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**ORIGINAL ARTICLE****THE SANITARY CONDITIONS OF FOOD SERVICE ESTABLISHMENTS AND FOOD SAFETY KNOWLEDGE AND PRACTICES OF FOOD HANDLERS IN BAHIR DAR TOWN****Mulugeta Kibret<sup>1\*</sup>, Bayeh Abera<sup>2</sup>****ABSTRACT**

**BACKGROUND:** *Lack of basic infrastructure, poor knowledge of hygiene and practices in food service establishments can contribute to outbreaks of foodborne illnesses. The aims of this study were to investigate the food safety knowledge and practices of food handlers and to assess the sanitary conditions of food service establishments in Bahir Dar town.*

**METHODS:** *A cross-sectional study was conducted in Bahir Dar in May 2011 and data were collected using questionnaire and observation checklist on employees' knowledge of food hygiene and their practices as well on sanitary conditions of the food service establishments*

**RESULTS:** *The median age of the food handlers was 22 years and among the 455 subjects 99 (21.8%) have had food hygiene training. Sixty six percent of the establishments had flush toilets whereas 5.9% of the establishment had no toilet. Only 149 (33.6%) of the establishments had a proper solid waste collection receptacle and there was statistically significant association between the sanitary conditions and license status of the establishments ( $p=0.01$ ). Most of all, knowledge gap in food hygiene and handling practice was observed. In addition, there was statistically significant difference between trained (professional) handlers and non-trained handlers with regard to food hygiene practices ( $p<0.05$ ). While more than 50% of the handlers prepare meals ahead of the peak selling time, more than 50% of the left over was poorly managed.*

**CONCLUSION:** *This study revealed poor sanitary conditions and poor food hygiene practices of handlers. Educational programs targeted at improving the attitude of food handlers and licensing and regular inspections have been recommended.*

**KEYWORDS:** *Food handlers, food safety, hygiene, practices*

**INTRODUCTION**

Food safety is defined by the FAO/WHO as the assurance that when food is consumed in the usual manner does not cause harm to human health and wellbeing (1). Food safety is of utmost concern in the twenty-first century (2). Food service establishments are sources of food borne illnesses and food handlers contribute to food borne illness outbreaks (3, 4). According to WHO (1989), food handling personnel play important role in ensuring

food safety throughout the chain of food production and storage (5).

Mishandling and disregard of hygienic measures on the part of the food handlers may enable pathogenic bacteria to come into contact with food and in some cases survive and multiply in sufficient numbers to cause illness in the consumer.

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Studies by FAO (1995) recorded poor knowledge, practices in food handling in the assessment of microbial contamination of food sold by vendors (6). The hands of food service employees can be vectors in the spread of food borne diseases because of poor personal hygiene or cross-contamination. Studies point out that most outbreaks result from improper food handling practices (7). Lack of basic infrastructure, lack of knowledge of hygiene, absence of potable water, lack of proper storage facility and unsuitable environments for food operations (such as proximity to sewers and garbage dumps) can contribute to poor microbial quality of foods. Inadequate facilities for garbage disposal posed further hazards (8). In addition poor sanitary practices in food storage, handling, and preparation can create an environment in which bacteria and other infectious agents are more easily transmitted (9, 10). Moreover, inadequate time and temperature control and cross contamination are responsible for food poisoning outbreaks (11).

Poor personal hygiene frequently contributes to foodborne illness which indicates that food handlers' knowledge and handling practices needs to be improved. Studies on the conditions of food and drink establishments have been scanty in Ethiopia (12, 14). A study conducted among food handlers in Bahir Dar town indicated that most of them were infected with enteric bacteria and parasites (15). Good personal hygiene and food handling practices are the basis for preventing the transmission of pathogens from food handlers to the consumers (16). A USA based study suggested that improper food handling practices contribute to about 97% of food borne illnesses in food services establishments and homes (17). Therefore, to reduce foodborne illnesses, it is crucial to gain an understanding of the knowledge and practices of food handlers (18). Information on the food safety knowledge and practices from Bahir Dar is limited. The aim of this study was therefore to obtain current information on the food safety knowledge and practices of food handlers and the sanitary conditions of food service establishments in Bahir Dar town.

## MATERIALS AND METHODS

A cross-sectional study was conducted in May 2011 to evaluate the food safety knowledge and practice of food handlers and assess the sanitary conditions of food and drink establishments in Bahir Dar town.

Bahir Dar town, the capital of Amhara National Regional State, is located 565 Km away from the capital of Ethiopia in North West direction. It is located at 11° 38' latitude and at 37° 10' East longitudes at 1810 m above sea level. The town has a total population of 256,999 and it is one of the tourist destinations in the country (19). In Bahir Dar rural to urban migration is on the increase and the number of people eating outside their homes is expected to increase which in turn demands for more food establishments.

A census was conducted to obtain the list of food and drink establishments in Bahir Dar town and the town was divided into three zones based on the density of food and drink establishments. A proportional sample size was determined for each zone and the food service establishments were randomly selected from each zone using random table. Four hundred fifty five food handlers working in hotels, cafe and restaurants cafes, hotels and juice houses were randomly selected for the study.

Five sanitarians were recruited for data collection and supervision. Data collectors and supervisor were oriented about the purpose of the study, the components of the questionnaire and data quality management. A pretested, structured questionnaire was used for data collection. The questionnaire was initially prepared in English and translated into Amharic for data collection. The knowledge questionnaire contained items on the source and methods of transmission of food borne pathogens and knowledge of food handling. The questionnaire on food safety knowledge includes seven questions. Data collectors interviewed the food handlers and observed the food handlers while they were performing their chores to see their food handling practices and collected information on food preparation and handling in the facilities and the sanitary condition of the facilities. Food handlers were asked to indicate their level of agreement to the statements. They have also collected information on the socio-economic and demographic characteristics of the

handlers. A checklist was used by data collectors to assess the food handlers' food handling practices. Respondents were asked to choose among the options. The scores ranged from 0 to 7 which were converted to 100% based on the number of correct answers scored by the respondents. A score of 50% and below was defined as poor knowledge and practice and a score above 50% was defined as good knowledge and practice (20, 21).

Data was entered into computer and analyzed with using EPI Info version 3.3. Chi-square test was used to test if there were statistically significant differences between licensed and unlicensed establishments, trained and untrained food handlers. P-value <0.05 was considered to indicate statistically significant association.

Ethical clearance was obtained for the Institutional Ethics Review Board of Bahir Dar University and informed verbal consent was

obtained from the food handlers before the interview.

## RESULTS

**Characteristics of the food handlers:** The socio-demographic data of the food handlers is presented in Table 1. Majority (73.4%) of the food handlers were females and 121 (26.6%) were males where most of them (55.6%) were between 21 and 30 years of age with median age of 22 years. Majority (50.2%) of the food handlers completed at least primary school and 8.1% had no formal education. Most of the food handlers (77.1%) were single while 20% of them were married. Only 99 (21.8%) of all food handlers in the study received food hygiene training and fifty six (10.5%) of the food handlers acquire knowledge of food preparation through formal training while 399 (89.5%) of them acquired through observation.

Table 1. Socio-demographic profile of food handlers in Bahir Dar Town, 2011 (n = 455).

Demographic Characteristics	Frequency	Percentage
<b>Gender</b>		
Male	121	26.6
Female	334	73.4
<b>Age (years)</b>		
≤ 20	163	35.8
21-30	253	55.6
31 -40	35	7.7
>40	4	0.9
<b>Marital status</b>		
Married	91	20.0
Single	351	77.1
Divorced	13	2.9
<b>Educational Attainment</b>		
No schooling	37	8.1
Elementary school completed	228	50.2
Secondary school completed	153	33.6
College/University completed	37	8.1
<b>Food hygiene Training received</b>		
Yes	99	21.8
No	356	78.2
<b>Acquisition of knowledge on Food Preparation</b>		
Formal Training	56	10.5
Observation	399	89.5

**Sanitary conditions of the food establishments:** Off the 455 establishment, 166 (36.6%), 154 (33.8%), 103 (22.6%) and 32 (7.0%) of the food establishments were Cafe and Restaurants, Hotels,

Cafes and Juice Houses, respectively. Four hundred seven (89.5%) of the establishments were licensed and 10.5% were not licensed. Four hundred twenty (92.3%) of the establishments

have piped private water supply and others use shared piped water supplies on the other hand about 66 % of the establishments have flush toilets, 27.7% have dry pit latrines while 5.9% of the establishments have no toilets. Nearly fifty per cent of the establishments have a proper liquid waste disposal system and only 33.6% have a proper solid waste collection receptacle with a lid. Domestic animals were found in 9.9% of the establishments. Availability of piped private water supply, availability flush type toilet, availability of closed ditch liquid waste disposal, availability of

solid waste storage receptacle with lid and absence of animals around the vending were the variables selected for characterization of the food and drink establishments as good and poor. Only 99 (21.3%) of the establishments studied had good sanitary conditions (Table 2). Cross tabulations were made to test the association between these variables and license status of the establishments). Licensed food establishments had good sanitary conditions and there was statistically significant association between the sanitary conditions and the type of establishments ( $p=0.01$ ).

Table 2. Sanitary condition of the establishments by license status, type of establishment and food hygiene training status of the food handlers, Bahir Dar Town, 2011 (n = 455).

Characteristic	Overall Sanitary Conditions		p-value
	Good	Poor	
<b>License status</b>			0.001
Licensed	97	310	
Not Licensed	2	46	
<b>Type of establishment</b>			0.001
Juice House	45	27	
Café and Restaurant	44	122	
Cafe	14	89	
Hotel	36	118	
<b>Food Hygiene Training Received</b>			0.1
Yes	16	83	
No	83	273	

**Food hygiene knowledge and practices of food handlers:** Most handlers had good knowledge of food hygiene. Most handlers appear to have good knowledge of food hygiene. However, it has been observed that they had poor knowledge in practice where they handled raw materials for food without washing their hands; wore hand jewelries and fondled their bodies while preparing food. Three

hundred (75.2%) of the food handlers have direct contact with food during food preparation, 242 (53.2%) of the food handlers touch their body and wear hand jewelries during food preparation and the food handling practice scores of the food handlers were lower than knowledge scores (Figure 1).

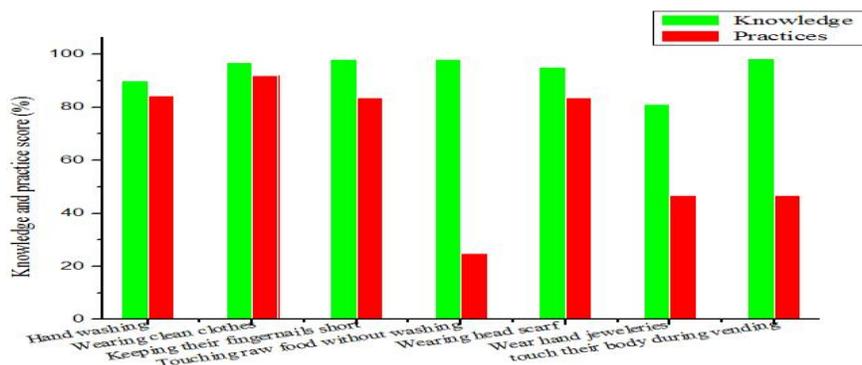


Figure 1. Food Hygiene knowledge and practice scores of food handlers

As shown in table 3 there was statistically significant difference in the number of trained and untrained food handlers with regard to practices of hand washing, contact with food without washing, wearing hand jewelries and touching their bodies

during vending ( $p = 0.01$ ). On the other hand, there has not been statistically significant association between the demographic factors and food handling scores except for the mode of acquisition of food preparation (Table 4).

Table 3. Food handlers' food hygiene knowledge and practices by food hygiene training in Bahir Dar Town May, 2011 (n = 455).

Practices	Trained	Not trained	P=value
Food handlers wash their hands frequently	91	325	0.04
Food handlers wear clean aprons	88	331	0.18
Food handlers cut their fingernails short	83	298	0.17
Food handlers wear hair restraints	78	303	0.17
Food handlers have direct hand contact with food items without washing their hands	34	79	0.01
Food handlers wear hand jewelries when preparing food	47	166	0.02
Food handlers touch their body during vending	34	80	0.02

Table 4. Socio-demographic profile of food handlers and food hygiene practice scores, Bahir Dar Town, 2011 (n = 455).

Demographic Characteristics	Food hygiene practice score		P value
	Good	Poor	
<b>Gender</b>			
Male	106	15	0.2
Female	304	30	
<b>Age (years)</b>			
≤ 20	149	14	0.1
21-30	223	30	
31 -40	34	1	
>40	4	0	
<b>Educational Attainment</b>			
No schooling	34	3	0.4
Completed Elementary schools	210	18	
Completed Secondary schools	134	19	
College/University completed	32	5	
<b>Food hygiene Training received</b>			
Yes	88	11	0.6
No	322	34	
<b>Acquisition of knowledge on Food Preparation</b>			
Formal Training	52	1	0.04
Observation	358	41	

**Food safety practices of the food handlers:** Most of the ready-to-eat foods were stored in refrigerators whereas 16% of the raw materials were stored at room temperature. More than 50% of the food handlers prepare food at the peak

selling time whereas about 50% of the leftover is consumed by the food handlers themselves and their families or sold the following day or otherwise given to beggars (Table 5).

Table 5 Food safety practices of food handlers in Bahir Dar Town May, 2011 (n = 455).

Food safety practices	Frequency	Percentage
<b>Storage of ready-to-eat foods</b>		
In the refrigerator	411	90.3
At room temperature	44	9.7
<b>Preparation time</b>		
Night of selling	36	7.9
Morning of selling	208	45.7
Any time during the day	21	4.6
On demand	190	41.8
<b>Peek selling time</b>		
Breakfast	76	16.7
Lunch	245	53.8
Dinner	134	29.5
<b>Management of leftover food</b>		
Throw it away	203	44.6
Eat it at home	174	38.6
sell it the following day	19	4.2
Give it to beggars	59	13.0

## DISCUSSION

This study reveals poor food handling practices by food handlers and poor sanitary conditions of food service establishments in Bahir Dar town. In this study majority of the food handlers were found to be females and most of them were in the age range between 21 and 30 years and only 41.7% of them had completed a minimum of secondary school education. Safer food preparation and handling were reported by persons who were females, at least 40 years of age and with at least high school level education (22). Food handlers are expected to have a substantial knowledge and skills for handling foods hygienically (8). Food handlers are expected to have a substantial knowledge and skills for handling foods hygienically (16). Although most of the handlers responded positively for the food safety related questions in reality they did not practice them and this has also been reported in other studies where food handlers did not usually translate their knowledge into practice (17, 23). Studies have documented discrepancies between knowledge and practices among food handlers (12, 24, 25) and a study in the USA indicated that improper food handling practices contribute to 97% of foodborne illness in food service establishments and at home (17, 26) and food safety training has been shown to have a positive impact on practices of handlers (27). Therefore, training and motivation should be

provided to the food handlers working in these establishments.

Liquid and solid waste disposal systems were not proper moreover domestic animals were found in some food establishments. It has been noted that foods should be prepared in places far away from the sources of contamination such as rubbish, wastewater, and animals (28). Ready to eat foods sold in unsanitary locations are susceptible to contamination by flies and domestic animals and the link between, other animals and diarrheal diseases has been reported (29) where dogs and cats are known to carry pathogens such as *E. coli* and *Salmonella* (30, 31). Then again, there was statistically significant association between the license status and the sanitary conditions of the food establishments and this result is in agreement with other results of studies conducted in Ethiopia (12, 13). This study supports the reports of earlier work that post processing contamination of ready to eat foods with animals is common and needs attention (32). Statistically significant difference in the sanitary conditions among the establishments was observed in this study which is in agreement to the finding of a study done in Turkey (20). This difference is attributed to the difference in licensing criteria employed by agencies among the establishment. Legal binding processes and inspection are crucial steps for maintaining good the sanitary quality of food and drink

establishments compared to unlicensed ones as well as among the establishments.

Most (53.6%) food handlers reported that meals are prepared well ahead of peak selling time (which is lunch time) where it varies between six to eighteen hours earlier. This timing difference would result in temperature abuse (33, 34). Preparation of meals long before their consumption and storing them at ambient temperature were identified as key factors in the handling of meals that contribute to food poisoning (35). Moreover, studies conducted on street vended foods have revealed that high microbial counts were associated with food when held at room temperature for four or longer hours (33, 36). Moreover, studies conducted on street vended foods have revealed that high microbial counts were associated with food. Thus the consumption of left-over food may cause foodborne illnesses to family members, consumers and the beggars. In the transmission of food borne diseases the role of time, temperature abuse and poor management of leftover has been highlighted (37, 38).

One of the limitations of this work is that some socio-demographic variables such as experience of the food handlers, working hours and details of the services in the establishments have not been considered. Besides, enumeration of bacteria and other enteric pathogens were not included in the study.

In conclusion, this study revealed poor food hygiene practices of food handlers as well as poor sanitary condition of in food and drink establishments. Poor hygienic practices by food handlers coupled with poor sanitary conditions in food and drink establishments can contribute to outbreaks of foodborne illnesses. Educational programs targeted to change the attitude of food handlers have been recommended. In addition, licensing and inspection should be conducted regularly. Future studies should focus on enumeration of bacteria from food utensils, food handlers, bacteriological examination of the water used for the washing.

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