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Effect of Food Safety Training on Achieving Good Hygiene Practices in Restaurants in the Emirates of Dubai

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Abstract: Food safety, specifically in restaurants, is becoming a key public health priority because of the increased number of meals eaten outside the home. Foodborne illness prevention thus is a significant concern and a public health priority in the United Arab Emirates, particularly Dubai, because of the extensive tourism industry. The purpose of the study was to evaluate the effectiveness of using demonstrations in training sessions to improve food safety knowledge and practices amongst food handlers. A descriptive and quantitative approach has been applied to collect the quantifiable information related to the research study. This has been further analyzed using the correlation tests to gather the required data. On comparison of the pre-test scores between the intervention and the control group, the *t*-test analysis showed significant difference in the level of food safety knowledge between the two groups. Pre-test score for the control group was 78.33 and post-test score was 104.66. In the case of the intervention group, pre-test score was 91.37 and post-test score was 130.75. The scores of food handlers' food safety practice for control group: pre-treatment score was 470 and post-treatment score was 646. For intervention group: pre-test score was 723 and post-test score was 1,056. The study concluded that training with demonstration techniques is an effective way of improving compliance with food safety guidelines. It has been understood that training helps in improving the performance of the employees while reducing the foodborne diseases and maintaining hygiene in the food. The study recommends every restaurant needs to provide regular trainings to the employees so that the restaurants can maintain hygiene and food safety practices.

Key words: Food safety training, food safety knowledge, food safety risk factors, food hygiene practices, demonstration, food handlers.

1. Introduction

Hygiene practices of the food handlers in various restaurants have gained considerable significance in every step of the food chain starting from production to preparation and food serving. The individuals satisfy their tastes or nutrition needs, but they pay a little attention to food safety and hygiene. The concept of food safety is used in terms of food hygiene and it further encompasses a number of issues that must be addressed to ensure the safety of the prepared food [1]. Food hygiene mainly refers to cleanliness, however, the food safety needs much more attention than a clean premise The increasing number of incidents on foodborne illness has enhanced the global concerns regarding food safety [2]. Food handlers or the persons handling the food regardless of whether they prepare it or serve it play significant roles in the prevention of foodborne diseases. According to Murphy *et al*. [3], food safety training is mandatory in many countries around the globe, Dubai Emirates is one of the examples. Information regarding the food handlers' practice is a key thing to address the trends of the increasing food borne diseases. Thus, to prevent the foodborne disease, it is necessary to get cooperation from all the people working in the food chain and handling it. In the present day, in the developing or developed countries, the foodborne diseases are the leading issues that threaten the well-being of the people. The foodborne diseases affect the well-being of the people as a result

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of which the national economy, foreign trade and development of the country get affected [4]. On the other hand, in the developing nations, the people are poisoned due to the consumption of the foods that are produced under the unhygienic situations, low levels of health education, contamination of water, drought, unsuitable food storage condition, heavy metals pollution, deficiency of cleaning and pesticide residue. The food not being stored under unhygienic conditions, failing to provide proper care and meet the demand of cheap food during the food preparation might result into food poisoning as well. Considering the restaurants of Emirates, Dubai, the outbreaks of the food poisoning along with the consumption of the contaminated food are important matters to be noted. According to the reports collected from the different restaurants of Dubai, it has been seen that the outbreak of the foodborne diseases is also due to the improper temperature under which the food is stored or prepared and the insecure sources from where the food is collected along with the poor unhygienic staffs. According to Pilling *et al*. [5], food handlers' knowledge plays an important role in terms of improving food hygiene practices in restaurants. Previous research studies have shown that there are three main factors which play a decisive role in the development of food poisoning in regards to the food handlers; these are personal hygiene, thermometer use, cleaning and disinfection.

The main aim of developing this paper was to understand the effectiveness of food safety training for the food handlers in the restaurants of Dubai Emirates to achieve a good hygiene and food safety practice in terms of dealing and serving the food.

The research objectives have been formed concentrating on the main purpose of this study (as stated above):

- To evaluate the effectiveness of conducting training sessions to improve food safety and maintain good hygiene practices;
- To focus on instilling knowledge on practices of food handling in the restaurants of Dubai;
- To identify the current food hygiene practices in Dubai restaurants based on well-established current good practices (cGPs);
- To find out the technologies used in the food safety training programs in the restaurants.

2. Literature Review

There are various literature studies conducted on the knowledge or practices of the food workers in the restaurants of Emirates, Dubai. Limited information was available regarding the issues of employees' knowledge on achieving food hygiene practices in the restaurants of Dubai for which the present study has been conducted to look after the matter of effect of food safety training along with the hygienic practices of the food workers. Thus, educational programs or trainings regarding the food safety to maintain hygienic practices at the restaurants in Dubai might help the workers to prepare safe foods and prevent foodborne diseases.

Though the safety of the foods served in the restaurants of Dubai has been an ongoing matter of concern, the unhygienic place where the restaurants are located may contribute to the transmission of the foodborne diseases. Though these outbreaks are quite often, the individual restaurants of Dubai have taken limited steps to implement the training or educational programs for the foodborne diseases. Soon and Baines [6] suggested that there is a need of proper training programs set in every restaurant of Dubai, so that the food handlers are aware of food safety and hygienic practices that need to be followed. There are various reasons for which the restaurants should arrange for food safety training to maintain hygienic factor in the served foods. Some of the reasons are listed as below:

(1) Proper handling of food—According to Seaman and Eves [7], the employees will be handling the food in the restaurants for which they should be aware of safety rules. This will protect the customers from the hazardous food and also ensure that the food handlers

maintain the hygienic standards to reduce the foodborne diseases.

(2) Reduction of the risks of food poisoning—Pilling *et al*. [8] state that interaction between one person and another is the main method of spreading harmful bacteria. Hence, the food handlers handling the food and serving it to the customers need to be trained accordingly to reduce the risks of food poisoning.

(3) Improvement of quality control of food—If the quality of the food is in control, then, it will help in reducing the wastage of food. Thus, food safety training is necessary to improve the food safety and quality. Pilling *et al*. [9] added that restaurant food handlers should be aware of the food handling practices to make sure that the food is safe and hygienic. The training also helps them to identify the required temperature to store the food, the safety of washing hands before handling and cooking. Following the above-discussed processes helps in avoiding the food poisoning issues in the restaurants of Dubai Emirates.

An unhygienic behavior causes a risk of foodborne diseases or illness among the customers [10]. The persons handling or preparing the food need to understand the food safety skills to demonstrate the good hygienic practices and reduce the presence of pathogens in the food or surrounding environment. Hence, there is a need of arrangement of a training program in every restaurant of Dubai to make the employees aware of food safety and hygienic matters and reduce the issues of food poisoning or foodborne diseases. Campbell *et al*. [11] commented that the food safety training or hygienic practices produced significant enhancement in the knowledge related to the personal hygiene and the rules to prepare the food. The employees gain better knowledge regarding the rules to be followed during the preparation of food in the restaurants. Besides that, the food handlers also become aware of the food poisoning, cross-contamination of high-risks food. The training benefits the employees to understand the temperature in which the food needs to be stored or heated so that there would be no issues of diseases or contamination of food. According to Kassa *et al.* [12], knowledge can be improved related to daily practices or exposures like the behaviors related to the personal hygiene. However, York *et al*. [10] argued that it is difficult to enhance the knowledge regarding the technical processes like temperature monitoring or time management and suitable sanitization measures. The training programs are beneficial in improving the knowledge of the food handlers regarding the process of handling or serving the food to prevent any types of foodborne diseases. Other than that, it also helps them improve their perceived behavior regarding food handling to satisfy the customers with safe food and enhanced behavior.

The notion of employee training on food safety tends to be followed by a traditional path. According to Mitchell *et al*. [13], the employees who are preparing and serving the food receive classroom training either through the tools like PowerPoint or through interactive technologies. Most of the restaurants started using the electronic teaching system which is useful in instant record keeping using the learning management system. The restaurants of Dubai which adopted this technology found that the food handlers became more active and are working proficiently to avoid the issues of foodborne diseases due to the lack of handling food safety properly. Other than these, Medeiros *et al*. [14] argued that an innovative application of food safety training has been launched in the market. This is available for the tablet technologies like iPad. Soon *et al.* [15] added that infrared thermometer is one of the recent technological advancements which the food industry has seen to store the food in an appropriate temperature. On the other hand, adenosine triphosphate (ATP) hygiene monitoring technology is applied to detect the store cleaning programs by the internal or the third-party auditors. The employees are trained on this ATP technology to identify the inadequate cleaning practices and then assist the management to conduct a root cause analysis while implementing the strategies

to reduce the potentials for the product contamination. Further, Park *et al*. [1] stated that the food handlers of restaurants of Dubai are trained on Internet of Things (IoT) to receive the real-time information in the cloud-based storage system which is visible in the form of a temperate tracking starting from the receiving, preparation and services.

3. Materials and Methods

3.1 Experimental Design

The population for this study was food handlers in commercial independent and chain restaurants licensed to sell food in Deira and Bur Dubai area chosen from the Dubai Municipality Food Safety Department listing licensed to operate in the Dubai Emirates. A control group and an intervention group were used to test the internal validity of the training effect (Fig. 1a). Six independent restaurants consisting of a total of 63 employees were invited to participate voluntarily as the control group, which did not receive food safety training. Eight other independent restaurants consisting of a total of 90 employees also were invited as the intervention group and also did not attend any food safety training (Fig. 1b). The managers of the restaurants contacted by telephone to participate the study and in return for their participation, were offered free training for their employees. Six-hour training is carried out two weeks of interval. Two types of questionnaires for measuring employees' food safety knowledge and food safety practices were administrated to the control and intervention group before and after food safety training. Food safety performance was also evaluated by trained auditors through the onsite observation technique with food safety practices observation form.

3.2 Questionnaire Development

The questionnaire developed for the study has been divided into three parts: knowledge assessment, food safety practices and employee demographics [16]. Under knowledge assessment, questions are designed on hand washing, use of thermometers and handling food surfaces. Food safety practices have been assessed on the basis of current workplace in the second part. In the third section, the demographic profiles have been assessed [17]. This questionnaire has been formed on the basis of pre-food safety training practices. Two weeks after the knowledge assessment (after training), a trained research assistant has been engaged to observe the candidates during the lunch and dinner working shifts. The form comprises of food handling practices, proper handling of the work and food, thermometer use and washing hands techniques.

3.3 Pilot Study

The pilot study technique was used to evaluate the questionnaire validity. The pilot study was done to help point out any flaws or errors that might be committed during the construction of the instrument. The findings of the pretest study were used to revise and refine the

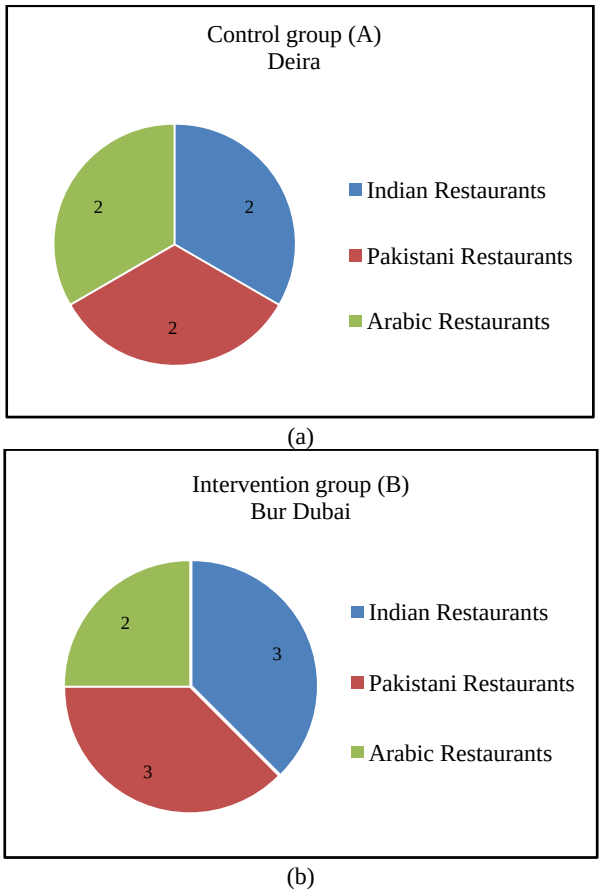

Fig. 1 Participating restaurants A (a) and B (b).

instrument questions to enhance the reliability and validity of the final instrument in this study. The questionnaire was pre-tested on a simple random sample in non-participating restaurants (one from each category) to ensure clarity of interpretation.

3.4 Data Collection

Different methods have been chosen for data collection, sampling, data analysis and research approach. The research approach is said to be a set of plan following which the data are collected, analyzed or interpreted to gather the required results [18]. In this research, quantitative research approach has been used to collect the numerical data from the training and then it has been translated into tables and charts in order to make it understandable [19]. The methods used here are more structured than the qualitative approach. Depending on this research approach, the survey research strategy has been chosen to collect the vast amount of information related to the effects of training on the untrained and trained food handlers in the restaurants of Dubai. Positivism helps in gathering factual information related to a topic using the measurements or observations [20]. The researcher collected the data using the data collection method which is later analyzed using the objective approach. In this study, positivism has been applied to collect the quantifiable and observable data using the quantitative approach as discussed earlier. Since detailed data have been collected using the survey method, the scientific method that has been used here involves the observation and description of the research subject. Hence, a descriptive research design has been used here where the information has been collected and presented in a tabular form [21]. The researcher has applied both primary and secondary data collection techniques here to collect the data related to the study. Research data are the important property of the research work and are considered as an important asset of the study. Primary research is applied to collect the raw data as a major set of information. The primary data are collected for the first time using the trainings, examination and observation. The primary data have been collected here using the quantitative research and the secondary data have been collected using the suitable secondary resources like questionnaire, observation sheets, etc. The data have been collected using the systematic random sampling where the respondents are selected randomly. The collected data have been analyzed in a SPSS software package. Pearson correlation test has also been done to understand the correlation among the food safety knowledge, onsite observation and behavior of the food handlers [22].

4. Results and Discussion

According to the analysis presented in Tables 1-4, it has been identified that the post-training results are significant compared to the pre-training results. In comparison of the pre-test scores between the intervention and the control group, the *t*-test analysis showed significant difference in the level of food safety knowledge between the two groups. Pre-test score for the control group was 78.33 as illustrated in Table 1 and post-test score was 104.66 as illustrated in Table 2. In the case of the intervention group, pre-test score was 91.37 as illustrated in Table 3 and post-test score was 130.75 as illustrated in Table 4. With food safety knowledge after training, the results showed that the level of knowledge on food safety from the trained group improved more than that of the no-trained group. In this study significant changes in the knowledge were detected, the potential effect of training was verified. In the evaluation of food safety knowledge for the control group score was increased from 78.33 to 104.66 and in intervention group, post-training scores increased from 91.37 to 130.75 after training; this shows statistically significant differences between the two groups. Hence, it can be interpreted that the training plays an important role in improving food safety knowledge. The scores of food handlers' food safety practice for control group: pre-treatment score was 470 as illustrated Fig. 2 and

Table 1 Pre-training score of control group A.

Variables	Score of each restaurant	Average score
(1) Proper handling food and work surfaces		
Pre	19 + 28 + 27 + 17 + 21 + 19	131/6 = 21.83
(2) Thermometer use		
Pre	0 + 2 + 2 + 6 + 3 + 3	16/6 = 2.66
(3) When to wash hands		
Pre	41 + 31 + 34 + 25 + 24 + 34	189/6 = 31.50
(4) How to wash hands		
Pre	19 + 22 + 32 + 20 + 19 + 22	134/6 = 22.33
	Total average	78.33®

® denotes the total average score for all categories of participated employees.

For individual questions, the McNemar non-parametric test was used, since every question is answered with a dichotomous dependent variable. For total scores in each section the Wilcoxon paired non-parametric test was used. The Wilcoxon tests were 1-tailed to test if the pre-training results were significantly lower than the post-training results. Statistical significance was declared at $p < 0.05$.

Table 2 Post-training score of control group B.

Variable	Score of each restaurant	Average score
(1) Proper handling food work surface		
Post	24 + 28 + 31 + 26 + 31 + 32	172/6 = 28.66
(2) Thermometer use		
Post	8 + 10 + 23 + 18 + 22 + 14	95/6 = 15.83
(3) When to wash hands		
Post	47 + 31 + 34 + 22 + 44 + 32	210/6 = 35.00
(4) How to wash hands		
Post	23 + 31 + 24 + 21 + 30 + 22	151/6 = 25.16
	Total average	104.66®

® denotes the total average score for all categories of participated employees.

For individual questions, the McNemar non-parametric test was used, since every question is answered with a dichotomous dependent variable. For total scores in each section the Wilcoxon paired non-parametric test was used. The Wilcoxon tests were 1-tailed to test if the pre-training results were significantly lower than the post-training results. Statistical significance was declared at $p < 0.05$.

Table 3 Pre-training score of intervention group A.

Variable	Score of each restaurant	Average score
(1) Proper handling food and work surfaces		
Pre	26 + 28 + 27 + 24 + 21 + 21 + 28 + 21	196/8 = 24.50
(2) Thermometer use		
Pre	17 + 10 + 6 + 6 + 20 + 22 + 10 + 5	96/8 = 12.00
(3) When to wash hands		
Pre	33 + 31 + 34 + 25 + 12 + 27 + 31 + 41	234/8 = 29.25
(4) How to wash hands		
Pre	19 + 30 + 27 + 20 + 30 + 30 + 30 + 19	205/8 = 25.62
	Total average score	91.37®

® denotes the total average score for all categories of participated employees.

For individual questions, the McNemar non-parametric test was used, since every question is answered with a dichotomous dependent variable. For total scores in each section the Wilcoxon paired non-parametric test was used. The Wilcoxon tests were 1-tailed to test if the pre-training results were significantly lower than the post-training results. Statistical significance was declared at $p < 0.05$.

Table 4 Post-training score of intervention group B.

Variable	Score of each restaurant	Average score
(1) Proper handling food and work surfaces		
Post	42 + 38 + 33 + 31 + 35 + 35 + 28 + 21	263/8 = 32.87
(2) Thermometer use		
Post	28 + 33 + 12 + 31 + 30 + 25 + 29 + 22	210/8 = 26.25
(3) When to wash hands		
Post	51 + 47 + 40 + 34 + 35 + 25 + 44 + 44	320/8 = 40.00
(4) How to wash hands		
Post	30 + 26 + 36 + 32 + 33 + 33 + 33 + 30	253/8 = 31.62
	Total average score	130.75®

® denotes the total average score for all categories of participated employees.

For individual questions, the McNemar non-parametric test was used, since every question is answered with a dichotomous dependent variable. For total scores in each section the Wilcoxon paired non-parametric test was used. The Wilcoxon tests were 1-tailed to test if the pre-training results were significantly lower than the post-training results. Statistical significance was declared at $p < 0.05$.

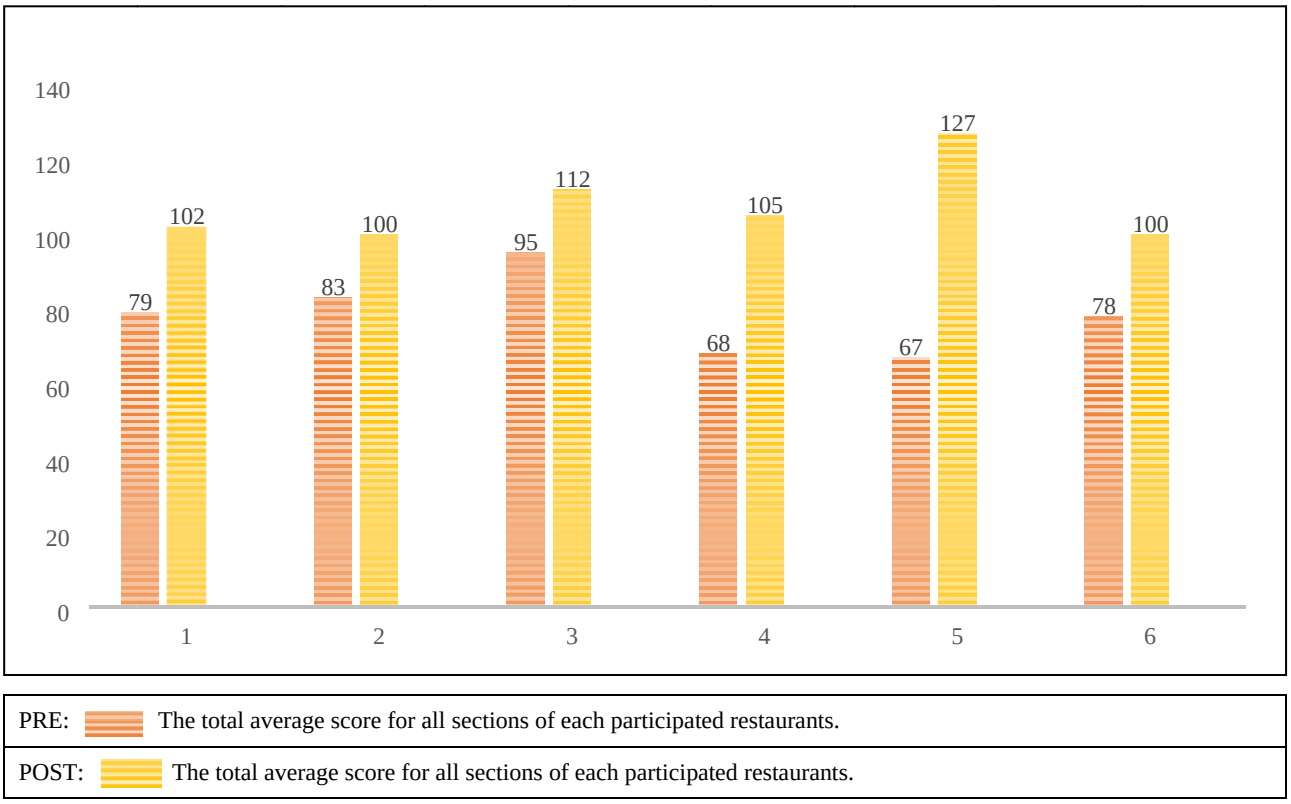

Fig. 2 Field observation descriptive statistics—group A (control group).

post-treatment score was 646 as illustrated in Fig. 2. For intervention group, pre-test score was 723 as illustrated Fig. 3 and post-test score was 1,056 as illustrated in Fig. 3. The scores for the post-training hygiene practices rated highly at 646 and 1,056 compared to post-training practices which rated 470 and 723, which shows significant difference between the pre- and post-training. Hence, this result supported the possibility that for employees who attended the training, their food safety practices are increased significantly due to increased knowledge. In the case of the intervention group, there was a significant increase in knowledge in the personal hygiene dimension, and handling methods on finished products and service in

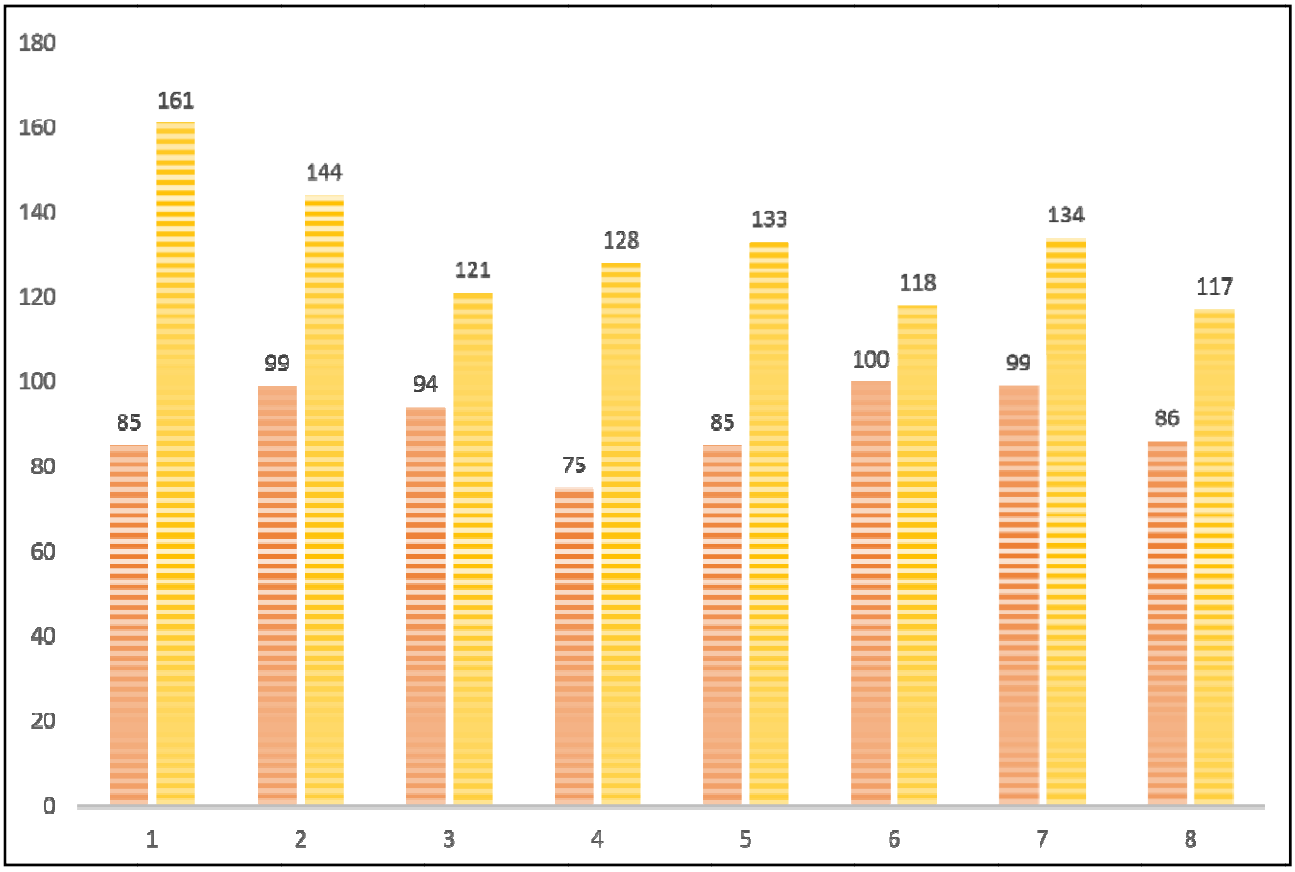

Fig. 3 Field observation descriptive statistics—group B (intervention group).

food hygiene dimension, while in the safety practices of the hygiene-related work improved behaviors were found high scores in hygiene practices. This pointed out that employees with knowledge have high hygiene practices. If continuous and specific-goal oriented training is provided to employees, hygiene practices such as personal hygiene, proper hand-washing, observation of uniform code, prevention of cross-contamination, or proper sanitation techniques could be easily improved.

In the evaluation of hygiene practices performance for the intervention group, performance scores increased from 723 to 1,056 after training, showing statistically significant differences between the two. Especially, proper temperature checking practices, hand washing practices, checking and recording of temperatures of food, preventing contamination by holding foods off the floor, pest control: no existence of insects and rodent, and toilet properly equipped and not well cleaned urgently needed to improve. In this study, employees stated they do wash their hands properly, and the panels evaluated them as having a high score. This indicates that training is effective by the following of proper procedures for employees' job performance, increased due to the increased food safety knowledge.

With food safety knowledge after training, the results showed that the level of knowledge on food safety from the trained group improved more than that of the no-trained group.

Thus, comparing the results of the literature review with the primary data, it has been understood that Dubai is a growing city in Middle East where the food

safety in the restaurants increases due to the huge number of tourists. The food handling industry is developed in terms of providing proper training to the staffs so that they can be professionals in terms of proper handling of food, use of thermometers and then, washing hands before serving or preparing food. As noted in the data gathered, it has been seen that the food handlers have been provided with proper training and this has helped in increasing the knowledge, attitude and practices of the employees. The concern was to see whether they are maintaining good hygiene practices in terms of preparation and handling of food. The study concluded that training with demonstration techniques is an effective way of improving compliance with food safety guidelines.

5. Conclusions

Food handlers of Dubai restaurants receive specialized training facilities to improve their process of handling and serving the food. They follow up a system and supervision under the managers of the restaurants for proper maintenance of the food and to reduce the foodborne diseases. Cleaning procedures or practices are maintained in every restaurant of Dubai to maintain good hygiene factor and improve the business. Hence, it can be suggested that training program and awareness strengthening for the food handlers need to be held regularly in the restaurants of Dubai to train them better on the process of serving or preparing food maintaining hygiene. It is also necessary to monitor the food handling processes properly while developing a science-based and food safety inspection guidelines. It has been understood that training helps in improving the performance of the employees while reducing the foodborne diseases and maintaining hygiene in the food. Thus, every restaurant needs to provide regular trainings to the employees so that the restaurants can maintain hygiene and food safety practices. It is concluded from this study that due to limitation of small sample group and language barrier an education effect could affect the improvement of hygiene knowledge, but the food safety practices and hygiene management performance were improved. However, considering the fact that there were some significant increases in the knowledge, it was concluded that hygiene management level as well as hygiene knowledge and hygiene practices was improved. To do this the frequency of food safety training reinforced through specific goal setting, and more concrete training programme suitable for employees' educational background should be designed. In addition, designing program to motivate employees to maintain and self-regulate proper practices should be required.

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Institutional Review Board

The study was approved by the International Review Board (IRB) of the Faculty of Food Science and Technology of University of Putra Malaysia.

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