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FOOD SAFETY KNOWLEDGE, PRACTICE AND ATTITUDE OF FOOD HANDLERS IN TRADITIONAL HOTELS OF JIMMA TOWN, SOUTHERN ETHIOPIA

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Abstract
Food safety is prime impotent among all the aspects of human safety, this study was designed to assess the food safety knowledge, practice and attitude of the food handlers in the traditional hotels of the Jimma Town located in Oromia region of Ethiopia. A total of 112 respondents (food handlers) were selected randomly (112 hotels) to assess food safety knowledge, attitude and practices by semi-structured questionnaire. The responses were converted to the percentages depending on the respondent's correct response for each statement. The results of this study showed that there is a gap of food safety knowledge in the study area. Particularly respondents were lack the knowledge about the microbiological information related to the foods and their pathogenicity and role in food born diseases. In food safety practice very less number of respondents was got good score (>70%), respondents are practicing some practices like handling food when suffering from the disease. In the attitude more number of the respondents got good score (>70%). But there is no significant relation between the demographical data and the food safety scores. Further, we are recommending that food safety training related to the microbiological issues is very important to improve the food safety knowledge, practice and attitude.

Key words: Food safety, Food handlers, Food safety knowledge scores, Food safety attitude, Food safety practice.

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INTRODUCTION

Food is a primary need for all individuals on the planet and providing the nutrients, energy for human overall growth, wellbeing and health. FAO and WHO (2002) reported that millions of people become diseased and thousands are died from unsafe food intake and improperly handled food is the responsible for a series of health problems even death; so, food safety is became a prime importance in all conditions. WHO recognized food born diseases are most common in present times, "defined food safety as the assurance that when food is consumed in the usual manner does not cause harm to human's health and wellbeing" (WHO and Global Strategy for Food Safety Geneva, 2002). Safe food can be defined as "food ready to consume and which retains its all nutritional value by protecting it from different kinds of spoilage and disease causing agents" (Gulse Bal et al., 2006).

Food borne diseases had significant public health risk, especially to young generation, the elderly and pregnant women in both developed and developing countries. As a result, food borne diseases may affect the consumers in different ways like causing health problems and loss of life and significant economic losses associated to cost related to medical treatments (Demir, 2007). Outbreaks of food poisoning have been reported in several food services sectors, e.g., in restaurants and hotels (Chan & Chan, 2008; Costalunga & Tondo, 2002; Xue & Zhang, 2013), hospitals (Todd, et al., 2007), schools/ students dormitory (Chan & Chan, 2008; Richards et al., 1993) and daycare centers (ESR, 2008).

Although many countries have legislation to protect citizens from food related illnesses, frequent outbreaks continue to occur (Ingelfinger, 2008). The principal goals of the general and specific hygiene rules of the different nations is to ensure a high level of consumer protection with regard to food safety (Jevšnik et al., 2008).

According to WHO (1989), food handling personnel play significant role in ensuring food safety throughout the chain of food production. Mishandling and inappropriate hygienic measures in the part of the food handler's duty

may allows the different pathogenic microorganisms to come into contact with food and in some cases those microbes survive and multiply to sufficient numbers to cause illness in the consumer.

Due to the development and life style changes food consumption patterns also changed; it leads to increased consumption of foods outside the home (Riethmuller and Morrison, 1995). The frequency of food borne illness reported thrice in the consumers when they consume food in private homes or hotels than homes (Redmond and Griffith, 2003; Tirado and Shcmidt, 2000). This fact made clear that the domestic food-handler is a critical link in the food chain: all the regulatory efforts may be in ineffective, if they are not combined with safe food purchase, preparation, cooking and handling (Kennedy et al., 2005; Medeiros et al., 2001a). The most frequent common mistakes reported in food handling includes serving the contaminated raw food, inadequate temperature maintenance (cooking or heating of food), collecting/purchasing food from un-safe sources, allowing more time between food preparation and consumption, food handling by an infected persons or poor personnel hygiene of food handler (Bryan, 1988; ICMSF, 1988; World Health Organization, 1999).

Different good food safety practices are required by the individuals in food preparation and serving, otherwise it may results in increased potential for unsafe. Food safety knowledge is important to prevent food borne illness. FAO (1995) identified that poor knowledge, practices and attitude in food handling in the assessment of microbial quality of food sold by vendors. The hands of food service employees can be a source in the transmission of food borne diseases because of poor personal hygiene or cross contamination. Many studied revealed the importance of the good personal hygiene and food handling practices to prevent the transmission of pathogens from food handlers to the consumers (Evans HS et al 1988). Different studies are reported the most outbreaks result from improper food handling practices (Angelillo et al., 2001; Patil et al., 2005 and Ehiri JE and Morris GP. 1996).

Therefore, to reduce food borne illnesses, it is crucial to gain an understanding of the knowledge and practices of food handlers (WHO, 2000). Several factors contribute to the spread of food borne outbreaks by food service workers. Among these factors are improper practices and low level of knowledge (Sharif et al., 2013). One good personal hygiene and sanitary handling practices at work place are an essential part of any prevention program for food safety. Although the majority of food handlers have the skills and knowledge to handle food safely, human handling errors have been implicated in most outbreaks of food poisoning (Ehiri & Morris, 1996; Greig et al., 2007; Howes et al., 1996).

The food born diseases are very common in Ethiopia. Wendafrash (2010), Ayalew H (2013) reported that people in Ethiopia are suffering with the different food born infections (Ascariases, typhoid, tapeworm, tuberculoses and infectious hepatitis). Abera Bayeh et al., 2010 reported that 1.6 % of food handlers working in Ethiopian cities hotel kitchens were suffering from multiple species of intestinal parasites with *S. typhi*.

The traditional hotel plays an important role in cities and towns of many developing countries both economically and in meeting food demands of city dwellers (Cress-Williams, 2001). In developing countries, there is a general rise in urban living and street food is an important component of the daily diet. As a result, outbreaks associated with food prepared outside the home are increasing in many regions (WHO, 2004; Global and Local, 2005). The major objective of this study is to determine the Food safety knowledge, Attitude and practices of the food handlers in Traditional hotels in Jimma town.

MATERIALS AND METHODS

Methodology

Jimma is one of the known oldest and historical cities in Ethiopia located in Oromia regioa; it is geographically located 346 km southwest of capital city Addis Ababa at about 7^0 33' N

latitude and 36^0, 57' E longitude at an altitude of 1710 masl (BPEDORS, 2000). According to the Jimma city Administrative office data 156 traditional hotels are present in 13 *Kebeles* (streets). The sample number was determined by Cochran's formula by 95% confidence level. Sample number of 112 was selected (one respondent from one hotel), Population probability sampling (PPS) technique was used to determine the number of samples collected from each *kebele*. Further from each *Kebeles* (streets) traditional hotels were selected randomly, from each randomly selected hotel a food handler randomly selected. Semi structured questionnaire was designed and administered to collect the demographical data, food safety knowledge, practice and attitude. Interview method was administrated to data collection. The Respondents were informed about importance of the study and after concerned only data was collected, throughout the study confidentiality was maintained.

Data Analysis

After data collection, questionnaires were verified; incomplete questionnaires were not considered for analysis. Questionnaires were coded randomly and entered data by the support of MS access data base. Descriptive statistics like, percentage, mean and standard deviations were determined by using SPSS version 22. Tabular and categorization method was used as a method of data analysis for qualitative information. Depending on the right answers given by the respondents the food safety knowledge, Practice and attitude score were determined. chi-squire was used to determine the food safety knowledge, practice and attitude scores percentages in relation to the demographic data.

RESULTS AND DISCUSSIONS

Socio-demographic data results: In total number of food handlers there are almost equal numbers of the male and females are present but round 2.68% of females are more, very less number of the respondents completed their diploma (2.68%) but highest number of respondents acquired their elementary education (58.04%). Respondents with the 1-2 years of experience were more with 30.4% and there were only three respondents had the experience in food handling more than 10 years. Around the 75.5% of the respondents were served to around 10-50 persons per day. 63.4% of respondents were not received any type of food safety training until the time of data collection. 67% of the (total respondents in the training received) respondents feel that the food safety training is very important in their job. The socio and demographic data details of the respondents were presented in Table1.

Food safety Knowledge: Food safety Knowledge score percentages and frequencies and their percentages were presented in figure 1. The food safety score were determined according to respondents answers for the statements, minimum food safety Knowledge percentage in 112 respondents was 47% and the maximum percentage of the food safety score was 100%. 10 (8.928) respondents among the 112 respondents were scored 100% of food safety scores. Around 70% of the respondents were having the food safety knowledge more than 77%. Only 30 % of the respondents are having the food safety knowledge less than 76%. The mean Food safety knowledge percentage is 82.72 % with the standard deviation of 10.99%.

Table 2 shows the different statements asked to the respondents to assess their food safety knowledge are presented but the most of the respondents are in a position to give their answer as YES or No for all the questions but about the microorganisms and their role in the food safety they are not aware, out 17 questions in the food safety questions related to the micro organisms most of the respondents were given the wrong answers. Knowledge about the role of salmonella and hepatitis, only 42% of the respondents were given the right answer. This may be due to their education level and lack of training on food safety. The basic hygiene questions like role of jewels and hand hygiene, role of Raw, cooked food; role of water in food born disease are well aware.

Table 1. Socio and demographical data of the food handlers in Jimma town (N=112)

Characteristics	Frequency	Percentage
Gender		
Male	53	47.32
Female	59	52.68
Age		
<19	6	5.35
20-35	77	68.75
36-50	21	18.75
51-65	7	6.25
>65	1	0.89
Educational status		
Informal education	8	7.14
Completed elementary school	65	58.04
Completed secondary school	36	32.14
Diploma	3	2.68
Marital status		
Married	53	47.32
Unmarried	59	52.68
Experience in food handling		
<1 year	22	19.6
1-2 years	34	30.4
3-4 years	30	26.8
5-6 years	11	9.8
7-8 years	8	7.1
9-10 years	4	3.6
>10 years	3	2.7
How many customers approximately you will serve per day		
<10	5	4.5
10-50	84	75
51-100	23	20.5
Have you received any training on food safety information		
Yes	41	36.6
No	71	63.4
When training was taken (N=41)		
Before 2 years	13	31.70
Before 1 years	19	46.3
Before six months	5	12.19
Before 3 months	4	9.75
What is your opinion about the use of food safety training for your job		
Highly useful	75	67
Useful	35	31.2
Cannot say	1	0.9
Not useful	1	0.9

Table 2. The response of the food handlers about the food safety knowledge statements (N=112)

#	Food safety knowledge statement	Yes (%)	No (%)	don't Know (%)
1	Use of jewels such as rings, watches, wearing in food handling cause food contamination	104(92.86)	8(7.14)	-
2	Water can be vehicle for diseases causing organisms	106(94.64)	6(5.36)	-
3	Hand hygiene can prevent food contamination	99(88.39)	13(11.61)	-
4	Contact between raw and cooked food allows the contamination	95(84.82)	16(14.89)	1(0.89)
5	Foods that is unfit for the consumption always does not have a bad smell and taste of spoil	79(70.5)	33(29.5)	-
6	Consumption of under cooked /un cooked meat leads to the food borne illness	94(83.9)	18(16.1)	-
7	Washing of the raw materials used in food handling is always important to decrease food borne infection	101(90.2)	11(9.8)	-
8	Food handler with disease such as diarrhea, flu and sore throat poses a risk of food contamination	96(85.7)	16(14.3)	-
9	Using of gloves in the food preparation handling reduces the food contamination risks	107(95.5)	5(4.5)	-
10	Proper cleaning and sanitation of the utensils is very important in the food safety	106(94.6)	6(5.4)	-
11	Salmonella is a food-born pathogen	48(42.9)	21(18.8)	43(38.4)
12	Hepatitis-A is food -borne pathogen	47(42)	21(18.8)	44(39.2)
13	Contaminated food always have some change in color, odor or taste	101(90.2)	8(7.1)	3(2.7)
14	Raw vegetables are higher of contamination than undercooked beef	99(88.4)	12(10.7)	10(0.9)
15	During the suffering from infection disease of the skin it is necessary to take leave from work	86(76.8)	24(21.3)	-
16	All bacteria found in food are not harmful	107(95.5)	5(4.5)	-
17	Preparation of food in advance likely to contribute to food borne illness	106(94.6)	6(5.4)	-

Also respondents were not having clear knowledge about the infectious disease remaining all the basic questions respondents are having acceptable knowledge.Similar results were obtained from previous studies in food handling (Angelillo, et al., 2001; Askarian et al., 2004; Buccheri et al., 2007). Dettenkofer & Spencer, (2007) reported hand hygiene is considered more critical in the pathogens control than cleaning and disinfection of surfaces.

The knowledge on food safety is very important and if knowledge insufficient it is difficult to promote positive attitudes and safe behaviours. As reported in previous studies on hospital and hotels and in caterings (Angelillo, Foresta, et al., 2001; Askarian et al., 2004; Buccheri et al., 2007; Endevelt et. al., 2009; Nelson et al., 2008), there is the need for continuous training and for alternative educational strategies.

In this study, food safety knowledge scores were high, even though improvement should include in training and education on appropriate food safety knowledge, care should be given in food safety related to micro organisms, including microbial role in the food handling. Some researchers (Askarian, et al., 2004; Gomes-Neves et al., 2011) have revealed that most food handlers had poor knowledge of pathogens. Some results also showed lack of training, and that the respondents had not received a sufficient amount of information (Garayo et al., 2012). Salmonella is one of the most important food-borne pathogens in the world (Tietjen & Fung, 1995). In this study, 48% of the respondents knew that salmonella was a kind of bacterium which causes food poisoning. This result is contradicted to the findings of Ehiri et al. (1997) indicated in their study that most of the people who took part in

food hygiene education in Scotland knew about the salmonella bacterium.

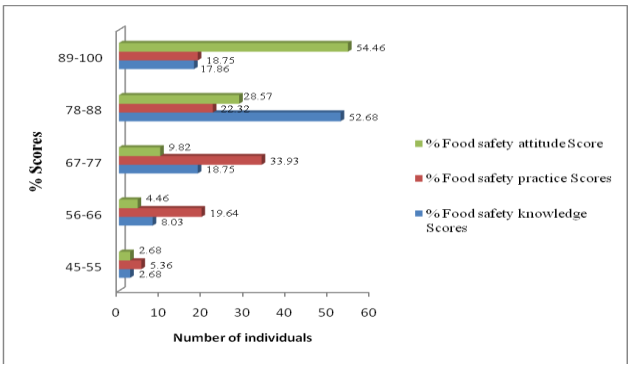

Figure 1. Distribution of food safety knowledge, practice and attitude scores percentages and frequencies of the different food handlers (N=112).

In the χ^2 analysis it was determined that gender, education status, marital status, experience, number of customers serving per day and food safety training taken have no significant relation with the food safety knowledge, but age of the respondents is highly significant ($p<0.0001$) with the food safety knowledge as shown in table 6.

Food safety Practice: Food safety practice score percentages 75.96% was observed for the food safety practices for all the respondents. The minimum score % is 50 and the Maximum is 100%, only 5 (4.5%) respondents among the 112 are scored 100% of the food safety practice. When compared to the food safety knowledge the practice score are less among the individuals. Around 41% of the individuals only have the food safety practice score more than 77%. In the food handling the practice is very important than any other issues in food safety, the food handlers having the knowledge without the practice is not at all fruitful to complete their roll successful. Figure 1 shows the total food safety practice percentages with their frequencies.

In the food safety practices in serving 70.5% of respondents are using the gloves, and 88.4% respondents wear special cloths related to the food service, 95.5% responds wash their hands before touching the foods, 80% of respondents were practiced the drinking and smoking in the work, there are clearly practicing the checking the food quality before serving and avoiding to serve the leftover food to the consumer after long time after preparation. But they will use the nail polish and rings when they are working in the food service. The remaining responses of basic food practices were presented in Table 3. Around seven questions were asked to the respondents to know about the practice how respondents are following, 93.8% of the food handlers are used the sanitizers always they handle the foods. Only 33.9% of respondents only remove their nails and remove ornaments always before they start handling the food. Only 25.5% of the respondents follow always change their uniform daily, but the 41% of the respondents are not following the avoiding the food handling in the diarrhea diseases. Always 97.3% respondents clean their hands with the detergent if they use the toilets in the middle of their food handling. The remaining food safety practices are presented in table 4.

One of the important rules in food production or handling is that the food staff should wear caps, masks and gloves in order to prevent contamination. Most respondents (97.6%) stated that they wore all three during food production. Çakiroglu and Uçar (2008) also found similar results in their study, where 82.9% of the staff wears caps, masks and gloves during food production. The hands of food handlers are an important vehicle of food cross contamination. Hedberg et al. (2006) found that 35% of outbreaks were identified due to the bare hand contact with food as a contributing factor. In the present study, 95.5% of the respondents reported they clean their hands before food processing; the previous results (about 30%) (De Bess et al., 2009) was lower than our study. The study of Gomes Neves et al. (2011) had observed that the food handlers did not know all the steps for a correct hand wash, while a simple intervention may result in a dramatic reduction in hand contamination (Shojaei et al., 2006). Training for food handlers on how to achieve hand hygiene could have a multiplier effect.

Proper practices by food handlers are a key factor in food safety, but converting knowledge into practice is a complex process.

Table 3. Response of the food handlers about the basic food safety practice (N=112)

#	Food Safety practice statement	I do it Frequency (%)	I don't do it Frequency (%)
1	Use gloves in handling of food	79(70.5)	**33(29.5)**
2	Wash hands before wearing the gloves	76(67.9)	**36(32.1)**
3	Wear special cloths before working	99(88.4)	**13(11.6)**
4	Were masks before distributing the unwrapped foods	97(86.6)	**15(13.4)**
5	Wash hands properly before touching the foods	107(95.5)	**5(4.5)**
6	Drinking and smoke in your work place	23(20.5)	**89(79.5)**
7	Avoid nail polish, rings and watches in the time of food handling	35(31.2)	**77(68.8)**
8	Don't serve the Serve the food which prepared in very advance	24(21.4)	**88(78.6)**
9	Check the shelf life of time of delivery/ serving	95(84.8)	**17(15.2)**
10	Do not serve leftover food to the consumers after	24(21.4)	**88(78.6)**
11	use sanitizer to washing the service utensils	92(82.1)	**20(17.9)**
12	use dry cloths /clean tissues to dry your hands after cleaning	76(67.9)	**36(32.1)**

Table 4. Response of the food handlers about the food safety practice (N=112)

#	Food safety practice statement	Follow always	Follow sometimes	May or may not follow	Not follow
1	Using of sanitize hands before handling foods	105(93.8%)	7(6.2%)		-
2	Keep your nails short and remove all ornaments(rings and watches etc) before starting activities	38(33.9%)	73(65.2%)	1(0.9%)	-
3	Hair is completely covered while serving	63(56.2%)	47(42%)	2(1.8%)	-
4	Change uniform cloths daily	29(25.9%)	82(73.2%)	1(0.9%)	-
5	Not handle food at work when you have diarrhea and other disease have cuts on your hand	33(29.5%)	5(4.5%)	28(25%)	46(41%)
6	Clean your hands with detergent if you use toilet in the middle of the food handling	109(97.3%)	3(2.7%)	-	-
7	Do not Handle other utensils or doing of other works while food handling	88(78.6%)	24(21.4%)	-	-

Powell et al. (2011) had proposed the concept of a food safety culture to correct and maintain proper practices, in which establishing a strong culture of food safety would be of help, including communication among employees, managers, and employers; encourage employers; consensus on food safety, and similar workplace values. The food safety practice was highly significant on gender (P=0.006) and age (P=0.0001). Educational status, marital status, experience, number of customers serve per day and food safety training taken data were shown in Table 6.

Food safety attitude: Food safety attitude scores percentages of the 86.67 were determined in the respondents with the minimum attitude percentage of 45% and maximum of 100%, around the 85% of the respondents were having the food safety attitude scores more than 78%. 18.8% have the food safety attitude scores of 100%. The Food safety attitude is also very important factor in the food safety (Figure 1).

The attitude of food handler about the food safety issues showed that most of the respondents accepted strongly (81.2%) and accepted (18.8%) that safe handling of food and avoiding of the contamination is the part of their job. 36.6% respondents only strongly accepted that the way of present food handling is enough to ensure food safety and remaining 2.7% of the respondents are neither accepted nor rejected. 79.5% of the food handlers are accepted that hand hygiene is very important in food service. 103(92%) respondents are strongly accepted that improper food handling is dangerous to the consumers. Only 4(3.6%) respondents are neither accept nor reject about the statement that handlers with bruises or injuries on their hands must not touch or handle the food but 74(66%) of the respondents are accepted strongly. 88.4% of the respondents

showed their strong attitude about the expired food never serve if they may not change in the smell and taste. The remaining attitude responses are presented in the table 5.

Attitudes are relatively permanent, important psychological construct because they have been found to influence and predict behaviour (Kraus, 1995). Thus, transferring knowledge into food handling practices is of priority concern (Ko, 2013). According to Mc Intyre et al. (2013), FOODSAFE trained food handlers' in different provenances of Canada reported significantly better hand washing practices and attitudes compared with the untrained food handler group. Some studies were reported that hygiene knowledge education alone was not sufficient to enhance the hygienic attitude and practices of food handlers (Chang, Lee, & Kwak, 2003; Walker et al., 2003), hence, hands on training should be equipped and the training program should be angled towards handlers' viewers with various activities.

These findings contradict those of Brannon et al. (2009) and Johnson et al. (2003), who stated that employees tend to have higher levels of food safety knowledge as they became experienced in the operations.

Azanza et al (2000) also stated that management would be better able to bridge the gap between food safety knowledge and practices by providing regular food safety education sessions and better water and waste management utilities.

Moreover, these findings are similar with those of other studies, in which lower education levels were reported to be associated with safer food handling behaviours (Altekruse et al., 1999; Medeiros et al., 2001b; Patil, Cates, & Morales, 2005). Food safety attitude is significance relation only with the Age (P=0.0001) of the respondents remaining all the other demographical characters were no significant and presented in Table 6.

Table 5. The response of the food handlers about attitude of food safety (N=112)

#	Food safety attitude statement	Accept strongly	Accept	Neither accepts nor reject
1	Safe food handling to avoid contamination and disease is my part job responsibility	91(81.2%)	21(18.8%)	-
2	Hand washing before handling food reduces the risk of contamination	90(80.4%)	22(19.6%)	-
3	The way that we handle food today is enough to ensure its safety	41(36.6%)	68(60.7%)	3(2.7%)
4	Hand hygiene is very important in food service	89(79.5%)	22(19.6%)	1(0.9%)
5	Improper food handling is dangerous to health of consumers	103(92%)	8(7.1%)	1(0.9%)
6	Food handlers with wounds, bruises or injuries on their hands must not touch or handle food	74(66%)	34(30.4%)	4(3.6%)
7	Expired food never serve even they not changed in the smell and taste	99(88.4%)	10(8.9%)	3(2.7%)

Table 6. The relation between Demographic data and Food safety Knowledge, Practice and Attitude percentages (KAP)

Demographical Characteristics	Food safety knowledge		Food safety practice		Food safety attitude	
	χ^2 Value	**P-Value**	**χ^2 Value**	**P-Value**	**χ^2 Value**	**P-Value**
Gender	0.793	0.939	14.312	0.006	1.129	0.890
Age	125.889	0.0001	134.460	0.0001	135.461	0.0001
Educational status	6.085	0.912	15.697	0.206	14.226	0.287
Marital status	7.024	0.135	2.742	0.602	2.521	0.641
Experience in food handling	30.899	0.157	18.656	0.770	28.880	0.225
No. of customers serve per day	8.918	0.349	2.112	0.977	2.271	0.686
Food safety training taken	1.710	0.785	2.271	0.686	1.663	0.797

CONCLUSIONS

Food safety is the most important issues in all aspects related to the food, the food safety knowledge of the 17.5 % respondents are have excellent food safety knowledge (more than 90%) remaining 50.9 % respondents have very good knowledge but 5.3% respondents only have poor knowledge about food safety. The respondents were asked very basic questions, because the traditional hotels are following the traditional methods in food preparation and provide services. There is no special requirement (education, training, etc) to work in such type of hotels in the studied area. In case of Food safety practice only 11.4% of the respondents have shown excellent practice although the number is lower than the knowledge percentage. This clearly tells that the knowledge and practice are the two different issues which may not have any relationship. The difference is very high between the number of respondents in very good knowledge (50.9%) and practice (21.1%). In the case of attitude, 52.6% of the respondents were showing the excellent attitude but very few respondents were showed poor attitude (3.5%). Further there is no relation between the demographic parameters and the food safety Knowledge, Practice and attitude score percentages. From this study we are recommending that the food safety training to the food handles are very important for better food safety knowledge, attitude and practice.

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REFERENCES

[1] Abera B, Biadegelgen, F, Bezabih B, Prevalence of *Salmonella typhi* and intestinal parasites among foodhandlers in Bahir Dar Town Northwest Ethiopia, Ethi. J. Heal. Dev., 2010, **24** (1): 46-50.

[2] Altekruse, SF, Yang S, Babagaleh TB, Angulo F, A multi-state survey of consumer food-handling and food-consumption practices, Amer. J. Prev. Med., 1999, **16**(3): 216-221.

[3] Angelillo IF, Foresta MR, Scozzafava C, Pavia M, Consumers and food borne diseases: knowledge, attitudes and reported behavior in one region of Italy, Int. J. Food Microbiol. 2001., **64**(1-2):161-6.

[4] Askarian M, Kabir G, Aminbaig M, Memish ZA, Jafari P, Knowledge, attitudes, and practices of food service staff regarding food hygiene in Shiraz, Iran. Infect. Control Hosp. Epidemiol., 2004, **25**(1):16-20.

[5] Ayalew H, Birhanu A, Asrade B, Review on food safety system: Ethiopian perspective, Afri. J. of Food Sci., 2013, **7**(12): 431-40.

[6] Azanza MP, Gatchalian CF, Ortega MP., Food safety knowledge and practices of street food vendors in a Philippines university campus, Int. J Food Sci. Nutr., 2000, **51**(4):235-46.

[7] Brannon LA, York VK, Roberts KR, Shanklin, CW, Howells AD., Appreciation of food safety practices based on level of experience, J. Food Ser. Busi. Res., 2009, **12**: 134-154.

[8] Bryan FL, Risks of practices, procedures and processes that lead to outbreaks of food-borne diseases, J. Food Prot., 1988, **51**: 663–673.

[9] BPEDORS., Physical and socio-economical profile of 180 District of Oromia Region. Bureau of Planning and Economic Development of Oromia Regional state, Physical planning Development, Finfinne, Ethiopia, 2000, pp. 248-251.

[10] Buccheri R, Trygstad L, Dowling G., Behavioral management of Command Hallucinations to Harm in Schizophrenia, J Psychosoc. Nurs. Ment. Health Serv., 2007, **45**(9): 46-54.

[11] Çakiroglu FP, Uçar A., Employees' perception of hygiene in the catering industry in Ankara, Food Control, 2008, **19**: 9-15.

[12] Chan SF, Chan ZC., A review of food borne disease outbreaks from 1996 to 2005 in Hong Kong and its implications on food safety promotion. J. food Safety. 2008, **28** (2): 276-99.

[13] Chang H., Lee JS, Kwak TK., Effectiveness of HACCP-based training on the food safety knowledge and behaviour of hospital foodservice employees, Nutritional Sci., 2003, **6**: 118-26.

[14] Costalunga S, Tondo EC., Salmonellosis in Rio Grande do Sul, Brazil, 1997 to 1999, Braz. J Microbio. 2002, **33**: 5-9.

[15] Cress-Williams L. 2001. Food micro-enterprises for food security in an urban slum community in East London: development of an awareness-creating programme (Doctoral dissertation, Stellenbosch: Stellenbosch University).

[16] De Bess EE, Pippert E, Angulo FJ, Cieslak PR., Food handler assessment in Oregon, Food borne Pathogens and Disease., 2009, **6**(3): 329-335.

[17] Demir C. 2007. Improvement and healthy expectations of the consumers within the EU integration, *Articles*, (Turkish), available at: www.gidavitrini.com (accessed 20 November, 2015).

[18] Dettenkofer M, Spencer RC. Importance of environmental decontamination: a critical view, J Hosp Infect., 2007, **65**(2):55-7.
[19] Ehiri JE, Morris GP., Hygiene training and education of food handlers: does it work?, Ecology of Food and Nutr., 1996, **35:** 243-2511.
[20] Endevelt R, Werner P, Goldman D, Karpati T., Nurses Knowledge and attitudes regarding nutrition in the elderly, J. Nutr. Health. Aging., **2009**, **13**(6):485-9.
[21] Evans HS, Madden P, Douglas C, Adak GK, O'Brien SJ, Djuretic T, Wall PG, Stanwell-Smith R., General outbreaks of infectious intestinal disease in England and Wales: 1995 and 1996, Commun. Dis. Public Health., 1998, **1**(3):165-71.
[22] ESR., Annual summary of outbreaks in New Zealand 2007, Population and Environmental Health Group, New Zeland, 2008, p. 28-38
[23] FAO. 1995. Codex Alimentarious. General requirements (food hygiene) FAO, Rome, 188-192
[24] FAO WHO Global Forum of Food Safety Regulators Marrakesh, Morocco, 28-30 Jan, 2000. Improving Efficiency and transparency in food safety systems sharing experience (accessed on Nov 20, 2015) *http://www.fao.org/docrep/meeting/004/y3680e/y3680e00.HTM*
[25] Garayoa R, Vitas AI, Díez-Leturia M, García-Jalon I., Food safety and the contract catering companies: food handlers, facilities and HACCP evaluation. Food Control., 2011, **22**(12): 2006-2012.
[26] Global and Local (2005). Food Safety around the World Center for Science in the Public Interest, June 2005 Washington, D.C. pp 5-15.
[27] Gomes-Neves E, Cardoso CS, Araújo AC, Correia da Costa JM., Meat handlers training in Portugal: a survey on knowledge and practice, Food Control. 2011, **22** (3):501-507
[28] Greig JD, Todd EC, Bartleson CA, Michaels BS., Outbreaks where food workers have been implicated in the spread of food borne disease. Part 1. Description of the problem, methods, and agents involved, J. of Food Prote., 2007, **70**(7):1752-61.
[29] Gülse Bal HS, Göktolga ZG, Karkacier O., The examination of consciousness level of consumers about food safety (a case of Tokat Province), Turkish J. of Agri. Eco., 2006, **12**(1): 9-18.
[30] Hedberg CW, Smith SJ, Kirkland E, Radke V, Jones TF, Selman CA., Systematic environmental evaluations to identify food safety differences between outbreak and non outbreak restaurants, J of Food Protec., 2006, **69**(11): 2697-2702.
[31] Howes M, Mc. Ewen S, Griffiths M, Harris L., Food handler certification by home study: Measuring changes in knowledge and behavior, Dairy, Food and Env. Sanitation, **1996**, 16(11):737-44.
[32] Ingelfinger JR., Melamine and the global implications of food contamination, New Eng. J of Med., 2008, **359**(26):2745-8.
[33] ICMSF (1988) Micro-Organisms in Food, Application of Hazard Analysis Critical Control Point (HACCP) System to Ensure Microbiological Safety and Quality, Blackwell Scientific Publications, Oxford.
[34] Johnson L, Shin J H, Feinstein AH, Mayer KJ., Validating a food safety instrument: measuring food safety knowledge and attitudes of restaurant employees, J. Food ser. Bus. Res., 2003, **6**: 49-65.
[35] Jevšnik M, Hoyer S, Raspor P., Food safety knowledge and practices among pregnant and non-pregnant women in Slovenia, Food control., 2008, **19**(5):526-34.
[36] Kennedy J, Jackson V, Cowan C, Blair I, Mc Dowell D, Bolton D., Consumer food safety knowledge: Segmentation of Irish home food preparers based on food safety knowledge and practice, British Food J., 2005, **107**(7):441-52.
[37] Ko, WH., The relationship among food safety knowledge, attitudes and self- reported HACCP practices in restaurant employees, Food Control, 2013, **29**(1): 192-197.
[38] Kraus SJ., Attitudes and the prediction of behavior: A meta-analysis of the empirical literature, Per. and Soc. Psy. Bul. **1995**, 21: 58–75.
[39] Mc Intyre L, Vallaster L, Wilcott L, Henderson SB, Kosatsky T.2013. Evaluation of food safety knowledge, attitudes and self-reported hand washing practices in FOODSAFE trained and untrained food handlers in British Columbia, Canada, Food Control, 30(1), 150-156.
[40] Medeiros LC, Hillers VN, Kendall PA, Mason A. 2001a. Food safety education: what should we be teaching to consumers?, Journal of Nut.Edu. 33(2):108-13.
[41] Medeiros L, Hillers V, Kendall P, Mason A., Evaluation of food safety education for consumers, J. of Nut. Edu., 2001, **33**(1):27–34
[42] Nelson JM, Bednarczyk R, Nadle J, Clogher P, Gillespie J, Daniels A,. Food net survey of food use and practices in long-term care facilities, J Food Prot., 2008, **71**(2):365–372
[43] Patil SR, Cates S, Morales R. 2005. Consumer food safety knowledge, practices, and demographic differences: findings from a meta-analysis, J. Food Prot., **68**(9):1884-94.
[44] Powell DA, Jacob CJ, Chapman BJ., Enhancing food safety culture to reduce rates of food borne illness, Food Control, 2011, **22**(6): 817-822.
[45] Richards MS, Rittman M, Gilbert TT, Opal SM, De Buono BA, Neill RJ, Gemski P., Investigation of a staphylococcal food poisoning outbreak in a centralized school lunch program, Pub. Heal. Rep., 1993, **108**(6):765-762
[46] Riethmuller P, J Morrison.1995. A comparative survey of beef consumption behaviour in Australia, Japan and the United States, Agricultural and Resource Management Services, Ptg Ltd., Parkside, USA.
[45] Redmond EC, Griffith CJ., Consumer food handling in the home: a review of food safety studies, J. Food Prot., 2003, **66**(1):130-61.

[46] Rowe B, Taylor J, Bettelheim KA., An investigation of traveller's diarrhea, Lancet, 1970, **1**(7) 1-5.
[47] Sharif L, Obaidat MM, Al-Dalalah MR., Food Hygiene Knowledge, Attitudes and Practices of the Food Handlers in the Military Hospitals, Food and Nut. Sci. 2013, **4**(03): 245-252.
[48] Shojaei H, Shooshtaripoor J, Amiri M., Efficacy of simple hand-washing in reduction of microbial hand contamination of Iranian food handlers, Food Res. Int., 2006, 39(5): 525-529.
[49] Tietjen M, Fung YCD., Salmonellae and food safety. Critical Rev.in Micro.bio., 1995, **21**(1): 53-83
[50] Todd ECD, Greig JD, Bartleson CA, Michaels BS., Out breaks where food workers have been implicated in spread of food born disease. Part 2. Description of outbreaks by size, severity, and settings, J. Food. Prot., 2007, **70**(80): 1975-1993
[51] Tirado, C, and Schmidt, K. 2000 (eds). WHO surveillance programme for control of food borne infections and intoxications in Europe, 7th report, 1993-1998. BGVVFAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses. Available at: http://www.bgvv.de/index - e.htm.
[52] Walker E., Pritchard C, Forsythe S., Food handlers' hygiene knowledge in small food businesses, Food Control, 2003, **14**, 339-43.
[53] Wendafrash A .2010. Food safety and codex activities In Ethiopia. Food-borne diseases December 14-15, Addis Ababa 21-26.
[54] WHO.1989. World Health Organization, Global Strategy for Health for all by the year 2000. Geneva.
[55] WHO. 1999. Adams M, Motarjemi Y, Basic Food Safety for Health Workers, World Health Organization, Geneva.
[56] WHO.2000. Food borne disease: A focus for health education, Geneva, World Health Organization.
[57] WHO and Global Strategy for Food Safety Geneva. 2002. http://apps.who.int/iris/bitstream/10665/42559/1/9241545747.pdf (accessed on 12/09/2015).
[58] WHO. (2002). Statistical information on food-borne disease in Europe: microbiological and chemical hazards. In Paper presented at FAO/WHO Pan-European conference on food safety and quality. Budapest, Hungary.
[59] WHO. 2004. Developing and Maintaining Food Safety Control Systems for Africa. Current Status and Prospects for Change, Second FAO/WHO Global Forum of Food Safety Regulators, Bangkok, Thailand, 12-14 October 2004.
[60] Xue JH, Zhang WJ., Understanding China's food safety problem: an analysis of 2387 incidents of acute food borne illness. Food Control, 2013, **30** (1): 311–3