.0
	Total	21	100.0	100.0	

Figure (1) shows the acceptable and unacceptable percentages in a check list among category of critical control points. The highest acceptable percentage was given to Identification CCP`s by the use of CCP determination tree (100%), followed by the hazards that are not controlled over CCP`s addressed (57.1 %). The least percentage of acceptable were given to the CCP`s as identified by the correct use of CCP determination tree and to the CCP`s by indicating all necessary CCP`s (47.6%).
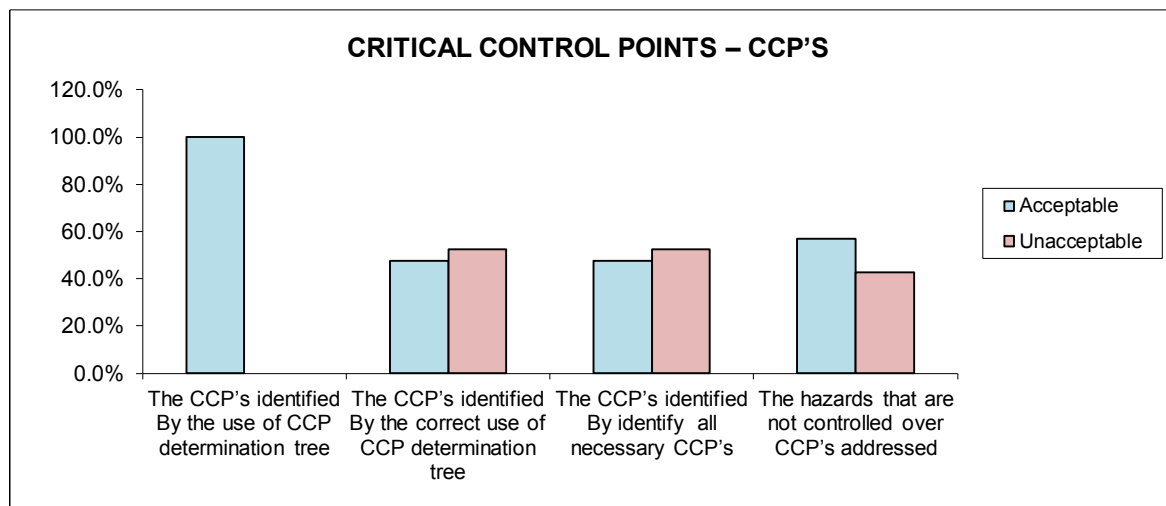
Figure 1: The acceptable and unacceptable percentage of check list among category of critical control points

DISCUSSION

The present study revealed that hazards analysis & preventive measures had the highest mean, then verifications procedures followed by product specification and then management assurance which means that hazards analysis & preventive measures had the highest impact on the application of HACCP, followed by the impact of verifications procedures, then the impact of product specification followed by management assurance for all the whole food companies as an all in the sample. The mean of corrective actions (6.81) came the tenth in order in the impact on the application of HACCP. Similarly, the results clarified the same effect which means the same ranking for the same check points, it had revealed that hazards

analysis & preventive measures had the highest impact on the application of HACCP, followed by the impact of verifications procedures, then the impact of product specification followed by management assurance that for each category of food industry companies (joint-stock company, private and public sector).Also, the mean of corrective actions was (7.00), (6.82) and (6.67) and came in the tenth in order in the impact on the application of HACCP in each of (joint-stock company, private and public sector) respectively.

According to Mortimore and Wallace [15], the product description should contain a brief description of the product with regards to storage temperature and shelf life. The description should also describe any hazards associated with the production of the product and how to control these hazards. Furthermore, it should give a description of target groups that may consume this product.[16] The purpose of the product description is to help familiarize the HACCP tea with the products and technologies being utilized. The check points in all categories under study revealed that the highest mean was noticed for the appointed a HACCP team leader check point in the management assurance group (1.2857) and the lowest mean was for the CCP'S identified by the correct use of CCP determination tree and all necessary CCP'S check points in the category of critical control points.When we tested the questions which had significant role in the research, we found that, all questions showed a significant effect, thus all questions had a significance role in all the data. This means also that all questions had served a significant and had been essential to be included role to in our questionnaire.Likewise; classification of these questions into categories that had significant role in the research was also found of statistical significance. The study alsoclarified direct relation between each of hazards analysis & preventive measures and critical limits with management assurance that means that when there is an increment in management assurance there will be increment in each of hazards analysis & preventive measures and critical limits. Oppositely there was an inverse relation revealed between management assurance and each of critical control points and monitoring procedures (-0.187, -0.102) respectively, which

means that with the increment of management assurance there will result in a decrease in each of critical control points and monitoring procedures.

Also, direct positive correlation was shown between process flow diagram and each of hazards analysis & preventive measures, critical limits and monitoring procedures(0.66),(0.014) and (0.137), respectively that clarify low positive correlation and critical control points (0.258) that represent medium positive correlation, that means when there is increment in process flow diagram it will result in increasing each of hazards analysis & preventive measures, critical limits and monitoring procedures.

While the hazard analysis & preventive measures had medium direct correlation with critical control points and low positive correlation with each of verifications procedures and monitoring procedures, a moderately reverse correlation was found between hazards analysis & preventive measures and critical limits, which means that when hazards analysis & preventive measures increase, an increment in each of critical control points, verifications procedures and monitoring procedures occur with an opposite decrease in critical limits. Moreover, the data for complaint check point, revealed a moderately inverse relation with recall (-0.273). This means that the increment of complaint decreases the recall and direct relation with corrective actions (0.011), which also, means that the increase of complaint leads to an increase in the corrective actions. Corrective actions might even be considered if monitoring indicates a trend towards loss of control at that CCP.[17]A significance correlation between complaint group and the category of product specifications was described in this work{0.513(*)}, which means any change or interference complaint group and the category of product specifications. In addition to a strong positive correlation found between documentations & record keeping group and monitoring procedures {0.554(**)}, which signifies that any change or interference for the documentations & record keeping group is related to the monitoring procedures. Similarly, a remarkable significant (positive strong) correlation was observed between internal audit

and sanitation control procedures {0.669(**)}, which means any intervention in internal audit will lead to change in sanitation control procedures by very strong direct relation.

On the other hand there was a strong negative correlation between documentations & record keeping group and recall group {-0.604(**)}, and this means that any intervention in one direction lead to very strong inverse change in opposite direction. The HACCP plan, clarified a reverse relation with each of the actions taken when a deviation has occurred (-0.108) and with monitoring results been recorded on daily basis and signed respectively (-0.198). This means that the increment in the HACCP plan reflect the decline of any actions taken when deviation occurred and monitoring results had been recorded on daily basis and signed respectively. Also, HACCP plan had developed an intermediate negative correlation with control the change of document (-0.271) and weak negative correlation with the accessible records, which means also, inverse relation, which means that if the first result had increased, the second result will decreased. In addition, HACCP plan had developed an intermediate positive correlation with an evidence to demonstrate that effective corrective actions are taken in the event of a CCP deviation (0.461) and inversely had shown a weak negative correlation with record corrective action (-0.157),signifying a direct relation, which means that the increment of HACCP plan, is followed by the increment of an evidence to demonstrate the effective corrective actions taken in the event of a CCP deviation and oppositely, an inverse relation between HACCP plan and record corrective action. A corrective action plan was developed, to state what responses were necessary if a critical limit was not met, and who was expected to take such actions, to regain control of the process and/or prevent unsafe product from reaching the consumer.[18] Record keeping was a requisite whenever HACCP verification work was done.[19,20]Simple verification exercises were built into the HACCP plan, with the intention of continuously reviewing the effectiveness of the HACCP system even as future changes are effected throughout the company and its processes. Similarly, HACCP plan had developed a week negative correlation with results been documented , indicating reverse relation between the two sets of data, which means that diminishing in one result was accompanied by an increment of other result. The HACCP plan was documented and included identification of the records that had to be maintained for each CCP in the process. These records were vital since they would prove that when products were made, operating and other named parameters were under control and any deviations were properly addressed.[21]By studyingvarious categories, the results in the management assurance was found to be divided into 3 main groups where the score (82%) represented two readings by 9.5%, and the response (91%) represented five readings by 23.8%, while the full approval represented 14 readings by 66.7%. This means that the largest proportion is the proportion of full approval in all questionnaire forms where it is the largest percentage of tendency for approval and therefore considering that this group tended to the application of this category.

Also, by studyingthe results in the training, it was found to be divided into 3 main groups where the score (57%) represented one reading by 4.8%, and the response (71%) represented five readings by 23.8 %, while the score (86%) represented15 readings by71.4 %, which means also, the largest proportion is the proportion of full approval in all questionnaire forms where it is the largest percentage for tendency for approval and therefore that this group tended tothe application of this category. Similarly, by studying the results in the monitoring procedures, it was found to be divided into 4 main groups where the score (63%) represented one reading by 4.8%, and the response (75%) represent five readings by 23.8%, while score (88%) represent three readings by 14.3 % , in addition to the full approval score that represented 9 readings by 57.1% . This means that the largest proportion is the proportion of full approval in all questionnaire forms where it is the largest percentage of tendency for approval and therefore considering that this group tended for the application of this axis.

By addressing the acceptable and unacceptable percentage of check list among the category of critical control points; the highest acceptable percentage was shown for the identification CCP`s by the use of CCP determination tree (100%), and the least percentage of acceptable were given to the CCP`s identified by the correct use of CCP determination tree and to the CCP`s identified by identifying all necessary CCP`s (47.6%).There was an increasing evidence that whilst HACCP use is

widespread in large food operations its use is limited within smaller companies. In the larger food establishments, implementation is mainly motivated by customer demand, market pressure, commitment to self-development and sometimes to meet licensing/certification regimes and surveillance programs.[22]

The main purpose of HACCP assessment is to establish whether a processor is capable of producing or distributing safe products consistently, i.e. ensuring that the HACCP program is effective in maintaining product safety.[23] Assessment should include review of the HACCP manual and an on-site verification to establish whether the HACCP plan is properly implemented.[2]

According to Mortimore [24], the outcome of any assessment should show that the manufacturer has implemented a sound HACCP system, the knowledge and experience needed to maintain it and the necessary support (prerequisite) programs in place

CONCLUSION & RECOMMENDATIONS

The present study proved that all food industry companies, which were represented in the community of the sample were highly qualified for HACCP application. Since all categories and questions among categories were statistically significant. This means that all categories had a highly significant role in this research. It means also that all categories had a significance role to be in these classifications in our questionnaire. It was found that there were different correlations between various categories and questions among categories, which differ as positive / negative from low until strong.

الملخص العربي

تعتبر صناعة الفنادق عملية ضيافة و هي مرتبطة بسلامة الغذاء الذي يصل للمستهلكين من نزلاء الفنادق. و من المعروف أن هناك ١,٨ مليون حالة وفاة نتيجة للإصابة بالإسهال الناتج عن التلوث الغذائي و المائي،حيث أن هناك حوال ٢٠٠ مرض يتم إنتقالهم للإنسان عن طريق الغذاء . و حاليا فإن تحليل المخاطر لنقاط التحكم الحرجة يعتبر نظام و أداة هامة للوقاية عن طريق التعرف علي المخاطر في الغذاء وإدارتها وهو يستخدم في صناعة الأغذية كوسيلة لضمان و زيادة سلامة الغذاء والمحافظة علي صحة المستهلك .

تم إجراء هذا البحث لدراسة مدي الاختلاف في تطبيق نظام تحليل المخاطر لنقاط التحكم الحرجة في بعض شركات الأغذية و التي تمد الفنادق بإحتياجاتها من المنتجات الغذائية المختلفة. و قد اعتمدت هذه الدراسة على المنهج الوصفي التحليلي اعتمادا على طبيعة الدراسة، والذي يهدف المنهج الوصفي لمعرفة كيفية تطبيق هذا النظام في بعض شركات تصنيع الأغذية لإمداد الفنادق في مصر باحتياجاتها، و أيضا يعتبر هذا البحث التحليلي من خلال التحليل الإحصائي .

و قد أوضحت النتائج أن تحليل المخاطر والتدابير الوقائية قد كان لديها أعلى تأثير على تطبيق نظام تحليل المخاطر ، تليها تأثير إجراءات التحقق. و قد كانت كلاالأسئلة حول كل المعايير المقاسة لها معنوية عند مستوي أقل من ٠.٠٥ وهذا يعني أن كل المعايير لها دورمعنوي عالي .ووجد أيضاً أن هناك علاقات ارتباط مختلفة بين المعايير المختلفة المقاسة ، حيث تختلف من علاقات موجبة إلي سالبة . و قد أثبتت هذه الدراسة أن كل شركات تصنيع الأغذية التي تم فحصها في عينة البحث كانت عالية الجودة من حيث تطبيق نظام تحليل المخاطر لنقاط التحكم الحرجةH

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