

## Survey

# Food Hygienic Practices and Safety Measures among Street Food Vendors in Zanzibar Urban District

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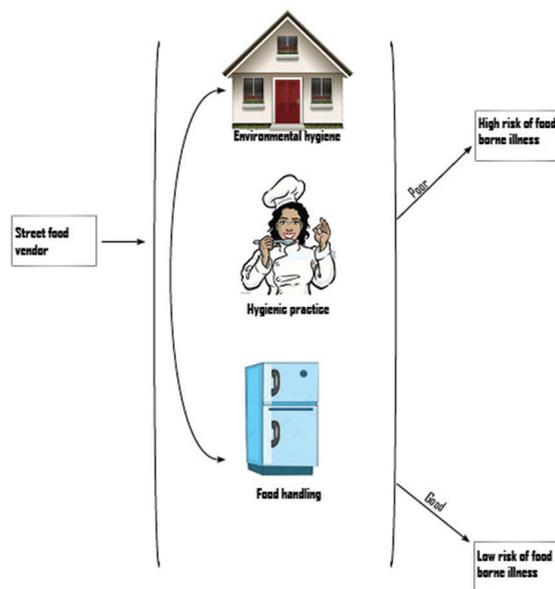
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## ABSTRACT

The purpose of this descriptive cross-sectional survey study was to assess the hygiene and safety precautions implemented by street food vendors in the Urban district of Zanzibar. The study involved 265 food vendors with immobile food vending sites. An organized researcher-executed questionnaire developed based on World Health Organization essential requirement for the safety of street-vended foods was used in data collection and complemented with observation. Data on environmental hygiene of the surveyed vending sites indicated that <50% of the sites had both washbasin and soap in place and only 50.2% and 42.6% vending sites had waste bin and/or refuse sites respectively. Adherence to safe food handling practices were reflected in adequate protection of food from flies and dust (40.8%), cold storage of food (28.3%), saving food hot or reheating before sale (35.1%), dishing out food with spoon/ladle (53%) and food covering (57.4%). Hygienic and sanitary practices among food vendors demonstrated the following levels of adherence: washing hands with soap after toilet use (always 33.2%, sometimes 46.8%), washing hands with soap prior to preparing food (always 63%, sometimes 34%), keeping clean fingernail (98.5%), protection of hair (33.6%) and use of apron (29%). The results indicate poor environmental sanitation and waste handling practices, moderate adherence to food handling practices, safety measures and hygiene. Based on the results it is suggested that food safety and hygiene training should be a prior condition for starting a food-vending venture and be complemented with regular monitoring.

## GRAPHICAL ABSTRACT



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## 1. INTRODUCTION

Food safety problems in the Africa continent (to which Tanzania belongs) are generally centered on foodborne diseases that are associated with poor hygiene [1] and are connected largely with eating of contaminated food and water. Foodborne disease is a significant public health problem and the costs of which includes medical care costs, inferior quality of life (comprising of lowered labour productivity) and decreased life expectancy [2]. Prior studies [2] indicate that it is uncommon for foodborne outbreaks to occur in well-established hotels and restaurants; most frequently their occurrence are the outcome of the eating of cheap street-vended foods, prepared with reduced care to sufficient food hygiene measures. Other similar views [1] indicate that food safety is still a key worry with street vended foods. They associated street foods poor safety with preparation and selling under insanitary conditions, with inadequate access to potable water, sanitary or waste disposal services [1]. It is indicated that, reducing the risk of foodborne diseases depends not only on the upkeep of sufficient food hygiene practice by food professionals, but also on the conduct of customers/food handlers when procuring food, and their attitude to food safety and hygiene in the course of food preparation [2].

World Health Organization [3] estimations of the global yearly load of foodborne diseases is 600 million cases of foodborne diseases and 420,000 deaths. Africa and Southeast Asia reveal the uppermost occurrence and death rates related to foodborne illness [3]. Up to 70% of estimated cases of diarrheal disease in developing countries are associated with ingestion of unwholesome food [4,5]. In sub-Saharan Africa, foodborne disease outbreaks are associated with inadequate individual hygiene of street food vendors and food handlers in food settings [6]. Street-vended foods might cause major civic health problems due to absence of basic facilities and services, such as safe water provisions, their short duration nature, and insufficient knowledge of basic food safety protections [1]. Earlier researchers [7] showed that the majority schoolchildren considered street vended foods to be unsafe to eat, which they associated with unhygienic preparation environment and keeping it uncovered. On the other hand, Marras [8] associated the contamination of street food in Dar es Salaam with various causes, mostly poor food handling, contaminated water and insanitary environment.

Earlier studies [9] indicated that in 2012–2014 yearly cases of food poisoning in Zanzibar were 590, 479 and 333 separately. Recent research data [10] related the occurrence of Shigellosis among the under-5 children in Zanzibar with the ingestion of street vended foods. This implies the importance of street vended foods safety to the wellbeing of consumers and the responsibility of food handlers in ensuring safety; however, there is limited information on the hygienic situation of street food vending sites and vendors compliance to food safety measures. It is therefore hardly possible to establish the truth about the prevalence of food poisoning in the Isles in relation to street food vending practices. This can however be well evaluated by having concrete information on the vendors' hygiene practices, food handling practices and sanitary and hygiene of the food vending premises, nonetheless, the sector has acquired tiny attention. Even though prior researches [11] have indicated major food safety concerns with street vended foods, it is nevertheless worth appreciating the impartial examination of the state of affairs based on the obtainable evidence. This study was thus designed to determine the hygienic practices and safety precautions of street food vendors in the Urban district of Zanzibar. The findings of the

current study could assist policy creators and food safety agencies in planning, designing and carrying out appropriate food hygiene and safety interventions to safeguard the public.

## 2. MATERIALS AND METHODS

### 2.1. The Design of the Study

A descriptive cross-sectional survey study design, which employed structured questionnaire, was adopted in the present study.

### 2.2. Study Area Description

This study was undertaken in Zanzibar specifically in the Urban district in the West urban region. The district consists of 55 shehia or villages accommodating 852 street food vendors in total [12,13]. Its selection was due to its high and prominence in commercial activities thus attracting the majority food vendors.

### 2.3. Target Population Sample Size

The source population constituted of street food vendors was the base for determining the sample size. The published tables described formerly [14] was used in determining the sample size. The guiding criteria in sample size ( $n$ ) determination was the total number of street vendors' in the area ( $N = 852$ ) and the level of confidence (95%). On this base, the sample size was determined to be 265.

### 2.4. Criteria for Inclusion and Exclusion

Street food vendors included in the study were only those with static food vending places (since they can easily be located and are mostly licensed.) and have operated for at least 6 months as described by Okojie and Isah [15] and Adane et al. [5].

### 2.5. Selection of Shehia and Vending Units

The selection of Shehia was done at random; out of 55 Shehia of the Urban district of Zanzibar, five Shehia were selected including Muembeladu, Malindi, Forodhani, Mikunguni and Darajani. A random selection of 53 street food vendors from each Shehia was similarly conducted, which involved a walk-through survey described by Okojie and Isah [15] based on the sampling frame obtained from the local authority. From the five Shehia 265 vending units were selected in total.

### 2.6. Collection of Research Data

Data collection was achieved by means of an earliest tried structured researcher-supervised questionnaire. The questionnaire and checklist for observation revised from previous studies [15] were initially made in English and then interpreted into Kiswahili. Kiswahili is the countrywide language and means of communication. Pretesting of the data collection tool was achieved by using

street food vendors operating in Shehia other than those, which took part in this study. Twenty street food vendors were involved to test for appropriateness, relevance and vagueness of the questions in the questionnaire. In view of the trial result, some minor amendments were implemented in the questionnaire. In the course of data collection, two pre-trained health officers who are diploma holders assisted the researcher.

### 2.7. Analysis of Data

The analysis of data analysis was achieved using IBM SPSS Software version 20.0 statistical package (Armonk, NY, USA). Data were analyzed and summarized specifically by using descriptive statistics.

## 3. RESEARCH RESULTS

### 3.1. Demographic Information of Street Food Vendors

The demographic information (Table 1) indicates the dominance of female food street vendors (67.5%), vendors aged 18–35 years and prevalent of primary and secondary school educational graduates (making up 42.6% and 42.3% respectively). The job experience documented for the numerous food vendors (59.2%) was <5 years and about 15% have been engaged for between 11–15 and over 15 years.

### 3.2. Environmental Hygiene of Street Food Vending Places

The findings on environmental hygiene of food vending sites (Table 2) indicate that only two environmental hygienic indicators (availability of waste bin and absence of rats and/or cockroaches) were complied by half or more than half of the vendors respectively. The compliance of vendors with the other indicators (clean environment at vending sites, presence of refuse site, hand washbasin and soap) was below 50%.

Table 1 | Demographic Information of street food vendors

Parameters	Answer choices	Occurrence (n = 265)	Proportion (%)
Gender	Male	86	32.5
	Female	176	67.5
Age (Years)	18–25	90	34.0
	26–35	94	35.5
	36–45	51	19.2
	46–55	30	11.3
Educational attainments	None	34	12.8
	Primary	113	42.6
	Secondary	112	42.3
	Vocational college	4	15.0
Duration of selling food (Years)	University	2	0.8
	<5	157	59.2
	5–10	69	26.0
	11–15	20	7.5
	Over 15	19	7.2

Table 2 | Environmental hygiene of food vending sites

Question item	Answer choices	Occurrence (n = 265)	Proportion (%)
Clean environment	Yes	96	36.3*
Waste bin available	Yes	133	50.2*
Refuse site available	Yes	113	42.6*
Wash basin available	Yes	146	44.9*
Soap and water present	Yes	125	47.2*
Presence of rats or cockroaches	Yes	62	23.4

Indicators with asterisk (\*) were self-reported and also observed. Clean environment in the present context refers to the healthy state of the physical environment that can make the vending premise conducive, safe for food preparation and attractive to the consumer (e.g. well ventilated, no visible filth, availability of water and soap, toilet, proper handling of wastes, no infestation with pests). Waste bin refers to a container for waste whereas refuse site refers to an underground waste disposal site.

### 3.3. Food Handling Practices by Street Food Vendors

The findings on food handling practices amongst street food vendors (Table 3) indicate that food covering was moderately adhered to (57.4%) however, protection of food from flies and dust as well as serving food hot/reheating were not observed by many food vendors, 60% and 64.9% respectively. Over half of the street food vendors (53.2%) did the dishing out of food using spoon/ladle with a substantial fraction of them however using bare hands (46.4%). The most common method for storing food was that of using plastic containers (37.7%) whereas only less than one-third (28.3%) refrigerated the food. Alternative storage practices involved keeping food in open areas (18.1%) as well as in cupboards and plastic containers, each of which being applied by 7.9% of the street food vendors.

### 3.4. Hygiene and Sanitary Practices of Street Food Vendors

The findings on hygiene and sanitary practices of street food vendors are summarized in Table 4. The indicators of good hygiene and sanitary practices which were recorded among the majority vendors (63–97%) included keeping finger nails short and clean, lack of hand cuts, regular hand washing with soap prior to preparing food, washing utensils in warm/cold water with soap and tap water supply source. On the other hand, poor hygiene and sanitary practices recorded among the majority vendors (59–70.9%) were presence of food debris on their hands, unprotected hair, lack of apron and irregular or non-handwashing with soap after toilet visit.

## 4. DISCUSSION OF THE RESULTS

### 4.1. Demographic Information of Street Food Vendors

Street food vending has a great commercial effect in several nations and is among the main providers of employment [16]. The findings of the present study indicates great domination of women in this venture, which agrees with the findings of previous studies [17–20], however, they also contradict other prior findings [21,22].

**Table 3** | Food handling practices by street food vendors

Question item/parameter	Answer choices	Occurrence ( <i>n</i> = 265)	Proportion (%)
Food in enclosed/covered container	Yes	152	57.4*
Food in unenclosed/uncovered container	Yes	117	44.2*
Adequate protection of food from flies and dust	Yes	108	40.8*
Food saved hot/reheated before sale	Yes	93	35.1
Method for dishing out food	Spoon/ladle	141	53*
	Bare hand	125	47
Method used to store and contain left over foods	Refrigerator	75	28.3*
	Cupboard	21	7.9
	Plastic containers	100	37.7
	Polyethylene bags	21	7.9
	Open place	48	18.1

Indicators with asterisk (\*) were self-reported and also observed. Covering refers to the use of the lid to cover the top of the food container, whereas adequate protection takes into account the hygienic situation of the working environment as well.

**Table 4** | Hygiene and sanitary practices of street food vendors

Question item/parameter	Answer choices	Occurrence ( <i>n</i> = 265)	Proportion (%)
Wash hands with soap before prepare food	Always	167	63
	Sometimes	90	34
	Not at all	8	3
Wash hands with soap after toilet visit	Always	88	33.2
	Sometimes	124	46.8
	Not at all	53	20
Presence of food debris on vendors' hands	Yes	157	59*
Vendor had long nails	Yes	7	2.6
Finger nails	Clean	261	98.5
Vendor had hair covering/protection	Yes	89	33.6*
Vendor had cut on the hand	Yes	8	3
Vendor wore apron	Yes	77	29.1*
Methods of washing utensils used by street food vendors	Washed in warm soapy water	60	22.6
	Washed in cold soapy water	59	22.2
	Washed in cold water	20	7.5
	Clean water used with soap	111	41.8
	Clean water without soap	15	5.7
	Water with dirty appearance	0	0
Water supply at vending sites	Tap	210	79.2
	Borehole	8	3
	Water vendor	47	17.7
	Protected well	0	0
	Unprotected well	0	0

Indicators with asterisk (\*) were self-reported and also observed.

This could be linked with their traditional involvement in cooking and childcare in many developing nations. Additionally, their narrow progression in scholastic career lowers their employability in formal sectors. According to Lues et al. [23] street foods retailing is a widespread venture for generating income typically amongst uneducated persons, mostly females. The prevalent work force are persons aged 18–35 years, which advocates the greater participation of energetic age groups possibly due to the employment's great energy demands. This age group (18–35 years) intersects well with the age ranges described by former researchers [18–20,22,24]. Vendors' learning achievements predominant in the current study specified a comparable pattern as that stated by former researchers [15,21,22] however with a trivial dissimilarity from that described by Monney et al. [24]. The findings showed that senior and junior secondary school graduates were the main clusters but vocational and primary schools graduates were minimally involved. A study conducted in Brazil [21] reported that of all the street food vendors only 4.7% were university graduates which is however a little higher

than stated in the current study (1.5%). The less participation of university graduates might be due to their higher employability in formal sectors. The job experience documented for many street food vendors (59.2%) in this study (of <5 years) equates well with that stated by former researchers [24], that is, 51.2%. This observation may well be related with either the latest multiplication of street food vending trade (prompting their internal relocation) or poor on job retention schemes or great attraction of other commercial segments.

## 4.2. Environmental Hygiene of Food Vending Sites

Environmental hygiene of food vending unit is key to ensuring food safety during food preparation, serving and even storage. In the present study, good environmental hygiene was maintained by as low as 36% of the vending units compared to 90.5% reported in

earlier studies [15]. Amaami et al. [18] on the other hand reported low capability of the food vendors to sustain a hygienic food preparation zone. The findings of the present study indicated merely 50.2% and 42.6% of the vending units had waste bins and refuse sites in place correspondingly. Although the possession of waste bins in the current study was much better than reported earlier [15], (i.e. 43.4%) it is still suggesting poor food waste handling by a substantial fraction of street food vendors in the area. The poor cleanliness documented among the majority food-vending units (63.7%) and nonexistence of waste bin and or refuse sites among a substantial fraction of vending units (49.8% and 57.4% respectively) (Table 2) further reflects those inadequacies. Nonetheless, the current findings indicate better adherence than reported by other researchers [17] who documented just 17.5% of the vendors had a waste disposal facility, whereas others used the neighboring waste disposal facility or municipal bins or left it behind, wrapped. Earlier researchers [15] reported that flies are mechanical vectors, which can disseminate infectious agents to food and water for human ingestion, initiating probable food-borne illnesses like dysentery, typhoid and cholera. The infestation of some vending sites (23.4%) with rats and/or cockroaches in the present study is reflective of the potential foodborne illness. The availability of hand washbasin and soap to merely 44.9% and 47% vending units correspondingly proposes uneven and inappropriate hand washing behaviour.

#### 4.3. Food Handling Practices by Street Food Vendors

Insanitary and unsuitable food handling practices is among the causes of food contamination. The results of food handling practices among street food vendors (Table 3) indicate some inadequacies in food handling which could predispose it to contamination. A significant fraction of food vendors (42.6%) did not keep food in covered containers suggesting great possibility of its contamination. Furthermore, only two-fifth of the food vendors (40.8%) provided acceptable protection of food from flies and dust. Non-covered food containers could predisposes prepared foods to such contaminants like dust, which may carry pathogenic microbes. Previous researchers [25,26] reported similar observation among street food vendors. FAO [27] recommends preparation of foods in areas designated entirely for the purpose and its cleanliness maintained at all times including keeping a desirable distance from any source of contamination such as wastewater, dust, rubbish and animals). It is desired that the vending units are designed and constructed in a manner that permits easy cleaning and maintenance. The results also show that less than one-third (28.3%) of street food vendors refrigerated prepared food, which suggest that prepared food was commonly kept in the temperature danger zone which makes it prone to microbial contamination and hence prevalence of foodborne illness among consumers. The recommended temperature for prepared food is at least 60°C [23] if kept for more than 4–5 h, however, street food vendors spend over 8 h in vending business. Holding food at temperatures <5°C or beyond 60°C slows or stops microbial proliferation significantly [18]. Serving food cold or without reheating was a common practice among the majority vendors (64.9%) as well as dishing out with bare hands (46.4%). The results generally show poor food handling practices and insanitary behaviour. Earlier studies [24] observed food remnants on the

hands among 65% street food vendors, suggesting possible hand contact with food during serving. Food handlers demonstrating poor personal hygiene are potential sources of food contamination.

#### 4.4. Hygiene and Sanitary Practices of Street Food Vendors

Individual hygiene and sanitary practices is an additional vital part in safeguarding food safety and quality. The results (Table 4) indicate that poor hygiene and sanitary practices recorded among the majority street food vendors (59–70.9%) included presence of food remains on their hands, unprotected hair, lack of apron and irregular or non-handwashing with soap after toilet visit. Infrequent observance and disobedience at all to proper hand washing indicates the risks customers' are subjected to such as acquiring foodborne diseases since hands are susceptible to contamination and hence infection. Hand washing without the use of soap implies poor elimination of dirt, which could promote microbial proliferation. Cortese et al. [21] observed that one-third of the street food vendors were not washing hands at all and others (about quarter of them) washed hands without using soap. The occurrence food remnants on the hands of a fraction of street food vendors could additionally denote poor and risky food handling behavior. Okojie and Isah [15] documented that some undesirable food handling behaviors are deeply rooted in traditions and customs as such they require messages aimed at altering such beliefs. This could possibly assist illuminating light on the hygienic and unhygienic practices experienced among food vendors in Zanzibar, which cannot be disconnected from their traditions and customs, as is the case elsewhere. However, results reported in an earlier publication [13] show that formal training on food hygiene and food safety plays a great role in guaranteeing compliance to food safety and hygiene values. Money handling (personal observation) between foods serving service without washing hands witnessed in the present study is a likely source of cross-contamination. Cortese et al. [21] made similar observation, which indicated that 95% of street food vendors did not wash hands amid food and cash dealings and restroom breaks. The engagement of a designated individual for all financial dealings, could address the problem though there is a cost implication. The results further indicate that the majority street food vendors' had no hair covering, which suggests the likelihood of food contamination since hair can be a cause of contamination, which can either be physical and biological. According to Lues et al. [23] hair has the potential to harbor *Staphylococcus aureus*, it is therefore critical to prevent free hair and white dead skin flakes (dandruff) from scalp from falling onto the food or food preparation zones. A small number of vendors (3%) had cuts on hands, which has potential for food contamination; hence, cut protection is important to avoid associated health risks. However, apart from those shortcomings good hygiene and sanitary practices were also recorded among the majority vendors (63–97%) such as lack of hand cuts, regular hand washing with soap prior to preparing food, washing utensils with water in warm/cold water with soap, presence of tap water supply sources and keeping finger nails short and clean. Lengthy finger nails are unwanted since can act as an excellent trap of filthy and pathogens and therefore make food susceptible to contamination.

## 4.5. Limitation of the Study

The limitations of this study is that the study sample was confined to the food vendors without engaging the consumers who would have shared their experience of the safety perception of the vended food and any foodborne illness related complications. Furthermore, quantitative evaluation of food safety based on microbial analysis should have further enriched the current study. The results from microbial analysis should have supplemented the self-reported food safety and hygiene practices, which might pose some challenges to objective evaluation due to associated self-reported biasness.

## 5. CONCLUSION

Results of this study underlined key food safety and hygiene issues that may escalate the possibility of foodborne illness emanating from several of these vending sites. It was established that vending sites are poorly maintained and vendors' exercises moderate adherence to both food safety measures and hygienic practices. The greatest risk being food exposure to temperature danger zone, dishing out food with bare hands and low compliance with regulations requiring soap and water for hand washing in restaurants by a significant fraction of surveyed vendors after toilet visit. It is thus suggested that basic training on food safety and hygienic practices should be a prior condition to entering a street food vending venture and consistent inspection and monitoring be done to ensure the translation of the acquired basic food safety and hygiene knowledge into appropriate and safe food codes practices. Furthermore, the results could imply that policy makers and regulatory bodies should possibly think about developing a framework policy or regulations at national or local level explicitly meant for regulating street food vending due to its predominance in engaging a huge fraction of self-employed individual population members. This could help to maintain the benefits of street vended food while guaranteeing the safety of the vended food.

## CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

## AUTHORS' CONTRIBUTION

JKH was the chief researcher (study design, data collection, data analysis, interpretation, write up and critical review). LWTF took part in the design of the study, interpretation, write up and critical review of the manuscript. All authors ratified the final version submitted for publication.

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