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A SURVEY ON DETERMINATION OF HACCP KNOWLEDGE OF FOOD HANDLERS IN ISTANBUL FOOD BUSINESSES

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The HACCP system is a food safety approach, which prevents hazards before they happen. With this survey we aimed to determine the HACCP knowledge of staff working in kitchens of food businesses in Istanbul and correlate the results with some demographic characteristics in order to evaluate HACCP awareness in the foodservice sector in Istanbul. A self-administrable questionnaire was developed in order to evaluate the knowledge of food handlers in all stages of kitchen work. The questionnaire consisted of a first set of 9 demographic questions followed by 12 items related to HACCP system application. According to data obtained from this study, food handlers' HACCP knowledge increases parallel with age, education level, and time spent in the sector and seniority. In addition, in order to increase the knowledge and awareness of HACCP, training has been found to be important.

Keywords: HACCP, food safety, food safety management, kitchen, foodservice

Hazard assessment and critical control points (HACCP) is a worldwide accepted system, which is an effective food safety assurance and can be applied throughout the food chain from primary production to final product (DOMÉNECH et al., 2008). Regulations on Turkey's food laws have been fulfilled according to the EU (HASCICEK et al., 2004; KARAMAN et al., 2012). Recently published Turkish food law named as "Veterinary Services, Plant Health, Food and Feed Law", no: 5996 obliged to apply the food safety procedures based on HACCP principles (ANON., 2010). Accordingly, as BAS and co-workers (2007) mentioned, the use of HACCP, based on the internationally accepted seven principles as promoted by the Codex Alimentarius Commission, is rapidly increasing in Turkish food businesses.

Though HACCP method is the best way to minimize hazards in the food production, the food safety literature demonstrates that success in building up a successful HACCP system sometimes seems to be difficult and complex because of some hurdles (TAYLOR, 2001). As WHO reported, these hurdles vary from country to country or from business sector to business sector and may be due to internal and external factors like the knowledge level on HACCP or available resources as internal factors. Others that related to external factors may be the accessibility of government or industry support (WHO, 1999). Among all these hurdles, lack of knowledge seems to be the major hurdle, because just the staff with knowledge can put the system in progress successfully. Many researchers reported similar statements about knowledge. As FLETCHER and co-workers (2009) concluded, HACCP's effectiveness relies on the knowledge and skills of both management and staff. EVES and DERVISI (2005) declared that one of the most important difficulties in caterings was inadequate knowledge.

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JEVSNİK and co-workers (2006) report the outcome of a meta-analysis of 12 studies that categorizes the identified barriers to HACCP implementation, with around 50% related to training, human resources, planning, knowledge and competence, and management commitments. Ten out of the 12 studies in the meta-analysis reported barriers related to worker motivation, awareness, interest, and familiarity with food safety controls. Other barriers classified by JEVSNİK and co-workers (2006) relate to poor planning of implementation, excessive documentation, knowledge and competence, external support, and lack of resources.

On the basis of these findings we searched the situation of HACCP knowledge in Istanbul kitchens. In this study we determined the HACCP knowledge of staff working at any level or department of kitchens in Istanbul and correlated the results with some demographic features in order to evaluate HACCP awareness in the foodservice sector in Istanbul.

1. Materials and methods

1.1. Sampling plan and data collection

This survey was conducted with a self-administrable questionnaire from May to September involving 48 food businesses in Istanbul, Turkey. Assessments consisted of caterings (15), school food services (8), hotels (10), kebab houses (5), and restaurants (10). Participants, who were related to food handling, were employees working at any level or department of foodservices. Questionnaire sheets were distributed to the heads of establishments by post and then received from them after they made their employees fill the sheets. The questionnaire consisted of a first set of 6 demographic questions (age, sex, education level, years worked in sector, current position, and training received), followed by 12 items (4 of 12 items negative) related to general HACCP knowledge. Furthermore, the questionnaire was pre-tested with 20 food handlers, then 1000 questionnaire sheets were distributed. Of the distributed sheets 430 were returned to us and 400 of the returned sheets, which were answered in full, were taken to statistical evaluation with the effective response rate of 43%.

1.2. Statistical analysis

The items regarding HACCP knowledge were scored on a 5-point Likert scale. The reliability of the instrument was substantiated with a Cronbach's alpha coefficient higher than 0.80 for all variables (NAKIP, 2006). In order to evaluate the results statistically, frequencies, arithmetic means, and standard deviations of demographic variables were calculated. On the other hand, in order to determine whether there are differences in the level of knowledge of HACCP according to the various demographic variables, one-way ANOVA analysis and *t*-test were performed. SPSS 17.0 was used for statistical analysis.

2. Results and discussion

2.1. HACCP knowledge scores

The questionnaire was designed as the highest point of 60 for each participant. The lowest score we obtained from this survey was 23 (one food handler got this score) and the highest was 60 (17 food handlers got this score). According to this score design of the questionnaire,

we grouped the scores as “low knowledge”, “middle knowledge”, and “high knowledge” with the score ranges of 23–40, 41–50, and 51–60, respectively. Accordingly, 18.3% of the respondents were seen to have low knowledge, 35.7% of the respondents had satisfactory high knowledge. BAS and co-workers (2007) conducted a survey on difficulties and barriers for the implementing of HACCP and food safety systems in food businesses in Turkey. Lack of knowledge on HACCP (83.5%), lack of time (88.7%), staff turnover (80.9%), lack of employee motivation (83.5%), complicated terminology (87.0%), and lack of personnel training (91.3) were the most common barriers in food businesses. VELA and FERNÁNDEZ (2003) identified barriers associated with limited HACCP application in food companies. In their survey, 46.6% of respondents claimed to have a good knowledge of HACCP, while 6.6% admitted having a poor knowledge. Nearly half of the respondents (44.5%) know that the principle of HACCP system is preventing the hazards in the stages before the endpoint of the production. For our study, frequency and percentage of the score groups are presented in Table 1. The answers that were given to the questions are presented in Table 2.

Table 1. Score groups of participants

Score groups	Score range	n	(%)
Low knowledge	23–40	73	18.3
Middle knowledge	41–50	184	46
High knowledge	51–60	143	35.7

2.2. Demographic characteristics

In our survey, the 400 valid questionnaires were divided between male and female participants with the ratio of 76% and 24%, respectively. Most participants were aged 19–40 and over 40 (75.8% and 19.4%, respectively). Considering the kitchen staff in terms of their education level, their highest education degree were primary school, high school, university degree with the ratio of 40.5%, 42.5%, and 17%, respectively. The 26.8% of participants were journeyman, 20.3% chef de party, 18% busboy, 14.3% sous chef of the kitchen, 11% executive chef, and 9.6% were working as steward. Most (34.8%) had work experience of more than 10 years, 30.8% had 1–5 years, 20.4% of them had 6–10 years, and 14% of the participants were working in a food plant less than 1 year. Of the participants 65% received training on food safety and 35% did not. The demographic information on the participants is presented in Table 3.

2.3. HACCP knowledge evaluation according to demographic characteristics

Participants' level of HACCP knowledge was compared with gender, age, level of education, work positions in the organization, and the training they received on food safety.

As a result of calculated scores, female employees were found to have lower average HACCP knowledge scores (43.48 ± 9.437) than male workers (46.91 ± 8.759). This result was analysed statistically by *t*-test with the confidence level of 0.05 and was found significant ($t = -3.284$, $P = 0.002 < 0.05$).

Average of HACCP knowledge scores for the age group 18 and less (43 ± 7.242) was found to be lower than the averages of age groups 19–40 and over 41 (47.70 ± 7.241 and 47.46 ± 6.486 , respectively). The average of HACCP knowledge scores according to age

Table 2. The answers of HACCP related questions

Items regarding general HACCP knowledge	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	n	(%)	n	(%)	n	(%)	n	(%)	n	%
The principle of HACCP system is preventing the hazards in the stages before the endpoint of the production	11	2.8	18	4.5	69	17.3	124	31.0	178	44.5
According to prerequisite programs it is enough to wash the hands only before starting the work	176	4.0	73	18.3	41	10.3	55	13.8	55	13.8
HACCP is an obligatory system that all food related plants should apply	13	3.3	14	3.5	50	12.5	112	28.0	211	52.8
HACCP is not a very effective system to provide food safety	134	33.5	109	27.3	79	19.8	33	8.3	45	11.3
HACCP is a mandatory system in Turkey's food law	14	3.5	31	7.8	95	23.8	138	34.5	122	30.5
Each hazard that may reflect to end product, should be identified and recorded according to HACCP principles	9	2.3	14	3.5	49	12.3	126	31.5	202	50.5
HACCP is a food safety law specific to our country	116	29.0	60	15.0	86	21.5	54	13.5	84	21.0
Prerequisite programs that include all hygiene rules must be fulfilled prior to the implementation of the HACCP system	7	1.8	13	3.3	44	11.0	142	35.5	194	48.5
The HACCP system requires staff training in hygiene	10	2.5	14	3.5	54	13.5	115	28.8	207	51.8
Prerequisite programs are accepted as infrastructure of any food business	6	1.5	6	1.5	54	13.5	126	31.5	208	52.0
Microbiological hazards cannot be included in HACCP	140	35.0	84	21.0	78	19.5	41	10.3	57	14.3
It is essential to keep track of and to record every step of food production in HACCP system	2	0.5	11	2.8	71	17.8	114	28.5	202	50.5

groups was analysed by One-Way ANOVA Test (JOHNSON & BHATTACHARYYA, 2006), because there were more than two groups. As a result of this statistical analysis, significant difference was observed between the groups ($F=3.922$, $P=0.021<0.05$). In order to determine difference between age groups, Scheffe test of Post Hoc tests was performed. As a result of this test it was found that lower average score of age group 18 and less was significantly different (Levene statistic=1.296, $P=0.275$).

According to education levels, the averages of university, high school, and primary school graduates were 50.03 ± 6.407 , 47.62 ± 7.280 , and 46.15 ± 7.038 , respectively. As a result of that, education levels and HACCP knowledge scores increased in parallel. The average of HACCP knowledge scores according to education level was analysed by One-Way ANOVA ($F=7.379$, $P=0.001<0.05$). As a result of this statistical analysis, not significant difference was observed between the groups based on education level. According to the results of Scheffe test of Post Hoc tests, two groups were observed. The first group consisted of high school and primary school graduates and the second group was of university graduates, which had higher average scores (Levene statistic=0.973, $P=0.379$). These results were

Table 3. Demographic characteristics of the participants

Characteristics	n	(%)
Gender		
Female	96	24.0
Male	304	76.0
Age		
≤18	19	4.8
19–40	303	75.8
>40	78	19.4
Education level		
Primary school	162	40.5
High school	170	42.5
University degree	68	17
Position of work		
Executive chef	44	11.0
Sous chef	57	14.3
Chef de party	81	20.3
Journeyman	107	26.8
Busboy	72	18.0
Steward	39	9.6
Years in foodservice		
<1 year	56	14.0
1–5 years	123	30.8
6–10 years	82	20.4
>10 years	139	34.8
Training received		
Yes	260	65.0
No	140	35.0

similar to the ones reported by JIN and co-workers (2008). According to their study on HACCP knowledge of managers in Chinese food industry, the higher the education level of the managers, the more likely it was that their company had adopted the HACCP system.

To achieve the successful implementation of HACCP, the concept must be understood first by the managers of the establishments (FAO/WHO, 2006). After providing that, it is important to remember that the system needs the involvement of all personnel in the HACCP methodology and philosophy. With another study, it was reported that 46.5% of managers did not really know what HACCP was (KARAMAN et al., 2012). As WALKER and co-workers (2003) reported, 42% of managers had heard of HACCP and 65% could not explain what it involved. As BAS and co-workers (2007) declared, approximately 57% of managers they surveyed told that they had heard of the HACCP system, 18.3% of those who had heard of the term said they had a HACCP team, and the minority (21.7%) said that food handling was carried out in accordance with the principles of HACCP system. In our study, according to

position of work situation, executive chefs had the highest average HACCP knowledge (49.89 ± 6.827) and the stewards had the lowest (41.15 ± 9.035). One-way ANOVA analysis test was performed in order to evaluate the results statistically and the difference was found to be significant ($F=4.098$, $P=0.001 < 0.05$). In order to view the groups of employees whom HACCP knowledge scores were close to each other, Scheffe test of Post Hoc tests was performed (Levene statistic=1.032, $P=0.399$). According to the results of this test, the employees were divided into groups up to their work positions as executive chef, chef de party, journeyman, sous chef, busboy, and steward.

In our study, as the kitchen food handlers' working period increased, the level of HACCP knowledge increased as well. One-way ANOVA analysis test was performed in order to evaluate the results statistically and the difference was found to be significant ($F=11.859$, $P=0.000 < 0.05$). In order to view the groups of employees whom HACCP knowledge scores were close to each other, Tamhane's T2 test of Post Hoc tests was performed (Levene statistic=3.839, $P=0.010$). According to the results of this test, the employees were divided into two groups up to their years in foodservice. One of the groups included employees that work less than 1 year and work for 1–5 years. The other group included employees that work for 6–10 years and more than 10 years.

The CODEX ALIMENTARIUS (1997), NACMCF (National Advisory Committee on Microbiological Criteria for Foods) (1998), and Turkish Food Law, no: 5996 (ANON., 2010) guidelines recognize that the need for training of personnel is essential for the effective implementation of HACCP. The findings of our study indicated that the kitchen employees who received food safety training had higher average HACCP knowledge scores (48.34 ± 7.630) compared to untrained employees (41.91 ± 9.937). This result was analysed statistically by *t*-test ($t=7.212$, $P=0.000 < 0.05$) and accordingly the difference was seen significant. Importance of hygiene and HACCP training was underlined and surveyed by many researchers. The findings obtained from the study of BAS and co-workers (2006) indicated that 28.4% of managerial staff and 56.3% of basic food handlers had not received basic food hygiene training. In a study, 55% of the 444 food handlers received formal food hygiene training, and 63% of managers had undertaken formal food hygiene training in UK food businesses (WALKER et al., 2003).

3. Conclusions

Based on the questionnaire survey we performed, we have received the following data on food handlers' HACCP knowledge in Istanbul kitchens: HACCP knowledge increases parallel with age, education level, time spent in the sector, and work position. In order to increase the knowledge and awareness of HACCP, training has been found to be important. On the other hand, receiving training did not fully reflect HACCP knowledge unfortunately. It is known that HACCP is an obligatory system, but it is less known that it is a system that the government obligated. Periodical training for PRPs and HACCP applications must be provided by the government. It should be taken into account that HACCP knowledge alone could not ensure HACCP guideline compliance. Audits, trainings, and more complicated researches on system application should be performed periodically. Additionally, knowledge must be completed with attitude and behaviour. More researches should be

done regarding the attitude and behaviour situation in Istanbul food business and in kitchens preparing food.

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