

Research Article

Food Hygiene, Safety Measures, and Associated Factors among Street Food Vendors in Addis Ababa, Ethiopia: Implications for Intervention Activity Design and Implementation

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Background. Foodborne outbreaks and epidemic diseases are common in resource-limited countries. Many people in developing countries are increasing their habit of eating fast foods prepared on the street due to their low cost and accessibility, while most of them get sick due to poor food hygiene practices and safety measures among the street food vendors. Therefore, this research is aimed at assessing food hygiene knowledge, practices, and associated factors among street food vendors. **Methods.** A community-based cross-sectional study design was conducted among 494 street food vendors in Addis Ababa, Ethiopia. The data were collected using a face-to-face interview with a pretested questionnaire. All precautions for prevention of COVID-19 were followed since the study was conducted during the COVID-19 era. The data were entered into a computer and cleaned using EpiData 3.4 before being exported to SPSS version 23 for analysis. A multivariable logistic regression with a 95% confidence interval was used to identify the factors that were significantly associated with poor hygiene practice. **Results.** In this study, 78% of street food vendors had poor hygienic practices. Monthly income less than 2000 birr (AOR = 1.95, 95% CI (1.36, 11.26), $p = 0.014$), age groups less than 25 years of age (AOR = 3.17, 95% CI (1.12, 8.97), $p = 0.03$), food vendors who prepare food while not healthy (AOR = 2.07, 95% CI (1.25, 5.93), $p = 0.025$), and lack of toilet facilities (AOR = 2.84, 95% CI (1.58, 9.68), $p \leq 0.001$) were significantly associated with the poor hygiene practices of street food vendors at a significance level of $p \leq 0.05$. **Conclusions.** The general food hygiene practices and safety measures were poor. Age groups younger than 25 years of age, monthly income less than 2000 birr, preparing food while sick, and lack of access to toilet facilities were significantly associated with poor food hygiene and safety practices. To promote food safety and community health, street food vendors should receive health education and training about proper food hygiene practices through health extension workers and mass media. Basic infrastructure and services like clean water supply and waste disposal facilities should be provided for street vendors to improve food hygiene and safety practices.

1. Background

Food hygiene is critical for generating and sustaining sanitary and healthy conditions for food production and consumption [1, 2]. Street food is defined by the World Health Organization (WHO) as “food prepared and sold for immediate consumption in the street and other public venues such as a bus station, huge construction sites, colleges, health

facilities, and other comparable business hubs” [3, 4]. It is also defined as food that is produced at home or on the street and consumed without any processing or preparation at the point of purchase or elsewhere [2, 5]. Street food is relatively inexpensive and suited for urban residents and economically disadvantaged rural migrants [4, 6].

Street food vending is typically a family or one-person operation, and it is frequently unregulated [4, 7, 8]. Poor

personal hygiene among those involved in food preparation poses a risk to food safety and lacks appropriateness for consumption [2, 4, 9]. Therefore, street food vendors should regularly maintain their hygiene and follow food safety measures. Furthermore, hair must be covered during food preparation to prevent loose hair and dandruff from falling onto food and food preparation supplies. The most frequent source of food contamination is improper food handling, which can result in several foodborne diseases [4, 7, 9].

A recent global report showed that 600 million people get sick and more than 420,000 die annually due to foodborne illnesses [1]. However, the actual data could be higher as many cases and small outbreaks remain uninvestigated. Street food vendors are the main contributors to foodborne illness since they have inadequate infrastructure, improper food handling, and poor sanitary conditions [10].

The unsanitary and low-quality conditions in which street foods are prepared or sold, as well as the food vendors' lack of understanding of food preparation and handling, are frequently seen as contributing to unsanitary and low-quality foods [4, 11, 12]. Street food vending is one of the causes of poor food safety and quality in Ethiopia, as it is in other developing countries [2, 4, 13]. Foodborne diseases are one of the most common health issues associated with poor quality. Despite significant attempts to ameliorate Ethiopia's public health problems, even in the capital, the safety of street food vendors' hygiene standards and procedures remains a challenge. Despite its importance as a component of community health, few studies have investigated food hygiene procedures and associated factors among Addis Ababa street food vendors. As a result, this study is aimed at exploring the food hygiene practices, safety measures, and related characteristics among street food vendors in Addis Ababa, Ethiopia.

2. Conceptual Framework

A conceptual framework which includes the sociodemographic characteristics, continuous training on food hygiene and safety measures, regular check of food handlers, sanitation, and awareness on food hygiene were among the parameters related to food hygiene among street food vendors, based on prior research included in this study (Figure 1) [2].

3. Methods and Materials

3.1. Study Design and Area. A community-based cross-sectional study was conducted in Addis Ababa, Ethiopia, from May 31 to June 30, 2021. The city is surrounded by the Oromia Special Zone and is populated by people from all around Ethiopia. There are 11 subcities and 117 weredas in this metropolis. According to the 2007 census, the town's population was 2,739,551 people; however, recent data estimates that the city's total population is more than 6 million (Figure 2).

3.2. Exclusion and Inclusion Criteria. Fixed food vending units were included in the study, while mobile or pushcart vending units were excluded.

3.3. Sample Size Determination and Sampling Technique. The sample size for this study was calculated using the single population proportion formula, considering a 95 percent confidence level, a 5% margin of error, and a proportion of 27.5% in the previous study [14], where n is the required minimum sample size, $Z/2$ is the level of assurance, P is the proportion of previous research, and D denotes the width or margin of error.

Hence, $n = 306$.

By considering the design effect 1.5, $n = 306 * 1.5 = 459$, and by adding a 10% nonresponse rate, the final minimum sample size is $n = 504$, and the response rate for this study was 98%, with 494 study participants.

3.4. Sampling Technique and Data Collection. The study participants were chosen using a multistage sampling process. Initially, three subcities were chosen from 11 by simple random sampling: Addis Ketema, Lideta, and Kirkos. From the Addis Ketema subcity, weredas 1, 7, and 9 were selected while from the Lideta subcity and Kirkos subcity, weredas 2, 6, and 10 and weredas 3, 7, and 10 were selected, respectively. The selection of weredas from each subcity was the second stage of sampling, which was done using a simple random sampling procedure. As a result, from each subcity, three weredas were selected, for a total of nine weredas. According to local government reports, the number of street food vendors in a specific wereda was proportionally allocated and selected using simple random sampling, as shown in Figure 3.

The calculated sample size ($n = 504$) was distributed proportionally among the nine weredas based on the number of food vendors. A simple random selection procedure was used to select the street food vendors from among the nine weredas. Data were obtained using a pretested questionnaire that was constructed with certain modifications based on the related published studies. A face-to-face interview was used to gather all questionnaires (Figure 3).

3.5. COVID-19 Prevention Methods during Data Collection. During data collection, the data collectors were urged to follow national legislation, guidelines, and practices. Because the novel coronavirus may live on paper for 2–3 days, any paper-based investigation poses the danger of infection. During data collection, street food vendors did not allow collectors to exchange papers. Street food vendors were told to wear masks. During data collection, precautions regarding COVID-19 were taken into consideration. The COVID-19 protocol was properly followed; vendors who did not have personal protective equipment were given it, and the instruments were sterilized before and after the data collection.

3.6. Data Processing and Analysis. Initially, the acquired data were manually checked for completeness and consistency. The data were entered into EpiData version 4.6 and then exported to SPSS version 23 for analysis. Descriptive statistics were used to describe the sociodemographic characteristics of the food vendors. The level of food hygiene and safety practices among food vendors was assessed. The connection between food hygiene practices and associated covariates

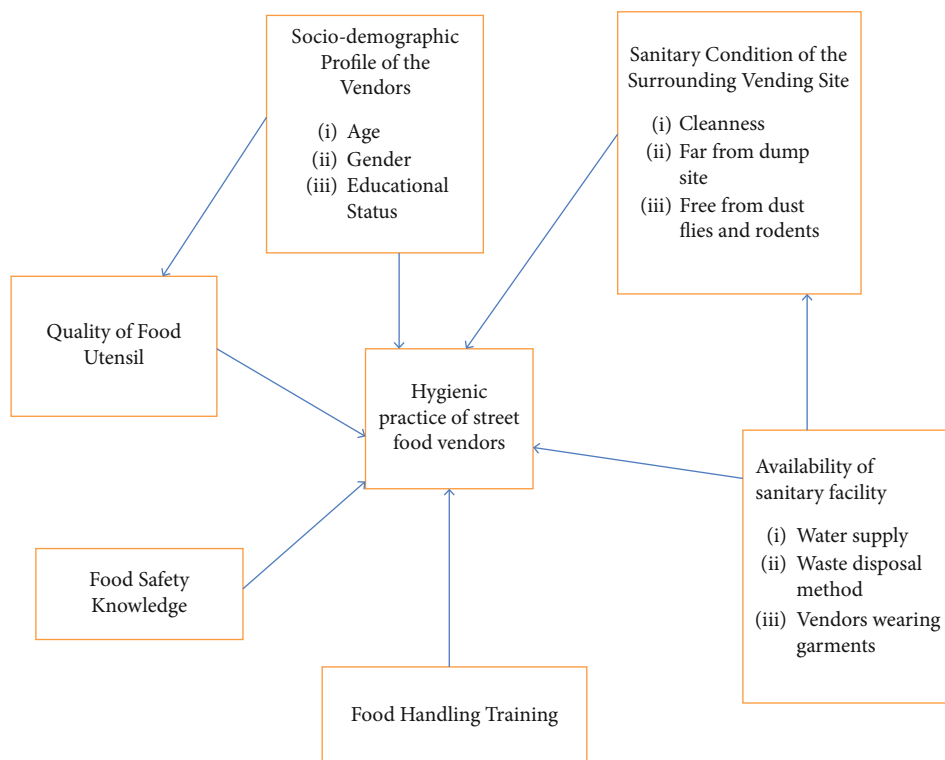


FIGURE 1: Conceptual framework showing the factors that affect food hygiene practice in Addis Ababa, Ethiopia, 2021 (n = 494) [22].

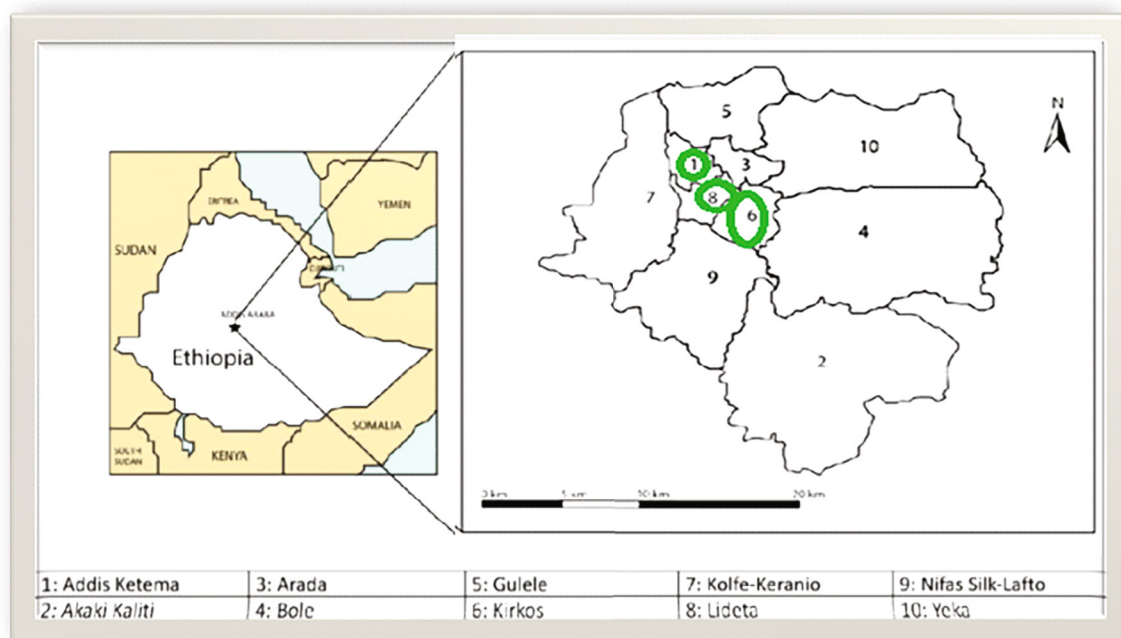


FIGURE 2: The map of Addis Ababa, Ethiopia, 2021 (n = 494) [22].

was calculated using bivariate analysis. To construct the adjusted binary logistic regression analysis, the independent variables with a *p* value less than 0.25 at the bivariable level were chosen. The goodness-of-fit test developed by Hosmer

and Lemeshow was used to assess model fitness. A logistic regression model with backward elimination was used. A *p* value of less than 0.05 was retained in the model with a 95% confidence interval.

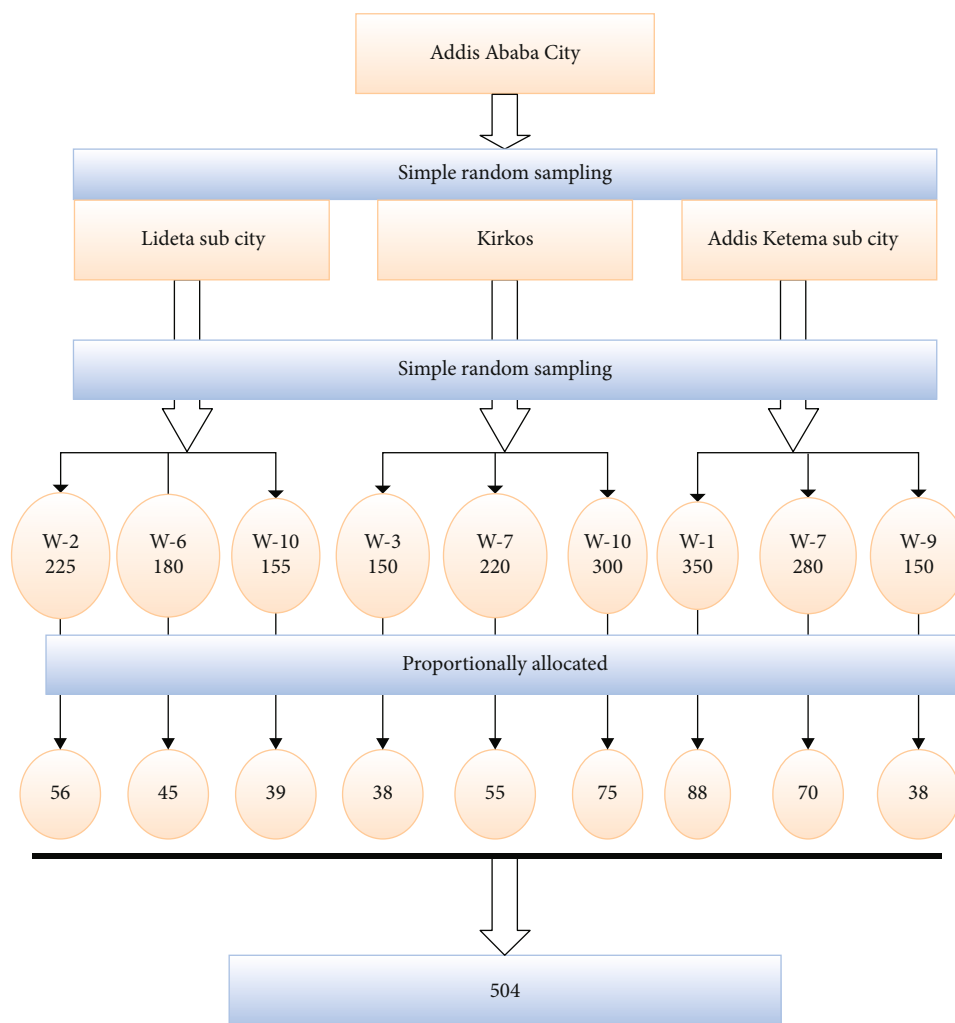


FIGURE 3: Sampling procedures for the assessment of food hygiene practices of street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

4. Result

4.1. Sociodemographic Characteristics. The response rate of the study participants was 98%. Of the total food handlers in the street food vending sites, 399/494 (80.8%) were female, while 95/494 (19.2%) were male. More than half of the street vendors (60.3%) were between the ages of 25 and 45, with a minor proportion of respondents under 25 (13.3%). About 340/494 (68.8%) of the survey participants had a monthly income of more than 2000 ETB, and about 409/494 (82.7%) of the food vendors worked more than 10 hours per week (Table 1).

4.2. Preventing

4.2.1. Water Supply and Raw Materials Used by the Street Food Vendors. From the 494 street food vendors, 150/494 (30.4%) said they bought raw materials from any merchant, 90/491 (18.3%) from formal merchants, 211/494 (42.7%) from other expressly indicated sellers, and 41/494 (8.3%) from the complete store. This indicates that there is no system for supply and that most street food vendors buy

from any accessible supplier. About 461/494 (93.3 percent) of the vendors got their water by paying for tap water (Table 2). Since they are from informally placed areas, they lack water supply. This has a significant impact on the quality of street foods.

Furthermore, 277/494 (56.1%) street food vendors paid 15 Ethiopian birr for a container of water. The majority of the vendors, 230/494 (46.5%), used both a jerry can and a bucket to store water for food preparation, whereas 181/494 (36.7%) exclusively used a bucket for cooking and water storage (Table 2).

4.2.2. Place of Food Preparation, Handling, and Storing before Selling. In terms of food preparation sites, 272/494 (55%) street food sellers cooked food on the street, 126/494 (25.6%) in the selling area, and 20/494 (4%) in the home; 3/494 (0.6%) of the respondents said the food was not prepared by them; and 74/494 (14.9%) prepared food at both home and selling site. The majority of street food vendors (377/494 or 76.4%) cooked the food while selling it, while 56/494, or 11.3%, cooked the marinade at sale.

TABLE 1: Sociodemographic characteristics of street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

Variable	Category	Frequency ($n = 494$)	Percent (%)
Sex of respondent	Male	95	19.2
	Female	399	80.8
	Total	494	100
Age of respondent	Less than 25 years	66	13.3
	25-35 years	298	60.3
	Greater than 35 years	130	26.4
	Total	494	100
Marital status	Single	55	11.13
	Married	153	31.0
	Divorced	198	40.1
	Widowed	88	17.8
	Total	494	100
Educational status	Illiterate	53	10.7
	Primary school completed	151	30.6
	Secondary school completed	197	39.9
	Certificate	58	11.7
	Diploma and above	35	7.1
Total	494	100	
Monthly income	Below 2000	154	31.2
	Above 2000	340	68.8
	Total	494	100
Work experience	Less than 5 years	409	82.7
	Greater than 5 years	85	17.3
	Total	494	100
Average working hour	Less than 10 hours	289	58.5
	More than 10 hours	205	41.5
	Total	494	100

Approximately 473/494 (95.8%) of the respondents said they cleaned or disinfected during manufacturing, while 441/494 (89.3%) said they washed their hands after using the restroom and before preparing food. The majority of street vendors (420/494 or 85.1%) were serving a variety of items (Table 3) (Figure 4).

4.3. During Vending

4.3.1. Transportation, Handling, and Storage of the Prepared Food. The findings revealed that 349/494 (70.6%) of the food vendors carried their wares, while most of the stalls were made of polythene bags and wood. Vendors sell sambusa, potatoes, and a variety of other meals prepared at the stalls. In terms of how food was served, 231/494 (46.7%) used papers, 150/494 (30.4%) used cups, 55/494 (11.1%) used plastic, 53/494 (10.7%) used a fork or spoon, and 1% used

TABLE 2: Water supply and raw materials used among street food vendors in Addis Ababa Ethiopia, 2021 ($n = 494$).

Variables	Category	Frequency ($n = 494$)	Percent (%)
Purchase raw material	Formal retailer	90	18.3
	Whole store	41	8.3
	Informal market	2	0.4
	Any merchant	150	30.4
	Any delay	211	42.7
Total	494	100	
Most important attributes of purchasing raw materials	Appearance	24	4.8
	Brand	396	80.2
	Price	4	0.8
	Quality	70	14.2
Total	494	100	
Storage of water for cooking	Jerry can	181	36.6
	Buckets	83	16.8
	Both	230	46.6
	Total	494	100
Type of water to prepare food	Spring water	12	2.4
	Boiled water	482	97.6
	Total	494	100

their hands. Three hundred ninety-six percent of the respondents (80.2%) said they reused oil for frying multiple times, while 394/494 (79.8%) said cooked and ready-to-eat meals were maintained in different ways and separately before being sold (Table 3).

One hundred eighty-six (37.6%) street vendors employed the preservation technique to store food at various stages, while 377/494 (76.4%) stored prepared or ready-to-eat foods on covered utensils. Two hundred and two (40.8%) street food sellers washed the utensils with cold water, adding detergent, while 179/494 (36.3%) changed the water used to clean the utensils twice a day. In terms of leftover goods, 231/494 (46.8%) food merchants handled them by storing them for the next day (Table 3).

4.3.2. Overall Cleaning and Equipment Handling. Separate utensils were used by street food vendors for each cuisine preparation (raw or cooked and ready-to-eat). About three hundred ninety-seven (80.4%) street food vendors were found to utilize separate utensils. Vendors' food service utensils were made of metal 90/494 (18.3%), plastic alone 184/494 (37.3%), plastic plate and plastic cups 4/494 (0.8%), and just plastic cups 158/494 (31.9 percent). While selling, 311/494 (62.9%) of the street food sellers utilized newspapers to pack the food items (Table 3).

TABLE 3: Transportation, handling, and storage of prepared food selling among street food vendors in Addis Ababa, 2021 ($n = 494$).

Variable	Category	Frequency ($n = 494$)	Percent (%)
Time of washing hand	After visiting toilet	86	17.4
	Before preparing food	170	34.5
	Both	238	48.01
	Total	494	100
Area of preparing food	Home	74	15.0
	Street	126	25.5
	Selling area	271	54.9
	Not prepared by me	23	4.6
	Total	494	100
Method of preparing food	Cooked during sale	377	76.4
	Cooked in the morning	56	11.3
	Do not prepare	61	12.3
	Total	494	100
Cleaning that may contaminate food	Yes	473	95.8
	No	21	4.2
	Total	494	100
Method of serving food	Using fork	53	10.7
	With hands	5	1.0
	By cup	150	30.4
	By paper	231	46.8
	By plastic	55	11.1
	Total	494	100

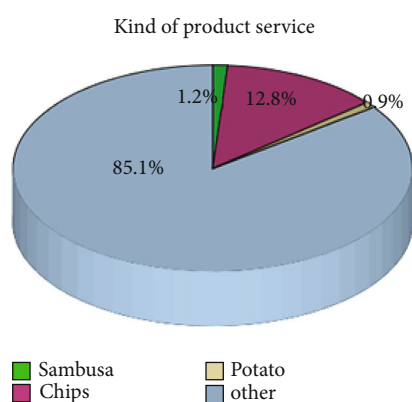


FIGURE 4: Kinds of products served among street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

4.4. Post Vending

4.4.1. *Sanitizing after Vending Food.* Street food vendors were polled about how they clean their utensils. Before

reusing utensils for service, 212/494 (42.9%) of the vendors washed the utensils with soap, 42/494 (8.5%) used water only, and the remainder of the vendors (240/494 (48.6%)) did not wash and sell takeaway. The majority of the sellers washed their utensils twice a day: 220/494 (44.6%) used soap and 241/494 (48.8%) used detergent to sanitize at the point of sale, respectively (Table 4 and Figure 5).

4.4.2. *Waste Disposal and Handling Method.* In terms of waste management, 263/494 (53.3%) of the food vendors put their trash in a waste bin, 134/494 (27.2%) on the street, and 83/494 (16.9%) in drainage or gutters. Three hundred sixty-four percent (73.6%) of the street food vendors experience pests and rodents on the job, and 378/494 (76.6 percent) say the surrounding environment of disposal sites is unsafe for the neighborhood. The majority of food vendors (317/494 (64.2%)) also stated that there was access to a toilet facility at the site, but it was not accessible or it was private (278/494 (56.3%)), public (117/494 (23.6%)), or another source (99/494 (23.6%)). Water flush latrines accounted for 393/494 (79.6%) of the total (Table 5).

4.4.3. *Food Vendor's Food Handling Practice.* Four hundred nine (82.7%) of all street food vendors said they could not access fresh running water at their location. The vendors' hygiene was evaluated. Four hundred forty-one (89.3%) of the sellers always wash their hands before handling food items, according to the findings. Ninety-seven percent (19.6%) of people always wash their hands after handling raw foods using container water (251/494 (50.8%)), water (41/494 (8.3%)), container water with soap (62/494 (12.5%)), and soap with running water (34/494 (6.9%)). In addition, alcohol gel was utilized in 333/494 (67.4%) of the food vendors.

When they were sick, 401 of the street food vendors (81.2%) wore aprons and 119/494 of the street food vendors (24%) did not prepare food. Four hundred fifty-nine people (92.9%) said they wash their hands after using the restroom, and 128 people (26%) said they wash their hands after sneezing, coughing, or smoking (Table 6).

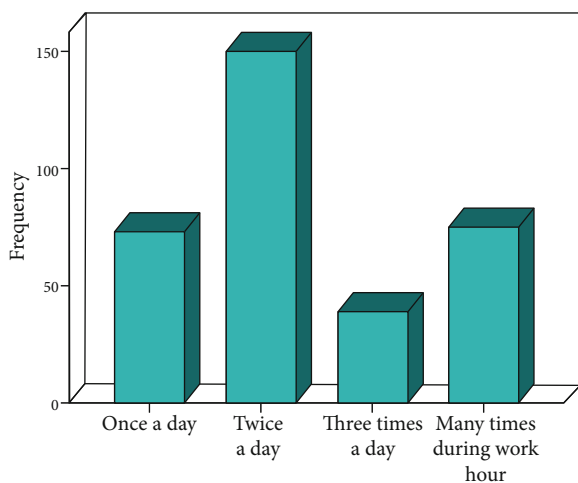
4.4.4. *Overall Street Food Vendors' Hygienic Practices.* This study used a few variables to assess street food sellers' hygiene practices. In this study, characteristics such as toilet availability, solid waste disposal, encounters with bugs and rodents, access to fresh water, and hand washing before handling food products were used to assess food hygiene practices. Regarding hygienic provisions, the presence of these characteristics was graded as acceptable if it was greater than 50 and poor if it was less than 50.

The general level of hygienic practices among street food vendors was poor, with 385/494 (78%) reporting poor hygiene practices.

4.4.5. *Factors Associated with Food Handling Practices.* The overall food vendor's poor hygiene practice was 78%. After conducting a bivariate logistic regression analysis, variables with a p value of less than 0.25 were kept in the multivariable analysis. Accordingly, age group, monthly income, place of purchase, methods of serving foods, product used to sanitize, preparation of food while sick, way of disposing of waste,

TABLE 4: Cleaning sanitizing utensils after vending food among street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

Variable	Category	Frequency ($n = 494$)	Percent (%)
Use of cleaning up the utensils after customers use	Water and soap	212	42.9
	Water only	42	8.5
	Do not use	240	48.6
	Total	494	100.0
Often sanitize utensils at the point of sale	Once a day	167	33.9
	Twice a day	216	43.7
	Three times a day	38	7.7
	Many times during work hour	73	14.7
	Total	494	100
Product used to sanitize	Chlorine	5	1.0
	Alcohol	21	4.2
	All-purpose cleaner product	143	29.0
	Detergent	325	65.9
	Total	494	100.0

FIGURE 5: Frequency of sanitizing utensils at the point of sale among street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

and access to toilet facilities were retained for the multivariable analysis at a p value < 0.25 .

The results of a multivariable logistic regression revealed that the young age group, low monthly income, preparing food while not healthy, and lack of access to toilet facilities were all factors significantly linked to poor food hygienic practices.

The probability of poor hygienic behavior was three times higher among those less than 25 years of age than

TABLE 5: Waste disposal handling and disposal methods among street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

Variable	Category	Frequency ($n = 494$)	Percent (%)
Ways of disposing of wastage	Open area dumping	14	2.8
	Waste bin	263	53.2
	On the street	133	27.2
	Gutter	84	16.9
	Total	494	100
Encounter pests and rodents on site	Yes	130	26.4
	No	364	73.6
	Total	494	100.0
Surrounding environment free of potential contaminants	Yes	101	20.4
	No	393	79.6
	Total	494	100.0
Access to toilet facilities at the site	Yes	318	64.3
	No	176	35.7
	Total	494	100.0
The owner of toilet facility	Public	117	23.6
	Private	278	56.3
	Other	99	20.0
	Total	494	100.0

those greater than 35 years (95% CI 1.121-8.971, $p = 0.03$). Similarly, food vendors with monthly income less than 2000 birr had 2.5 times more poor hygienic practices than those with greater than 2000 birr monthly income (AOR = 2.619; 95%CI = 1.212 – 5.619, $p = 0.014$). At the same time, those food vendors who prepared food while not healthy had 2.0 times more poor food hygiene practices than those vendors who did not prepare food while not healthy (AOR = 2.074; 95%CI = 1.251 – 5.93, $p = 0.025$). Similarly, those food vendors without toilet facilities had 3.0 times more poor food hygiene practices than those with toilet facilities (AOR = 2.837; 95%CI = 1.577 – 9.677, $p \leq 0.001$) (Table 7).

5. Discussion

In Addis Ababa, Ethiopia, a community-based cross-sectional survey was undertaken among street food vendors. According to the survey, over 78 percent of the vendors had poor food hygiene practices. Age group, monthly income, preparing food while not healthy, and access to toilet facilities were all factors linked to poor food hygiene practices among Addis Ababa street food vendors. The research findings of Benin City, Nigeria (90.5%), and Ghana (87%) showed that the food hygiene and safety practices were better than the results of this study (22%) [3, 4]. This might be due to the low food hygiene and safety regulations in our country.

Nearly 69.5 percent of street food vendors have at least a high school diploma. This figure was greater than that of the

TABLE 6: Food handling practice among street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

Variable	Category	Frequency ($n = 494$)	Percent (%)
Access to freshwater	Yes	85	17.3
	No	409	82.7
	Total	494	100.0
Always wash hands before handling food items	Yes	441	89.3
	No	53	10.7
	Total	494	100.0
Always wash hands after handling raw food items	Yes	97	19.6
	No	397	80.4
	Total	494	100.0
Materials used to wash hands	Soap with running water	34	6.9
	Tap water only	164	33.1
	Container water	251	50.8
	Container water with soap	41	8.3
	Other	4	.8
	Total	494	100.0
Usage of supplementary hand washing	Alcohol	155	31.3
	Alcohol gel for hands	333	67.5
	Other	6	1.2
	Total	494	100.0
Always wear protective clothing while preparing or handling	Yes	90	18.3
	No	404	81.7
	Total	494	100.0
Prepare food while not healthy	Yes	119	24.0
	No	75	76.0
	Total	494	100.0
Wash hands after visiting the toilet	Yes	459	92.9
	Sometimes	33	6.7
	No	2	0.4
Wash hands after sneezing, coughing, smoking	Total	494	100.0
	Yes	127	26.0
	Sometimes	293	59.5
	No	74	14.5
	Total	494	100.0

research conducted in Dessie town, where the hygiene practices of street food vendors were 28% [2, 5, 6]. In contrast, one study in Ghana found that out of 50 street food vendors, 26 (52%) had no schooling and 15 (30%) had only primary education [7, 8]. Furthermore, 93.3 percent of the vendors were paying money to get water from the storage tank. Lack

of water supply and low academic levels might be the causes of the poor hygiene practices of the street food vendors in this study.

This survey discovered that 53.3 percent of street food vendors in Addis Ababa dispose rubbish in waste bins, 27.2 percent on the street, and 16.9 percent in drains or gutters, which was consistent with the findings from another study conducted in Bangladesh [9–11]. In Sudan, however, less than 40% of people used the trash can, and the rest were deposited on the streets, major roads, and drainage channels. Several studies concluded that good food storage practices were directly related to good sanitary practices [9, 12, 13].

The investigation also revealed that 22% of the vendors practiced good hygiene. This was lower than the results of studies done in Dessie town and Gondar, which were 53 percent and 58 percent, respectively [2, 8, 14]. This could be attributed to the participants' lack of food hygiene training and food safety expertise, as well as the congested settlement of the subcities as a result of the presence of large markets and bus stations with poor infrastructure at street food vending sites.

According to this study's findings, three hundred fifty (70.9%) street food vendors were female. This finding was in line with research conducted in Ghana's northern area, which found that the majority of food vendors were women [14–17]. The general hygienic practice of street food vendors was unsatisfactory. This result was lower than that of a study done in Dessie town, where street food sellers' good hygienic procedures were found to be at 28 percent [2, 14, 18, 19].

In this study, food vendors in an age group above 35 years had better hygiene practices than those in an age group of less than 25 years. This finding was similar to the study conducted in Nigeria [12, 20, 21]. This might be due to as age increases, food vendors might have more experience and awareness of food safety measures and practices.

In terms of vendor revenue, the study found that 89.9% of street food vendors earn more than 2000 ETB each month. The researchers discovered that street food vendors with a higher monthly income had a better likelihood of implementing appropriate food hygiene practices. This finding was in line with research undertaken in Bangladesh and Addis Ababa, which found that higher-income vendors were more likely to practice proper food hygiene than lower-income vendors [10, 13, 21, 22], and this conclusion was comparable to that of an Indian study. The increased money may assist in the purchase of conditions that improve hygiene and safety practices.

In addition, in this study, 24% of the food vendors continued preparing food while they were sick, and this variable was also significantly associated with poor food hygienic practices. This result was quite low compared to the study conducted in Nigeria [21, 22]. This difference might be due to the knowledge and experience differences between the food vendors in these two countries.

A significant association was found between a lack of access to toilet facilities and poor food hygiene practices. Similarly, a study conducted in Kenya and Cameroon toilet facilities was significantly associated with street food vendors' poor hygiene practices [19]. Lack of toilet facilities with

TABLE 7: Factors associated with good hygienic practice among street food vendors in Addis Ababa, Ethiopia, 2021 ($n = 494$).

Variables	Category	COR (95% CI)	<i>p</i> value	AOR (95% CI)	<i>p</i> value
Age group	<25	0.670 (0.314-1.428)	0.300	3.172 (1.121-8.971)	0.03
	25-35	0.531 (0.309-0.913)	0.022	1.291 (0.638-2.612)	0.477
	>35		1		1
Monthly income	Below 2000	2.234 (1.330-3.753)	0.002	2.619 (1.212-5.659)	0.014
	Above 2000		1		1
The place where raw materials are purchased	Formal retailers	0.429 (0.241-0.764)	0.004	1.676 (0.759-3.702)	0.201
	Whole store	0.376 (0.179-0.786)	0.009	1.000 (0.364-2.748)	1.000
	Informal market	—	0.999	—	0.999
	Any merchant	0.657 (0.388-1.115)	0.120	1.487 (0.977-5.252)	0.170
	Any dealer		1		1
Time of washing hands	After visiting the toilet	0.195 (0.078-0.487)	0.000	1.121 (0.036-1.407)	0.101
	Before preparing food	0.644 (0.365-1.138)	0.130	0.854 (0.392-1.858)	0.690
	Both		1		1
Methods of serving food	By using fork	1.066 (0.425-2.65)	0.891	1.815 (0.663-5.533)	0.230
	With bare hands	0.068 (0.007-0.668)	0.021	0.109 (0.007-1.86)	0.120
	By using cup or plate	0.545 (0.265-1.122)	0.100	1.852 (0.748-4.584)	0.182
	By using Paper	1.739 (0.830-3.641)	0.142	1.167 (0.9229-7.164)	0.160
	By using plastic		1		1
Product used to sanitize	Chlorine	0.304 (0.05-1.86)	0.198	1.116 (0.947-2.945)	0.300
	Alcohol	0.184 (0.075-0.455)	0.000	—	1.000
	All-purpose cleaner product	0.520 (0.328-0.824)	0.005	—	1.000
	Detergent		1		1
Prepare food while not healthy	Yes	1.81 (1.04-3.15)	0.036	2.074 (1.255-1.912)	0.025
	No		1		1
Way of disposing of wastage	Open area dumping	7.46 (0.93-59.82)	0.058	0.480 (0.340-1.677)	0.233
	Waste bin	3.7 (2.10-6.50)	0.000	—	1.00
	On the street	1.30 (0.73-2.30)	0.371	—	
	Drainage/gutter		1		1
Access to toilet facilities at the site	Yes		1		1
	No	1.64 (1.03-2.61)	0.038	2.837 (1.577-9.677)	0.000

COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; 1: reference category; *p* value: $p \leq 0.05$.

no hand washing facilities might result in poor hygienic practices with increased risk of feco-oral transmission of different microorganisms. Those without access to toilet facilities had more poor hygiene practices.

6. Conclusions

In general, the food hygiene practices of the vendors were poor. These poor hygiene practices have health risks and calls for intervention. Age group less than 25 years of age, monthly income less than 2000 birr, preparing food while sick, and lack of access to toilet facilities were the factors significantly associated with poor food hygiene and safety practices. This indicates that the street food vendors have low knowledge of food safety and practices and there is limited support from the government for clean water supply. This study also has shown that there is little control and regulation on street food vendors.

7. Recommendations

Accordingly, health education and training related to food hygiene and safety practices should be given to street food vendors through health extension workers and mass media to minimize food contamination and foodborne illnesses. Food vendors should have regular stool examinations. Therefore, those who are sick and carrier individuals will be treated to reduce the transmission to the customers. The government should also provide basic infrastructure services like clean water supply, waste disposal facilities, and financial support to increase their capital.

8. Limitations of the Study

Since the study used a cross-sectional design, describing the cause-and-effect relationship between the exposure and the

outcome variables was difficult to assess. Further studies should be conducted by taking food samples and isolating the pathogens. In addition, our study was also limited to Addis Ababa; therefore, other studies should investigate people from other areas of Ethiopia, the microbial profile of the foods, and the type's food items served in the food vending sites.

Abbreviations

ETB:	Ethiopian birr
FMHACA:	Food Medicine Health Administration Control Office
WHO:	World Health Organization
RTE:	Ready-to-eat
FBD:	Foodborne disease
SFV:	Street food vendors.

Data Availability

The data sets used and/or analyzed during the current study are available from the corresponding author without limitation.

Ethical Approval

The Ethical Review Board of the Menelik II Medical and Health Science College, Department of Public Health (MPH), gave its approval for this study. Permission letters were received from the Addis Ababa City Administration Health Bureau as well as the health offices of the selected subcities. All study participants were reassured/informed that their identities would be kept private. The COVID-19 procedure was maintained by supplying personal protective equipment and disinfecting devices. Before performing the interview, the study participants gave their written (signed) consent, and the data were kept private.

Disclosure

The funder had no role in the study design, data collection, analysis, decision to publish, or preparation of the manuscript.

Conflicts of Interest

The authors declare that they have no competing interests.

Authors' Contributions

HN was responsible for the proposal development, supervision during fieldwork, data analysis, and writing the draft of the manuscript. HW was responsible for the supervision during fieldwork and the writing of the draft of this manuscript. YC initiated the idea for this work and title selection, provided the necessary information for the design, guided the design during fieldwork, and contributed during the writing of the draft of the manuscript. All authors read and approved the final document. DJ initiated the idea for this work and title selection, provided the necessary information for the design, guided the design during fieldwork, and contributed during the writing of the draft of the manuscript.

All authors read and approved the final document. All authors contributed equally to this research work.

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