

Compare the Effects of two Educational Methods on the Health Principles Knowledge of Employees in Food Preparation

¹Fereshteh Farzianpour,
²Gholamreza Jahed Khaniki, ³Farjad Batebi and ²Masood Yunesian
¹Department of Health Management and Economic,
²Department of Environmental Health Engineering,
School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
³Department of Environmental Health,
Health School, Semnan University of Medical Sciences, Semnan, Iran

Abstract: Problem statement: Conducting educational programs to enhance the knowledge of food preparation and distribution commerce is important in achieving health and food safety. This study aimed to compare the effects of two educational methods (booklet and trade school) on the health principles knowledge of employees in food preparation and supply centers. **Approach:** In this cross-sectional study, 420 employees who were working at food supply centers in Semnan were entered. They were divided into three groups. Two groups received educational programs regarding health principles and food safety practice; one group was trained at a trade school (135 cases) and one group using booklet as a distant learning method (145 cases). 140 employees received no educational intervention and were considered as the control group. Knowledge of these groups in terms of health principles and food safety practice was assessed before and after educational intervention. **Results:** Analysis of Variance (ANOVA) results after the educational intervention showed a significant difference between each of the two educated groups (either by trade school or booklet) in comparison to the control group ($p < 0.001$). No significant difference was seen between the two educated groups ($p = 0.593$). Difference in the rate of the knowledge of each of the trained groups before and after intervention was significant, with minimal difference. **Conclusion:** It was concluded that the important thing according to observed findings is comparison of mean scores in both educated groups after intervention did not show considerable increase. There is a requirement to develop training methods that they could change knowledge as well as behavior.

Key words: Effect, educational methods, food preparation, educational intervention, educational methods, food safety practice, Analysis of Variance (ANOVA)

INTRODUCTION

With increasing population, preparation of enough food is one of the complicated and critical issues in different countries, especially in developing ones. Besides lack of sufficient food, problems in these countries include non-compliance with health standards throughout preparation, conversion, storage, distribution and food consumption. Food stuff is considered as one of the most important sources of food contamination by chemical and biological agents. It is estimated that 70% of infectious diseases are transmitted to humans through

unhealthy food and more than 450 types of viral, parasitic, fungal and microbial diseases can be transmitted to humans through foods with animal origin (Pilling *et al.*, 2008). Food hygiene training can be a main necessity in food industry and should place as a part of an effective food safety management strategy. Education and training will lead to an improvement in food safety if the knowledge imparted leads to suitable changes in behavior at the workplace (Kassa *et al.*, 2010). The development of evaluation criteria for the effectiveness of training is very important to protect public health (Marriott, 1999; Park *et al.*, 2010; Gomes *et al.*, 2011).

Corresponding Author: Fereshteh Farzianpour, Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran Tel: +98-2144648943

Utilization of educational methods can be effective and successful for increasing the knowledge about food safety and preventing food borne illness throughout the world (Medeiros *et al.*, 2001; Choudhury *et al.*, 2011; Powell *et al.*, 2011). Providing safe food is a necessary prerequisite for ensuring society health, which is one of the important indices of development. This objective is achieved only through increasing education and awareness of different social groups. Education is the key element in development of a society and it is one of the most important strategies to ensure successful health programs (Egan *et al.*, 2007; Montenegro *et al.*, 2008; Seaman, 2010).

Teaching food handlers can be the most important indices of development in food establishments. Effective education can improve the knowledge, attitude and skills. Some studies have done about effectiveness of instructional techniques for teaching food safety and hygiene principles in food employees of USA (Costello *et al.*, 1997), Canada (Howes *et al.*, 1996), UK (Kirby and Gardiner, 1997; Seaman, 2010) and Bahrain (Nabali *et al.*, 1986). Most studies in food hygiene and safety education courses persist highly on the increasing of information and the evaluating the education method, education content and its design can be important in training. Personnel of food preparation and supply centers are one of the groups which affect food safety and health. Performance of educational programs in terms of food hygiene knowledge with the aim of increasing their knowledge is effective in reaching the goal of food safety and health. Educating of food handlers and administrators can be influential in application of health principles in food preparation and supply centers for reducing food Safety and hygiene affairs. In this study, we investigated the knowledge level of food preparation, distribution and supply centers employees, with the objective of need assessment and educational priorities of this group through comparison with correspondence education. Using the results of this study, we would be able to achieve the main goal which is higher level of food healthiness.

MATERIALS AND METHODS

Description of study: This was a cross-sectional study to determine the knowledge level of employees who were working in food preparation and supply centers as the target population with respect to hygiene principles and effectiveness of educational intervention trade school and booklet in Semnan city of Iran.

Sampling method and data collection: Study population comprised of all operators who were

working at food supply centers in Semnan at the time of study. Since 1506 food preparation and distribution centers were active at the time of study, the sample size calculated and it was determined as 140 individuals in each group. Six major food supply categories which were studied here and their frequency distribution in Semnan at the time of study were as follows: Groceries (57%), restaurants (10.5%), fruiterer and greengrocer (7.2%), butchery (10.8%), pastry and fruit juice cafes (5.8%) and bakery (8.7%). These numbers are according to the report of Semnan Health Center in 2010. Due to regional distribution of food preparation and supply centers, cluster sampling method was used for sampling. Three groups each constituted of 140 subjects were included by cluster sampling method from all food supply centers. The educational method for the three groups were as following: the first group received educational programs at a trade school (face to face methods, 135 cases), second group by correspondence method (distant learning, 145 cases) and the third group with no educational intervention as the control group (140 cases).

For data collection, a questionnaire was designed and its validity and reliability were approved. This questionnaire was filled out before and after educational intervention for the three studied groups.

Statistical analysis: The gathered data were entered to the software and statistical analyses including Analysis of Variance (ANOVA) and t-test were done by SPSS software for Windows. A probability level of $p < 0.05$ was considered statistically significant.

RESULTS

A total of 420 operators and workers knowledge of food supply centers before and after educational intervention were assessed. Results of this study have been shown in Table 1-6. Shows that the highest number of participants was working in groceries (48.57%) regarding the commerce involved. The lowest number was seen in pastry and fruit juice cafes (7.62%). The most participants have high school education and their record of service was less than five years.

Table 2 presents one-way ANOVA results for the three groups studied. As shown, difference between knowledge score of the three groups is significant after educational intervention ($p < 0.001$). But no difference was seen before educational intervention ($p = 0.134$). This shows that the interventions performed in this study were effective. A relative growth was seen in the control group which can be due to motivation for learning and more attention to health issues while completing questionnaires or due to the media.

Table 1: Sociodemographic characteristics and frequency of participants in the study

Demographic items	Participants number		Educational booklet		Trade school		Control	
	N	(%)	N	(%)	N	(%)	N	(%)
Food services								
Grocery	204	48.57	66	45.52	75	55.56	63	45.00
Restaurant	54	12.86	14	9.56	19	14.07	21	15.00
Vegetable and fruit seller	41	9.76	21	14.48	9	6.67	11	7.86
Chicken and butcher	51	12.14	23	15.87	6	4.45	22	15.71
Pastry and fruit juice cafes	32	7.62	7	4.83	12	8.89	13	9.28
Bakery	38	9.05	14	9.65	14	10.36	10	7.15
Age (year)								
<21	31	7.40	8	5.51	3	2.22	20	14.28
21-30	112	26.70	38	26.20	36	26.67	38	27.15
31-40	95	22.60	41	28.28	28	20.74	26	18.57
41-50	93	22.10	30	20.69	30	22.22	33	23.57
51-60	52	12.40	17	11.72	21	15.56	14	10.00
>60	37	8.80	11	7.6	17	12.59	9	6.43
Education level								
Primary school	57	13.57	20	13.79	19	14.07	18	12.86
Guidance school	57	13.57	20	13.79	21	15.56	16	11.43
High school	266	63.33	88	60.69	79	58.52	99	70.71
College	40	9.53	17	11.73	16	11.85	7	5.00
Record of service (year)								
0-5	185	44.00	64	44.14	46	34.08	75	53.57
6-10	92	21.90	29	20.00	35	25.92	28	20.00
11-15	47	11.20	22	15.17	16	11.85	9	6.43
16-20	43	10.20	14	9.66	16	11.85	13	9.28
>20	53	12.60	16	11.03	22	16.30	15	10.72
Total	420	100.00	145	100.00	135	100.00	140	100.00

Table 2: Comparison of mean and standard deviation (M±SD) of knowledge score before and after educational intervention in three groups

Items	Trade school M±SD	Educational booklet M±SD	Control M±SD	ANOVA	
				F	P-value
Knowledge score before Educational intervention	41.98±15.51	40.89±12.54	39.81±13.06	3.407	0.134
Knowledge score after Educational intervention	51.04±11.51	51.88±14.67	42.62±13.16	20.680	< 0.001

Table 3: Comparison of mean and standard deviation (M±SD) knowledge scores with each other groups after educational intervention

Education groups	M±SD	T	df	T-test	P-value
Trade school	51.04 ±11.51				
Booklet	51.88 ±14.6	0.535	278		0.593
Trade school	51.04 ±11.51				
Control	42.62±13.16	-5.59	269		< 0.001
Booklet	51.88 ±14.67				
Control	42.62 ± 13.16	5.55	279		< 0.001

Table 4: Comparison of mean and standard deviation (M±SD) knowledge score before and following educational intervention in each educated group

Items	Trade school (M±SD)	Booklet (M±SD)	Control (M±SD)
Knowledge score before education	41.0 ±15.51	40.89±12.54	39.81±13.06
Knowledge score after education	51.04 ± 11.51	51.88±14.67	42.62±13.16
Paired t test and P value	< 0.001	< 0.001	0.09

Table 5: Mean knowledge score changes before and after education in the three groups

Groups	Before education	After education	Score changes before and after education
Trade school	40.890	51.88	10.990
Booklet	41.980	51.04	9.060
Control	39.810	42.62	2.810
ANOVA, P- value	0.134	< 0.001	0.016

Table 6: Post-hoc test results for comparing groups after significant ANOVA

Comparative groups	Difference of means	Tukey, P-value
Booklet and control	8.18	0.013
Trade school and control	6.25	0.036
Booklet and trade school	1.93	0.646

Based on the data of Table 3, a significant difference was seen between the group educated using the booklet and control as well as between the trained group at trade school and control (p<0.001). No significant difference was seen between the group

educated by booklet and the one which was undergone education at trade school ($p = 0.593$).

Table 4 depicts the paired T test results in each group separately before and after education. As shown, a significant difference exists in both educated groups either by booklet or trade school before and after education ($p < 0.001$). The results of paired T test in control group indicates that mean knowledge score did not show significant difference before and after education ($p = 0.09$).

Table 5 shows mean changes of knowledge score before and after intervention in the three studied groups using one-way ANOVA. The data confirms significance of difference between the three groups after education in comparison to baseline regarding mean knowledge score changes ($p = 0.016$). The difference of Table 5 with Table 4 is that in the former table, the variable is mean difference of score before and after education whereas Table 3 shows mean of scores.

Table 6 presents post-hoc test results following significance of ANOVA (mean score difference). This test showed that there was a significant difference in mean knowledge changes between booklet and control groups ($p = 0.013$) and also between trade school and control groups ($p = 0.036$). But, this difference was not significant between booklet and trade school groups.

DISCUSSION

Implementation of educating methods can be essential for developing and changing knowledge and practice among employees. The most studies suggested that food hygiene education programs can be a means of improving food safety and hygiene principles in food service centers. Acikel *et al.* (2008) represented that the most efficient method to stop food related epidemics problem or at the very least to decrease it is by to training those working in the food industry and repeating this training periodically (Acikel *et al.*, 2008).

This study was done due to effectiveness of educational methods for increasing health principles knowledge among employees of food preparation and supply centers. A relative growth was seen in the control group which can be due to motivation for learning and more attention to health issues while completing questionnaires or due to the media. A significant difference was observed between the group educated using the booklet and control as well as between the trained group at trade school and control. Also, there is no significant difference between the group educated by booklet and the one which was undergone education at trade school.

Yeganeh *et al.* (2006) reported that mean knowledge scores after receiving education has

increased in lecture group and in booklet group (Sadrzadeh and Angvrany, 2006). They refer to this word that this increasing knowledge in booklet and lecture group is not significant compared to booklet group alone. We also reached to this outcome and it can be in agreement with our results. Also, Roberts *et al.* (2008) reported a significant association between education and improvement in knowledge of foodservice employees (Roberts *et al.*, 2008). According to present research, the obtained data confirms significance of difference between the three groups after education in comparison to baseline regarding mean knowledge score changes ($p = 0.016$). Based on work of Pilling *et al.* (2008) due to study on the training effects of food handlers on their knowledge in American restaurants, one-way ANOVA showed significant difference between mean differences of knowledge score of trainees compared to control (Pilling *et al.*, 2008). Present study also refer to have a significant difference in mean knowledge changes between booklet and control groups and have a significant difference between trade school and control groups which this difference cannot be significant between booklet and trade school groups. In a study, the mean knowledge scores after education by lecture method in comparison to control increased and this increase was with high score in booklet group compared to control (Sadrzadeh and Angvrany, 2006).

Statistical analyses indicated the significant differences in terms of mean knowledge changes of booklet and lecture groups in comparison to control group in this study. It was found that distance learning by booklet (correspondence method) was more effective than trade school method in increasing the knowledge level of the studied population.

Some researchers commented that lecture method for educating nutrition to students is a more dynamic than using booklets, however due to large number of students in educational systems and the inability for direct training, using educational booklets is more cost-effective. This study also demonstrated that knowledge and practice of group trained by lecture and booklet increased significantly compared to control group. This increase was more prominent in lecture but the two methods of education were not different significant (Sadrzadeh and Angvrany, 2006) In a research reported that distant learning had meaningful effects on increasing knowledge scores of high school female students after providing training by booklet (Mohammadpour, 2000). A study on the effects of a computer education program (remote) on the Austrian school children about nutrition training showed a significant increase in knowledge of trained students (Kreisel and stumps, 2004). In a research showed the

significant effects of health education in knowledge of foodservice personnel (Rennie, 1995). Soon and Baines (2012) also reported that the significant differences in participants' level of knowledge were observed in examined people (Soon and Baines, 2012). They found an increase in immediate knowledge gain after training and they suggested that the educational and training program was successful in improving food safety knowledge of participants (Soon and Baines, 2012). Also, Friel and Kelleher (1999) found a significant increase in the knowledge and practice of a group of Irish primary school students after providing a face-to-face educational program (Friel and Kelleher, 1999). Mahdi *et al.* (2006) reported that the mean knowledge score between three groups who were undergone education by lecture, play and role-play were not significant at baseline. But after intervention, mean knowledge scores increased which was the least in lecture group (Mahdi *et al.*, 2006).

Sinclair *et al.* (2003) found evidence that safety training increases knowledge and they mentioned that the knowledge test scores were apparently higher in the new training units than in the usual training units.

Medeiros *et al.* (2011) mentioned that the methodological strategies used in training programs designed to enhance food safety in food services (Medeiros *et al.*, 2001). The resources most widely used during the training courses were interactive media, audiovisual materials, videos, lectures and recreational activities. These activities contribute toward the enhancement of employees' skills and knowledge and encourage changes in attitude and behavior.

Dipietro (2006) demonstrated that in class training method is advantageous because it brings many people together at the same place, thus reducing costs, in addition to increasing interaction (Dipietro, 2006). In-service training allows people to see what is being taught while they work (Dipietro, 2006). Malhotra *et al.* (2008) mentioned that in addition to lectures and posters, more training techniques are required to solve food safety issues (Malhotra *et al.*, 2008). A study showed that training with the aid of interactive media was better accepted by participants than other methods (Dipietro, 2006). This training method led to more changes in knowledge (Dipietro, 2006). Martins *et al.* (2012) studied to assess food hygiene knowledge of professional food handlers from an institutional catering company which manufactures and distributes meals to the canteens of schools, kindergartens and nursing homes (Martins *et al.*, 2012). They referred that the level of knowledge was influenced by the level of formal education of respondents (Martins *et al.*, 2012). Choudhury *et al.* (2011) found that the knowledge level of the food employees increased about 42.5 % after training interventions (Choudhury *et al.*, 2011), but we

found the rate of knowledge raise was less than 50% after performing this study and it determines that we did not success at high level in increasing knowledge level of studied population and it needs to revise our training methods.

CONCLUSION

It was concluded that the important thing according to observed findings is comparison of mean scores in both educated groups after intervention did not show considerable increase. Both methods were not successful in increasing knowledge level of studied population. There is a requirement to develop training methods that they could change knowledge as well as behavior. This necessitates launching appropriate actions for improvement of methods (specially, the method of education) and preparation of appropriate educational content/curriculum and more practical ones. Such training program requires be clearly thinking out, well designing with good baseline data to reach benefit effects.

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