

Research Article

Evaluation of the Level of the Adopted Hygienic Requirements in Some Food Organizations

Nabil M.A El-Shimy¹‡, Gaber Abd Elkader²

¹ Lecturer in Public Health Sciences "Food Analysis "Faculty of Tourism & Hotel Management- Pharos University

² General Manager-Edfina Company for Preserved Foods - Quality systems consultant for UNION company for training & quality systems

ABSTRACT

Background: Food safety is a significant aspect for any food product, which is related directly with the hospitality process that is represented in Hotel industry. Assessment of the level and quality of applied hygienic requirements is thus of utmost importance.

Objectives: This study was carried out to evaluate level of the adopted hygienic requirements in some food organizations which can provide hotel establishments in Egypt their needs of different products.

Methods: A descriptive study was conducted to describe the applied hygienic requirements during food processing in 25 food industry companies. The selected food industry companies were categorized into three groups; public, private and joint-stock companies.

Results: The results clarified that the construction layout had the highest impact on the application of hygienic requirements. Training came second and followed by water safety. All categories and related questions showed statistical significance, which highlight their importance to be included in the adopted classifications in the questionnaire tool. Different correlations between various categories and related variables were studied and were varied between positive / negative relationships that ranged between weak to strong.

Conclusion: The present study proved that all food industry companies, which were represented in the sample, adopted standard hygienic requirements that were applied at a high quality level.

Key words: food safety, sanitation, cross contamination, pests' exclusion, water safety, waste control, employee health and construction layout

Available on line at:
www.ebscohost.com

‡ Correspondence:
Email: elshimylaila@yahoo.com

Tel: +(203) 3877200
Fax: +(203) 3830249

Address: Faculty of Tourism & Hotel Management - Pharos University. Canal El Mahmoudia Street. Somoha, Alexandria, Egypt.

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INTRODUCTION

Food safety is a significant aspect for any food product, which is related directly with the hospitality process that is represented in Hotel industry.⁽¹⁾ Since the first records in the history that clarified that unsafe food caused in a human health problems, and many food safety problems encountered today are not new.⁽²⁾ Almost every country around the world has begun focusing on food safety in "intense and multifaceted" ways. The use of Hazard Analysis Critical Control Points (HACCP) is widely accepted as a food safety management system.⁽³⁾ To get an appreciation of the food manufacturing process, plant schematics were prepared and verified layout through audits

conducted alongside the steering committee and involved staff. These considered building, facility, and equipment locations, material flow paths, and the areas where spillage and dead spots were most prevalent. A flow diagram was also generated to map out the steps in the manufacturing process, and to assist in identifying food carriers that could contribute to contamination of the food.^(4,5) The most detailed part of the HACCP involving evaluation of the integral hazards of the operations.⁽⁶⁾ Flow charts and schematics, coupled with intensive physical reviews of personnel and processing methods, raw materials, design of facility, plant and

equipment, extrinsic parameters, packaging, storage and distribution, were used to develop a comprehensive "gate to plate" list of potential hazards.^(7,8)

Before HACCP implementation within the food industry, certain programs called prerequisite programs place to provide for food safety.⁽⁹⁾ The prerequisite programs at the majority of the larger properties can form the foundation for full implementation of HACCP with some technical assistance and support.⁽¹⁰⁾ Some examples of common prerequisite programs are supplier control GMPs (Good Manufacturing Practices), SSOPs (Sanitation Standard Operating Procedures), letter of guarantee and pest control.⁽⁹⁾ Prerequisite programs ensure that HACCP plan(s) are functioning effectively.⁽¹¹⁾

Two of the most common prerequisite programs for HACCP are GMPs and SSOPs. GMP's emphasize sanitary effectiveness and hygienic practices during food processing. Many companies require that their supplier conduct regularly scheduled audits to assure that they are adhering to their GMPs.⁽¹¹⁾ An effective GMP program will help reduce the level of spoilage and pathogenic microorganisms.⁽¹²⁾

SSOPs are a widely used program to maintain proper sanitation within food processing plants even before HACCP was mandated.⁽¹³⁾ SSOPs describe all daily procedures that will be conducted to maintain sanitation, specify the frequency of the procedures, and identify those responsible for implementing and monitoring the SSOP.⁽¹¹⁾ Both GMPs and SSOPs are signed and dated by a qualified official and kept with all HACCP related documents.⁽¹⁴⁾

Food sanitation is protection from contamination. With this in mind, all functions and operations must be included in a sanitation program. All food products must be protected from contamination from receiving (and before) through distribution. Sanitation is a dynamic and ongoing function and cannot be sporadic or something that can be turned on once a day, once a week, etc. Therefore, another definition could be: "Sanitation is a way of life".⁽¹⁵⁾

The aim of the present research was to study the assessment of application of hygienic requirements in some food organizations. Since these food companies can provide hotel

establishments in Egypt their needs of different products.

METHODS

Study design

A descriptive study was carried out in the period from October 2010 to March 2012 to find out how to evaluate the application of hygienic requirements during food processing in some of food industry companies that can provide institutions of hotel in Egypt needs of different products.

Study setting

A total of 25 food industry companies were selected guided by a case study of these companies, which provide the different food needs for hotel establishments to examine the extent of application of hygienic requirements during food processing, which covers many branches of food industries. These companies were categorized into three groups; public, private and Joint-stock companies that varied in number and nature of production lines as shown in table (1).

Data collection methods and tools

Self-administered questionnaire was designed guided by the frame of reference and previous studies and was used to collect data for the present research. Before starting, an exploratory and acquaintance visit was organized by the researchers for all companies. After this step, easily accessed companies; those in and near Alexandria were approached directly by the researchers and questionnaires were distributed on food safety team. Otherwise, the questionnaire has been sent by e-mail, for some food industry companies, to food safety team leaders through company chiefs, since it was difficult to gain access to these companies. The food safety team consists of at least of production and quality control engineers. A cover letter was included before the questionnaire to explain the aim, concerns and procedure of the study. Questionnaire has been designed to answer research questions relevant to the evaluation of the extent of application of the HACCP system in the food industry companies under study. It comprised 68 questions covering several variables including training (7 questions), sanitation control procedures (5

questions), water safety (7 questions), food contact surfaces cleanliness (6 questions), cross contamination prevention (4 questions), hand washing and toilet facilities (4 questions), protection of food, packaging materials from adulteration (5 questions), proper labeling storage & use of toxic compounds (6 questions), employee health control (5 questions), pests' exclusion (8 questions), construction layout (7

questions and 4 sub questions). Responses were between acceptable and unacceptable. Of the total 25 food industry companies, only 23 have responded which represent 92% of the total sample. Nevertheless, responses from only 21 companies were found valid for the statistical analysis. Thus the response rate represented 84% of the total sample.

Table 1: Indicate the production lines for food companies represented in the sample

Food companies		Production lines						
No.	Ownership	1	2	3	4	5	6	7
1	Public	tomato sauce,	juices	jam	Legumes	pickles	Fish	frozen foods
2	Public	tomato sauce,	juices	jam	Legumes			
3	Public	margarine	oils					
4	Private	Dairy Industry	Cheese	juices	Butter			
5	Private	canned vegetables	frozen foods	Pickles				
6	Private	Dairy Industry	Cheese	juices				
7	Private	Dairy Industry	Cheese	juices				
8	Private	frozen foods	juices					
9	Private	juices						
10	Private	juices						
11	Private	frozen foods						
12	Private	half-fried frozen potatoes						
13	Private	baking products						
14	Private	meat products						
15	Private	meat products						
16	Private	sorting, purging & waxing citrus						
17	Private	sorting, purging & waxing citrus						
18	Private	sorting, purging & waxing citrus						
19	Private	wheat flour Production						
20	Private	Medical Rubber Gloves used in the food industry						
21	Joint-stock	margarine	oils					

Statistical Analysis

The objectives of the analysis in the present study was to find the variation in the extent of application of hygienic practices during food processing in some of food industry companies at the level of all the companies under study as a whole, and per category as a joint-stock, private and public sector companies and between categories and questions inside each category. 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. 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 (ρ) is expressed

as the Pearson coefficient. 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 in Table (2) represent minimum, maximum, mean, SD, ranking and T test of different broad categories of the checklist for the questionnaire. Construction layout had the highest

impact on the application of sanitary regulation with a recorded arithmetic average of 6.67. Training came the second and recorded an arithmetic average of 6.48. This was followed by water safety, proper labeling storage & use of toxic compounds, pests exclusion, food contact surfaces cleanliness, employee health control, sanitation control procedures, protection of food, packaging materials from adulteration, cross contamination prevention, waste control and hand washing and toilet facilities that recorded arithmetic average of 6.40, 5.90, 5.81, 5.29, 4.81, 4.67, 4.14, 3.95, 3.62 and 2.95 respectively. These categories showed statistical significance thus had a significant role in the study. This also means that all categories were important to be included in the designed assessment questionnaire tool.

Table 2: Minimum, Maximum, Mean, SD, Ranking and T test of various categories for the sanitation checklist

Different Axes	Minimum	Maximum	Mean	SD	Ranking	P Value
Training	5.00	7.00	6.48	.60	2	0.000
Sanitation control procedures	.00	5.00	4.67	1.11	8	0.000
Water safety	4.10	7.00	6.40	1.00	3	0.000
Food contact surfaces cleanliness	3.00	6.00	5.29	1.06	6	0.000
Cross contamination prevention	3.00	4.00	3.95	.22	10	0.000
Hand washing and toilet facilities	.00	4.00	2.95	1.20	12	0.000
Protection of food, packaging materials from adulteration	1.00	5.00	4.14	1.20	9	0.000
proper labeling, storage & use of toxic compounds	5.00	6.00	5.90	.30	4	0.000
Employee health control	4.00	5.00	4.81	.40	7	0.000
Pests exclusion	2.00	8.00	5.81	2.04	5	0.000
Construction layout	5.00	7.00	6.67	.58	1	0.000
Waste control	3.00	4.00	3.62	.50	11	0.000

In comparing the effect of the extent of the application of hygienic requirements in the joint-stock, private and public sector companies, data was studied. The results presented in table (2) showed that, water safety had the highest impact on the application of hygienic requirements according to score ranking ($p=0.000$) for each of the joint-stock, and public sector companies, while construction layout recorded the highest impact on private sectors. In the sector of the Joint-stock company, it was remarkable that the categories of training, proper labeling storage & use of toxic compounds and construction layout had recorded an average of 6.00. These categories showed statistical significance thus had significant role in

the study. This also means that all categories were important to be included in the designed assessment questionnaire tool. In the private sector, it was noticed that the training occupied second ranking (6.65), and proper labeling storage & use of toxic compounds in the third order (6.25), while pest exclusion in fourth order (6.18). In the public sector, it was found that the construction layout had the second value in the order of the category's sample with a mean of 6.33, then came proper labeling storage and use of toxic compounds (6.00), followed by training in the fourth ranking (5.67). The least value of impact on the application of hygienic requirements was noticed for hand washing and toilet facilities,

Table 3: Mean, SD and significance of different check points inside various categories

CHECK POINTS	Mean	SD	P - value
Sanitation control			
documented & reviewed control records	0.9048	0.30079	0.000
Water Safety			
status of surrounding environment	0.9524	0.21822	0.000
treated water	0.9048	0.30079	0.000
chemical additives had monitored	0.7619	0.43644	0.000
chart of water supply & drainage	0.9048	0.30079	0.000
Condition & Cleanliness of Food Contact Surfaces			
condition of food contact surfaces meet the requirement of hygiene	0.8095	0.40237	0.000
cleaning plans	0.9048	0.30079	0.000
adequate cleaning facilities	0.7619	0.43644	0.000
cleaning results was monitored & verified for effectiveness	0.9048	0.30079	0.000
well trained employees	0.9048	0.30079	0.000
Prevention of Cross-contamination			
equipment & facilities in different risk areas been properly separated	0.9524	0.21822	0.000
Maintenance of Hand Washing, Hand Sanitising & Toilet Facilities			
maintenance plans	0.9524	0.21822	0.000
adequate hand washing & sanitising facilities in production areas	0.6190	0.49761	0.000
adequate toilet facilities and in good condition	0.5238	0.51177	0.000
contamination possibly occur	0.8571	0.35857	0.000
Protection of Food& Food Packaging Material, from Adulteration			
packaging materials in good condition	0.9048	0.30079	0.000
products & packaging materials being protected from contamination	0.8571	0.35857	0.000
lubricants & maintaining facilities are properly controlled	0.8571	0.35857	0.000
lights being protected	0.7619	0.43644	0.000
environment condition around the production areas	0.7143	0.46291	0.000
Proper Labeling, Storage and Use of Toxic Compounds			
instructions available	0.9524	0.21822	0.000
keep records of the use	0.9524	0.21822	0.000
Control of Employee Health Conditions			
employees gone through regular health examinations	0.9048	0.30079	0.000
training records	0.9048	0.30079	0.000
Exclusion of Pests			
rodent control 's chart	0.5238	0.51177	0.000
adequate rodent baits	0.5714	0.50709	0.000
reliable rodent prevention facilities	0.6190	0.49761	0.000
doors, windows & other facilities in good condition	0.3810	0.49761	0.000
effective pesticides	0.8095	0.40237	0.000
ensure all pests are being controlled effectively	0.9048	0.30079	0.000
Construction and layout			
walls & floors in good condition	0.8571	0.35857	0.000
layout of equipment, facilities & processes reliable	0.9048	0.30079	0.000
adequate storage for keeping goods	0.9524	0.21822	0.000
Waste Control			
waste treatment	0.7143	0.46291	0.000
waste treatment method comply with the relevant regulations	0.9048	0.30079	0.000

which recorded (0.00, 3.35 and 1.67) respectively as recorded for the joint-stock, private and public sector. The data shown in table (3) represent the mean, SD & P-value of different check points. The highest mean (0.9524) was observed for each of status of environment surrounding in water safety category,

equipment& facilities, in different risk areas been properly separated check point in the prevention of cross contamination category, in maintenance of hand washing, hand sanitising & toilet facilities category, also in instructions available and keep records of the use check points in the proper labelling, storage and use of toxic compounds

category, and finally in adequate storage for keeping goods check point in the category of construction and layout. The lowest mean (0.3810) was observed for doors, windows & other facilities in good condition in the category of exclusion of pests. P-value is compared to the value of allowable error (complementary of confidence percentage). Likewise these categories and relevant questions showed statistical significance thus were important to be included in the assessment questionnaire.

The data presented in table (4) reveal that an intermediate correlation was noticed between

water safety group and each of the category of cross contamination prevention ($\rho=0.513$) and proper labeling storage & use of toxic compounds ($\rho=0.444$). Also, a positive correlation was observed between training category and category of proper labeling storage & use of toxic compound ($\rho=0.538$), and between food contact surfaces cleanliness and protection of food, and packaging materials from adulteration ($\rho=0.548$). In addition, positive correlation was observed between training and each of cross contamination prevention $\rho=0.624$ and employee health control $\rho=0.618$, which reflected a very significant correlation.

Table 4: Correlation between various categories

	Training	Water safety	Food contact surfaces cleanliness	Cross contamination prevention	Hand washing and toilet facilities	Protection of food, packaging materials from adulteration	proper labeling storage & use of toxic compounds	Employee health control
Training	Pearson Correlation			0.624(**)			0.538(*)	0.618(**)
	Sig. (2-tailed)			0.003			0.012	0.003
Water safety	Pearson Correlation			0.523(*)	.620(**)		0.444(*)	
	Sig. (2-tailed)			0.015	0.003		0.044	
Food contact surfaces cleanliness	Pearson Correlation				0.601(**)	0.548(*)		
	Sig. (2-tailed)				0.004	0.010		
Cross contamination prevention	Pearson Correlation	0.624(**)	0.523(*)					
	Sig. (2-tailed)	0.003	0.015					
Hand washing and toilet facilities	Pearson Correlation		0.620(**)	0.601(**)				0.573(**)
	Sig. (2-tailed)		0.003	0.004				0.007
Protection of food, packaging materials from adulteration	Pearson Correlation			0.548(*)				
	Sig. (2-tailed)			0.010				
proper labeling storage & use of toxic compounds	Pearson Correlation	0.538(*)	0.444(*)					0.606(**)
	Sig. (2-tailed)	0.012	0.044					0.004
Employee health control	Pearson Correlation	0.618(**)			0.573(**)		0.606(**)	
	Sig. (2-tailed)	0.003			0.007		0.004	

A remarkable significant (positive intermediate) correlation was found between hand washing and toilet facilities and each of water safety ($\rho=0.620$), food contact surfaces cleanliness ($\rho=0.601$) and employee health control ($\rho=0.573$). Furthermore, a positive correlation was found between employee health controls and each of hand washing and toilet facilities ($\rho=0.573$), proper labeling storage & use of toxic compounds ($\rho=0.606$) and training ($\rho=0.618$).

Table (5) details the scores and percent of various categories. Water safety category comprised 3 main groups where 71% of the sample represent four readings by 19.0%, and the score 86% represented two readings by 9.5%, while the full approval represent 15 readings by 71.4%. Also, in the same table, by studying the results in the construction layout category, it was found to comprise 3 main groups where the score 71% represented one reading by 4.8%, and the response 86% represent four readings by 19.0%, while the full approval represent 16 readings by 76.2 %. The results of the food contact surfaces cleanliness included 4 main groups where the

score 50% represented two reading by 9.5%, and the score (67%) was repeated three readings by 14.3%, while the score (83%) repeated three readings by 14.3 % , in addition the full approval score represent nine readings by 61.9 %.

By studying the results of the hand washing and toilet facilities, it was found to comprise 5 main groups where the score 0 % represented one readings by 4.8 %, and the response 25% represented two readings by 9.5%. Also, the score 50% represented three readings by 14.3 %, while the response 75% represented six readings by 28.6%. In addition, the full approval score represented nine readings by 42.9%.

The results of pest exclusion are detailed in table (8). It included 7 main groups where the score 25% represented two readings by 9.5%, and the response 38% represented two readings by 9.5%. Also, the score 50% represented two readings by 9.5%, then came the score 63% represented two readings by 9.5%, the response 75% represented one reading by 4.8%, the response 88% represented eight readings by 38.1%, and finally the full approval score represented four readings by 19.0%.

Table 5: score and Percent of various categories

Sanitation control procedures		Score	Percent	Valid Percent	Cumulative Percent
Valid	0.80	2	9.5	9.5	9.5
	1.00	19	90.5	90.5	100.0
	Total	21	100.0	100.0	
Water safety					
Valid	0.71	4	19.0	19.0	19.0
	0.86	2	9.5	9.5	28.6
	1.00	15	71.4	71.4	100.0
	Total	21	100.0	100.0	
Food contact surfaces cleanliness					
Valid	0.50	2	9.5	9.5	9.5
	0.67	3	14.3	14.3	23.8
	0.83	3	14.3	14.3	38.1
	1.00	13	61.9	61.9	100.0
	Total	21	100.0	100.0	
Cross contamination prevention					
Valid	0.75	1	4.8	4.8	4.8
	1.00	20	95.2	95.2	100.0
	Total	21	100.0	100.0	
Hand washing and toilet facilities					
Valid	0.00	1	4.8	4.8	4.8
	0.25	2	9.5	9.5	14.3
	0.50	3	14.3	14.3	28.6
	0.75	6	28.6	28.6	57.1
	1.00	9	42.9	42.9	100.0
	Total	21	100.0	100.0	

Table 5: cont.

Protection of food, packaging materials from adulteration					
Valid	0.20	1	4.8	4.8	4.8
	0.40	1	4.8	4.8	9.5
	0.60	4	19.0	19.0	28.6
	0.80	4	19.0	19.0	47.6
	1.00	11	52.4	52.4	100.0
	Total	21	100.0	100.0	
proper labeling storage & use of toxic compounds					
Valid	0.83	2	9.5	9.5	9.5
	1.00	19	90.5	90.5	100.0
	Total	21	100.0	100.0	
Employee health control					
Valid	0.80	3	14.3	14.3	14.3
	1.00	18	85.7	85.7	100.0
	Total	21	100.0	100.0	
Pests exclusion					
Valid	0.25	2	9.5	9.5	9.5
	0.38	2	9.5	9.5	19.0
	0.50	2	9.5	9.5	28.6
	0.63	2	9.5	9.5	38.1
	0.75	1	4.8	4.8	42.9
	0.88	8	38.1	38.1	81.0
	1.00	4	19.0	19.0	100.0
	Total	21	100.0	100.0	
Construction layout					
Valid	0.71	1	4.8	4.8	4.8
	0.86	4	19.0	19.0	23.8
	1.00	16	76.2	76.2	100.0
	Total	21	100.0	100.0	
Waste control					
Valid	0.75	8	38.1	38.1	38.1
	1.00	13	61.9	61.9	100.0
	Total	21	100.0	100.0	

Figure (1) shows the acceptable and unacceptable percentage of check list among category of water safety. The highest acceptable percentage was given to water quality examination and good water (100%), followed by the status of environment surrounding (95.2%). The least percentage of acceptable were given to the chemical additives had been monitored (76.2%).

Figure (2) shows the acceptable and unacceptable percentage of check list among category of condition and cleanliness of food contact surfaces. The highest acceptable percentage was given to water quality examination and good water (100%), followed by cleaning plans, monitored verified for effective cleaning and well trained employees, which they represent (90.5%) in each of the previous check points. The least percentage of

maintenance of hand washing sanitizing and toilet facilities. The highest acceptable percentage was given to each of maintenance plans and contamination possibly occur, which represent (90.5%), followed by adequate hand washing & sanitizing facilities in production areas (61.9%). The least percent of acceptable was for the adequate toilet facilities and in good condition (52.4%). acceptable was given to the adequate cleaning facilities & in good condition (71.4%). Figure (3) shows the acceptable and unacceptable percentage of check list among category of maintenance of hand washing sanitizing and toilet facilities. The highest acceptable percentage was given to each of maintenance plans and contamination possibly occur, which represent (90.5%), followed by adequate hand washing & sanitizing facilities in production areas

(61.9%). The least percent of acceptable was for the adequate toilet facilities and in good condition (52.4%).

Figure (4) shows the acceptable and unacceptable percentage of check list among category of protection of food , food packaging material, and food contact surfaces from adulteration. The highest acceptable percentage was given to each of packaging materials in good condition and lubricants & maintaining facilities are properly controlled, which represent (90.5%), followed by products & packaging materials being protected from (85.7%). The least percentage of acceptable were given to the environment

condition around the production areas (71.4%). Figure (5) shows the acceptable and unacceptable percentage of check list among category of exclusion of pests. The highest acceptable percentage was given to each of pest control plan and controls been documented, which represent (100%), then pests are being controlled effectively (90.5%), followed by pesticides effective (81%), in addition to facilities in good condition, which represent (38.1%).

The least percentage of acceptable were given to each of rodent control 's chart, adequate rodent baits and reliable rodent prevention facilities which represent (52.4%) for each of the previous chek list.

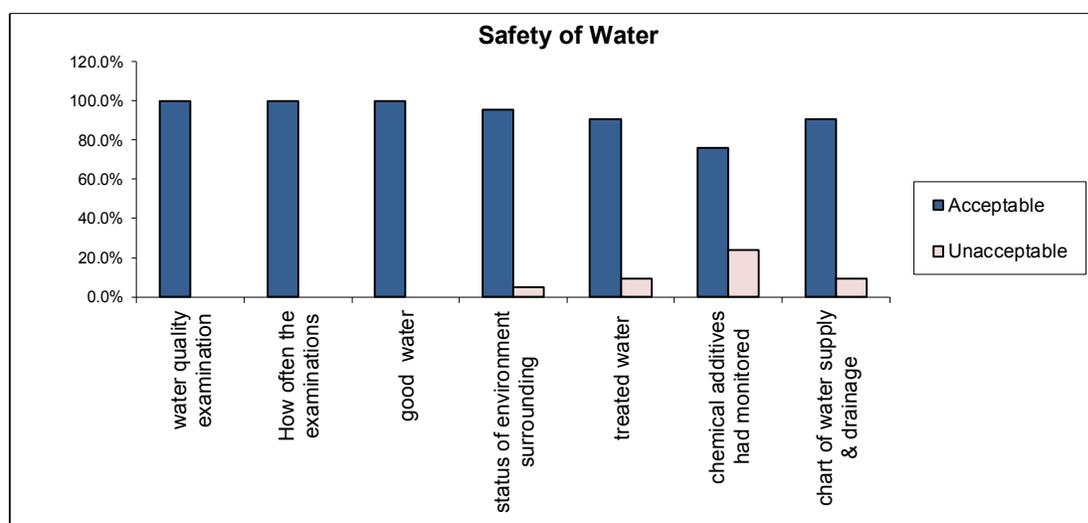


Figure 1: Percentage of acceptable and unacceptable of check points in category of safety water

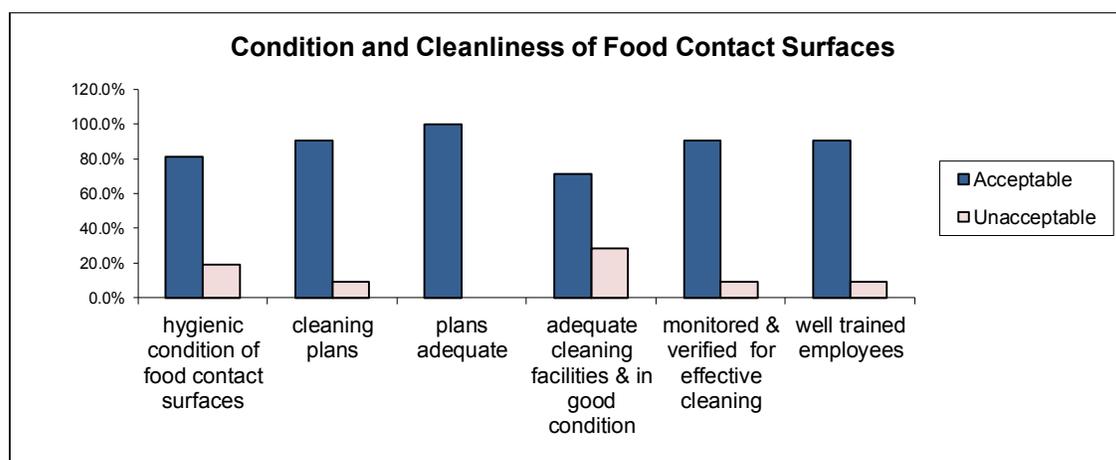


Figure 2: Percentage of acceptable and unacceptable of check points in category of condition and cleanliness of food contact surface

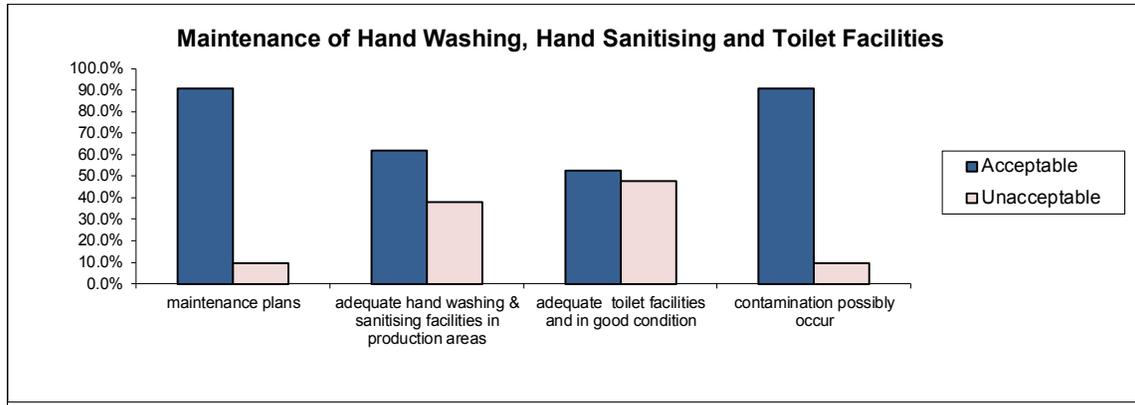


Figure 3: Percentage of acceptable and unacceptable of check points in category of maintenance of hand washing sanitising and toilet facilities

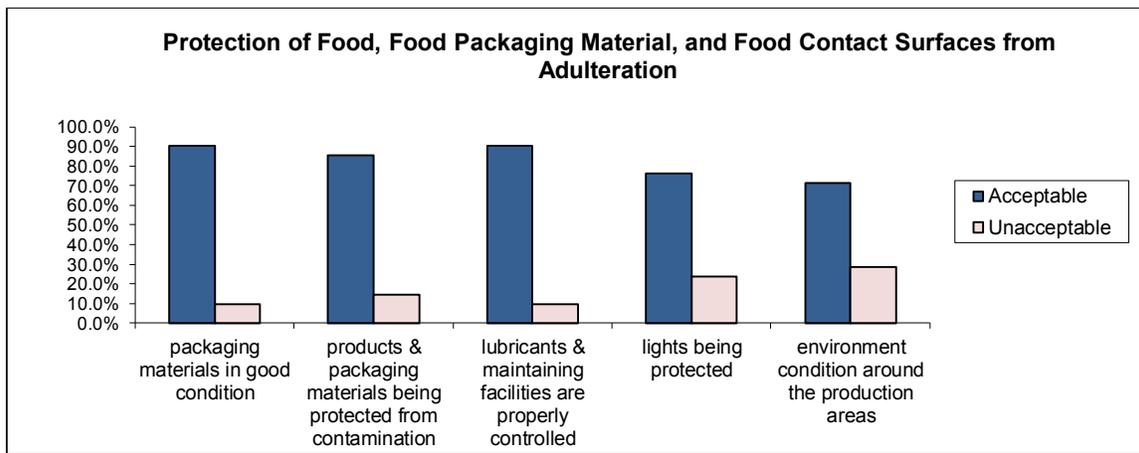


Figure 4: Percentage of acceptable and unacceptable of check points in category of protection of food , food packaging material, and food contact surfaces from adulteration

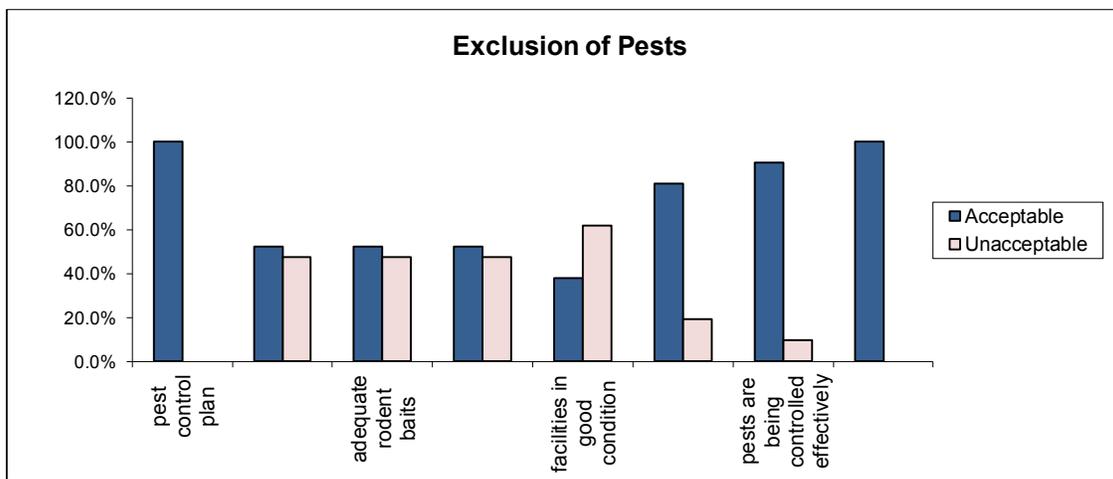


Figure 5: Percentage of acceptable and unacceptable of check points in category of exclusion of pests

DISCUSSION

Food safety is becoming a vital requirement of the hospitality industry. As the cost effective for consumers of food products from the industry has a great impact on health and well-being of the nation. One of the competencies that were highlighted in tourism education is sanitation and safety course.⁽¹⁶⁾ According to Walker⁽¹⁷⁾ additional management skills like supervisory training, accounting, sanitation and safety are also essential as the level of the professionalism rises in the twenty-first century. The data in table (2) reveal that all questions had a significant role to be included in questionnaire of the study ($p < 0.05$). The data revealed also that the construction layout had the highest impact on the application of hygienic requirements, followed by training and water safety. So buildings and facilities should be of sound construction and maintained in good repair.⁽¹⁸⁾ All construction materials should ensure not to transmit any undesirable substances to the food. It is designed to permit easy and adequate cleaning and to facilitate proper supervision of food hygiene. Adequate working space should be provided to allow satisfactory performance of all operations.⁽¹⁹⁾

The status of environmental surrounding had a significant impact on the application of sanitary requirements, while doors, windows & other facilities in good condition in the category of exclusion of pests were not significant. External surroundings should be evaluated for sources of contamination such as vermin, bird harborage areas, drainage problems, odor problems, debris, refuse, and pollution-smoke, dust, other contaminants. Appropriate steps must be taken to contain and control any potential sources of contamination.⁽¹⁵⁾ It has been mentioned that facilities having potable running water supply, adequate plumbing system, hand washing facilities, and functioning sewage disposal systems are essential for preventing contamination and promoting personal hygiene in food handling establishment.⁽²⁰⁾ Cross-contamination is an important factor that contributes to food-borne outbreaks.⁽²¹⁾ Poor personal hygiene is a risk factor

contributing to food borne disease.⁽²²⁾ The highly significant correlation between many categories may indicate the stepwise importance in classification of categories.

The largest proportion concerning categories is the proportion of full approval in various categories whereas the largest percentage was for the tendency for approval and thus any all of the groups have a tendency for application of various categories.

The highest acceptable percentage was given to water quality examination and good water. An ample supply of water, in compliance with the WHO "Guidelines for Drinking Water Quality", under adequate pressure and of suitable temperature should be available with adequate facilities for its storage, where necessary, distribution, and with adequate protection against contamination.⁽²³⁾

The least percentage of acceptability were given to the adequate cleaning facilities & in good condition and to the adequate toilet facilities. Thorough evaluation of the effectiveness of cleaning and sanitizing programs. Consult a reputable cleaning and sanitizing supplier and follow recommended procedures for cleaning and sanitizing both food-product contact and non-product contact surfaces in specific operations.⁽¹⁵⁾ The least percentage of acceptable were given to the environment condition around the production areas. Surfaces should be smooth and free from pits and crevices. Suitable materials include stainless steel, synthetic wood and rubber substitutes should be used. The use of wood and other materials which cannot be adequately cleaned and disinfected should be avoided except when their use would clearly not be source of contamination. The use of different metals in such a way that contact corrosion should be avoided.⁽²⁴⁾

The highest acceptable percentage was given to each of pest control plan and controls been documented. The least percentage of acceptable were given to each of rodent control 's chart, adequate rodent baits and reliable rodent prevention facilities. An adequate pest control program is necessary for sanitary operation of a food-processing or -

handling facility. Effectiveness of the pest-control program should be verified on a regular frequency.⁽¹⁵⁾

Because insects and rodents are known carriers of pathogenic bacteria from areas of contamination to prepared foods and food contact surfaces therefore they must be vanished. There should be an effective and

continuous program for the control of pests. Establishments and surrounding areas should be regularly examined for evidence of infestation.⁽²³⁾

The pre-requisite programs at the majority of the larger properties can form the foundation for full implementation of HACCP with some technical assistance and support.⁽¹⁰⁾

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