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Food access vs food safety: The case of street food operation around Mexico Square, Addis Ababa, Ethiopia

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ABSTRACT: Street foods are common in in Addis Ababa. The city administration considers the business as informal and illegal. However, street food operation creates significant self-employment opportunities. Moreover, it markedly contributes to the food security of low-income consumers and vendors. The food security status, food safety knowledge and practice of 160 stationary street food vendors were assessed around Mexico Square, Addis Ababa. A detailed site observation was made around vending sites. Household food insecurity experience and food safety KAP of vending households was assessed using close-ended standard questionnaires. Job-specific interviews were made on street food operation with key informants from among woreda officials and consumers. Quantitative data was analyzed using descriptive statistics and opinions of key informants were described. About 72% of the street food vendors were female. Over 90% were adolescents or young adults and 30% had more than three children. About 71% of the vendors were either moderately or severely food insecure. Vendors had good knowledge (81%), moderate attitude (74%) but very poor practice (14%) in food safety. Street food vending was the only source of affordable meals to low-income groups in the study area. Meals were served and consumed immediately after cooking minimizing food safety risks. As street food vending creates economic and physical access to the low-paid urban poor and is a livelihood to poor families, it may be useful to recognize its positive role in mitigating food insecurity. Government control on food safety compliance, allocation of vending zones, and giving training to street food vendors could improve safety of street foods.

Key words/phrases: food security, food safety KAP, Street foods

INTRODUCTION

Street foods are ready-to-eat foods and beverages purchased on the street and prepared at home or on-site by vendors or hawkers in streets or other public places(Sharma, 2016). Street foods provide a convenient diet for many people, especially in developing countries, and approximately 2.5 billion people eat street foods every day (Ma *et al*., 2019). With their ubiquitous presence and their availability round the clock, street food vendors can be an answer to the access problems of the urban poor to food.

Safety concerns about street foods are reported from all over the developing world (Lamin-Boima, 2017; Mukherjee *et al*, 2018; Letuka *et al*., 2019;Hossen *et al*., 2020; Kaptso *et al*., 2021). Similarly there are reports on street foods from several urban centers in Ethiopia such as, among others, Gondar town (Azanaw Amare *et al*., 2019), Hawassa (Mogessie Ashenafi, 1995; Temesgen Eliku *et al*., 2016), Jigjiga city (Tesfaye Wolde *et al*., 2016), Jimma town (Tibeso Gemechu, 2022), towns in West Gojjam zone (Chekol Chalachew *et al*., 2021), Addis Ababa (Temesgeneliku, 2016; Diriba Muleta and Mogessie Ashenafi, 2000), Dire Dawa (Gizaw Tadesse *et al*., 2019), Woldia town (KinduAlem, 2020). All the studies used either microbiological or KAP methods to point out the health risk associated with street food consumption. None of them, however, considered the crucial role played by street foods in the food and nutrition security of the urban poor.

Street food supply inexpensive, attractive, diversified, and convenient foods for consumers (Namugumya and Muyanja, 2012). They are physically and economically accessible to most people and can play an important role in satisfying their basic energy and nutrient needs. Employment opportunities created by street food vending is important in alleviating poverty, the major causative factor of food insecurity (Sharma, 2016). It enables poor household members to develop business skills with low capital investment. Moreover, 74% of countries

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reported street foods to be a significant part of the urban food supply (WHO, 1996).

The aim of this studywas, therefore, to assess the food security status of street food vending households, their knowledge and practice in safe food preparation and the food and nutrition security benefit offered bystreet foods to consumers and vendor households.

METHODS

Description of the Study Area

Mexico Square (9°0'37"N; 38°44'40"E) is a traffic circle in Addis Ababa, Ethiopia, bordering woredas Five and Six of Kirkos sub-city and Woreda Eight of Lideta sub-city. The Addis Ababa Light Rail system has an overpass over Mexico Square.

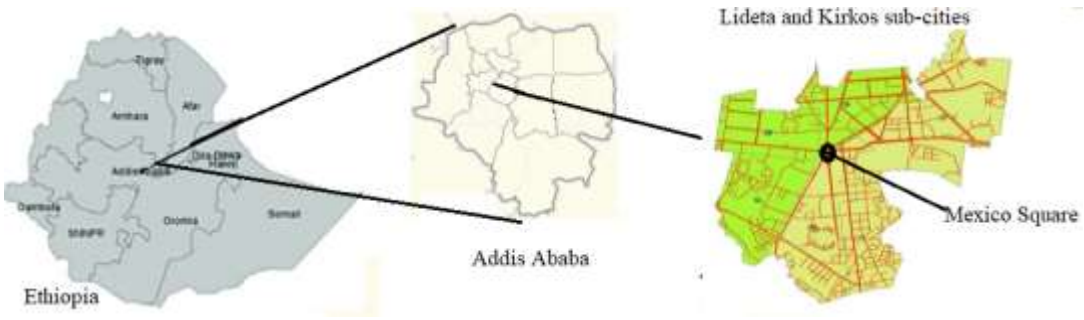

Figure 1. Map of the study area bordering Lideta (green) and Kirkos (yellow) sub-cities.

Study population

This is a cross-sectional study and the population consisted of street food vendors from the three woredas found along the streets within 200-meter radius of Mexico Square.

Sampling and sample size determination

Street food vendors, working in stationary sheds, were selected by simple random sampling. According to the Small and Medium Enterprise Offices of the woredas, there were about 300 street food vending sheds within the radius (personal communication). Sample size was determined according to Yamane (1967) at 95% confidence interval.

$$n = \frac{N}{(1+N(e^2)}$$

n= 300/ (1+300(0.05)2) n =160

To compensate for non-response, 10% of the calculated sample size was added resulting in a total of 176.

Data collection and analysis

Quantitative and qualitative approach was used in the study. Structured questionnaires were used to assess knowledge, attitude and practice (KAP) on food safety (Macías and Glasauer, 2014). Household Food Insecurity experience and food security status were determined using household food insecurity access scale (HFIAS) as in Coates *et al*., (2007). Secondary data was collected from relevant Woreda offices and street food consumers using open-ended questionnaires. Moreover, field observations were made around the study sites.

Total KAP percentage among respondents was calculated as in Macías and Glasauer (2014):

$$\text{Percent of knowledge} = \frac{\text{Sum of correct responses given by all respondents}}{\text{Sum of all responses given by all respondents}} \times 100$$

Total positive attitude among respondents was calculated as

$$\text{Percent of positive attitude} = \frac{\text{Sum of positive responses given by all respondents}}{\text{Sum of all responses given by all respondents}} \times 100$$

Similarly, appropriate practice was calculated as

$$\text{Percent of practice} = \frac{\text{Sum of appropriate responses given by all respondents}}{\text{Sum of all responses given by all respondents}} \times 100$$

Values of food safety KAP of street food vendors were classified as good (>80%), moderate (60%-79%) or poor (<60%), using Bloom's cut-off points for KAP studies as in Zelalem Destaw *et al*. (2021).

In addition, four key informants from among woreda health extension workers, small and micro enterprise (SME) officers and woredaenforcementofficers were interviewed.

Questions were specific and sector-based and focused on street food operation. About 21 other key informants, engaged in other jobs in the study area, were asked to prioritize external factors that could help to improve safety of street food for consumption.

Data were analyzed using STATA for windows version 14.2. Household food insecurity access scale (HFIAS) and food safety KAP were analyzed using descriptive statistics.

Ethical Consideration

The nature and aim of the survey were explained to respondents and verbal consent to participate was obtained. Confidentiality of the information obtained from respondents and anonymity of respondents were maintained. In addition, COVID-19 protocols were followed during interview.

RESULTS AND DISCUSSION

Field observation results

The study area had several taxi stops and bus stations resulting in heavily populated walkways. There were also many ambulatory street vendors of other goods, mainly clothes and shoes. About 85% of street food vendors had stationary sheds, wherein consumers were served with on-site prepared fresh foods. The rest prepared and served breakfast foods on-site in the open (no sheds), but each used the same spot always for food-vending operation.

Sheds were covered with plastic canvas. Street food vendors brought along from home '*injera*' and hot-spiced foundation stews (*qulet* in Amharic) on which different fresh stew types were cooked on-site. Fresh foods were made ready following customer order and included a variety of cultural foods (Table 1). The price of food items ranged from ETB 25 to 30. (USD 1=ETB 50 during study period). The price was about 30% to 50% of that of similar meals in small eating houses. Open air street food vendors usually served only breakfast and worked from 5:00 am to 10:00 am. Those with sheds served meals from 6:00 am to 8:00 pm.

Regular consumers consisted of low-income groups such as street vendors of other goods in the surrounding, shoe-shine boys, taxi station controllers, mini-bus taxi assistants, woreda enforcement officers, daily laborers, road-side solid waste cleaners, and other low-income groups.

Water for cleaning utensils and for hand-washing purposes was brought from home in Jerrycans or buckets. The plastic canvas covers of sheds reduced contamination from suspended dust from the surrounding. Some vendors put on gowns mainly to attract attention of customers by appearing hygienic.

Table 1.Description of common street vended foods in the study area.

#	Food Item	Descriptions
1	*Injera*	A leavened thin flat bread with eyes on its top surface made from teff flour and used to scoop up stews to eat with.
2	Stews	Based on a hot-spiced foundation stew ('*qulet*'), ready-to-eat stews include legume-based stews containing split lentils or powdered faba bean (*shiro*).Vegetable stews are usually mild spiced and prepared from Ethiopian Kale or Swiss Chard. Potato stews are spiced with turmeric. A combo consists of *Injera* and portions of *shiro*, potato and/or vegetable stews. The stews are thoroughly cooked at home and heated up at order immediately before serving.
3	*Sambuusa*	Thin-layered deep-fried bread stuffed with lentil or minced meat
4	Egg	Scrambled egg with bread or *injera*
5	Coffee	Roasted, ground and brewed on-site following the typical Ethiopian coffee ceremony.
6	Pasta spaghetti and Pasta macaroni	Brought cooked from home and mixed with heated vegetable stew on site.
7	*Ertib*	A moderately fried sliced potato with some onion and green paprika added to it.
8	Tomato meals	*Injera* with tomato slices mildly surface-fried on the pan; Raw tomato slices sprinkled with salt and vinegar.

Woreda administrators considered street vending, in general, informal, and illegal with the belief that it blemished the urban look of the city. Street food vendors claimed that they did not feel confident in the business and feared that their sheds might be confiscated or demolished

any time by Woreda enforcement officers. According to some key informants, some woreda officials allocated street food vending sites and, even provided plastic canvas to cover sheds, for those vendors who participated in different woreda-organized political events. When those officials got replaced, new officials ordered confiscation of the sheds on the ground that the operation was informal.

Most of the young street food vendors considered the job not as a long-lasting means of livelihood, but as a steppingstone to another better-paying and dependable job. They, thus, considered food safety protective measures such as sanitizing utensils and wearing protective clothing as superfluous.

Sociodemographic status of respondents.

About 72% of the street food vendors were female, which was similar to the studies of Ackah *et al*. (2011; Tuglo *et al*. (2021) and Letuka *et al*. (2019). Over 90% of our respondents were adolescents or young adults. Most were married (46.9%). About 59% of the vendor households had children, 30% having more than three children (table 1). A higher number of children in a household puts an extra burden on food supply and consumption (Drammeh *et al*. (2019).

Table 1. Socio-economic and demographic status of respondents in the study area.

Variables	Category	Frequency
Sex of respondents	Female	115 (71.9%)
	Male	45 (28.1%)
Age of respondents	15-18 Years	58 (36.3%)
	19-34 Years	92 (57.5%)
	35-49 Years	10 (6.3%)
	Married	75 (46.9%)
Marital status	Unmarried	66 (41.3%)
	Single (Divorced, widowed, or separated)	19 (11.9%)
	None	66 (41.3%)
Number of children	1 to 2	46 (28.8%)
	3 to 4	38 (23.8%)
	5 or more	10 (6.2%)
	Illiterate	5 (3.1%)
Education status	Primary school	99 (61.9%)
	Secondary school	46 (28.8%)
	Diploma and above	10 (6.3%)
	<1 year	96 (60%)
Street food vending experience	1 to 2 Years	35 (21.9%)
	2 to 4 Years	21 (13.1%)
	>4 years	8 (5%)
Training access	Yes	21 (13.1%)
	No	139 (86.9%)
Credit access	Yes	13 (8.1%)
	No	147 (91.9%)
Water access	Yes	158 (98.7%)
	No	2 (1.3%)

The majority (93.8%) had elementary or secondary education and only 3% were illiterate. Similar to the observation of Abid *et al*. (2022), 87% of the street food vendors in our study did not have access to food safety training. However, similar studies elsewhere showed that food safety training had direct effect on food safety knowledge and attitude of street food vendors (Letuka *et al*, 2019; Hossen *et al*, 2020). Only 7.2% of respondents got credit access,in the form of borrowing or gift, from their families and relatives.No institutional support was made available to them to start the business. Most of the street food vendors (60%) were in the business for less than one year, and the proportion dwindled to 5% within four years. This indicated that the business was dominated by beginners, and they gradually left the business after about five years.

Household's food insecurity experience scale (HFIAS)

Based on the household food insecurity experience during the previous 30 days, vendor households were grouped under four experiences. All vendor households, not only worried about whether the food they had would be enough for family consumption, but also

compromised the quality of food they ate by not eating food they preferred to eat, or by eating a limited variety of foods, or by eating foods they did not like to eatup to 10 times (Table 2). Moreover, all compromised the quantity of food they ate by eating smaller meals or fewer meals in a day up to 10 times because there was not enough food for household members. Worse than that, over 28% of the vendor households experienced hunger in different ways because of lack of resources to get food.

Table 2. Food insecurity experiences of vendor households (n=160) during the previous four weeks.

		Frequency		
Household food insecurity experience	Occurrence	Rarely	Some-times	Often
Felt anxiety and uncertainty	160 (100%)	0	160 (100%)	0
Reduced quality of food	160 (100%)	0	160 (100%)	0
Reduced quantity of food	160 (100%)	0	145 (90.6%)	15 (9.4%)
Experienced hunger	46 (28.8%)	0	45 (97.8%)	1 (2.2%)

Rarely (1 or 2 times), sometimes (3 to 10 times), Often (more than 10 times)
Detailed data is found in Appendix 1

Similarly, based on HFIAS, the vendor households were classified into four food insecurity categories. None of the households were food secure, as they, at least, felt anxiety and uncertainty about the sufficiency of available food for the previous month at least sometimes (Table 3). About 30% of the households were considered mildly food insecure because they had to compromise the quality of food they ate. Most (56%) were, however, moderately food insecure and about 15% were severely food insecure because they often had to eat much less than they needed or experienced hunger because of lack of food in the household.

Table 3. Food security status of street food vender households (n=160).

Food security status	Number	Frequency
Food secure	0	0
Mildly food insecure	47	29.1
Moderately food insecure	89	55.5
Severely food insecure	24	15.4

Detailed data is found in Appendix 1

Food safety knowledge of street food vendors

Knowledge in personal hygiene was assessed in terms of hand washing, protective clothing and trimming fingernails short. Respondents had good knowledge (>80%) in the importance of handwashing to food safety (Table 4). Similar good knowledge was also reported from Ghana (Addo-Tham *et al*., 2020), Cameroon (Kaptso *et al*., 2021) and South Africa (Khomotso *et al*., 2020). Although most of our respondents knew that personal hygiene also included covering hair during food handling, knowledge in trimming fingernails short, not touching the hair after handwashing, putting on protective clothing (apron, mask, gloves, and caps) was only moderate (60-80%). Similarly, average knowledge in personal hygiene among our respondents was moderate (79.3%), which was similar to the observation of Tuglo *et al*. (2021) from Ghana.

Table 4. Food Safety Knowledge of Street food vendors in the study area (n=160) Table 4.

Knowledge indicators	No. (%)
Personal hygiene	
Appropriate hand washing and proper cleaning of utensils	149 (91.3%)
Wearing protective clothing	108 (67.5%)
Maintaining short and clean nails	112 (70%)
Average knowledge in personal hygiene	72.3%
Food handling	
Actions to avoid contamination	142 (88.8%)
Average knowledge in general food safety = 80.6%	

Detailed data is available in Appendix 2.

Average knowledge of our respondents in general food safety was good (80.6%). Similar to the reports of Addo-Tham *et al*. (2020) from Ghana, our respondents' knowledge in food handling was generally good (83.9%) (Table 4). However, Letuka *et al*., (2020)from Maseru, Lesotho and Jember Azanaw *et al*. (2022) from Gondar, Ethiopia, reported poor knowledge in food safety among the vendor population in their study. Our respondents' knowledge in avoiding eating and drinking in the workplace, which would cause contamination, was only moderate (63.8%).

Food safety attitude of respondents

Attitude was assessed in terms of applying food safety actions in personal hygiene and food handling (Table 5). Attitude towards maintaining personal hygiene was only slightly moderate (67.9%), although attitude towards times and methods of hand washing was good (>80%). Negative attitude was, however, observed towards wearing protective clothing (38%-58%). Attitude towards keeping nails short and clean and avoiding wearing jewelry during food preparation was poor. However, attitude towards maintaining proper food handling methods to prepare safe food was good (81.4%). In general, total positive attitude of our respondents towards food safety was moderate (75%). In contrast to the findings of our study, attitude of street food vendors elsewhere towards preparing safe food was poor as reported by several workers (Hossen *et al*., 2021; Tuglo *et al*., 2021).

Table 5. Food safety attitude of street food vendors in the study area (n=160).

Attitude Indicators	Positive attitude
Personal hygiene	
Benefit of proper handwashing at appropriate times	134 (83.8%)
Benefits of wearing clean protective clothing	85 (53.1%)
Benefits of keeping finger nails short and clean and removing jewelries during food handling	82 (51.3%)
Average positive attitude in personal hygiene	*62.5%*
Food handling	
Benefit of knowing proper food handling	159 (99.4%)
Benefit of cleaning and sanitizing utensils and equipment	126 (78.8%)
Benefit of avoiding bad practices during food handling	125 (78.1%)
Average positive attitude in food handling	*85.4%*
Average positive attitude towards general food safety = 74%	

Detailed information is given in Appendix 3.

Food safety practice of respondents

Of the 15 different actions that help to maintain the required personal hygiene, our respondents had good practice only in washing hands before preparing food (80%) (Table 6). Appropriate practice in all actions and moments of handwashing and putting on protective clothing during food handling was very poor (2%-44%). Average appropriate practice in personal hygiene was poor (18.7%).

Poor practice in wearing protective clothing and handwashing was also reported by Hossen *et al*. (2021) from Bangladesh and by Kaptso *et al*. (2021) from Cameroon. Practice of cleaning working areas and kitchen utensils with detergents and sanitizing them was noticeably poor (7%). Average appropriate practice in food handling was even worse (10.8%) (Table 6).

Table 6. Food safety practice of street food vendors (n=160).

Practice indicators	No (%)
Personal hygiene	
Practice in appropriate time and method of handwashing	44 (27.5%)
Practice in using protective clothing during food preparation	16 (10%)
Keeping nails short and clean; avoiding wearing jewelries and watch	8 (5%)
Handling food while having diarrhea	50 (31.3%)
Average appropriate practice in personal hygiene	*18.8%*
Food handling	
Appropriate time and method of cleaning and sanitizing utensils and working clothes	18 (11.3%)
Avoiding actions that lead to food contamination	8 (5%)
Average appropriate practice in food handling	*8.1%*
Average appropriate practice in general food safety = 13.5%	

Detailed data is given in Appendix 4

Total food safety practice of our respondents was very poor (14.8%). Poor practice in food safety was also reported by Tuglo *et al*. (2021, Kaptso *et al*.(2021) and Khomotso *et al*., (2020). Similar to the observation of Mukherjee *et al*, (2018) from India, the good knowledge and moderate attitude shown by our respondents was not, unfortunately, translated into practice.

The final critical control point

Although KAP assessments indicated poor practice of vendors in food handling and personal hygiene, street food vendors served meals to consumers immediately after cooking,directly from the frying pan or cooking pot. This action has an important microbiological significance. Although, in many cultures, food is cooked to enhance its flavor, The cooking process also destroys vegetative bacterial cells, toxins, enzymes, and bacterial spores that may spoil food or cause disease. Heating food at 72°C for 15 seconds destroys roughly 99%–99.9% of bacterial cells (Mogessie Ashenafi, 2012). Cooking food at 70˚C for at least 2 min, is also effective in killing antibiotic resistant bacteria (James *et al*., 2021). The cooking temperature of street foods by frying or boiling is much higher than 90˚C. The final heating, at or above the stated temperatures before serving can be considered as a critical control point. Thus, practically, such street foods are safe for consumption if they are served to consumers without further delay. Cooked food should not be kept at ambient temperature because, in case of re-contamination, disease-causing bacteria can multiply in it (FSEH, 2020). According to the recommendations of WHO on food safety (WHO, 2006), to avoid multiplication of bacteria to a dangerous level, cooked foods should not be stored for more than 2 hours at ambient temperature. It is, thus, unlikely to isolate heat sensitive disease-causing bacterial from cooked foods served without delay. Fresh-served cooked or fried foods should be, therefore, safe for consumption. Street food vendors also put a considerable amount of vinegar into uncooked salads, thus, making them free from disease-causing bacteria.

Key informant assessment

Some key informants had to say the following with regards to street food vending operation:

A woreda health extension officer,
"*The sites are not appropriate for food preparation. Because of air-suspended dust, exhaust fumes from passing-by vehicles, open defecation during late evening in the surrounding, street food vending operation should not be allowed in the sites, or street food zones should be allocated and the operation regulated. Street food vendors in open spaces do not have any facility to wash their hands. Those in sheds, at least, use water from jugs to do so*".

Considering the benefits of street food operation for the urban poor, prohibiting the operation may not be the best measure to take. The other alternatives forwarded by the key informant are accommodative choices

A small and micro enterprises officer,
"*Street food vending is a job opportunity and source of income for many of our sisters. The operation is a source of affordable food, mainly for low-income laborers and government employees. Consumers do not care much about the hygienic food handling practices as long as they get food at an affordable price. I believe that it is good if they are given training and the operation is regulated. We attempted to have them organized and get some support from the woreda administration, but, since it is considered an illegal business, no one was willing to listen*".

A Woreda enforcement officers,
"Usually, a woreda administrator permits low-income groups to make sheds, covered with plastic canvas, and use them for any business. Most use it for street food vending. Since we, ourselves, are low paid, we get much of our meals from them. When we are ordered to demolish sheds, we are soft on street food vendors, when compared to sheds for other purposes. They are also more ethical than vendors of other goods. The other vendors are so mobile that they move into streets and hamper the traffic flow. That is why we chase them away. However, when woreda administrators are replaced by new ones, they order a demolishing campaign of all sheds. We inform street food vendors of the intended campaign ahead of time, then we demolish their sheds. Most suffer from psychological pain and from loss of whatever property they lose".

A consumer selling other goods in the area,
"That we get an affordable food is a security for us to live on what we have. We neither have the time nor the capability to eat in a hotel, or to rent a house, buy all required cooking utensils and prepare food at home. We, therefore, eat from close-by vendors with what we earn. Thanks God, nothing bad has happened to us till now".

The population of the city is increasing, possibly due to migration from the rural areas, resulting in limited employment opportunities (FAO, 1995). Street food vending, though considered informal or illegal by woreda officials, is a means of income to food insecure households and a major source of food to the urban poor. Although the contribution of street food vending to the economy of the country is not recognized well, its contribution to food security of vendors and consumers of the urban poor cannot be ignored. Moreover, despite what most KAP studies indicate, the safety of street foods is acceptable if meals are served immediately after cooking. It, thus, may be wise to acknowledge the importance of street food vending to the local economy and the urban poor. Relevant government officials may need to support and monitor the operation.

CONCLUSION AND RECOMMENDATION

Street food vending provides self-employment opportunity to the unemployed youth. It is also a good source of affordable food for the low-paid urban poor. Therefore, government control on food safety compliance, allocation of vending zones, and giving training to street food vendors could improve acceptability of street foods.

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Appendix 1. Food insecurity experiences of vendor households in the study area (n=160) during the previous four weeks.

Food insecurity experiences	Occurrence		Frequency		
	Yes	No	Rarely	Sometimes	Often
1. In the past four weeks, did you worry that your household would not have enough food?	160 (100%)	0	0	160 (100%)	0
2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	160 (100%)	0	0	160 (100%)	0
3. In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	160 (100%)	0	0	160 (100%)	0
4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	160 (100%)	0	0	156 (97.5%)	4 (2.5%)
5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	160 (100%)	0	0	133 (83.1%)	27 (16.9%)
6. In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	160 (100%)	0	0	156 (97.5%)	4 (2.5%)
7. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	123 (76.8%)	37 (23.2%)	0	119 (74.4%)	4 (2.5%)
8. In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	15 (9.4%)	145 80.6%)	0	15 (9.4%)	0
9. In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0	160(100%)	0	0	0

Appendix 2. Food Safety Knowledge of Street food vendors in the study area (n=160).

Knowledge Indicators	No. (%)
Personal Hygiene	
Washing hands regularly before work is one part of personal hygiene.	160 (100%)
Washing hands regularly after work is one part of personal hygiene.	156 (97.5%)
Proper hand Washing using soap reduces risk of food contamination.	158 (98.7%)
Washing hands with only water cannot clean enough.	157 (98.0%
Wearing apron, mask, gloves, and caps is part of personal hygiene.	96 (60.0%)
Wearing gloves regularly while starting work is part of personal hygiene.	90 (56.3%)
Use of gloves reduces the risk of transmitting infection to consumers.	97 (60.6%)
Broken gloves need to be changed with new ones.	106 (66.0%)
Wearing hair cover is one part of personal hygiene.	150 (93.8%)
Workers should avoid touching their hair after washing hands.	115 (71.9%)
Worker cannot have long nails and make coloring it.	112 (70.0%)
Average knowledge in personal hygiene	***79.3%***
Food Handling	
Eating and drinking in the workplace increase the risk of food contamination.	102 (63.8%)
Proper cleaning and handling of instruments reduces the risk of food contamination.	156 (97.5%)
Cleaning equipment after work can reduce cross contamination.	148 (92.5%)
Using hot water to clean equipment still decreases risk of contamination.	146 (91.0%)
Separating dirty zone from clean zone can reduce cross contamination.	150 (93.8%)
Contaminated foods always have some change in color, odor or taste.	160 (100%)
Reuse of oil is dangerous for health	141 (88.0%)
Reheating cooked foods can contribute to food contamination.	141 (88.0%)
Paper/polythene packs are unsafe for food packaging	131 (81.9)
Average knowledge in food handling	***88.5%***
Average knowledge in general food safety = 80.6%	

Appendix 3. Food safety attitude of street food vendors in the study area (n=160).

Attitude Indicators	Positive attitude
Personal hygiene	
Washing hands using soap is good	148 (92.5%)
Washing hand after toilet is good	153 (95.6%)
Washing hands before handling food reduces risk of food poisoning.	146 (91.3%)
Washing hands before touching non-packed foods is good	149 (93.1%)
Washing hands after touching non-packed foods avoids contamination	149 (93.1%)
Washing hands before touching ready foods avoids contamination	128 (80%)
Washing hands before wearing gloves is good	63 (39.4%)
Using apron is important in reducing risk of food contamination.	92 (57.5%)
Cleaning and sanitizing apronsis important	82 (51.3%)
Using mask is important in reducing risk of food contamination.	61 (38.1%)
Masking while sneezing and coughing is important	89 (68.5%)
Using hair cover is important in reducing risk of food contamination.	119 (74.4%)
Using gloves is important in reducing risk of food contamination.	67 (41.9%)
Keeping nails short and clean is good to reduce the risk of food contamination.	89 (55.6%)
Wearing jewelries at working hours is not good	74 (46.3%)
Average positive attitude in personal hygiene	***67.9%***
Food handling	
Food safety knowledge will benefit to personal life.	160 (100%)
Food safety knowledge will benefit to consumers.	158 (98.8%)
Safe food handling is an important part of your job responsibility.	136 (85%)
Using cleaning and sanitizing chemicals for food contact machines	84 (52.5%)
Eating and drinking at working hours	138 (86.3%)
Smoking at workplace should be avoided	147 (91.9 %)
Paper/polythene packs are unsafe for food packaging	90 (56.2%)
Average positive attitude towards food handling	***81.5%***
Average positive attitude towards general food safety = 74.7%	

Appendix 4. Food safety practice of street food vendors *(n=160).*

Practice Indicators	No (%)
Personal Hygiene	
Using soaps/detergents to wash hands.	70 (43.8%)
Washing hands before preparing food.	131 (81.9%)
Washing hands before touching unwrapped raw foods.	14 (8.8%)
Washing hands after touching unwrapped raw foods.	12 (7.5%)
Washing hands after touching prepared foods.	6 (3.8%)
Washing hands after going to toilet.	70 (43.8%)
Washing hands before using gloves.	3 (1.9%)
Using apron at work daily.	35 (21.9%)
Using mask at work daily.	8 (5%)
Using cap at work daily.	16 (10%)
Using gloves at work daily.	14 (8.8%)
Using a tissue/cloth when coughing or sneezing.	5 (3.1%)
Using jewelries and wearing watch while working.	9 (5.6%)
Keeping nails short and clean	7 (4.4%)
Handling foods at work while having diarrhea.	50 (31.2%)
Average appropriate practice in personal hygiene	***18.7%***
Food handling	
Cleaning the work area before starting work.	65 (40.7%)
Washing and sanitizing the working clothes.	11 (6.9%)
Washing and sanitizing the knife after chopping raw chicken or meat or other raw food.	11 (6.9%)
Using detergent to clean equipment.	11 (6.9%)
Eating or drinking in the workplace.	5 (3.1%)
Rubbing hands on face, hair, etc. while working.	7 (4.8%)
Average appropriate practice in food handling	***10.8%***
Average appropriate practice ingeneral foodsafety = 14.8%	