Food Hygiene Knowledge, Practice and Associated Factors of Food Handlers in Selected Food Establishments in Nekemte Town, Ethiopia

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ABSTRACT

Background: Food hygiene continues to be a public health problem worldwide because food borne illnesses are widespread. In developing countries, up to an estimated 70% of cases of diarrheal diseases are associated with the consumption of contaminated foods. Approximately 10% to 20% of food borne disease outbreaks are due to contamination by the food handler.

Objective: The objective of this study was to assess the food hygiene knowledge, practices and associated factors of food handlers in selected food establishments in Nekemte town, Ethiopia.

Methods: A cross-sectional descriptive study was conducted on 357 food handlers who work in selected 125 food establishments. Data was collected using pre-tested questionaries and analyzed using statistical package for social sciences (spss) version 22.

Results and discussion: The study result showed that 37.5% of respondents had good knowledge whereas 62.5% of respondents had poor knowledge. The study result also showed that 58.5% of respondents had good practice whereas 41.5% of respondents had poor practice. The strength of the association was measured by adjusted odds ratio with 95% confidence level, and p value <0.05 will be considered statistically significant. In multivariate logistic regression analysis, educational status (AOR=2.345, 95% CI, 0.01-25.926) and work experience (AOR=3.724, 95% CI, 0.943-31.410) were significantly associated with food hygiene knowledge of food handlers. Work activity (AOR=1.084, 95% CI, 0.379-3.103), working while having cut or any skin problem (AOR=1.131, 95% CI, 0.022-0.784), availability of soap or detergents (AOR=3.756, 95% CI, 1.021-13.813) and presence of utensil and equipment store container and shelves (AOR=1.509, 95% CI, 1.044-5.033) were also significantly associated with food hygiene practice of food handlers.

Conclusion: The present study identified the majority of the respondents had poor knowledge. Whereas, food hygiene practice of food handlers in this study was more than half of respondents had good food hygiene practice. Hence 62.5% and 41.5% respectively knowledge and practice of food handlers do not hygienic handle foods, the concerned stakeholders need to facilitate awareness raising activities to prevent food borne diseases.

Keywords: Food handlers; Food hygiene; Knowledge; Practice; Food establishments

INTRODUCTION

Food hygiene is concerned with activities that should ensure that food meet the requirements of safety and wholesome nutritional values. Food hygiene measures also must be taken at each step of the operation including, when choosing where to buy food, at its reception, for its proper storage, during its preparation and after wards in the distribution and delivery to consumers.

World Health Organization (WHO) has developed five main keys to food hygiene, which include keeping clean, separating raw and cooked food, cooking thoroughly, keeping food at safe temperatures, using safe water and raw materials. These five keys to food hygiene are immense importance accouters and equipping food handlers with such information could impact significantly on food hygiene [1]. Food handlers play an important role in food hygiene and in the transmission of food poisoning. Food handlers can easily spread bacteria onto food and food surfaces, because they may introduce pathogens into foods during production, processing, distribution and even presentation.

The food if not handled hygienically, could be a mode for transmission of hazards and the contaminated food can pose a health threat, a problem that is serious in developing countries due to difficulties in securing optimal hygienic food handling practices. A hazard is an agent that is reasonably likely to cause illness or injury in the absence of its control. Hazards that are known to cause foodborne illnesses include microbiological, chemical and physical hazards [2].

Adequate personal hygiene practices which are essential for reducing the risks of a food borne illness, hand washing with water and soap is one of the most effective and cheapest measures against infections and food borne diseases that significantly reduce bacterial contamination and risk of food borne illness. During food processing other food borne microbes can be introduced from infected food handlers or by cross contamination from some other raw food products. Regarding food hygiene knowledge and practice among food handlers showed that the existing knowledge and practice were prone to cause food borne diseases. Therefore, those findings need to be further strengthened by conducting other studies in areas where not previously considered. In the study area Nekemte town, Ethiopia to the best of our knowledge there was no studies conducted on food hygiene knowledge, practice and associated factors that show the local context regardless of some influencing factors. Those influencing factors include the existing large number of food establishments and food handlers serving large consumers. Therefore, the objective of this study was assess the status of food hygiene knowledge, practice and associated factors among food handlers in selected types of food establishments. The specific objectives were to assess food hygiene knowledge of food handlers in Nekemte town; to assess food hygiene practices of food handlers in the study area and to assess the associated factors of food handlers with food hygiene knowledge & practices in Nekemte town, Ethiopia [3].

MATERIALS AND METHODS

Study area and period

The study area was conducted in Nekemte, which is located in the East Wollega zone of the Oromia region. Currently, the town is at the center of the road network for South-Western Ethiopia and found at a distance of 328 Km away from Addis Ababa. Nekemte is currently serving as the capital city of Eastern Wollega zone and administratively, it is divided in to eight sub-cities namely: Sorga, Bake Jama, Darge, Burka Jato, Keso, Cheleleki, Bekenisa Kase and university area. The study was conducted from February 2018 to January 2019.

Study design

A cross-sectional descriptive study was employed to assess the food hygiene knowledge, practice and associated factors of food handlers in selected food establishments in Nekemte town.

Source population

The source population for this study was all food handlers who were working in selected food establishments in the study area.

Study population

The study population for this study was selected or sampled food handlers from the selected food establishments in the study area.

Inclusion criteria

All selected food establishments authorized and licensed by the local authorities were included in the study. Food handlers who were handle packaged/unpackaged food, food equipment and utensils or food contact surface that includes both food establishment owners and managers if they perform food handler's role too [4].

Exclusion criteria

Those had only drinking service establishment, street food venders, establishments which provide service temporarily around market place and bus station were excluded.

Sample size determination

The sample size was calculated using a single population proportion formula considering (p) of 67.5%. This means 67.5% of food handlers had poor food hygiene practice as per the mentioned source. Therefore margin of error (d) of 5% and non-response rate of 10% was used to calculate the sample size [5].

Accordingly, the sample size determined by the formula below:

$$n = \frac{(Z\alpha/2)^2 P\ (1-P)}{d^2}$$

$$n = \frac{(1.96)^2 \times (0.675) \times (1-0.675)}{(0.05)^2}$$

$$n = 337$$

The calculated sample size was 337. By adding 10% of the calculated sample size for possible non-response rate the final sample size was 371.

Sampling procedure

Three sub cities, namely Cheleleki, Burka jato and Bekenisa kase were purposively selected from the total eight (8) sub cities found within the town. The selected food establishments were first stratified by type (Restaurant, hotel, cafeterias and butcher shops). Then from each stratum by proportion to their number sample of the food establishments was done by lottery method. In order to present a representative sample, the study drew respondents or study units using simple random sampling method from the sampling frame.

Dependent variables

Knowledge on food hygiene and practice on food hygiene.

Independent variables

Socio demographic variables: Age, gender, income, educational status, marital status, building ownerships, religion of food handlers, ethnicity, service year, training, work activity and work experience.

Data collection methods

Data was collected using standardized questionnaire and observational checklist source.

Quality control

The quality of data was assured by proper designing and pre-testing of the questionnaires. The questionnaire was prepared in English, translated to Afan Oromo and then translated back to English to check for consistency. Training was given to data collectors and supervisors for one day on the objective, importance of the study, confidentiality of information, respondent's right, techniques of observation and about pre-test. Pre-test was conducted on the other sub-cities those were not included in the study area to ensure the validity and reliability of the survey tools and the necessary feedbacks were presented to data collectors. The supervisor and the principal investigator monitored the data collection process to ensure the completeness and reliability of the gathered information throughout the data collection process [6].

Definition of operational terms

Food handler: Is anyone who handles package or unpackaged food directly as well as the equipment and utensils used to prepare or serve food and/or surfaces that come into contact with food. Food handlers are expected to meet food hygiene requirement.

Food hygiene: All conditions and measures necessary to ensure the safety and appropriateness of food along the entire food chain.

Food establishment: An operation that stores, prepares packages, serves, vends or otherwise provides food for human consumption.

Knowledge: If respondent's knowledge score is 70% and above for critical food hygiene factor related questions and poor knowledge if respondent's knowledge score was below 70% for critical food hygiene factor related questions.

Practice: Activities carried out by food handlers to protect food from contamination and ensure a supply of food for consumers. So it can good practice if respondents score for food hygiene practice related questions was greater than or equal to 70% and poor practice if respondents score for food safety/hygiene practice related questions was less than 70%.

Statistical analysis

The questionnaire and observational checklist were checked for completeness, cleaned, coded and entered into the computer using Statistical Package for Social Sciences (SPSS) version 22 for further analysis. Data on food handler's socio-demographic characteristics was summarized using descriptive statistics of frequency and percentages. The respondents rating of questionnaire items regarding food hygiene knowledge, practice and associated factors of food handlers were summarized using frequency, percentage and logistic regression.

Using the data for food hygiene knowledge, practice and associated factors of food handlers was assessed as per their score. Accordingly, to assess knowledge, practice and associated factors questions on the food hygiene factors were prepared based on previous similar studies with some contextualization [7].

RESULTS

Socio-demographic characteristics of food handlers

Socio-demographic characteristics of food handlers as shown in Table 1 reported that across four selected food establishments 40 restaurants, 61 hotels, 11 cafeterias and 13 butcher shops. From the total respondents 130 (36.41%) were males and 227 (63.59%) were females. The age interval of 16 to 20 years were dominated the entire food establishment. More of the participants from the restaurant 82 (36.1%) were females and 30 (23.1%) were males. This distribution is also nearly similar to sex wise distribution of respondents in hotels and cafeterias except in the butcher shops 32 (24.6%) were males and 5 (2.2%) were females (Table 1).

Table 1: Socio-demographic characteristics of food handlers in study area.

Characteristics	Selected food establishments				
	Restaurants	Hotels	Cafeterias	Butcher shops	Total
Age					
16-20	49 (33.1%)	75 (50.7%)	14 (9.5%)	10 (6.8%)	148 (41.46%)
21-24	35 (33.3%)	50 (47.6%)	7 (6.7%)	13 (12.4%)	105 (29.41%)
25-28	18 (28.6%)	32 (50.8%)	7 (11.1%)	6 (9.5%)	63 (17.65%)
29-33	9 (28.1%)	13 (40.6%)	3 (9.4%)	7 (21.9%)	32 (8.96%)
34-50	1 (11.1%)	6 (66.7%)	1 (11.1%)	1 (11.1%)	9 (2.52%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4)	357 (100.0%)
Gender					
Male	30 (23.1%)	57 (43.8%)	11 (8.5%)	32 (24.6%)	130 (36.41%)
Female	82 (36.1%)	119 (52.4%)	21 (9.3%)	5 (2.2%)	227 (63.59%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4)	357 (100.0%)
Religion					
Protestant	49 (40.2%)	54 (44.3%)	7 (5.7%)	12 (9.8%)	122 (34.17%)
Orthodox	48 (29.1%)	84 (50.9%)	19 (11.5%)	14 (8.5%)	165 (46.22%)
Muslim	10 (22.2%)	28 (62.2%)	3 (6.7%)	4 (8.9%)	45 (12.61%)
Waqefata	5 (20.0%)	10 (40.0%)	3 (12.0%)	7 (28.0%)	25 (7.0%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4%)	357 (100.0%)
Marital status of food handlers					
Single	63 (30.9%)	108 (52.9%)	18 (8.8%)	15 (7.4%)	204 (57.14%)
Married	41 (31.8%)	58 (45.0%)	12 (9.3%)	18 (14.0%)	129 (36.13%)
Divorced	7 (41.2%)	4 (23.5%)	2 (11.8%)	4 (23.5%)	17 (4.76%)
Widowed	1 (14.3%)	6 (85.7%)	0 (0.0%)	0 (0.0%)	7 (1.97%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4%)	357 (100.0%)
Educational status					
Non-formal education	8 (26.7%)	15 (50.0%)	3 (10%)	4 (13.3%)	30 (8.4%)
Primary education	31 (31.0%)	56 (56.0%)	10 (10.0%)	3 (3.0%)	100 (28.01%)
Secondary education	60 (35.9%)	77 (46.1%)	13 (7.8%)	17 (10.2%)	167 (46.78%)
College diploma	12 (24.0%)	20 (40.0%)	5 (10.0%)	13 (26.0%)	50 (14.01%)

Degree or more	1 (10.0%)	8 (80.0%)	1 (10.0)	0 (0.0%)	10 (2.8%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4%)	357 (100.0%
Work activity of food handlers					
Waiter	67 (37.2%)	92 (51.1%)	21 (11.7%)	0 (0.0%)	180 (50.42%)
Cooker	42 (34.1%)	70 (56.9%)	11 (8.9%)	0 (0.0%)	123 (34.45%)
Butcher	3 (5.6%)	14 (25.9%)	0 (0.0%)	37 (68.5%)	54 (15.13%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4%)	357 (100.0%)
Work experience of food handlers					
0-1	40 (36.7%)	54 (48.7%)	8 (7.3%)	8 (7.3%)	110 (30.81%)
2-4	50 (31.3%)	78 (48.8%)	16 (10.0%)	16 (10.0%)	160 (44.82%)
3-5	21 (26.9%)	39 (50.0%)	7 (9.0%)	11 (14.1%)	78 (21.85%)
6-30	1 (11.1%)	5 (55.6%)	1 (11.1%)	2 (22.2%)	9 (2.52%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4)	357 (100.0%)
Do you attend food hygiene training					
Yes	5 (23.8%)	9 (42.9%)	3 (14.3%)	4 (19.0%)	21 (5.88%)
No	107 (31.8%)	167 (49.7%)	29 (8.6%)	33 (9.8%)	336 (94.12%)
Total	112 (31.4%)	176 (49.3%)	32 (9.0%)	37 (10.4)	357 (100.0%)

The educational background of the respondents shows, 31 (31.0%), 60 (35.9%) and 12 (24.0%) of respondents in restaurants, 56 (56.0%), 77 (46.1%) and 20 (40.0%) of respondents in hotels, 10 (10.0%), 13 (7.8%) and 5 (10.0%) of respondents in cafeterias and 3 (3.3%), 17 (10.2%) and 13 (26.0%) of respondents in butcher shops had completed primary, secondary and college diploma education respectively. The work activity of food handlers of the sample in restaurants 67 (37.2%) were waiter and 42 (34.1%) were cooker the same distribution to for hotels and cafeterias 92 (51.1%) and 70 (56.9%), 21 (11.7%) and 11 (8.9%) respectively. The work experience of the food handlers was nearly more than 95% have worked in the establishments below 6-30 years. In terms of salary those from hotels were better with 33 (48.5%) earning 900-1000 Birr. The highest and lowest income of food handlers were 500 birr and 2700 birr respectively. Regarding the training of food handlers majority, 107 (31.8%), 167 (49.7%), 29 (8.6%) and 33 (9.8%) of respondents respectively from restaurants, hotels, cafeterias and butcher shops were none trained [8].

Food hygiene knowledge of food handlers

Food hygiene knowledge of food handlers is shown in Table 2 regarding the study result majority, 340 (95.2%) of food handlers reported as they agree on hand hygiene can prevent food contamination and 17 (4.8%) of food handlers disagree with it. On the other hand cooked foods do not have microbe majority, 218 (61.1%) of food handlers reported as they agree and 34 (9.5%) of food handlers don't know. Regarding it's not necessary to wash hands to handle food that is already cooked majority, 200 (56.0%) of food handlers reported as they agree and 126 (35.3%) of food handlers disagree. From the respondents reported there was poor knowledge because it may be lack of training. As per the study resultmajority, 209 (58.5%) of food handlers reported as they agree on food can be contaminated with microbes by coming in contact with unsafe foods and 72 (20.2%) and 76 (21.3%) of food handlers reported as they disagree and don't know respectively (Table 2).

In assessing the food hygiene knowledge of food handlers 58.5% of the reported as they agree food can be contaminated with microbes by coming in contact with unsafe foods the finding had not similarity with finding in with study in Jima, Ethiopia that is 84.82% of food handlers agree (yes). This deference can be showing to us the existence of one factor on knowledge in the study area it may be the lack of training.

Table 2: Food hygiene knowledge of food handlers in study area.

Food hygiene knowledge	Agree	Disagree	Don't know	Total
Hand hygiene can prevent food contamination	340 (95.2%)	17 (4.8%)	0 (0.0%)	357 (100.0%)
You can prepare food with wound on the hand if the wound covered	156 (43.7%)	156 (43.7%)	45 (12.6%)	357 (100.0%)
After washing, hands may be dried with a kitchen towel	163 (45.7%)	168 (47.1%)	26 (7.3%)	357 (100.0%)
It's not necessary to wash hands to handle food that is already cooked	200 (56.0%)	126 (35.3%)	31 (8.7%)	357 (100.0%)
After using the toilet, we should always wash hands with soap. water	280 (78.4%)	54 (15.1%)	23 (6.4%)	357 (100.0%)
Food preparation surface can contaminate food.	260 (72.8%)	82 (23.0%)	15 (4.2%)	357 (100.0%)
Prepared or ready to eat food are stored on the top shelf in a refrigerator that also stores raw food	197 (55.3%)	128 (35.9%)	32 (9.0%)	357 (100.0%)
Cutting boards, meat slicers & knives should be sanitized after each used.	261 (73.1%)	60 (16.8%)	36 (10.1%)	357 (100.0%)
Refrigeration kill all the bacteria that might cause food-borne illnesses	206 (57.7%)	99 (27.7%)	52 (14.6%)	357 (100.0%)
Food that need to be kept hot should be at sixty degree Celsius or above	130 (36.4%)	88 (24.6%)	139 (38.9%)	357 (100.0%)
Microbes may grow because of prepared food was left at room temperature for a long period	174 (48.7%)	109 (30.5%)	74 (20.7%)	357 (100.0%)
Cooked foods might be safely stored in the refrigerator at five degree Celsius	177 (49.6%)	101 (28.3%)	79 (22.1%)	357 (100.0%)
Over all knowledge	Good	Poor	Total	
	134 (37.5%)	223 (62.5%)	357 (100.0%)	

Towards refrigeration kill all the bacteria that might cause food-borne illnesses majority 206 (57.7%) of food handlers reported as they agree and 52 (14.6%) of food handlers don't know. Also regarding foods stored at 40 degree celsius is being held in the temperature danger zone majority 163 (45.7%) of food handlers reported as they agree and 79 (22.1%) and 115 (32.2%) of food handlers disagree and don't know respectively. From this reported as we have concluded that regarding the use of temperature control most of respondents had poor knowledge may be cause of untrained (Table 2).

Finally, this study showed that, 134 (37.5%) of food handlers had good knowledge (score ≥ 70%) and 223 (62.5%) had poor knowledge (score <70%). The good food hygiene knowledge of

food handlers which is 37.5% in this study was closely related with studies conducted in Malasia 36.80% and in Florida 43%. On the other hand this finding is less than the findings of other studies in Putrajaya 73.3%, Sir Lanka 59.6%, in Nigeria 56.3%, in Ethiopia Gondar town 47.4% and Jima town 94.7%. Also this finding is greater than the findings of other studies in Thailand 15.2%. As mentioned above, the finding of this study was closely related, higher and lower as reported by different studies including the above areas [9].

Food hygiene practice of food handlers

Food hygiene practice of food handlers is shown in Table 3 in assessing the food hygiene practice of food handlers 59.4% of respondents reported as they always use separate utensils when preparing raw and cooked foods. This finding had almost like with study in Putrajaya, 60.9% of food handlers practiced it always. This may be related to lack of facilities like separate kitchen for raw and cooked foods as well as lack of awareness towards the risk of the practice. In this study, 28.3% of respondents reported as they never use gloves when serving unwrapped foods, which is in fact the potential channel for food borne diseases transmission. As well as in this study, 32% food handlers did report as they sometimes wear jewelry while serving food which is less than the study in Bahir Dar, Ethiopia 53.2%.

Regarding the use of kitchen towels to dry utensils majority, 144 (40.3%) of food handlers reported as they always practice use kitchen towels to dry utensils and 129 (36.1%) practice sometimes. Towards wear an apron majority, 266 (74.5%) of food handlers reported as they always practice wear an apron when serving foods, 56 (15.7%) practice some times and 35 (9.8%) practice never (Table 3).

Table 3: Food hygiene practices of food handlers in study area.

Food hygiene practice	Always	Sometimes	Never	Total
Do you wash your hands after touching unwrapped raw foods	299 (83.8%)	56 (15.7%)	2 (0.6%)	357 (100.0%)
Do you wash your hands before touching cooked foods	281 (78.7%)	67 (18.8%)	9 (2.5%)	357 (100.0%)
Do you use separate utensils when preparing raw and cooked foods	212 (59.4%)	116 (32.5%)	29 (8.1%)	357 (100.0%)
Do you wear an apron when serving foods	266 (74.5%)	56 (15.7%)	35 (9.8%)	357 (100.0%)
Do you use gloves when serving unwrapped foods	159 (44.5%)	97 (27.2%)	101(28.3%)	357 (100.0%)
Do you wear hair restraints when prepare and serving foods	198 (55.5%)	113 (31.7%)	46 (12.9%)	357 (100.0%)
Do you disinfect cutting boards after each use	260 (72.8%)	64 (17.9%)	33 (9.2%)	357 (100.0%)
Do you use kitchen towels to dry utensils	144 (40.3%)	129 (36.1%)	84 (23.5%)	357 (100.0%)
Do you wear nail polish when handling food	122 (34.2%)	111 (31.1%)	124 (34.7%)	357 (100.0%)
Over all practice	Good	Poor	Total	
	209 (58.5%)	148 (41.5%)	357 (100.0%)	

According to the result of this study, 209 (58.5%) of food handlers had good practices (score ≥ 70%) and 148 (41.5%) have poor practices (score <70%). The good food hygiene practice of food handlers which is 58.5% in this study was consistent with studies conducted in Putrajaya 58.5% and Dangila, Ethiopia 52.5%. The similarities may be due to socio-demographic status of the food handlers i.e. may be the same gender, age, work experience, training etc. On the other hand this finding is greater than the findings of other studies in Addis Ababa, Ethiopia 47.7%, Arba Minch, Ethiopia 32.6% and Gondar,

Ethiopia 30.3% and in Jima, Ethiopia 32.5%. Such differences where the good food hygiene practice was higher in this study might be due to the difference in study setting and study population.

As per the study results majority, 212 (59.4%) of food handlers reported as they always practice use separate utensils when preparing raw and cooked foods and 116 (32.5%) practice it sometimes. Towards hand wash majority, 299 (83.8) of food handlers reported as they always practice frequently after touching unwrapped raw foods and 56 (15.7%) practice it sometimes.

Associated factors for food hygiene knowledge of food handlers

An associated factor for food hygiene knowledge is shown in Table 4 the result shows that 54 (36.5%) of respondents 16-20

years, 38 (36.2%) of respondents 21-24 years, 23 (36.5%) of respondents 25-28 years, 16 (50.5%) of respondents 29-33 years and 3 (33.3%) of respondents 34-50 years had good food hygiene knowledge. Also 48 (36.9%) of males and 86 (37.9%) of females had good food hygiene knowledge. From those who had non-formal education 16 (53.3%), primary education 37 (37.0%), secondary education 60 (35.9%), college diploma 14 (28.0%) and degree and above had good food hygiene. From those who had training 11 (52.4%) and non-training 123 (36.6%) had good food hygiene knowledge (Table 4).

Table 4: Associated factors for food hygiene knowledge of food handlers in study area.

Variables	Food hygiene knowledge		Crude OR (95% IC)	P-value	Adjust OR (95% IC)	P-value
	Good	Poor				
Age						
16-20	54 (36.5%)	94 (63.5%)	1.056 (0.188, 5.938)	0.951	-	-
21-24	38 (36.2%)	67 (63.8%)	0.913 (0.161, 5.17)	0.918	-	-
25-28	23 (36.5%)	40 (63.5%)	0.789 (0.139, 4.47)	0.789	-	-
29-33	16 (50.0%)	16 (50.0%)	0.467 (0.078, 2.79)	0.404	-	-
34-50	3 (33.3%)	6 (66.7%)	-	1	-	-
Gender						
Male	48 (36.9%)	82 (63.1%)	1.257 (0.776, 2.036)	0.352	-	-
Female	86 (37.9%)	14 (62.1%)	-	1	-	-
Religion						
Protestant	44 (36.1%)	78 (63.9%)	1.92 (0.807, 4.570)	0.14	1.81 (0.717, 4.570)	0.209
Orthodox	56 (33.9%)	109 (66.1%)	2.259 (0.869, 5.870)	0.048	2.165 (0.875, 5.360)	0.095
Muslim	21 (46.7%)	24 (53.3%)	1.255 (0.435, 3.623)	0.675	1.132 (0.403, 3.182)	0.084
Waqefata	13 (52.0%)	12 (48.0%)	-	1	-	1
Marital status of food handlers						
Single	80 (39.2%)	124 (60.8%)	1.051 (0.170, 6.516)	0.957	-	-

Married	43 (33.3%)	86 (66.7%)	1.804 (0.297, 10.941)	0.521	-	-
Divorced	8 (47.1%)	9 (52.9%)	1.464 (0.182, 11.774)	0.72	-	-
Widowed	3 (42.9%)	4 (57.1%)	-	1	-	-
Educational status						
Non-formal education	16 (53.3%)	14 (46.7%)	1.042 (0.442, 9.438)	0.361	1.435 (0.284, 7.265)	0.662
Primary education	37 (37.0%)	63 (63.0%)	2.973 (0.968, 16.308)	0.056	2.929 (0.968, 16.308)	0.159
Seconder education	60 (35.9)	107 (64.1)	3.161 (1.032, 16.689)	0.04	2.286 (0.710, 14.413)	0.115
College diploma	14 (28.0%)	36 (72.0%)	3 (1.357, 26.536)	0.018	2.345 (1.01, 25.926)	0.037
Degree or more	7 (70.0%)	30 (30.0%)	-	1	-	1
Work activity of food handlers						
Waiter	66 (35.5%)	120 (64.5%)	1.492 (0.740, 3.011)	0.263	-	-
Cooker	49 (38.6%)	78 (61.4%)	1.627 (0.795, 3.329)	0.183	-	-
Butcher	19 (43.2%)	25 (56.8%)	-	1	-	-
Work experience of food handlers						
0-1	37 (33.9%)	73 (66.1%)	3.095 (1.366, 34.910)	0.019	3.724 (0.943, 31.410)	0.045
2-4	64 (40.0%)	96 (60.0%)	2.333 (1.073, 26.503)	0.041	2.194 (0.782, 22.511)	0.094
3-5	26 (33.3%)	52 (66.7%)	3.741 (1.309, 34.708)	0.022	3.322 (0.873, 24.650)	0.056
6-30	7 (77.8%)	2 (22.2%)	-	1		1
Do you attend food hygiene training						
Yes	11 (52.40%)	10 (47.60%)	-	-	-	-
No	123 (36.60%)	213 (63.40%)	1.951 (0.798, 4.768)	0.143	-	-

Results of bivariate logistic regression analysis showed that religion of respondents with (OR=2.259, 95% CI, (0.869-5.87), educational status (OR=3.161, 95% CI, (1.032-5.689) and (OR=3.000, 95% CI, (1.357-6.536), work experience (OR=7.550, 95% CI, (1.201-47.4) and (OR=5.858 95% CI, (1.012-33.908), were statistically significant with knowledge of food handlers. However, age, gender, marital status, work activity, salary and food hygiene training were not statistically significant with knowledge of food handlers [10].

Associated factors for food hygiene practice of food handlers

An associated factor for food hygiene practice is shown in Table 5 regarding the result 70 (47.8%) of male and 139 (68.7%) of female had good food hygiene practice. From those who had non-formal education 17 (56.7%), primary education 61 (61.0%), secondary education 103 (61.7%), college diploma 23 (46.0%) and degree and above 6 (60.0%) had good food hygiene practice. From those who had work experience 72 (65.5%) of respondents 0-1 years, 86 (53.75%) of respondents 2-4 years, 46 (58.97%) of respondents 3-5 years and 5 (55%) of respondents 6-30 years had good food hygiene practice. From food handlers working in food establishments that are having soap or detergent available for hand washing 44 (41.9%) had good food hygiene practice (Table 5).

Table 5: Associated factors for food hygiene practice of food handlers in study area.

Variables	Food hygiene knowledge		Crude OR (95% IC)	P-value	Adjust OR (95% IC)	P-value
	Good	Poor				
Age						
16-20	53 (35.8%)	95 (64.2%)	0.403 (0.078, 2.068)	0.276	-	-
21-24	54 (51.43%)	51 (48.57%)	0.643 (0.125, 3.309)	0.597	-	-
25-28	36 (57.14%)	27 (42.86%)	0.503 (0.097, 2.596)	0.412	-	-
29-33	20 (62.5%)	12 (37.5%)	0.405 (0.073, 2.248)	0.301	-	-
34-50	5 (55.5%)	4 (44.4%)	-	1	-	-
Gender						
Male	70 (47.8%)	60 (52.2%)	1.369 (0.861, 2.175)	0.184	-	-
Female	139 (68.7%)	88 (31.3%)	-	1	-	-
Work activity of food handlers						
Waiter	67 (37.3%)	113 (62.7%)	1.474 (0.256, 0.878)	0.018	1.084 (0.379, 3.103)	0.047
Cooker	72 (58.54)	51 (41.46%)	1.567 (0.297, 1.081)	0.049	1.303 (0.449, 3.781)	0.064
Butcher	30 (55.60%)	24 (44.40%)		1		1
Do you attend food hygiene training						
Yes	13 (61.70%)	8 (38.30%)		1	-	-
No	196 (58.40%)	140 (41.60%)	1.267 (0.506, 3.172)	0.0614	-	-
Selected of food establishments						
Restaurant	37 (33.00%)	75 (67.05%)	0.278 (0.127, 0.607)	0.001	0.24 (0.067, 0.856)	0.058

Hotel	72 (40.90%)	104 (59.10%)	0.358 (0.71, 0.749)	0.006	0.308 (0.092, 1.030)	0.056
Cafeteria	11 (34.40%)	21 (65.60%)	0.542 (0.206, 1.425)	0.214	0.469 (0.114, 1.932)	0.295
Butcher shop	14 (37.80%)	23 (62.20%)	-	1	-	1
Working while having cut or any skin problem						
Yes	2 (22.20%)	7 (77.80%)	1.09 (0.042, 1.050)	0.004	1.131 (0.022, 0.784)	0.026
No	49 (42.2%)	67 (57.8%)		1	-	1
Is there any supervision by owner or supervisor						
Yes	34 (48.6%)	36 (51.4%)	0.65 (0.26, 1.65)	0.373	-	-
No	22 (40.0%)	33 (60.0%)		1	-	-
Do the establishment store rubbish far from food preparation area						
Yes	23 (35.4%)	42 (64.6%)	2.232 (1.087, 4.581)	0.029	1.809 (0.817, 4.006)	0.144
No	33 (55.0%)	27 (45.0%)		1	-	1
Do utensils and equipment store in containers, on shelves under conditions which can protect against contamination						
Yes	15 (32.6%)	31 (67.4%)	-	-	-	-
No	41 (51.9%)	38 (48.1%)	1.23 (1.045, 3.759)	0.028	1.509 (1.044, 5.033)	0.04

Results of bivariate logistic regression analysis showed that work activity of food handlers with (OR=1.474, 95% CI, (0.256-0.878) and OR=1.567, 95% CI, (0.297-1.081)), selected of food establishments (OR=1.278, 95% CI, (0.127-0.607) and OR=1.358, 95% CI, (0.71-0.749)), were statistically significant with food hygiene practice. However, age, gender, educational status, work experience and food hygiene training were not statistically significant with food hygiene practice. The bivariate logistic regression further revealed that institutional facilities such as availability of soap (OR=2.080, 95% CI, (0.784-3.513)), having store rubbish far from food preparation area (OR=2.232, 95% CI, (1.087- 4.581)), having hand wash facility in the kitchen (OR=1.56 95% CI, (0.346-2.870)), the presence of utensils and equipment store in containers and shelves (OR=1.230, 95% CI, (1.045- 3.759)). In addition to those working while having cut or any skin problem (OR=1.09, 95% CI, (0.042-1,050)) were statically significant with food hygiene practice. However, presence of piped water supply, separate dressing room, hot water for utensils and supervisor or owner supervision were not statistically significant with food hygiene practice [11].

DISCUSSION

In this study 134 (37.5%) of food handlers had good knowledge and 223 (62.5%) had poor knowledge. The good food hygiene knowledge of food handlers which is 37.5% in this study was closely related with studies conducted in Malasia 36.80% and in Florida 43%. On the other hand this finding is less than the findings of other studies in Putrajaya 73.3%, Sir Lanka 59.6%, in Nigeria 56.3, in Ethiopia Gondar town 47.4% and Jima town 94.7%. Also this finding is greater than the findings of other studies in Thailand 15.2%. The probable reasons for the differences might be due to difference in socio demograhic and environmental factors difference in the different study groups.

Food handlers with only college diploma were 63% less likely to have good food hygiene knowledge compared with food handlers degree and above (AOR=2.345, 95% CI, (0.01-25.926)). In other studies also educational status was identified as statistically significant factor with food hygiene knowledge, Malaysia, Sir Lanka in Nigeria, in Kenya, Gondarand Addis Ababa. The reason behind may be education enables or supports food handlers to improve knowledge and awareness about the nature of work they are assigned [12].

Food handlers with only work experience 0-1 years 55% less likely to have good food hygiene knowledge compared with food handlers work experience 6-30 years (AOR=3.724, 95% CI, (0.943-31.410)). In other studies also work experience was identified as statistically significant factor with food hygiene knowledge, Addis Ababa. The reason behind may be work

experience enables or supports food handlers to improve knowledge and awareness about the nature of work they are assigned. Work activity of food handlers, working while having cut or any skin problem, availability of soap or detergent and presence of utensils and equipment store containers and shelves were statistically significant with food hygiene practice in the study area.

In this study, 209 (58.5%) of food handlers had good practices and 148 (41.5%) have poorpractices. The good food hygiene practice of food handlers which is 58.5% in this study was consistent with studies conducted in Putrajaya 58.5% and Dangila, Ethiopia 52.5%. The similarities may be due to socio-demographic status of the food handlers *i.e.* may be the same sex, age, work experience, training etc. On the other hand this finding is greater than the findings of other studies in Addis Ababa, Ethiopia 47.7%, Arba Minch, Ethiopia 32.6% and Gondar, Ethiopia 30.3% and in Jima, Ethiopia 32.5%. Such differences where the good food hygiene practice was higher in this study might be due to the difference in study setting and study population.

Food handlers with only waiters were 53% less likely to have good food hygiene practice compared with food handlers butchers (AOR=1.084, 95% CI, (0.379-3.103)). In other studies also work activity of food handler was identified as statistically significant factor with food hygiene practice, in Uganda and in Military hospitals. The reason behind may be the work activity of food handlers enables or supports food handlers to improve practice and awareness about the nature of work they are assigned. Food handlers with no availability of soap or detergents 54% less likely to have good food hygiene practice compared with food handlers with availability of soap or detergents (AOR=3.756, 95% CI, (1.021-13.813)). Other studies support this finding in Mekele university. This may be related to lack of facilities like enough soap or detergent as well as lack of awareness towards the risk of the practice.

Food handlers working while having cut or any skin problem 74% less likely to have good food hygiene practice compared with food handlers working while having no cut or any skin problem (AOR=1.131, 95% CI, (0.022-0.784)). Other studies support this finding in Slovenia. The reason behind is may be the lack of permission to take rest during injury or problem time. Food handlers who were working in an establishment which had absence of utensils and equipment store container and shelves 60% less likely to have good food hygiene practice, compare with food handler with the presence of utensil and equipment store container and shelves (AOR=1.509, 95% CI, (1.044-5.033)). This may be related to lack of facilities like utensils and equipment store container and shelvesas well as lack of awareness towards the risk of the practice [13].

CONCLUSION

Food hygiene is becoming a key public health priority because a large number of people take their meals outside their homes. As a result, they are exposed to food borne illnesses that originate from food stalls, restaurants and other food outlets. Therefore, the purpose of this study was to assess food hygiene knowledge,

practices and associated factors of food handlers in selected food establishments in Nekemte town, Ethiopia. The present study identified the majority of the respondents (study participants) had poor knowledge. The poor knowledge regarding to use refrigeration, wash hands to handle food that is already cooked, cooked foods does not have microbes and hands may be dried with a kitchen towel. Moreover, this finding identifies educational status and work experience where statistically significant with food hygiene knowledge.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical clearance was obtained from the institutional review board of the Wollega university. The supportive letter was obtained from Jibat Woreda, West Shoa zone, Ethiopia. During house to house data collection, verbal informed consent was obtained from each respondent after briefly explaining the purpose and benefit of the study. Confidentiality was maintained by avoiding personal identifiers and keeping the data locked.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIAL

All the required data will be made available upon request of the primary author.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

No funding was obtained for this study.

AUTHORS' CONTRIBUTIONS

HFG conceived the study, developed the title, coordinated the data collection activity, carried out the statistical analysis and reviewing the manuscript. BT participated in the design of the study, tool development, data collection supervision, statistical analysis and drafting the manuscript. All authors read and approved the final manuscript.

ACKNOWLEDGEMENT

The authors would like to extend their gratitude to the participants and data collectors.

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