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ORIGINAL RESEARCH

Food Hygiene Practice and Its Determinants Among Food Handlers at University of Gondar, Northwest Ethiopia, 2019

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Ketseladingle Lema
Negasi Abuhay
Walelign Kindie
Henok Dagne
Tadesse Guadu

Department of Environmental and Occupational Health and Safety, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

Introduction: Food hygiene is an essential matter of public health for protecting or preventing diseases caused by unsafe food due to lack of good quality from production to consumption.

Objective: The current study aimed at assessing the food hygiene practice and determinant factors among food handlers working at the University of Gondar.

Methods: Univariate and multivariable binary logistic regression analyses were used to test the association of covariates with the food safety practice. Variables with *p-value* <0.2 were candidates for multivariable analysis. The adjusted odds ratio with 95% confidence interval and *p*-values less than 0.05 were used to report associations in the final model.

Results: A total of 184(46.7%) of the study subjects had good self-reported food hygiene practice. Being male [Adjusted odds ratio (AOR): 2.37, 95% confidence interval (CI) (1.34, 4.19)], educational status (primary [AOR: 2.54, 95% CI (1.16, 5.58)] and secondary [AOR: 2.20, 95% CI (1.11, 4.37)]), workers with greater than 2 years work experience [AOR: 1.86, 95% CI (1.06, 3.25)], monthly income of 2044–4867ETB/month [AOR: 2.05, 95% CI (1.01, 4.16)] were independent predictors of food safety practice of food handlers.

Conclusion and Recommendations: Below half of the study subjects had good self-reported food hygiene practice. Sex, educational status, and income were factors associated with the food hygiene practice. There should be continuous supportive supervision to raise the skills of food handlers to comply to better food hygiene practice. Food hygiene training should be given especially to female food handlers. Frequent audits are also required to ensure the permanence of effective and continuous training. Regular medical check up and strict hygiene follow-up should be encouraged to prevent foodborne disease outbreaks at universities.

Keywords: food hygiene, knowledge, attitude and practice

Introduction

Food hygiene is an essential matter of public health for protecting or preventing diseases caused by unsafe food due to lack of good quality from production to consumption.[1]

Foodborne disease (FBD) is of public health significance both in developed and developing nations. About 600 million individuals become ill every year due to consumption of contaminated food and an approximately 420,000 of these victims die per annum.[2] The World Health Organization (WHO) disclosed that 1 in 10 individuals worldwide are sick from foodborne illnesses.[3] Foodborne infectious

Correspondence: Henok Dagne
Email enoch2313@gmail.com

diseases have been estimated to affect 550 million persons and cause 230,000 deaths globally in 2010 although it is difficult to determine the exact mortality associated with foodborne diseases.[4] It is difficult to quantify the burden of foodborne diseases since most of the hazards that cause foodborne diseases are not transmitted exclusively by food.[5]

The consumption of contaminated food is correlated with an estimated 70% of diarrheal diseases in developing countries. The occurrence of foodborne illnesses is more common in developing nations because of poor hygiene, absence of drinking water, contaminated and inappropriate food storage equipment and absence of food safety education.[6] In addition in low-income countries, in particular, FBDs outbreak is more serious due to inadequate sanitation, insufficient food safety regulations, weak regulatory structures, unsafe raw food, abused temperature, poor storage infrastructures, inadequate cooking, poor personal hygiene, improper handling methods, and cross-contamination of cooked food with uncooked raw food.[7–9]

Potential FBDs in institutions with a high number of people is a public health concern, since outbreaks in those places may affect a large number of consumers at once. Food handlers are expected to have excellent hygiene practice to reduce cross contamination and protect the consumers from foodborne diseases.[10,11] 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.[12,13]

In most developing countries hygiene is important since hygiene preventable diseases are prevalent. In Ethiopia these diseases account for 80% of the illnesses together with other infectious diseases and malnutrition.[14]

Food handlers with poor personal hygiene and lack of awareness of important issues in preventing foodborne diseases, working in food establishments could be potential sources of infections of many intestinal helminthes of protozoa and estrogenic pathogens.[15]

Institutional foodservice is an important sector of the food industry. Foods consumed at such institutions have been identified as important sources of foodborne disease outbreaks and often feature prominently in many national statistics on outbreaks of foodborne illness.[16] Food poisoning could result in the institutional food service suffering huge financial losses and public confidence.[10] This study, therefore was aimed at assessing the food hygiene practice and determinant factors among food handlers at the University of Gondar.

Method

Study Design, Area and Period

An institution-based cross-sectional study design was used to assess food hygiene practice and determinant factors among food handlers at the University of Gondar (UoG) from April 1 to April 15, 2019. The UoG currently has five campuses; Atse Fasil campus (Technology College), College of Medicine and Health sciences (CMHS), Tseda Campus (Agriculture College), Atse Tewodros Campus (College of Natural and Computational Sciences), and Maraki Campus (College of Social Sciences and Humanities). A total of 645 food handlers (492 females and 153 males) are serving the five campuses.[17]

Study Population and Unit

All food handlers in the UoG students' cafeteria, 645 in total, were the source of our study population. The study units were all randomly selected food handlers from the study population. Workers who were absent during data collection time due to different reasons (maternity leave, sick and absent from work for any reason) were excluded from the study.

Sample Size Determination

Sample size (n) was determined by using a single population proportion formula,[18] based on the following assumptions. The proportion of good food hygiene practice (p) was 47.7% from a study conducted among Addis Ababa university food handlers,[19] standard normal distribution confidence interval ($z_{a/2}$) (1.96), and margin of error (d) = 0.05.

$$n = \frac{(z_{a/2})^2 \times p(1-p)}{d^2} n = \frac{(1.96)^2 \times 0.477(1-0.477)}{0.05^2} = 384$$

Taking 5% none response, the total sample size became 403.

Sampling Technique and Procedures

A simple random sampling technique was employed for selecting the study units and self-reported food hygiene practice was assessed. The total sample size was proportionally distributed in the five campuses based on the number of food handlers at each campus.

Operational Definitions

Food Hygiene Practice

The food handlers were asked 19 questions regarding their food hygiene practice. Study subjects who scored less than the mean value of the score of the practice questions were considered as having "poor food hygiene practices" and those who scored mean and above the mean value of the practice questions were considered as having "good food hygiene practice."[20–22]

Food Hygiene Knowledge

Food hygiene knowledge was assessed by asking food handlers 16 knowledge items (yes or no questions). Study subjects who scored below the mean score were considered as having "poor knowledge" and those who had a score of mean and above the mean were classified as having "good knowledge" about food hygiene.[21,23,24]

Food Hygiene Attitude

Food hygiene attitude was measured by asking respondents 14 questions about their attitude. Study subjects with mean and above score of the attitude questions were considered as holding desirable (good) attitude and otherwise "poor attitude" towards food hygiene practice.[21,22]

Data Collection Tool and Procedure

Data were collected using a self-administered structured questionnaire which included: sociodemographic characteristics, 19 practice questions with a three-point Likert scale (1=always, 2=sometimes and 3=never), 16 knowledge items (yes/no) regarding food-borne disease transmission, knowledge of personal hygiene, knowledge of cross contamination and knowledge of temperature control and 14 attitudinal questions with a four-point Likert scale (1-strongly agree, 2-agree, 3-disagree strongly and 4-disagree). The data collection tool was prepared after a careful literature survey.[21–27] Content validity was done by doing a pretest. The pretest was done among 5% (ie, 21 food handlers out of the study population) and editorial and language adjustments were done based on the pretest results.

Data Processing and Analysis

Complete items were coded and entered onto Epi Info version 7 and transported to Statistical Package for the Social Science (SPSS) version 21 software for analysis. Univariate and multivariable binary logistic regression were employed to test the association of covariates with the outcome variable. Association was declared at p-value< 0.05.

Results

Overall, 394 study participants (98.2% response rate) were included in thecurrent study. About 263 (66.8%) were female. The mean age of the study participants was 28 years. The majority of participants (62.4%) were married. About half of the participants (53.6%) had over 2 years' experience (Table 1).

Above three-fifths (61.9%) of the study subjects had good knowledge. Above half (54.8%) of the respondents had a desirable/good attitude but only 46.7% of the participants had good practice regarding food hygiene (Figure 1).

Factors Associated with Food Hygiene Practice

Sex, age, educational status, work experience, monthly income, family size, knowledge, attitude, job category and orientation about food hygiene had a p-value <0.2 in the univariate binary logistic regression and hence were candidates to be used in the multivariable logistic analysis. Only monthly income, work experience, educational status, age and sex were associated with the food hygiene practice in the final model (p-value <0.05).

Male food handlers were 2.37 times more likely to have better food hygiene practice than females [AOR: 2.37, 95% CI (1.34, 4.19)].

Study subjects with primary educational status were 2.54 times more likely to have better food hygiene practice [AOR: 2.54,95% CI (1.16, 5.58)] and respondents with secondary educational status were 2.20 times more likely to have better food hygiene practice [AOR: 2.20, 95% CI (1.11, 4.37)] than those with college and above educational status.

Study subjects who had more than 2 years work experience were 1.86 times more likely to have better food hygiene practice than those with 2 years and less than 2 years' experience [AOR:1.86, 95% CI (1.06, 3.25)].

Study subjects with 2044–4867 ETB average monthly income were 2.05 times more likely to report good food hygiene practice than those with an average income of 1100–1743 ETB [AOR: 2.05, 95% CI (1.01, 4.16)] (Table 2).

Discussion

This study was aimed at assessing the food safety practice and associated factors among food handlers in the University of Gondar. Accordingly, 46.7% with 95% CI (42.4%, 51.5%) of UoG food handlers had good food hygiene practice. Sex, work experience, educational status,

Table 1 Sociodemographic Characteristics of University of Gondar Food Handlers, 2019 (n=394)

Variables	Category	Frequency (n)	Percent (%)
Sex			
	Female	263	66.8
	Male	131	33.2
Age in years			
	19–26	108	27.4
	27–28	92	23.4
	29–32	78	19.8
	33–58	116	29.4
Marital status			
	Single	118	29.9
	Married	246	62.4
	Divorced	30	7.6
Educational level			
	Primary	123	31.2
	Secondary	208	52.8
	College and above	63	16.0
Religion			
	Orthodox	376	95.4
	Muslim	5	1.3
	Protestant	13	3.3
Experience in years			
	<2	211	53.6
	≥2	183	46.4
Income per month in ETB			
	1100–1743	136	34.5
	1743–2000	146	37.1
	2000–2043	16	4.1
	2043–4867	96	24.4
Family size			
	1–2	113	28.7
	2–3	102	25.9
	3–4	117	29.7
	4–9	62	15.7
Job category			
	Ticker/shift leader/ manager	61	15.5
	Waiter	111	28.2
	Cooker/baker/chef	153	38.8
	Laborer	69	17.5
Food hygiene orientation			
	Monthly	109	27.7
	Biannually	114	28.9
	Annually	171	43.4

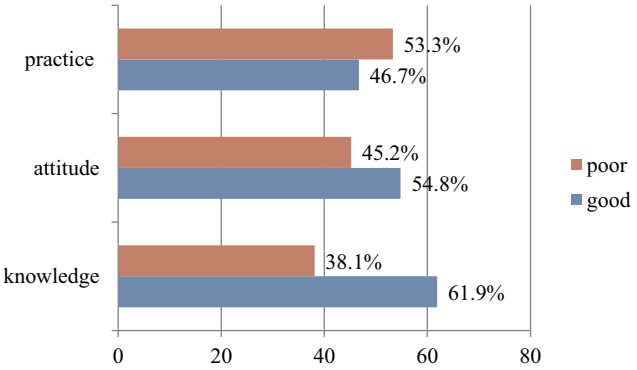

Figure 1 Knowledge, attitude and practice of food hygiene among University of Gondar food handlers 2019 (n=394).

and monthly income were factors associated with food hygiene practice.

The proportion of food handlers with good food handling practice in the current survey is consistent with studies conducted in Ghana[16] and Addis Ababa, Ethiopia.[28] However, the current food hygiene practice is lower than the practice levels reported in Malaysia,[29] and Nigeria.[30] The discrepancy in food hygiene practice level might be due to variations in the study tool used, time of the study and variation in sociodemographic and the socioeconomic status. Above half of the study subjects had poor food hygiene practice which could have a huge impact in the disease pathogenesis. According to the Codex Alimentarius Commission (2003), poor food handling is a main reason for the occurrence of foodborne diseases.[31] A study done in Gondar town among food handlers earlier in 2008 indicated that 29.1% and 3.1% of the study subjects were positive for stool parasites and enteropathogenic bacterial species respectively.[32] A study among Arba Minch University food handlers also revealed that among stool cultures 6.9% of Salmonella and 3% Shigella isolates were reported.[33] Several other studies conducted among food handlers at universities in Ethiopia also revealed that food handlers were vehicles of disease causing microorganisms such as Shigella and Salmonella.[34–38] Food safety culture is required to create proper food handling and establishing regulations concerning food hygiene and safety.[39,40]

Male study participants had better food hygiene practice than females in the current study. This is in line with a study conducted regarding food hygiene practice in Iran.[41] But in other studies[29,42] females had better food hygiene practice than males. There was no significant difference regarding food safety and hygiene

Table 2 Factors Associated with Food Hygiene Practice Among University of Gondar Food Handlers, 2019 (n=394)

Variables	Categories	Practice		COR (95% CI)	AOR (95% CI)
		Good (%)	Poor (%)		
Sex					
	Male	89(67.9%)	42(32.1%)	3.75(2.40,5.85)	2.37(1.34,4.19)***
	Female	95(36.1%)	168(63.9%)	1	1
Age					
	19–26	41(38.0%)	67(62.0%)	1	1
	27–28	44(47.8%)	48(52.2%)	1.50(0.85,2.63)	1.14(0.60,2.15)
	29–32	65(56.0%)	51(44.0%)	2.08(1.22,3.56)	1.64(0.83,3.25)
	33–58	34(43.6%)	44(56.4%)	1.26(0.70,2.28)	0.96(0.44,2.13)
Educational status					
	Primary	65(52.8%)	58(47.2%)	2.41(1.27,4.56)	2.54(1.16,5.58)*
	Secondary	99(47.6%)	109(52.4%)	1.95(1.08,3.55)	2.20(1.11,4.37)*
	College and above	20(31.7%)	43(68.3%)	1	1
Experience					
	≤2	89(42.2%)	122(57.8%)	1	1
	>2	95(51.9%)	88(48.1%)	1.48(0.99,2.20)	1.86(1.06,3.25)*
Monthly income ETB[a]					
	1100–1743	49(36.0%)	87(64.0)	1	1
	1744–2000	74(50.7%)	72(49.3%)	1.82(1.13,2.94)	1.69(0.97,2.94)
	2001–2043	10(62.5%)	6(37.5%)	2.96(1.01,8.64)	2.11(0.60,7.39)
	2044–4867	51(53.1%)	45(46.9%)	2.01(1.18,3.43)	2.05(1.01,4.16)*
Family size					
	1–2	54(47.8%)	59(52.2%)	1.55(0.82,2.92)	2.03(0.94,4.39)
	2–3	45(44.1%)	57(55.9%)	1.34(0.70,2.56)	1.28(0.61,2.71)
	3–4	62(53.0%)	55(47.0%)	1.91(1.02,3.60)	1.63(0.80,3.33)
	4–9	23(37.1%)	39(62.9%)	1	1
Knowledge					
	Good	102(55.4)	142(67.6%)	0.60(0.40,0.90)	0.78(0.49,1.26)
	Poor	82(44.6%)	68(32.4%)	1	1
Attitude					
	Good	112(51.9%)	104(48.1%)	1.58(1.06,2.37)	1.36(0.84,2.20)
	Poor	72(40.4%)	106(59.6%)	1	1
Job category					
	Ticker/shift leader/manager	30(49.2%)	31(%)	1	1
	Waiter	52(46.8%)	59(53.2%)	0.91(0.49,1.70)	0.73(0.33,1.63)
	Cooker/baker/chef	50(32.7%)	103(67.3%)	0.50(0.27,0.92)	0.56(0.26,1.21)
Food hygiene orientation					
	Monthly	59(54.1%)	50(45.9%)	1.79(1.10,2.90)	1.24(0.70,2.21)
	Biannually	57(50%)	57(50%)	1.52(0.94,2.44)	1.19(0.68,2.09)
	Annually	68(39.8%)	103(60.2%)	1	1

Notes: *p<0.05, ***p<0.001 Hosmer and Lemeshow goodness-of-fit 0.364, at approximately the rate of 1 USD = 27 ETB.

practice based on difference in gender in some previous studies.[6,43–47] This might be due to other factors such as educational status and work role which could predict the food safety practice better than gender.

Educational status was inversely associated with food hygiene practice in the current study. However, in other studies educational status was positively associated with food hygiene practice.[13,20,29,41,48] Other studies reported

no association between educational status and food hygiene practice.[6,11,49,50] The food handlers who attended college and above education had poor food hygiene practice. This might be due to the fact that these workers are not frequently engaged in food handling and preparation.

Work experience was associated with food hygiene practice of respondents. Experienced food handlers had reported better food hygiene practice. This association is consistent with earlier studies conducted regarding food hygiene practice and determinant factors.[20,28,29,41,42,51–54] However other studies reported that work experience has no association with level of food safety practice.[44] Work experience is important to develop better food hygiene practice as it enables workers better opportunity to undergo food hygiene training and orientation.

Monthly income was another factor associated with food hygiene practice of food handlers. Study participants with better income had better food hygiene practice in the current study. This is consistent with earlier studies.[55–58] But in another study income was not significantly associated.[22]

Knowledge, attitude and practice of food safety play a basic role in preventing and controlling food poisoning outbreaks.[59] Knowledge and attitude were not associated with food hygiene practice of study subjects in the current study. Numerous other previous studies[11,60–64] also indicated no association between knowledge and food hygiene practice. In other studies,[23,29,65] however, it was significantly associated with the participants' food hygiene practice. Earlier studies[21,26,51,63,66–68] revealed that knowledge has a positive correlation with food hygiene practice. Whereas other literature[11,69] showed that knowledge of food hygiene may not be translated to food hygiene practice. In another study it was negatively associated with food hygiene practice.[70] The difference may be due to the study participants having surface level knowledge that cannot bring about behavioral change. Attitude, also was not associated with the respondents of food hygiene practice in the current study. This is consistent with previous studies.[71–78] However in other studies attitude was significantly associated with food hygiene practice.[25,54,63,79–81]

Limitations of the Study

This study is susceptible to the participants being biased and does not represent the actual practice because the self-reported practices and behaviors were assessed. Self-reported practice is usually over estimated.[82] Observational data provide the most reliable information denoting actual food safety behavior.[82] The other limitation is the lack of generalizability to the large population as this study was conducted among food handlers at university colleges. Finally, cross-sectional designs lack the capacity to definitely demonstrate cause-effect relationships because of the inherent limitation of the design. Also, because self-reported hygiene practice was assessed it may be affected by social desirability bias.

Conclusion and Recommendation

Only less than half of the study participants had good food hygiene practice. Sex, educational status, work experience and monthly income were factors significantly associated with food handlers' food hygiene practice. Strategies targeted at improving the hygienic practice of food handlers are imperative. There should be continuous supportive supervision to raise the skills of food handlers to comply to better food hygiene practice. Targeted food hygiene improvement training should be given especially to female food handlers. Additionally, frequent audits are also required to ensure the permanence of effective and continuous training. Regular medical check ups and strict hygiene follow-up should be encouraged to prevent foodborne disease outbreaks at universities.

Abbreviations

AOR, Adjusted odds ratio; COR, Crude odds ratio; CI, Confidence interval; SPSS, Statistical package for social sciences.

Data Sharing Statement

Data will be available upon request from the corresponding author.

Ethics Approval and Consent to Participate

Ethical clearance was obtained from the Environmental and Occupational Health and Safety ethical review committee at the University of Gondar with ethical approval number of EOHS/841/2011. The purpose of the study was clearly explained to the study subjects. Written consent was obtained. Confidentiality of the information was maintained at all levels of the study. Health education was given for study subjects about good food hygiene practice after the data collection was over. This research was carried out in accordance with the principles of the Declaration of Helsinki.

Consent for Publication

This paper does not contain any individual person's data.

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Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed on the journal to which the article was submitted; gave final approval of the version to be published; and agreed to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest for this work.

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