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Authors: Bulto, Tadesse Weyuma, Juta, Getachew Yigezu, Demissie, Betelhem Beleyneh, Woldemichael, Setusaga Jote, Werku, Birhanu Chalchisa, et al.

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Knowledge of Food Safety and Handling Practices Among Food Handlers of Student Cafeteria at Kotebe Metropolitan University, Addis Ababa, Ethiopia

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Tadesse Weyuma Bulto[1], Getachew Yigezu Juta[1], Betelhem Beleyneh Demissie[1], Setusaga Jote Woldemichael[2], Birhanu Chalchisa Werku[3] and Yifru Waktole Berkessa[1]

[1]Department of Environmental Management, Faculty of Urban Development Studies, Kotebe Metropolitan University, Addis Ababa, Ethiopia. [2]Department Nursing, College of Menelik II Medical and Health Science, Kotebe Metropolitan University, Addis Ababa, Ethiopia. [3]Department of Rural Development and Agricultural Extension, Faculty Resource Management and Economics, Shambu Campus, Wollega University, Nekemte, Oromia, Ethiopia.

ABSTRACT

INTRODUCTION: Food-borne disease is a major health problem especially in low-income countries like Ethiopia. This study aimed to assess the knowledge and practice of food handlers at student cafeteria of Kotebe Metropolitan University.

METHODS: A cross-sectional study design was conducted among 68 food handlers in student cafeteria of Kotebe Metropolitan University from May 30, 2018 to October 30, 2019. A structured questionnaire was used via face-to-face interviews to assess food handler's knowledge of food safety and practices food safety. Data were analyzed using Statistical Package for the Social Sciences window version 20 and presented in the form of frequency tables, percentages, and graphs. The association was tested using Pearson's chi-square, where *P*-value (<.05) was considered statistically significant.

RESULTS: The result showed that food handlers had good knowledge of food safety and good practice of food safety measured by the passing score of 40 (57.94%) and 48 (70.6%), respectively. Almost all food handlers were aware of the crucial role of knowledge of food safety and food safety practices in the student cafeteria. Accordingly, results of this work revealed that 67 (98.5%), 60 (88.2%), 65 (95.6%), and 56 (82.4%) of the subjects had food safety knowledge, always wash vegetables and fruits, had hand washing facilities with a supply of hot water, soap, and hand drying towel, had a hair mask or cloth during food preparation, and wore safety cloth during food preparation, respectively.

CONCLUSION: The findings revealed significant relationship between food safety practices of food handlers and *level of* education, specifically regarding access to hand washing facilities, hand washing after a break and in the toilet, changing gloves between raw and ready-to-eat food, and drying and cleaning hands before handling food ($P < .05$). Additionally, Kotebe Metropolitan University should design food handling and safety guidelines and offer specific training for food handling workers.

KEYWORDS: Food handling, food safety, knowledge, practices, student cafeterias

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CORRESPONDING AUTHOR: Tadesse Weyuma Bulto, Department of Environmental Management, Faculty of Urban Development Studies, Kotebe Metropolitan University, Addis Ababa +251, 31248, Ethiopia. Email: tadesseweyuma@kmu.edu.et

Introduction

Food safety practice is vital to minimize food-borne disease. Food-borne diseases have a huge impact on human health around the world, raising concerns among consumers, producers, and policymakers.[1] Foodborne infections and their prevention are still poorly understood in many parts of the developing world today.[2,3] Diseases caused by contaminated food and/or drink are still one of the leading causes of morbidity in several countries and, under certain circumstances, can lead to serious consequences.[4] Food safety has become one of the 10 threats to global health in 2019 and outbreaks of foodborne diseases are major public health problems and have caused approximately 76 million illnesses, 325 000 hospitalizations, and 5000 deaths yearly.[5]

Food safety concerns have existed for a long time, as millions of people across the globe suffer from food-borne diseases every year.[6] It is described as the degree of certainty that food will not cause illness or harm to the customer when cooked, served, and eaten as intended.[7] Food safety is vital for consumers, food producers, and the economy.[8] Food safety, on the other hand, has become a major concern for the food industry as contaminated food and water lead to a variety of health concerns around the world.[9,10] Food safety standards for high-risk whole products in farmers' markets face particular issues in terms of temperature control, potable water, and contamination exposure.[11] The issue of food safety is an issue that is widely discussed, but cases of food poisoning in particular are still continuing.[12] In particular, meals prepared outside of the home

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were a risk factor for acquiring food borne illness,[13] and had been implicated in up to 70% of traced outbreaks.[5,14]

Similarly, food safety is one of the important issues that have emerged during the socio-economic development of China.[15] Additionally, improper food handling practices and lack of knowledge of food hygiene among food handlers were implicated as a vehicle for the transfer of food pathogens that cause disease outbreaks.[16] Similarly, lack of knowledge of food safety and poor food handling practice were the main contributors to food-borne disease and diarrheal-related morbidity in Ethiopia.[17] Food safety is a serious public health issue in Ethiopia as in other developing countries and has been overlooked in the past by governments and the public in general.[18] The lack of basic infrastructure and the low level of knowledge of hygiene and hygiene practices in catering establishments contribute to outbreaks of food-borne diseases.[19]

However, to reduce consumer health risks from food-borne diseases that result from improper handling of domestic food, consumers need to know how to handle food safely.[20] Risk communication and consumer education to promote safer handling of food can be the best way to manage the risk of food-borne disease at the consumer end of the food chain.[21]

In addition, a better behavior in food handling in consumers is likely to reduce the risk and incidence of food-borne disease.[22] Food safety education directed toward young adults should focus on increasing awareness of FBD and knowledge of proper cross-contamination prevention procedures to help promote better compliance with actual safe food handling.[23] Efforts to improve knowledge and food safety behaviors were essential to protect the health of young adults and enable them to fulfill their role of protecting the health of their future families.[24] The levels of food safety levels in school food services were of great concern, as any incident can affect a large number of students.[25] Controlling and ensuring the safety of food play an important role in preventing foodborne illnesses.[26] The supply of safe and healthy food is crucial to prevent foodborne illnesses.[27] In addition, there are no data on the status of food safety and handling practice in relation food knowledge and the practice of food handlers at the Metropolitan University of Kotebe. The role of food handlers, effectively reducing the risk of food-borne diseases, is critically important, as they are in direct contact with food or consumers. The objective of the study is to assess the status of knowledge of food safety and practice of food safety among food handlers in the student cafeteria of Kotebe Metropolitan University.

Materials and methods

Study setting and design. The study area was Kotebe Metropolitan University (KMU), students' cafeteria. The university was founded in Addis Ababa city, which is the capital city of Ethiopia. A cross-sectional study was conducted among 68 food handlers who had direct contact with food with at least 1 year of work experience in the cafeteria of Kotebe Metropolitan University students from 30 May, 2018 to 30 October, 2019. The 68 food handlers working in food cafeteria were used source population during the study (Figure 1).

Sample size determination. The sample size was calculated from the total population size of food handlers of Kotebe Metropolitan University (N): 68, based on assumption of a hypothesized % frequency of outcome factor in the population (P = 50% ± 2.5%) (because there is no similar study in the study area), confidence limits as percentage (%) of 100 (absolute ±%) (d) = 2.5%, and 97.5% confidence level, and design effect (for cluster surveys-DEFF): 1.

$$\text{Sample size } n = \left[\text{DEFF}^{*}\text{Np}\left(1\text{-p}\right)\right] / \left[\left(\text{d}^2/\text{Z}^2_{1\text{-}\alpha/2}{}^{*}\left(\text{N-1}\right) + \text{p}^{*}\left(1\text{-p}\right)\right] = \mathbf{68}$$

Then, for the analysis, the final sample size required was 68 food handlers.

Inclusion and exclusion criteria. Inclusion criteria: All food handlers who had worked for at least 1 year in the student cafeteria of Kotebe Metropolitan University during the study period were included.

Exclusion criteria: Food handlers who had less than 1 year of work experience as food handlers in the student's cafeteria of Kotebe Metropolitan University and those absent during the data collection period were excluded from the study.

Data collection tools and procedures. Data were collected from food handlers using structured questionnaire through a face-to-face interview. Respondents had sufficient time (15 minutes) to answer the questionnaire. The researcher managed the general interviews and guides the general research activities. Also, data were gathered using an observation checklist and a structured pre-tested, questionnaire. The survey instruments were first produced in English before being translated into the local language (Amharic) in order to ensure the accuracy and coherence of the material. Both qualitative and quantitative survey techniques were used to acquire the data. Six distinct sections made up the questionnaire: demographics (6 questions), knowledge of food handlers regarding food safety (10 questions), food handling and food safety practices (7 statements), hand washing practices of food handlers (6 questions), food handler practices regarding contamination prevention and symptoms of food illness (14 questions), and gloves use practices (4 questions). The questionnaire was developed based on questions from previous work.[4,15,27-30] Most items were evaluated using closed-ended questions with the options "yes" or "no." Finally, before beginning of data collection, training was given for data collectors and supervisors about data collection tools, objectives, and ethical issues that have to be taken into consideration.

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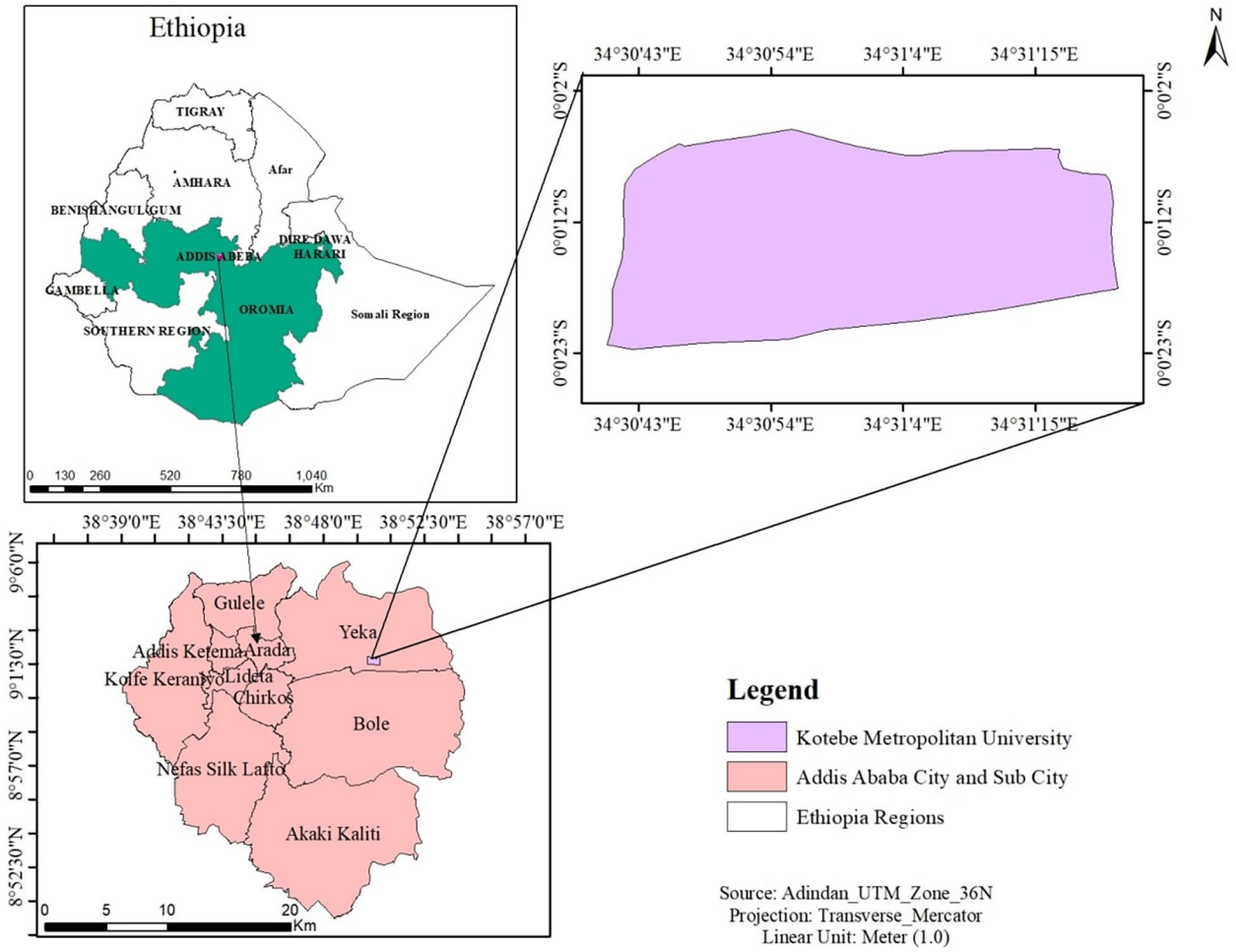


Figure 1. Map of study site.

Data processing and analysis. The questionnaire was checked for completeness, cleaned up, and edited. Complete items were coded and entered into Epi Info version 7.3 (2016) and transferred to the Statistical package to the Social Science (SPSS) version 20 software package for analysis. The results were presented in tables, and figures using descriptive statistics such as mean, frequency, and percentage to describe the study population in terms of relevant variables. For all analyses, P value $<.05$ was considered statistically significant.

Operational definitions

- Knowledge: It is the awareness of food handlers about food safety and handling. It is measured by calculating the mean score of the 10 items and classified as knowledgeable (if the participants scored the greater or equal to the mean score of the correctly answered questions) or not knowledgeable (if the participants scored the less than the mean score of the correctly answered questions). Food handlers who scored less than or equal to the mean value (⩽50%) were considered as having a "poor level of knowledge" and those who scored greater than the mean value (>50%) were considered to have a "high level of knowledge."[27,31]
- Practice: The practice of food handlers on food safety and handling. The Practice of food handlers on food safety and handling. It is measured by 31 questions with "Yes," or "No." Food handlers who scored less than or equal to the mean value (⩽50%) were considered to have a "poor level of practices," and those who scored more than the mean value (>50%) were considered to have a "good level of practices." Furthermore, if the food handlers' answer is always, usually, or sometimes it considered to be "Yes" for food handling practices and if the food handlers' answer is rarely or never it is considered to be "No" for food handling practices.[32-34]
- Food handler: Person who is directly and indirectly in contact with food or with any equipment or utensil used in food handling.
- Food safety: is the assurance that the food will not cause any harm to the consumers when it is prepared and/or consumed according to its intended use.

Ethical considerations. The study was carried out after approval from the Vice President Office for Research and Community Service at Kotebe Metropolitan University. Written informed consent was also obtained from study participants after the

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purpose of the study was explained during data collection. Confidentiality was maintained by asking the participants not to write their names on the questionnaires. Further, this study was approved by the Research and Development Committee of the Metropolitan University of Kotebe.

Results

Socio-demographic characteristics of the study participants

In this study, a total of 68 study participants participated with a response rate of 100%. Demographic characteristics of the respondents' summary were explained in Table 1. The majority of food handlers 88.2% (60) were women, while 11.8% (8) were men. Of the total of the participants, most of them were women and 79.4% (54) of the food handlers were Orthodox Christian religious followers. A higher number of participants, 58.8% (40) had between 21 and 35 years age, and 36.8% (25) had work experience between 2 and 5 years working in the foodservice. On the other hand, 57.4% (39) of the respondents were married, and almost all 89.7% (61) of the respondent were less than 12 grade education completed.

As indicated in Table 2, most of the food handlers 60 (88.2%) had hand practice washing facilities with a supply of hot water, soap and 65 (95.6%), hand drying towel in or very close to the food preparation room, 56 (82.4%) had hair mask or cloth during food preparation and wear safety clothe/ Cover/net cloth during food. However, most food handlers 67 (98.5%) did not always wear safety shoes during food preparation, and did not always wear safety mouth mask during food preparation 67 (98.5%). Furthermore, the results showed that there was a significant association between food handlers on food safety practices with education, specifically for appropriate hand washing facilities with a supply of hot water, soap and a means of hand drying in or very close to the preparation, and the use of disinfectant or antibacterial spray on the equipment and preparation surfaces were significant ($\chi^2 = 20.962^a$; P value $\leqslant .000$ and $\chi^2 = 7.942^a$; P value $\leqslant .019$), respectively.

As shown in Table 3, 49 (72.1%) of the food handlers had been washing vegetables and fruits that were used to soak in cold water. On the other hand, only 8 (11.8%) of them used detergent soak, 7 (10.3%) of them used cold water washing, and 4 (5.9%) of them used hot water washing. Most of the 35 respondents (51.5%) do not know the optimal temperature to store frozen food. Overall, 40 respondents were answered correctly section was 57.94% from all 10 questions. There was an association between knowledge of food safety and food handlers with education, and significant associations were with were particularly with the ways of food left over heating raw vegetable storage fragments and the best time to purchase frozen food from shopping ($\chi^2 = 13.115^a$; P value $\leqslant .011$, $\chi^2 = 35.249^a$; P value $\leqslant .000$, and $\chi^2 = 33.841^a$; P value $\leqslant .000$), respectively.

Table 1. Percentage of socio demographic characteristics of food handlers.

VARIABLES	VARIABLES RESPONSES	FREQUENCY	PERCENT (%)
Sex	Male	8	11.8
	Female	60	88.2
	Total	68	100
	21-35	40	58.8
	36-45	22	32.4
	Greater than 46	6	8.9
Religion	Orthodox	54	79.4
	Muslim	4	5.9
	Protestant	6	8.8
	Catholic	1	1.5
	Other	3	4.4
Marital status	Married	39	57.4
	Unmarried	17	25.0
	Divorced	7	10.3
	Widowed	5	7.4
Ethnicity	Oromo	21	30.9
	Amhara	40	58.8
	Tigrey	3	4.4
	Other	4	5.8
Educational status	Couldn't read and write	3	4.4
	From Grade 1 to 12 grades	61	89.7
	Diploma	3	4.4
	Degree	1	1.5
Work experience	1-2 years	1	1.5
	2-5 years	25	36.8
	6-10 years	23	33.8
	10-20 years	17	25.0
	>20 years	2	2.9

As shown in Table 4, concerning the practice of food handlers on hand washing; Most of them 67 (98.5%) always wash vegetables and fruits, 66 (97.1%) practiced right hand washing procedures, 66 (97.1%) washed their hands when returning from the toilet, 43 (63.2%) washed their hands after rubbing the nose or scratching their body, 63 (92.6%) washed their hands when back to work after break or rest, and 63 (92.6%) washed their hands after handling food waste or rubbish.

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Table 2. Association between food handling practice and food safety based on education.

S. NO	VARIABLES	VARIABLES RESPONSES	FREQUENCY	PERCENTAGE	CHI-SQUARE (χ^2)	*P*-VALUE
Q6	Do you cook, prepare, sell, and/or serve food on your premises?	Yes	61	89.7	0.488[a]	.784
		No	7	10.3		
Q7	Do you have a disinfectant/anti-bacterial spray available for use on equipment and preparation surfaces?	Yes	64	94.1	20.962[a]	.000
		No	12	17.7		
Q8	Do you have hand washing facilities with a supply of hot water, soap and a means of hand drying in or very close to the preparation room?	Yes	60	88.2	7.942[a]	.019
		No	8	17.8		
Q9	Do you have hair mask or cloth during food preparation?	Yes	65	95.6	0.129[a]	.938
		No	4	4.4		
Q10	Do you wear always safety clothe/cover/net cloth during food preparation?	Yes	56	82.4	0.911[a]	.634
		No	12	17.6		
Q11	Do you wear always safety shoes during food preparation?	Yes	1	1.5	0.063[a]	.969
		No	67	98.5		
Q12	Do you wear always safety mouth mask during food preparation?	Yes	1	1.5	0.063[a]	.969
		No	67	98.5		

[a]Most of the food handlers 60 (88.2%) had hand practice washing facilities with a supply of hot water, soap and 65 (95.6%), hand drying towel in or very close to the food preparation room, 56 (82.4%) had hair mask or cloth during food preparation and wear safety clothe/Cover/net cloth during food. However, most food handlers 67 (98.5%) did not always wear safety shoes during food preparation, and did not always wear safety mouth mask during food preparation 67 (98.5%). Furthermore, the results showed that there was a significant association between food handlers on food safety practices with education, specifically for appropriate hand washing facilities with a supply of hot water, soap and a means of hand drying in or very close to the preparation, and the use of disinfectant or antibacterial spray on the equipment and preparation surfaces were significant ($\chi^2 = 20.962^a$; P value $\leq$.000 and $\chi^2 = 7.942^a$; P value $\leq$.019).

Table 3. Food handlers knowledge of food safety based on education.

S. NO	VARIABLES	VARIABLES RESPONSES	FREQUENCY		PERCENTAGE OF "YES"	CHI-SQUARE (χ^2)	*P*-VALUE
			YES	NO			
Q2	What is the primary component of washing vegetables and fruits?	Soak in detergent	8	60	11.76	10.519[a]	.104
		Wash with cold water	7	61	10.29		
		Wash with hot water	4	64	5.88		
		Soak in cold water	**49**	19	72.06		
Q3	Which of the following is the least safe method for thawing raw meat?	**In refrigerator**	**60**	8	88.24	2.463[a]	.651
		On chopping board	1	67	1.47		
		In microwave oven	6	62	8.82		
		I don't know	1	67	1.47		
Q4	Which of the following is the proper way to heat leftovers?	Heat it to the temperature you prefect	28	40	41.18	13.115[a]	.011
		Reheat is not necessary if it is during the summer	34	34	50.00		
		Heat until they are boiling	**6**	62	8.82		
		Do not know	28	40	41.18		

(Continued)

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Table 3. (Continued)

S. NO	VARIABLES	VARIABLES RESPONSES	FREQUENCY		PERCENTAGE OF "YES"	CHI-SQUARE (χ^2)	*P*-VALUE
			YES	NO			
Q5	What is the best option if the leftovers are not completely consumed?	**Put in the refrigerator immediately and reheat before consuming**	**40**	28	58.82	8.373[a]	.212
		Store in kitchen and reheat before consuming	16	52	23.53		
		As long as they smell good, eat them	3	65	4.41		
		Others specify	9	59	13.24		
Q13	What is the standard distance between the cafeteria and the toilet?	1 m	0	68	0.00	2.128[a]	.345
		2 m	0	68	.00		
		3-5 m	21	47	30.88		
		>5 m	**46**	22	67.65		
		Do not know	1	67	1.47		
Q14	What is the standard distance between the toilet and the well?	1 m	0	68	0.00	0.732[a]	.694
		2 m	0	68	.00		
		3-5 m	12	56	17.65		
		>5 m	**56**	12	82.35		
Q15	How should chunks of raw vegetables be stored?	**Store it directly in the refrigerator**	**29**	39	42.65	35.249[a]	.000
		Slice it into smaller pieces, then store them in the refrigerator	14	54	20.59		
		Slice into smaller pieces, seal, and store them in the refrigerator	23	45	33.82		
		Store it in a cool place	2	66	2.94		
Q17	When is the best time to purchase frozen food when shopping?	**At the beginning of the shopping time**	**59**	9	86.76	33.841[a]	.000
		Whenever, does not matter	4	64	5.88		
		At the beginning of the shopping time	2	66	2.94		
		I don't know	3	65	4.41		
Q18	What is the optimal temperature for storing frozen food?	**0°F (–180°C)**	**17**	51	25.00	2.040[a]	.728
		39.2°F (4°C	16	52	23.53		
		I don't know	35	33	51.47		
Q19	What should be done with freshly prepared food that will be consumed 3 h later?	**Put in the refrigerator, then reheat when ready to eat**	**32**	36	47.06	2.513[a]	.642
		Put it in the cupboard, then reheat when ready to eat	11	57	16.18		
		Put it in the microwave oven	25	43	36.76		

[a]Concerning the practice of food handlers on hand washing; Most of them 67 (98.5%) always wash vegetables and fruits, 66 (97.1%) practiced right hand washing procedures, 66 (97.1%) washed their hands when returning from the toilet, 43 (63.2%) washed their hands after rubbing the nose or scratching their body, 63 (92.6%) washed their hands when back to work after break or rest, and 63 (92.6%) washed their hands after handling food waste or rubbish. While, 25 (36.8%) of the respondents did not wash their hands after rubbing the nose or scratching their body, and similarly very few food handlers 2 (2.9%) did not practice right hand washing procedures, 2 (2.9%) did not wash their hands when returning from the toilet, 5 (7.4%) did not wash their hands when back to work after break or rest, and 5 (7.4%) did not wash their hands after handling food waste or rubbish, respectively. There was significant ($P < .05$) between the practicing food handler and the education about hand washing after returning from the toilet ($\chi^2 = 10.164^a$; P value ≤.006), and hand washing when back to work after the break ($\chi^2 = 16.240^a$; P value ≤.000).

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Table 4. Association between food handlers' practice of hand washing by food handlers and food safety practices based on education.

	VARIABLES	VARIABLES RESPONSE	FREQUENCY	PERCENTAGE	CHI-SQUARE (χ^2)	*P*-VALUE
Q1	Do you wash vegetables and fruits?	Yes	67	98.5	0.063[a]	.969
		No	1	1.5		
Q20	Do you practice right hand-washing procedures?	Yes	66	97.1	0.129[a]	.938
		No	2	2.9		
Q21	Do you wash your hands when returning from the toilet?	Yes	66	97.1	10.164[a]	.006
		No	2	2.9		
Q22	Do you wash hands after rubbing the nose or scratching your body?	Yes	43	63.2	0.611[a]	.737
		No	25	36.8		
Q23	Do you wash your hand when back to work after the break?	Yes	63	92.6	16.240[a]	.000
		No	5	7.4		
Q24	Do you wash hands after handling food waste or rubbish?	Yes	63	92.6	0.337[a]	.845
		No	5	7.4		

[a]Most of the food handlers 60 (88.2%) did not touch food when their hands or fingers were cut and not properly covered, whereas; 8(11.8%) the respondents were touched food when their hands or fingers were cut and not properly covered. Most food handlers 42 (61.8%) took a break if they were suffering from food-borne illness, but 26 (38.2%) of the food handlers did not take a break if they were suffering from food-borne illness. Additionally, most handlers 65 (95.6%) did not smoke when cooking. The majority of food handlers 36 (52.9%) did not practice eating, drinking, or chewing gum when preparing food, nevertheless; 31 (45.6%) of the food handlers were eating, drinking, or chewing gum when preparing food. Regarding the carrier of typhoid from food handlers, 49 (72.1%) of them were not carriers of typhoid, but 19 (27.9%) of them were carriers of a history typhoid from medical examinations. Similarly, 65 (95.6%) of food handlers were not carriers of skin infections, on the contrary, 3 (4.4%) were carriers of skin infections. Additionally, regarding then, or during those last two (2) weeks, respondents did not experience diarrhea and/or vomiting 63(92.6%); stomach pain, nausea, or fever 67 (98.5%), and suffering from typhoid history 65 (95.6%), respectively.

While, 25 (36.8%) of the respondents did not wash their hands after rubbing the nose or scratching their body, and similarly very few food handlers 2 (2.9%) did not practice right hand washing procedures, 2 (2.9%) did not wash their hands when returning from the toilet, 5 (7.4%) did not wash their hands when back to work after break or rest, and 5 (7.4%) did not wash their hands after handling food waste or rubbish, respectively. There was significant ($P < .05$) between the practicing food handler and the education about hand washing after returning from the toilet ($\chi^2 = 10.164^a$; P value $\leqslant .006$), and hand washing when back to work after the break ($\chi^2 = 16.240^a$; P value $\leqslant .000$).

As indicated in Table 5, most of the food handlers 60 (88.2%) did not touch food when their hands or fingers were cut and not properly covered, whereas; 8(11.8%) the respondents were touched food when their hands or fingers were cut and not properly covered. Most food handlers 42 (61.8%) took a break if they were suffering from food-borne illness, but 26 (38.2%) of the food handlers did not take a break if they were suffering from food-borne illness. Additionally, most handlers 65 (95.6%) did not smoke when cooking. The majority of food handlers 36 (52.9%) did not practice eating, drinking, or chewing gum when preparing food, nevertheless; 31 (45.6%) of the food handlers were eating, drinking, or chewing gum when preparing food. Regarding the carrier of typhoid from food handlers, 49 (72.1%) of them were not carriers of typhoid, but 19 (27.9%) of them were carriers of a history typhoid from medical examinations. Similarly, 65 (95.6%) of food handlers were not carriers of skin infections, on the contrary, 3 (4.4%) were carriers of skin infections. Additionally, regarding then, or during those last two (2) weeks, respondents did not experience diarrhea and/or vomiting 63(92.6%); stomach pain, nausea, or fever 67 (98.5%), and suffering from typhoid history 65 (95.6%), respectively.

Table 6 shows the practice of food handlers on how to use the glove. Therefore, most of the food handlers the 39 (57.4%) did not wear gloves when touching ready-to-eat foods, but 29 (42.6%) of the food handlers wore gloves when touching ready to eat foods. In the same way, 41 (60.3%) did not wash their hands before putting on gloves, 48 (70.6%) did not wash their hands after removing gloves, and 58 (85.3%) did not change gloves between handling raw and read- to-eat foods.

Moreover, based on Tables 2 and 4 to 6, the result showed that the general practice of food handlers had a good practice on food safety, as measured by the passing score of 48 (70.6%).

The student cafeteria at Kotebe Metropolitan University has a local or regional health Bureau regulatory authority's operating license and records of food production and receipt, according to the qualitative results. However, the student cafeteria at

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Table 5. Practice of food handlers of respondents on prevention of food contamination and symptoms of food illness, and association between food safety practices based on education.

S. NO	VARIABLES	VARIABLES RESPONSE	FREQUENCY	PERCENTAGE	CHI-SQUARE (χ^2)	*P*-VALUE
Q25	Do you touch food when your hands or fingers are cut and not covered properly?	Yes	8	11.8	0.567[a]	.753
		No	60	88.2		
Q26	Do you make sure that your hands are dry and clean when handling food?	Yes	60	88.2	8.979[a]	.011
		No	8	11.8		
Q27	Do you wear jewelry when handling food?	Yes	39	57.4	1.457[a]	.483
		No	29	42.6		
Q28	Do you take leave if you suffer from food-borne illness?	Yes	42	61.8	1.661[a]	.436
		No	26	38.2		
Q29	Do you smoke when preparing food?	Yes	3	4.4	1.238[a]	.539
		No	65	95.6		
Q30	Do you eat, drink or chew gum when cooking?	Yes	31	45.6	1.377[a]	.502
		No	36	52.9		
Q31	Do you put on a clean and suitable uniform before starting work?	Yes	66	97.1	4.173[a]	.124
		No	3	4.4		
Q32	Do you put on proper shoes before starting work?	Yes	52	76.5	1.648[a]	.439
		No	16	23.5		
Q33	Do you put on a mask before starting work?	Yes	45	66.2	1.986[a]	.370
		No	23	33.8		
Q34	Have you ever had, or are you known to be a carrier of typhoid?	Yes	19	27.9	2.683[a]	.261
		No	49	72.1		
Q35	Have you ever had, or are you known to be a carrier of skin infections?	Yes	3	4.4	0.196[a]	.907
		No	65	95.6		
Q36	At present, or in the last 2 week have you experienced; Diarrhea and/or vomiting?	Yes	5	7.4	0.337[a]	.845
		No	63	92.6		
Q37	At present, or in the last 2 week, have your experienced; Stomach pain, nausea, or fever?	Yes	1	1.5	0.063[a]	.969
		No	67	98.5		
Q38	In the last 21 days have you had contact with anyone, at home or abroad, who may have been suffering from typhoid or paratyphoid?	Yes	3	4.4	0.196[a]	.907
		No	65	95.6		

[a]Most of the food handlers 60 (88.2%) did not touch food when their hands or fingers were cut and not properly covered, whereas; 8(11.8%) the respondents were touched food when their hands or fingers were cut and not properly covered. Most food handlers 42 (61.8%) took a break if they were suffering from food-borne illness, but 26 (38.2%) of the food handlers did not take a break if they were suffering from food-borne illness. Additionally, most handlers 65 (95.6%) did not smoke when cooking. The majority of food handlers 36 (52.9%) did not practice eating, drinking, or chewing gum when preparing food, nevertheless; 31 (45.6%) of the food handlers were eating, drinking, or chewing gum when preparing food. Regarding the carrier of typhoid from food handlers, 49 (72.1%) of them were not carriers of typhoid, but 19 (27.9%) of them were carriers of a history typhoid from medical examinations. Similarly, 65 (95.6%) of food handlers were not carriers of skin infections, on the contrary, 3 (4.4%) were carriers of skin infections. Additionally, regarding then, or during those last two (2) weeks, respondents did not experience diarrhea and/or vomiting 63(92.6%); stomach pain, nausea, or fever 67 (98.5%), and suffering from typhoid history 65 (95.6%), respectively.

Kotebe Metropolitan University lacks thermometers to measure temperature (degrees of heat or cold), written standard operating procedures (guidelines) on food safety and handling, method of managing liquid waste, a location to dispose leftovers from food, and regular training on food safety and handling standards were observed.

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Table 6. Association between food handler practice on glove use and food safety practices based on education.

S. NO	VARIABLES	VARIABLES RESPONSE	FREQUENCY	PERCENTAGE	CHI-SQUARE (χ^2)	*P*-VALUE
Q39	Do you wear gloves when touching ready to eat foods?	Yes	29	42.6	4.885[a]	.087
		No	39	57.4		
Q40	Do you wash your hands before wearing on gloves?	Yes	27	39.7	1.580[a]	.454
		No	41	60.3		
Q41	Do you wash your hands after removing gloves?	Yes	20	29.4	4.656[a]	.097
		No	48	70.6		
Q42	Do you change gloves between handling raw and ready to eat foods?	Yes	10	14.7	6.878[a]	.032
		No	58	85.3		

[a]The practice of food handlers on how to use the glove. Therefore, most of the food handlers the 39 (57.4%) did not wear gloves when touching ready-to-eat foods, but 29 (42.6%) of the food handlers wore gloves when touching ready to eat foods. In the same way, 41 (60.3%) did not wash their hands before putting on gloves, 48 (70.6%) did not wash their hands after removing gloves, and 58 (85.3%) did not change gloves between handling raw and read- to-eat foods.

Discussion

The main goal of this study was to evaluate the general level of food handler practice and awareness of food safety in the student cafeteria at Kotebe Metropolitan University. Most of the participants, who handled food were women and this was similar to research in Debre Markos town, Ghana, and Slovenia, where more women handled food.[27-29] In the cafeteria there were 57.94% and 70.6% food handlers had good knowledge of food safety and good practice of food safety, respectively. The finding of this work was similar with another study conducted in Debre Markos northwest, Ethiopia where 53.7% of food workers used good and safe food handling techniques[27]and (72%) of food handlers in food establishments had a good level of food hygiene and safety practices compared to almost half 53% of the street food vendors in the city of Dessie. Likewise, another study conducted in Oman Muscat reported that 58.6% food handlers had knowledge food safety as compared to region 2 and region 3 which were 52.1% and 53.2%, respectively.[35] Also, another study conducted in Egypt's Sohag Governorate reported that out of the 994 food handlers included in the survey, 39.2% strong understanding of food safety, 61.2% had favorable attitudes, and 56.3% had good food safety practices.[36]

In the cafeteria of student from Addis Ababa University, the research found that 93.7% of food handlers had adequate knowledge of food-borne diseases.[30] Most food handlers were washing hands before food preparation to reduce the risk of food contamination.[28] Another study reported that the evaluation of food safety knowledge and practices of food handlers and hygienic sanitary conditions improved the quality of meals served.[13] Food hygiene and food safety are of paramount importance in a hospice setting, especially since reducing microbial hazard is vital in a context where health-compromised patients are treated.[37,38] Most food handlers washed their hands after visiting the restroom, before preparing food in general and raw meat or poultry specifically, and when they changed tasks, work stations, or items they were handling.[39] Lack of knowledge of food safety and poor food handling practices are the main contributors to food-borne diseases and diarrheal-related morbidity in Ethiopia.[27] As in the study conducted in Kuala Pilah, Malaysian food handlers have excellent knowledge and attitude and good practices in food hygiene.[40]

Most respondent food handlers do not know the optimal frozen temperature for food storage. Most food handlers had knew that bacteria in food can be completely killed by freezing at 18°C. Our study is consistent with the study conducted at the University of South Africa.[41] As in a study conducted on national young adults in United States, 60% of the participants correctly answered the knowledge questions and were more knowledgeable about the groups at the greatest risk for food-borne disease and less knowledgeable about the common food sources of foodborne disease pathogens.[24] Most food handlers did not touch food when their hands or fingers were cut or not covered properly, and most food handlers took leave if they suffered from food-borne illness. Most of the respondents showed average practices in food handling of with 68.0% in hand washing; 66.5% in personnel hygiene; 66.2% in raw material management; 59.3% in food safety control and 52.3% in gloves use in Malaysiana.[34] Other study reported that food-borne illness have a substantial health and economic burden on society, and most cases are believed to be due to unsafe food handling practices at home.[42] Additionally, most food handlers did not wear gloves when touching ready-to-eat foods. Our study is consistent with the study conducted by only 54.9% of those involved in touching or serving unwrapped raw or cooked foods that routinely used gloves during food preparation; this practice was significantly greater among younger respondents.[4]

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Food handlers may be aware of the need for personal hygiene, but do not understand critical aspects of personal hygiene, such as cleaning work surfaces and controlling the food temperature while cooking.[43] The market of minimally processed fruits as street foods, despite numerous benefits, can cause food-borne illnesses due to poor hygiene practices and unsanitary conditions.[44] However, as research conducted in Bahir Dar town, the lack of basic infrastructure, poor hygiene knowledge, and practices in food service establishments can contribute to outbreaks of food-borne illnesses.[45] Additionally, an unsanitary environment, lack of awareness of food safety regulations, poor hygiene knowledge, and improper food handling practices among food vendors can contribute to outbreaks of foodborne illnesses.[46] Foodborne diseases, including food poisoning, are becoming a concern due to the increasing prevalence of food poisoning and incidents worldwide.[47]

Conclusions and Recommendations

The current study revealed that the level of knowledge and good handling practice in food safety was relatively high. Most food handlers had good knowledge of food safety and handling practice with student cafeteria of Kotebe Metropolitan University. Also, during food preparation, most food handlers wash vegetables and fruits and use a hair mask or cloth, as well as wear protective clothing. Most of the respondents followed proper hand washing procedures, washing their hands after using restroom, rubbing their noses or scratching their bodies, and handling food waste or trash. However, most food handlers did not always wear safety shoes and mouth mask when preparing food. Proper food safety and handling practice minimize the likelihood of food-borne disease and prevent food contamination. Thus, concerted effort among environmental health expert, public health expert, student cafeteria managers, and food handlers in student cafeteria should be in place to prevent potential food-borne diseases. Inspections should be conducted on a regular basis to ensure effective liquid waste management and food waste management. Furthermore, the authors recommend future work based on detailed laboratory analysis of food and water quality analysis for Kotebe Metropolitan University and other universities in Ethiopia to better understand and abate food safety and handling related issues.

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Author Contributions

Tadesse Weyuma designed the study concept, drafted the manuscript, collected data, analyzed data, interpretation of data, and made revisions to the manuscript. BC revised the final comments provided by the authors. TW, GY, BB, SJ, BC, and YW reviewed and approved the final version of the manuscript.

Data Availability

Data used to support the findings of this study are available from the corresponding author upon request.

Informed Consent

Written informed consent was obtained from all study participants.

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