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Effect of food safety and hygiene training on KAP score among food handlers in multiple food service institution, Pakistan

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ABSTRACT

Food safety is an assurance that foodstuff which is consumed are safe to human health. Insufficient practices and absence of knowledge among food handlers are contributing factors for the spread of foodborne diseases. To evaluate knowledge, attitudes, and practices concerning food safety issues among food handlers in multiple food service area's by conducting face to face interviews and administrating structured questionnaire. A cross sectional analytical study was conducted among 72 food handlers by using purposeful sampling technique. The study demonstrated that the positive association was found between working experience, formal training with knowledge, attitude and practices towards food safety and disease control measures ($p < 0.05$). The mean percentage of pre training KAP and observed practices scores were 75.8 and 13.7 while Post training KAP were 95.9 and 16.8 respectively. Food handlers have adequate knowledge regarding the basic food hygiene but needs improvement in HACCP (critical temperatures of hot or cold ready-to-eat foods, time temperature control of food and cross-contamination etc). There is an immediate need for periodic education and increasing awareness regarding safe food handling practices. Verdicts from this study gives a vision for better food sanitation practices and influence all food service institutions to follow HACCP practices.

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1. Introduction

Food safety is the assurance that foodstuff which is consumed is safe to human health and wellbeing. World Health Organization in 2015 revealed that annually about 0.42 million died and 600 million people affected by foodborne illnesses globally.

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Food handlers play a vital role in ensuring food safety during the course of food procurement, production and stowage. Neglecting hygienic measures may permit pathogenic microorganisms to grow and multiply abundantly, that may cause illnesses. The hands of food handling employees can be potential source of microbial contamination and they become carriers of food borne diseases (1).

Among all bacterial food poisoning outbreaks about 70% caused by malpractices of food caterers primarily due to the inadequate time and temperature control of food and cross-contamination (2).

Mismanaging food can be throughout the chain of food production primarily preparation and processing e.g. unsafe storage temperature, improper cooking, filthy equipment and bad personal hygiene (3). The causative agent may be insufficient food preservation methods or hazardous handling techniques due to cross-contamination from surfaces, utensils, even from caterers who have been infected with enterotoxigenic staphylococci, camphylobacter, salmonella etc., (2). Food and Drug Administration USA describes the food hazards into 3 categories: biological (bacteria, viruses, molds, parasites and fungi); chemical (kitchen cleaning chemicals, insecticides, and food additives); or physical (insects, dust, broken glass and crockery that unintentionally gets into food (4). Globally Hazard Analysis and Critical Control Point (HACCP) system has been applied for safe practices (4). HACCP ensures safe practices beginning from buying products to cooking meals focusing on preventing contamination (4). It may be a high risk group for food poisoning due to food handlers malpractices (5). Food handlers may also transmit food borne viruses and pathogenic bacteria's like Hepatitis A, noroviruses, E. coli O157:H7, typhoidal Salmonella, Staphylococcus aureus and Shigella species in their hands, cuts or sores, mouth and hair during the contagious period of active infectious disease. The study was conducted to assess the sociodemographic characteristics of food handlers and to evaluate knowledge, attitudes and practices among food handlers regarding food safety and hygiene practices. To create awareness about food safety, hygiene practices and critical hazards analysis among food handler's and managers to prevent the spread of food borne diseases. Previously on literature not any study was done on KAP score among the food handlers in non commercial food service setup of Pakistan.

The aim of study was to evaluate the food safety knowledge, attitudes and practices of food handlers in multiple food service institutions. Also, to assess the efficacy of knowledge retention after training.

2. Materials and Methods

2.1. Study Design and Target population

A cross sectional analytical study had been designed from Feb 2020 to Jul 2020 involving 72 food handlers in 4 different areas of multiple food services institutions. Participants were purposefully selected, all those involved in food handling practices from all setups i.e., tea bars, cafeterias, restaurants and cook house.

2.2. Data Collection

Data were collected by face-to-face interview, structured questionnaire and periodic inspection of cooking areas to ensure the accurateness of the replies. The questionnaire was also modified into Urdu for better understanding of participant

3.3. Questionnaire Design

Questionnaire consisted of 4 parts (demographic profile, Food safety Knowledge, Attitude, Self-reported practices). The demographic information (age, gender, education level, experience in foodservices, formal

cooking course and lectures/Training on safe food handling).

The information about food safety knowledge were obtained via 25 questions. For correct answer, a score of "2" was given while score "0" was given for incorrect answer.

Attitude towards food safety were assessed by their level of agreement with 5 statements using Likert Scale. For "agree" or "strongly agree" a score of "2" was given, whereas "0" was given to answers with "strongly disagree", "disagree" or "neutral".

Self-reported practices about food safety was evaluated in 5 categories as ("never", "seldom", "sometimes", "frequently" and "always"). Correct practices (frequently or always) were given a score of "4" whereas incorrect practices (never, seldom or sometimes) were given "0" score.

2.4. Statistical Analysis

Data was analyzed using IBM SPSS Statistics version 22. Statistical significance for all tests were set as $p<0.05$. Means, standard deviations and frequencies were calculated for all variables. To find the correlation between knowledge, attitude and practices about food safety both parametric and non-parametric analysis was used. Multiple regression was used to assess the effect of socio-demographic factors (education level, Job experience and formal training/course) on food safety knowledge, attitude and practices. While Spearman's correlation coefficient was used to analyze the association between knowledge, attitudes and practices scores of the food handlers. While Parametric (paired sample t-test) test were used to find the effect of food safety training on KAP score.

3.5. Ethical Consent

Ethical clearance was attained for the Institutional Ethical Review Committee and informed consent was signed by all the food handlers before the interview. Concerning the ethical aspects, all information will be kept confidential and used merely for research purpose.

4.Results

4.1. Demographics of Participants

Seventy two food handlers comprises of 27 cooks, 30 waiters, 3 dishwashers, 4 storemen, 4 restaurant supervisor, 4 restaurant manager working in military food service institution. The results represented the mean age of employees working in food area was 35 yrs. as depicted in table 4.1. 96% of them were permanent employed while only 4% were temporary employed. Only 48% particularly cooks have been attended formal training/lecture on safety hazards and disease control measures while 63% never attend any sort of training /lecture on safety hazards. Approximately 35% have got certified training about cooking and handling foods after induction in food service setup and all of them are cooks/chefs while 65% did not have any training/course/certification in food production. Almost half have working experience of 15 years.

Table1. Demographics information of Participants

Variables	Items	Number	Percentage%
Age	26-30	31	43
	31-35	8	11
	35-40	33	46
Qualification	Under Matric	3	4
	Matric	65	90
	Bachelor's	4	6
Employment Category	Permanent personnel	69	96
	Temporary	3	4
Work experience	<5yrs	18	25
	5-10yrs	30	42
	11-15yrs	16	22
	16-20yrs	8	11
Job Responsibility	Cook	27	37.5
	Waiter	30	41.7
	Dishwasher	3	4.2
	Store man	4	5.6
	Food Supervisor	4	5.6
	Food Manager	4	5.6
Formal Training/certification	Yes	27	37
	No	45	63
Safe Food handling/Safety Hazards lecture	Yes	35	48
	No	37	51

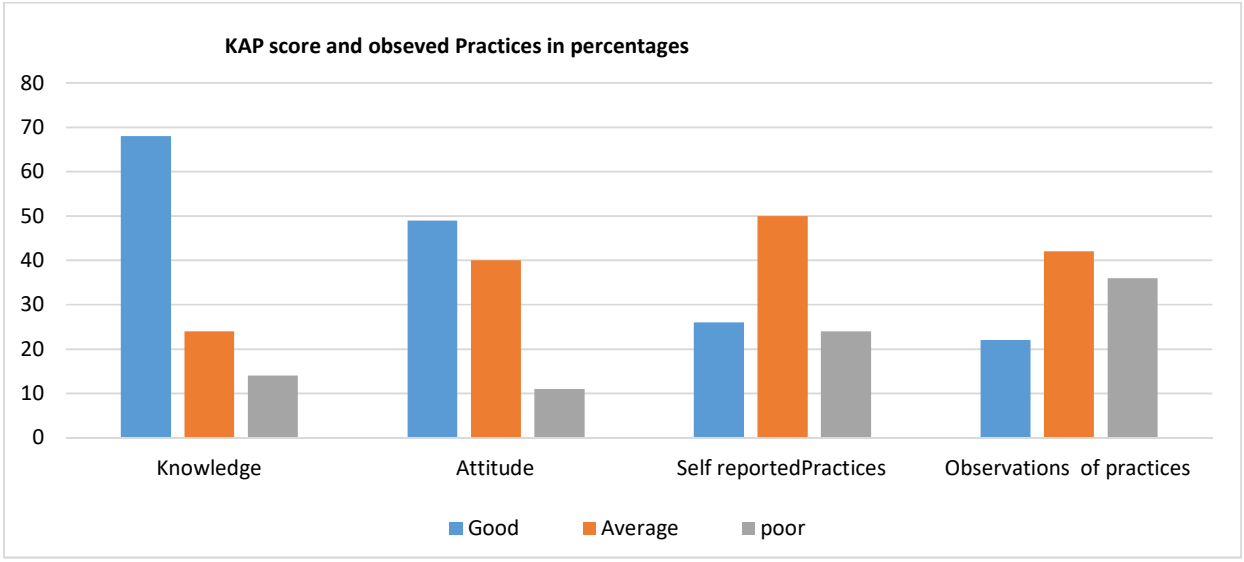

Figure 1. Distribution of Score of Knowledge, Attitude and self-reported practices and observed Practices

4.2. Knowledge, Attitude and Practices (KAP) Score

The mean score of knowledge was 31.6±5.3 (52%) with minimum 25 and maximum 50. The mean attitude score of the respondents was 6.08±1.1 (61%) with a minimum score of 5.0 and maximum 10.0. The mean (SD) score of practice was 11.3±2.4 (56%) with minimum of 6.0 and maximum of 12.0 as depicted in graph 4.2.

4.3. Correlations of Mean Score of KAP

Among participants as depicted in table 4.3, analysis using Pearson correlation test showed that there were correlations between the mean scores of knowledge, attitude and self-reported practices.

The correlations between the mean scores of knowledge and attitude were strong (r = 0.633; p = 0.000) and knowledge and practice were slightly strong (r = 0.390; p = 0.001) and attitude and practice were also strong (r = 0.682; p = 0.001). The results proposed a positive relationships between knowledge, attitude and practice, predicted that if knowledge will increase, attitude and practice will also increase accordingly.

Table 2. The correlations of mean score of KAP of food safety among respondents

		Mean±SD	knowledge	Attitudes	Self reported Practices
Knowledge	Pearson Correlation	41.6±5.3	1	0.633**	0.390**
	Sig. (2-tailed)			0.000	.001
Attitudes	Pearson Correlation	7.08±1.1	0.633**	1	0.682**
	Sig. (2-tailed)		.000		0.000
Self-reported Practices	Pearson Correlation	13.3±2.4	0.390**	0.682**	1
	Sig. (2-tailed)		.001	0.000	

** Correlation is significant at the 0.01 level (2-tailed).
KAP, knowledge, attitudes, and practices; SD, standard deviation

The knowledge of food safety among food handlers has been shown in Fig. 3.

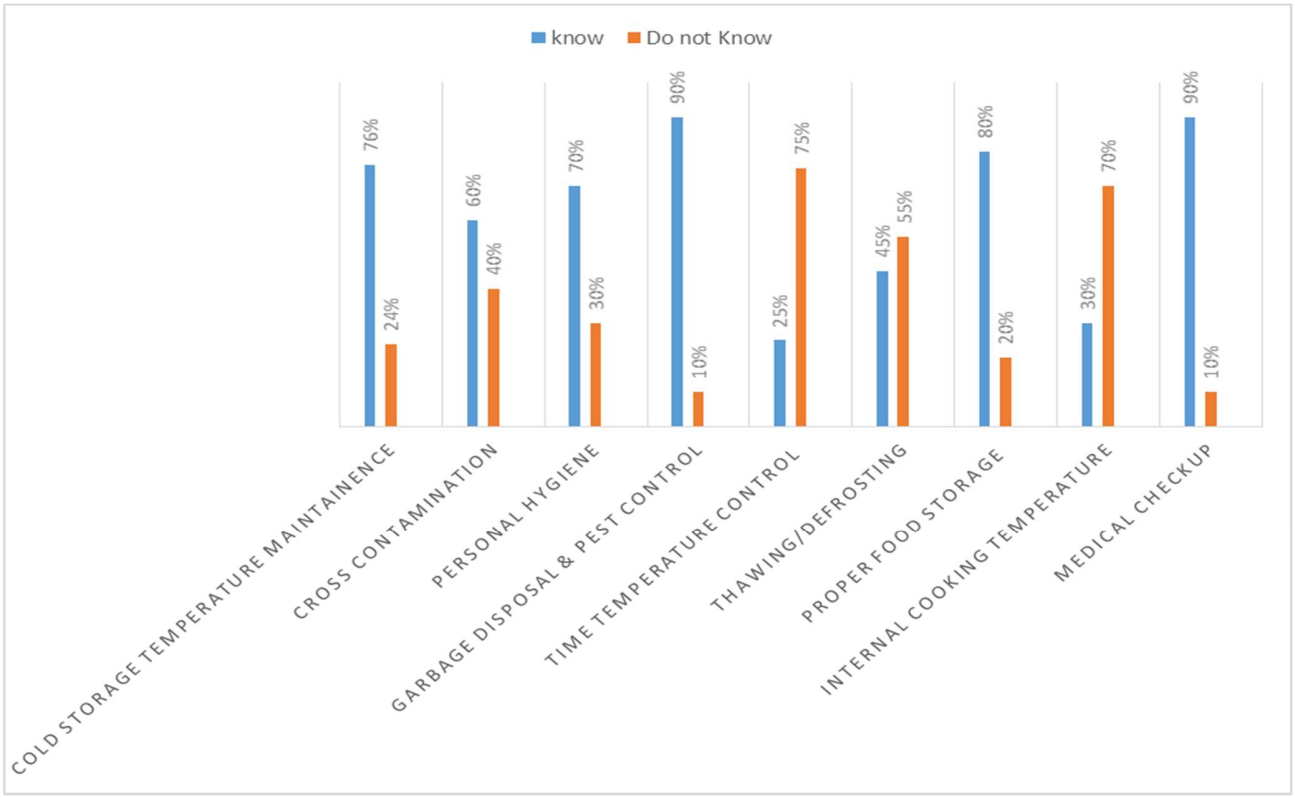

Figure3. Knowledge of food safety among food handlers

The pre training and post training KAP scores and observed practices are summarized in Table 3 .

Table 3. Pre training and post training KAP scores and observed practices

	PreTraining	Post Training	Df	t	P value
	Mean±SD	Mean±SD			
KAP Score	75.8 ±3.8	95.9 ±3.5	71	18.5	0.000
Observed Practices	13.7± 2.1	16.8±1.9	71	10.0	0.000

5. Discussion

5.1. Knowledge of Food Handlers

It has been observed that food handlers' with formal induction training reported significantly better KAP scores. Food handlers' working experience and higher education significantly improved KAP scores ($p<0.05$). Age and level of education has not significantly affect the KAP score, which is in correspondence with the study by Abd Lataf et al. 2018 (6). Periodic Practical training at workplaces will help them to retain knowledge and adopt healthy hands on practices certainly (7).

5.1.1. Thawing/Defrosting

About 45% responded that thawing frozen food in the refrigerator while 55% answered to left the frozen food in running water or in any open place for thawing. This finding is agreeable to Abd Lataf et al. study in 2018. The reason could be the lack of written s0tanding ordering procedures to describe the correct method for thawing and storing of foods(6).

5.1.2. Temperature Maintenance of Cold Storage

About 76% reported accurately about temperature of refrigerator and freezer and rechecking protocol. This is in accord with Abdul-Mutalib et al. study in 2012 that mostly food handlers know about the refrigerator and freezer temperature to lessen the likelihood of food spoilage(6).

5.1.3. Contamination Prevention

Only 8% reported that towels/napkins should be used to wipe plates instead of allowing utensils to air dry while 92% believed that reusing dishtowels might be potential source of contamination.

Mohamed K conducted a study in 2006 among saudi troops after gasteroenteristis outbreak and found that eating contaminated rice with *Bacillus cereus* and *Clostridium perfringens* due to mal practices of food handlers (8). In Riyadh city of KSA, a cross sectional study was conducted to assess the prevalence of parasitic infections, 14.9% have positive results on stool examination (8).

5.1.4. Time /Temperature Control

All 92% of participants believed that meals should be cooked at least 1-2 h prior to serving time as advance food preparation may be hazardous. 75% food handlers are not familiar about HACCP and the accurate temperature obligatory for foods safety. They reported that meals may be kept safe at room temperature (40 C) for 8-10 h.

5.1.5. Internal Cooking Temperature

70% of food handling personnel's are not well-informed about the accurate cooking temperature for poultry, meat, seafood and eggs.

5.1.6. Cross Contamination

Only 60% answered correctly about separated utensils (cutting board and cutlery) for raw vegetables and meat to prevent **cross contamination**. Majority of food-borne outbreak salmonella was the causative agent. Cross contamination of handling cooked food with raw poultry could be the cause of salmonella or staphylococcal intoxication (8,9).

5.1.7. Personal Hygiene

74% reported correctly regarding the personal hygiene but only 26% reported the proper hand-washing techniques. About 70% believed that use of face mask, head caps and gloves may avoid contamination during food processing similar to findings of Kwol et al.(10).

5.1.8. Medical Checkup/Illness or Injury Protocol 90% have knowledge about illness or injury protocol that they immediately report to medical officer or apply moisture proof dressing in case of small wounds/cuts.

5.1.9.Garbage Disposal/Pest Control

92% reported that they disposed off garbage twice in a day and use pest control sprays to kill insects once a week.

5.2. Attitude of Food Handlers

The mean attitude score towards food safety (7±1.16) with 5 minimum and maximum 10. The safe food handling course also has influence on food safety knowledge and attitudes of food handlers. It has been found that a significant number of food handlers, waiters and caterers (67%) were not trained under formal food safety training program, they only got training from experienced cooks. The cooks were shown to have much better attitude than waiters towards healthy meal preparation similar to findings of Issa et.al, in 2015 (11). Another study found that food handlers' attitude relatively influences by the knowledge on kitchen cleanliness and food safety measures (10).

5.3. Self-Reported Practices of Food Handlers

Mean score of self-reported practices was 12±2.4 with 8 minimum and 16 maximum. Seaman and Eves described that knowledge will affect the practices, and provide a basis principal to a direct change in attitude and subsequently in practices (12). Similar findings has been proved by Howes indicated that there is an association between positive attitude and continued education of food handlers towards the adoption of safe practices (5).

5.4. Observation of Food Safety Practices

Frequency of hand washing at work were observed, it has been found that only 80% wash hands after handling raw food and before handling ready-to-use food. Washing fruits and vegetables before cutting was always done by 94% of handlers. About 75% washed hands after touching face, mouth and nose or after handling money or throwing peels in garbage container. 100% washed hands after every visit to washroom. Only 10% have been found smoking or chewing tobacco (Naswar) in the cooking area, otherwise there has been special designated place for them. Proper labelling was observed in the entire central kitchen outlet. Personal hygiene of all food handlers had been inspected by supervisor once a week and medical checkup once a month. Separate handwashing areas designated for food handlers with all necessary tools of handwashing like hot water, soap, etc. Silent observation of hygiene practices revealed that 45% dried their hands with same towel or 20% with their aprons/cloths instead of using Paper towel. Disposable hand dryer, air dryer, disposable gloves should be made available (13). The common

malpractices are bare-handed contact with food, improper hand washing practices that may become the root cause of food borne illnesses. The identified specific unhygienic practices, limited awareness about preventing methods of chemical and biological contamination of food due to lack of knowledge may increase the risk of food poisoning. Specific attention should be set to the significance of time and temperature control and cross contamination. Similar findings has been reported by Nakyanzi in 2016 (14).

5.5. Post Training KAP Score

The 2 months intermittent trainings (Formal lectures, practical skills by regular visits) has been conducted after KAP which showed a significant change in post KAP score and mild change in score of observed practices($P<0.000$). Similar outcomes reported by Chaudhry et.al, in 2018, after training sessions significant 30% increase in knowledge and 13% in performance rate (15). To integrate the food safety culture, strong commitment dedicated leadership, adequate risk perception should be incorporated in food management system. Therefore, reeducation every (6mon-1yr) will retain knowledge and decrease the likelihood of forgetting (16).

A construction of food safety system to meet the physical and operational standards of food safety and risks/hazards analysis and critical control points should be incorporated (17). There is a need of rigorous quality control and quality assurance measures to sustain food safety in handling, processing and serving of food (13). Attention needs to be given on time and temperature control to prevail food safety culture (18). Areas identified for more positive improvements are monitoring of end point cooking temperature by usage of cooking thermometers (19). Food handlers should be trained and supervised periodically to ensure good sanitation practices and preventing cross contamination (3). Regular and periodic training should be provided to food handlers on hygiene and sanitation practices such as adequate sanitation practices, observation of proper personal hygiene, prevention of cross-contamination and avoiding mishandling hazards (3). Food handlers, cooks, mess waiters, managers and supervisors of food businesses should be sufficiently competent in food hygiene so that they realize the microbiological impact of practices for which they are accountable (2). They must ensure that food handlers are educated, directed and skilled in food hygiene to an apt level for appropriate practices. Increasing of food handlers' knowledge, will modify their attitudes by adopting positive behaviors which eventually leads to healthy behavioral modifications (20).

5.Conclusion

There is a significant effect of the periodic awareness lectures/ trainings on food safety practices among food handlers. Food handlers, managers and supervisors of food businesses should be sufficiently competent in food hygiene and HACCP so that they ensure food safety practices and disease control measures. This study can be used as a resourcefulness for further researchers to embark on studies concerning food safety in military Setup.

Conflict of interest

Authors declare that they have no conflict of interest.

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