



Self-reporting of Food Handlers in Food Production and Distribution Centers in Sanandaj City, Iran

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

One of the ways to get thorough knowledge to food handlers is self-reporting. The aim of this study was to evaluate and compare self-reporting and routine inspection of Environmental Health Inspectors (EHIs) on elimination of health defects in food production and distribution centers. This was a case-control study in which a questionnaire checklist was designed based on Article 13, an Iranian law for inspecting the food production and distribution centers. The questionnaire consisted of five parts including personal, building, tools, transportation, and food hygiene. It was distributed among 45 case and control groups for six months. The case group included the food handlers filling up the checklists monthly according to their place conditions, whereas, the control group included EHIs. After data collection, it was analyzed by means of SPSS (Ver.19), K² and Mann Whitney tests. Research found significant differences in mean of sanitation conditions in both groups with respect to the food centers with checklist at the end of program in personal hygiene ($P=.011$), food hygiene ($P=.008$) and transport hygiene of food ($P=.050$). Moreover, it was found that the mean differences in place sanitation conditions compliance with the questionnaire at the end of the study was statistically significant in both case and control groups except in the case of building hygiene and food hygiene. This research work proved that self-reporting of food handlers can promote different aspects of sanitation criteria in their workshops. However, it had no significant effect on building and food hygiene.

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1. INTRODUCTION

Nowadays, more people serve their meals out of their home, especially in food preparation and distribution centers. By increasing the volume of work in restaurants and food preparing centers, ignoring the principles of hygienic methods could make serious public health problems [1]. Poor hygiene has been shown to lead to detection of pathogens like *Salmonella enteritidis* on hand towel samples and *Staphylococcus aureus* and *Escherichia coli O157:H7* on working equipment [2]. Among food handlers, a lack of knowledge has been reported regarding food allergens, temperatures in food handling, hand hygiene, and other microbiological risks for food contamination [3-6].

In 2006, World Health Organization (WHO) identified the same factors associated with food borne diseases including poor personal hygiene, lack of environmental sanitation, cross-contamination from other foods, inadequate cooking, improper temperature during storage, and purchasing food from unsafe sources [1].

In order to prevent food borne diseases, proper sanitation methods are necessary and the food handlers should be trained and educated to prepare healthy food. On the other hand, activities of food handlers must be under sanitary regulation [7].

Poor sanitation can cause secondary contamination of food and poor personal hygiene of food handlers, especially from their hands, may result in vector-borne diseases [8]. Mortlock et al showed that the less than 10% of food handlers had awareness about healthy conditions during food preparing and less than 20% of managers of restaurants had been trained for supervising [9].

One of the main information, which the managers need is guidelines and regulation about safety of food. Definitely, this awareness would prompt detailed implementation of rules, correct the potential deficiency of place, result in appearance of good behaviors for the preparation of food, and play an important role in food safety assurance [10]. In order to monitor all of the food production and distribution center, a food law entitled "Article 13: Food, Beverage, Cosmetics, and Hygienic Materials" was developed by the Ministry of Health and Medical

Education in Iran [11,12]. EHIs are responsible to take healthy policy measures and the concerned centers are regularly inspected by them. Inspection is the first way of assessor organization for control of food in production and distribution centers [13].

A *self-reporting* or *self-inspection* checklists imply the regulations and guidelines, which are supposed to be filled up periodically by food handlers or managers. This checklist is filled up twice a week in Georgia, U.S.A, whereas, it is performed daily in Autonomous Republic of Macau China [14,15]. Health self-reporting is considered as one of the useful tools to involve the main process owners (operators) [16].

This study aimed at comparing the effect of self-reporting by food handlers with the inspection conducted by the EHIs on following environmental health principles in four groups of food production and distribution centers, restaurants, Kabab roasters (a traditional food; mixture of meat and onion roasted), confectionary workshops, and fast food centers in Sanandaj City, Iran.

2. MATERIALS AND METHODS

This case control study was performed in four groups of food production and distribution centers, restaurants, kabab roasters, confectionary workshops, and fast food centers. The criteria defined in the Article 13 for these four categories are the same; hence, these jobs were selected for this study. Article 13 consists of five sections listed follow:

Personal hygiene: It includes 20 questions. These questions imply having valid medical card for all employees, having attendance certificate of public health training course for all staffs, wearing apron, gloves, and hat at working place, washing hands with liquid soap, and no smoking at work place.

Building hygiene: It includes 21 questions related to the hygienic conditions of ceiling, walls, floors, doors, and windows, use of potable water, sanitary disposal of sewage, sanitary toilet, and good ventilation.

Tools hygiene: It includes 36 questions concerning with hygienic tables and utensils, having suitable sink for dish washing, suitable

place for dish hanging, refrigerators and freezers with suitable temperature, and hygienic collection of solid wastes generated.

Transportation hygiene: It includes 8 questions focusing on the use of permissible vehicles approved by Health Center and equipped with suitable fridge fit for spoilable foods.

Food hygiene: It consists of 7 questions concerned with the use of raw food packaging labeled with healthy characteristics, sanitation of vegetables, use of liquid oil, treated iodized salt, and permitted additives.

In the Table 1 some of the main questions summarized in five sections.

The value of each question in checklists is equal. Managers and EHIs were asked to fill up the checklist based on the conditions of the shops. List of restaurants, kabab roasters, confectionary workshops, and fast food centers were prepared from Sanandaj City Health Center. Volume of samples for case and control groups were 90

shops including 15 restaurants, 56 confectionary workshops, 31 kabab roasters, and 16 fast food units selected randomly. From this list, 45 places were simple randomly subcategorized as intervention (case) group and 45 places as control.

Case group or self-reporter group included those managers having at least one year working experience and familiar with Article 13. Forms of the Article or checklists were distributed among the managers. EHIs trained them on how to fill the checklists at the end of each month for six months according to her/his place conditions. The compliance with the questionnaire was supposed to be indicated using √ sign and incompliance with the questionnaire was supposed to be indicated using × sign. Later these answers were given values of 1 and 0 while entering data in SPSS software. EHIs controlled filling of the checklists without any force on how fill them monthly. Therefore, advice of EHIs in this group was not the goal of program.

Table 1. Summarized questions in five sections

Hygiene items	Summarized questions
Personal	<ul style="list-style-type: none"> - Have public health and clinical certificate. - Pay attention to EHIs orders. - Wear white apron, gloves, white hair cover. - Wardrobe for clothes and shoes. - Work of others is prohibited. Managers should take money. - No smoking. Board of no smoking.
Building	<ul style="list-style-type: none"> - Appropriate circumstances of floor, ceiling, sink, doors, windows. - Insect and rodent proof. - Sanitation water, wastewater collection, toilet, central system of liquid soap, warm and cool water and bathroom. - Good ventilation, complete combustion of fuel.
Tool	<ul style="list-style-type: none"> - Washing and dry tools in two stages. - Warm and cool tap water in the kitchen. - Have dish washing machine. - Clean shelves, tables, chairs, showcases, refrigerators (have thermometer), fire fighter cylinders. - Clean rubbish bin (washable, portable) suitable volume.
Transport	<ul style="list-style-type: none"> - Refrigerated vehicles for dairy and protein products, do not use them for other purposes. - Use of stainless steel tools, forceps and disposable gloves for transport of row and cooked food.
Food	<ul style="list-style-type: none"> - Use of traditional dairy products are forbidden. - Raw materials have healthy labels. - Use of frying oil, treated iodized salt, permitted additives. - Clean and disinfected vegetables and fruits.

One of the main duty of EHIs in this study is the check of checklists whom the managers filled. EHIs in her/his inspection checked the manager's checklists with places condition without any interference. If the managers had any problems with fill the items of checklists they would tell them how to solve or fill the blanks according to her/his shop conditions.

Control group contained 45 places for which checklists were filled monthly by EHIs during six months of program running. In this group no self-report was performed.

At the end of program, all of the checklists from case and control groups were collected. Data of both groups were analyzed using SPSS (Ver.19), Chi-square test (for Nominal qualitative variables), and Mann-Whitney test (for quantitative variables with non-normal distribution) as follow:

- A. Case group: for each place algebraic sum scores were calculated for those five parts (personal, building, tools, transportation and food hygiene) at the onset of program and at the end. The mean of scores in each part was calculated and finally, the means of the onset and end of program were compared with each other.
- B. Control group: Data collection and analysis were the same as case group.
- C. Comparison between case and control groups: the mean of scores in two groups was calculated for those five parts (as mentioned) at the end of program.

Data required were collected for six months from October 2013 to march 2014 using a checklist questionnaire containing 92 questions adopted from the regulations pertaining to Article 13.

Before starting the project, a briefing was performed for the EHIs. The questionnaires were delivered to the food handlers by EHIs. In control group, routine inspection (at least once per season) was conducted by EHIs to complete the control checklists.

3. RESULTS AND DISCUSSION

Data of 38 questionnaires related to the control group (seven places were closed or changed their job during the study) and 36 questionnaires related to the case group (nine places were closed or changed their job during the study) were collected at the end of study. Table 2 shows the base characteristic of both case and control groups.

3.1 Results in Case Group

The data analysis in case group showed that the difference in mean of compliance the checklists before and after intervention was statistically significant in personal hygiene ($P=.000$), building hygiene ($P=.003$), tools hygiene ($P=.000$), and food hygiene ($P=.002$) sections. But no significant difference was appeared in transportation sector ($P=.595$). Table 3 tabulates the data analysis for case group.

3.2 Results in Control Group

In control group, difference in mean before and after the study was significant in personal hygiene ($P=.007$), building hygiene ($P=.006$), tools hygiene ($P=.004$), and food hygiene ($P=.008$). However, there was no significant difference in transportation ($P=.589$). Table 4 shows data analysis of the study variables before and after intervention in control group.

3.3 Comparison of Data in Case and Control Groups

Comparison and analysis of data related to case and control groups at the end of program indicated that the mean difference was statistically significant in personal hygiene ($P=.011$), tools hygiene ($P=.008$), and transportation ($P=.005$). However, difference between building hygiene ($P=.126$) and food hygiene ($P=.311$) was not significant (Table 5).

Table 2. Comparing case and control groups from the base characteristic point of view

Sex	Variable case control									
	Male(34)		Female(2)				Male(37)		Female(1)	
Age	19-29(3)	29-39(10)	> 40(23)		19-29(7)	29-39(7)	> 40(24)			
Literacy level	I(0)	P(12)	S(12)	D(7)	AD(5)	I(1)	P(11)	S(11)	D(10)	AD(5)

I = Illiterate; P = Primary school; S = Secondary/high school; D = Diploma; AD = Academic degree

Personal hygiene. Self-reporting of food handlers could increase the personal hygiene variable in case group up to 7.12% ($P=.000$) compared with before intervention. The result of inspection of EHIs in control group could increase this variable up to only 6.05% ($P=.007$). Comparison of these groups with each other indicated that at the end of study personal hygiene improved ($P=.011$).

Saccol et al. [10] studied hygiene and sanitary conditions in 31 self-service restaurants in Sao Paulo, Brazil. Regarding personal hygiene and preventing food contamination, 70% of personals were responsible but 30% of them did not care. Osaili et al. [17] found that 79.9% of the food suppliers in restaurants in Jordan answered correctly to personal hygiene questions. The research results revealed that this value for case and control groups was 76.42 and 66.44% respectively. It confirms that the self-reporting in case group could help the food handlers to decrease the failure of personal hygiene more than the control group. It might be attributed to the fact that observing and continuous remaindering personal hygiene points in the checklist and spending low cost on solving the personal hygiene deficiency resulted in changing behavior and compliance with personal hygiene criteria in case group, whereas, seasonal education in control group was not so helpful in this regard.

In another study conducted on 236 restaurants by two semi-structured questionnaires (food handlers and field observation) in Palestine, 10.5% reported never washing their hands, 22.1% reported washing their hands with water only and 76.5% with water and soap in food handlers group and in the case of field observation group, cleaning materials were not available near the hand washing sinks of the kitchens, 14.2% of restaurants' sink and 37.3% of restaurants' toilet [18].

Building hygiene. Comparison of variables before and after intervention in case group showed that the building hygiene improvement was 5.42%, whereas, this value was 2.38% in control group. In addition, it was found that comparison between two groups at the end of six months showed no difference in mean of building hygiene ($P=.126$). On the other hand, although self-reporting and routine inspection resulted in improving the building hygiene, there was no statistically difference between two groups, which is in contrary to the findings of Saccol et al. [10].

A favorable environment for insect and rodent proliferation is enhanced by the lack of adequate building, storage areas, kitchen, water supply, sanitation and solid waste management facilities, as well as poor attitudes and practices of food handlers found in many of the restaurants by Al-Khatib and Al-Mitwalli [18].

It is noteworthy that building conditions have certain uninterpretable standards so that both environmental officers and food handlers have the same concept; hence, no significant differences could be observed neither in self-reporting nor in environmental inspection.

Tools hygiene. The promotion of variables in class of tools hygiene in case and control groups was 5.95 and 3.24%. On the other hand, the mean of variables in both groups was significant ($P=.008$). These findings match well with Martins et al, study in which totally 101 food suppliers' knowledge from 18 geographically distributed business units were assessed in Portugal using multiple choice questionnaire. They reported that in the case of the utensils hygiene, the average score achieved by 95% confidence was 0.814 and the correct answers to questionnaire were statistically meaningful ($P=.001$) [8]. Our results indicated that the promotion was higher in case group rather than control group. It was

Table 3. Mean and p-value of variables before and after intervention in case group

Variable	Personal		Building		Tools		Transportation		Food	
	before	after	before	after	before	after	before	after	before	after
Mean	69.30	76.42	75.39	80.82	73.91	79.78	42.36	43.05	73.80	81.42
P-Value	.000		.003		.000		.595		.002	

Table 4. Mean and p-value of variables before and after intervention in control group

Variable	Personal		Building		Tools		Transportation		Food	
	before	after	before	after	before	after	before	after	before	after
Mean	60.39	66.44	74.81	77.19	68.05	71.92	25.32	25.98	75.18	79.69
P-Value	.007		.006		.004		.589		.008	

Table 5. Comparison of mean and p-value of study variables in both groups before and after the intervention

Variable	Mean		P -value
	Control	Case	
Personal hygiene	30.97	43.54	.011
Building hygiene	33.80	41.40	.126
Tools hygiene	30.71	43.83	.008
Transportation hygiene	32.99	43.26	.005
Food hygiene	35.17	39.96	.311

contributed to the existence of various items in the checklist attracting the food handler notice to meet them, whereas, these points might be neglected by EHIs due to the long interval between seasonal inspection.

Transportation hygiene. The mean difference in the transport of food in the case and control group was $P=.595$ and $P=0.589$ respectively, indicating no significant differences in compared with standard regulation or checklists. Comparing two groups with each other at the end of study indicated that the mean of differences were statistically significant ($P=.050$). It could be attributed to the suitable conditions of the transporting vehicles in the study area. Moreover, providing a suitable vehicle equipped with coolant was not possible because of financial issues. However, different interpretation of transportation hygiene by EHIs and food handlers was another reason for this finding.

Food hygiene. In compliance with food hygiene questionnaire, mean difference in both groups ($P=.02$ for case and $P=.008$ for control) were significant. EHIs' scores improved 4.51% from start of the study to the end. But, the comparison between two groups after the intervention showed that the differences in not statistically significant. The small values in this regard indicates necessity of focusing more on this aspect of food centers. In a study conducted by CDCP, U.S.A., it was found that 34% of the individuals scored 90-100; 27% of them 80-89, 25% of them 70-79; and 14% less than 70 in self-reporting. Conducting that study promoted the food safety. Clearness of points in the checklist, continuous observation, simplicity, cost-effectiveness, and feasibility were main reasons for this promotion. This finding supports our findings in this regard [19].

Training in food hygiene that embodies the concept of risk should be implemented in restaurants in order to emphasize food handlers, especially those in managerial positions, with the level of risk associated with their business. This

training is suggested to be implemented with the supervision of health inspectors [18].

One of the limitations of this study was lack of monthly supervising the case group by EHIs due to high volume of the allocated tasks, dispersion of the samples, and financial constraints. In the case of supervising EHIs as consultant for the food handlers, the results might be different. It is suggested to use the inspectors consulting in self-reporting studies.

4. CONCLUSION

One of the best managerial and executive tools for increasing awareness of food handlers is their involvement in educational programs. Self-reporting is one of the methods to increase the involvement and participation of food handlers to identify their problems in workshop. Based on the results of this study, self-reporting of managers or food handlers could raise the environmental health indicators of food production and distribution effectively.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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