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Street food handlers' food safety knowledge, attitudes and self-reported practices and consumers' perceptions about street food vending in Maseru, Lesotho

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Abstract

Purpose – Food safety knowledge and hygienic practices by food handlers play an important role in the prevention of contamination of food prepared.

Design/methodology/approach – This descriptive survey was conducted in Maseru around the taxi ranks amongst 48 food handlers and 93 consumers using a semi-structured questionnaire for assessing food handler knowledge, attitudes and practices, open-ended questionnaire for obtaining consumer perceptions and observation checklist.

Findings – Majority of the food handlers were females (60%) and males constituted only (40%). The mean age was 35.5 ± 10.3 and 28.2 ± 9.9 respectively for street vendors and consumers. There was a statistically significant difference in knowledge among the trained and untrained vendors ($p = 0040$). On average the vendor population that participated in this study was considered to have poor knowledge (scores < 50%) of food safety since they scored 49% ± 11, while 84% of the respondents were considered to have positive attitudes towards food safety. Only 6% of the consumers reported that they never buy street vended foods mainly due to the hygiene issues. The observation checklist showed that the vendors operated under unhygienic conditions and that there was scarcity of clean water supply and hand washing facilities.

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Ethical Review: This study was approved by the Institutional Review Board of Central University of Technology as well as the Ministry of Health Lesotho.

Informed Consent: Written informed consent was obtained from all study participants.

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Originality/value – This study provides knowledge that was previously unknown about food vending in Lesotho. It has significantly added to the body of knowledge on food safety in Lesotho which can be used to modify policies and structure food safety training for people involved in the informal trade.

Keywords Street vendors, Consumers, Food safety, Knowledge, Attitudes, Practices, Lesotho, Hygiene, Contamination, Foodborne disease, Food security, Nutrition

Paper type Research paper

Introduction

Street vended foods can be described as food and beverages prepared and sold in and around public areas in non-permanent structures. Such food normally costs less than foods sold in restaurants (Hill *et al.*, 2019). Street food consumption is common in most countries, including Lesotho, and selling such food provides a livelihood for most individuals who would otherwise be unemployed (Sanlier *et al.*, 2018). Moreover, street vended food contributes significantly to the diet of many people in developing countries (Hill *et al.*, 2019) although it has been associated with unhygienic practices and foodborne illnesses.

Serious concerns about the safety of street foods have been escalating because most vendors are poor, uneducated and have little or no regard for food safety (Samapundo *et al.*, 2015). These concerns have been confirmed as studies have shown that street foods may transmit pathogenic microorganisms that inevitably lead to foodborne diseases outbreaks (Imathiu, 2017). Such contamination often arises from poor decontamination and/or sanitation, poor cooking methods, direct and indirect contamination of cooked foods by raw foods, and contamination of cooked or raw foods by hands and surfaces contaminated by other sources such as human or animal faeces (Alimi, 2016). Some of the foods sold in the streets – such as salads and fruits – are eaten raw, and run the risk of being contaminated preharvest by manure, irrigation water or postharvest by water used for rinsing and sprinkling them to retain their freshness (Sabbithi *et al.*, 2014; Jung *et al.*, 2014). It is therefore in this regard that consumers are becoming increasingly concerned regarding food related risks associated with street vended foods. Preharvest contamination is of course not effected by the food preparation knowledge or practices of the vendors, whether good or bad, but vendor practices such as poor temperature control, overlong storage and the use of in appropriate types of packaging can facilitate pathogen growth (Alegre *et al.*, 2010).

Akabanda *et al.* (2017) highlighted that many foodborne diseases and outbreaks have been attributed to infected food handlers and their unhygienic food handling practices. Food handlers are thus pivotal in the control of food poisoning incidences, but this control will only occur is they possess high levels of food safety knowledge, a positive attitude towards food hygiene and hygienic food preparation and storage practices (Yusof *et al.*, 2018). Elaborating on knowledge about food handling specifically, Nee and Sani (2011) state that good levels of food safety knowledge by food handlers is a necessity, and that putting such knowledge effectively into practice is invaluable in ensuring safe food production in any food establishment. Additionally, knowledge is explained by the cognitive-consistency theory, various learning and functional theories, and social judgement theories as being associated with what one knows, feels and implements (Olufemi, 2012), whereas Jain (2014) and Olufemi (2012) argue that attitude involves evaluations that are associated with the way people think, feel and behave regarding any given phenomenon.

To mitigate the problem of foodborne disease outbreaks, the government of Lesotho requires that food handlers be screened for venereal and any communicable diseases before they can work on food premises (Government of Lesotho, 1970, 1973). The regulations further stipulate that no person shall be allowed to work with food that is consumed by the public if he/she is infected with a venereal or any communicable diseases. If any such person is found to be knowingly working while ill, he/she will be liable for a fine or imprisonment, or both.

With the rapid growth of street food vending, risks of foodborne outbreaks are also heightened (Khairuzzaman *et al.*,2014). Thi *et al.* (2021) argue that foodborne outbreaks are often under reported in many countries. Marutha and Chelule (2020) reported that 89% of the vendors in Polokwane city in South Africa had no prior formal training on food preparation. A similar report was issued by Htway *et al.* (2020), who found that 81% of the vendors under study had never attended any form of food safety training. A recent study postulated that the prevalence of Shigellosis in children under the age of 5 in Unguja Island, Zanzibar, was attributed to the consumption of street vended food (Marras, 2018). Poor handling practices, such as dishing out food with bare hands, were reported by Hassan and Fweja (2020), who found that a substantial proportion of street vendors (46.4%) attested to handling food in this manner. According to Lamin-Boima (2017), only 47% of the vendors who took part in their study agreed that they check freshness and the expiry date of ingredients before purchasing them. Moreover, only 6.6% of respondents in another study knew that ingredients such as spices and colourings are potential food contaminants (Okojie and Isah, 2019).

Factors other than food handler hands, such as the equipment and utensils used in food preparation, can directly contaminate food if not adequately cleaned. For instance, Mwove *et al.* (2020) found that out of the 345 vendors surveyed in the Kiambu County, only 54.5% used soap and water when cleaning equipment and utensils. Many findings in the same vein suggest that it is imperative that food handlers undergo food safety training to enhance their knowledge of food safety and best food handling practices (Adesokan *et al.*, 2015; Husain *et al.*, 2016).

Although food handlers in Lesotho are legally required to undergo medical examination, this unfortunately does not imply improvement in their food safety knowledge, attitudes and practices. Therefore, the aim of the study on which this paper is based was to assess the state of food safety and security of street vended foods *n* the city of Maseru and to determine to what extent street food safety was impacted by the knowledge, attitudes and practices of food handlers. At the same time, the daily activities of the food vendors were observed while a large number of consumers' perceptions regarding the street food trade were also elicited.

Materials and methods

Study area

The study was conducted in Maseru, which is the capital city of Lesotho. Potential respondents were randomly approached near and at taxi ranks and other public areas that were populated with street food vendors.

Sampling population

This survey involved 58 ($n = 58$) street food vendors and 93 ($n = 93$) pedestrians who were deemed consumers or potential consumers of street vended foods.

Study design

The study was conducted as a cross-sectional descriptive survey that involved the distribution and on-site completion of questionnaires. The latter were administered by the researcher to both the food handler and consumer respondents. An observation checklist was concurrently completed to determine the nature of the infrastructure where street food was sold as well as the hygiene aspects thereof.

Sampling method

A random sample was used in this study for both street food handlers and consumers. Inclusion criteria were that participants had to be 18 years or older and voluntarily give consent to participate.

Data collection

The questionnaire was slightly adapted from one that has been used in previous studies (Thanh, 2015; Akabanda *et al.*, 2017). The questionnaire was designed to analyse the four constructs: food safety knowledge, food safety attitudes, self-reported practices and demographic characteristics of the street food handlers. The demographics section of the questionnaire included age, gender, education level and food safety training. The food safety knowledge section assessed food handlers' knowledge on food pathogens, good hygiene and food handling practices, high risk groups and foodborne illnesses. This section comprises 18 questions with the option of three possible answers: "Yes", "No" and "Don't know". Each correct response was awarded one point while zero was awarded for an incorrect or "Don't know" response. Food handlers with any score below 50% were considered to have poor knowledge of food safety, whilst those who scored between 50 and 75% were considered to have average knowledge. Those with scores above 75% were considered to have good food safety knowledge. The same scoring strategy was applied for the food safety attitudes part of the questionnaire which consisted of 16 questions.

With regards to the self-reported food safety practice section, 11 questions were asked regarding food handlers' behaviour with options of "yes" and "no" being possible answers. In this section points were awarded on a basis of whether the food handler's actions were correct or not. Additionally, one point was allocated for good practice and zero point was allocated for bad practice.

Consumer questionnaire

A different questionnaire was administered to assess the perceptions and experiences of consumers regarding street vended foods. Participants included high school and university students, taxi drivers, people who worked and lived around the street food vending areas such as police officers.

Observation checklist

The checklist that was used in this study was adapted from those used in previous studies (Ifeadike *et al.*, 2014; Thanh, 2015). It was divided into sections that focused on five important aspects: (1) the facilities, (2) environment around the stall, (3) personal hygiene, (4) food storage and (5) cooking utensils.

Data analysis

Data were captured electronically by the researcher using Microsoft Excel. Further analysis were done by a statistician using SAS Version 9.2. Descriptive statistics namely, frequencies and percentages were calculated for categorical data and means and standard deviations or medians, and percentiles were calculated for numerical data. Correlation analysis was used to investigate the relationship between variables while analytical statistics, namely the Shapiro–Wilk Test was used to test for normality. The independent *t*-test was used to compare means of food safety training among food handlers in order to determine if an association existed between food safety training and food safety knowledge. In order to establish whether an association existed between food safety knowledge and education levels of food handlers, the mean differences among education levels were tested using ANOVA. The Mann–Whitney *U* test was used to compare median differences between genders in order to determine an association between attitudes and gender, while the Kruskal–Wallis test was used to test for median differences between food safety training in order to determine if an association existed between food safety training and food handler attitudes. A significance level (α) of 0.05 was used.

Ethical consideration

Ethical clearance was obtained from the Ministry of Health in Lesotho (id 97-2017) and the Central University of Technology. Informed consent was obtained from all the participants.

Results

Demographic characteristics

Majority of the street vendor participants were female ($n = 35$, 60%), and males constituted only ($n = 23$, 40%). The mean age of all the street vendors *s* who agreed to give their age ($n = 55$) was (36 ± 10). Some food handlers ($n = 3$) were unwilling to provide their age and the information was recorded as such. Less than half of the food handlers ($n = 23$, 40%) had food safety training while the majority ($n = 35$, 60%) had received no such training at all. Additionally, 67% ($n = 39$) had a high school education, while 24% ($n = 14$) had elementary school education. Only 5% ($n = 3$) held a higher/tertiary education qualification and 3% ($n = 2$) was illiterate.

Food safety knowledge

The results of food handler knowledge are shown in Table 1. On average, the vendor population had poor food safety knowledge as they scored $49\% \pm 11$ in this regard. Conversely, Addo-Tham *et al.* (2020) found that the mean knowledge score in their study that was conducted in Ejisu-Juaben Municipality of Ghana to be $78.35 \pm 9.33\%$, which was considered to be good. In this study, all the food handlers (100%) exhibited good knowledge of general sanitary practices such as regular hand washing, while the majority (84%) was knowledgeable regarding proper cleaning and sanitization of utensils. However, only (3%)

Table 1. Food safety knowledge

Questions	Response (%)		
	Correct	Incorrect	Don't know
Washing hands before work reduces the risk of food contamination	58 (100%)	0 (0%)	0 (0%)
Using gloves while handling food reduces the risk of food contamination	28 (48%)	11 (19%)	19 (32%)
Proper cleaning and sanitation of utensils decreases the risk of contamination	49 (84%)	7 (12%)	2 (3%)
Eating and drinking during food preparation increases the risk of food contamination	30 (52%)	20 (34%)	8 (14%)
Preparing food in advance reduces the risk of food contamination	36 (62%)	12 (21%)	10 (17%)
Reheating cooked food can contribute to food contamination	14 (24%)	33 (57%)	11 (19%)
Washing utensils with detergent leaves them free of contamination	2 (3%)	55 (95%)	1 (2%)
Children, healthy adults, pregnant women and the elderly are at equal risk for food contamination	3 (5%)	50 (86%)	5 (9%)
Typhoid fever can be transmitted by food	37 (64%)	10 (17%)	11 (19%)
HIV/AIDS can be transmitted by food	37 (64%)	13 (22%)	8 (14%)
Bloody diarrhoea can be transmitted by food	40 (74%)	9 (16%)	9 (16%)
Abortion in pregnant women can be induced by foodborne diseases	43 (74%)	2 (3%)	13 (22%)
Salmonella is among foodborne pathogens	1 (2%)	0 (0%)	57 (98%)
Hepatitis A is among foodborne pathogens	2 (3%)	1 (2%)	55 (95%)
Staphylococcus is among foodborne pathogens	1 (2%)	0 (0%)	57 (98%)
Can swollen cans contain microorganisms	53 (91%)	0 (0%)	5 (9%)
Microbes can be found on the skin, nose and mouth of healthy individuals	24 (41%)	13 (22%)	21 (36%)
During an infectious disease of the skin, it is necessary to take leave from work	55 (95%)	2 (3%)	1 (2%)

knew that washing utensils with detergent does not necessarily leave them free of contamination. The majority (86%) of the vendor respondents had poor understanding of foodborne disease transmission in high risk groups, while 64% seemed to know that typhoid fever is transmitted by food. Ant outstanding 64% mentioned that HIV/AIDS could be transmitted by food.

The association between demographic characteristics of the food handlers and their knowledge of food safety was assessed. The mean values from both genders were compared and found to be 51 ± 13 for males and 47 ± 10 for females ($p = 0.3281$); therefore, there was no association between gender and food safety knowledge among food handlers. There was a weak positive correlation ($r = 0.11684$) between age and knowledge, thus no association existed between age and food safety knowledge ($p = 0.3956$). An ANOVA test was also conducted to compare the mean scores of the education level of the food handlers. These were illiterate 36 ± 20, elementary school 48 ± 12, high school 49 ± 11 and higher education 59 ± 6, ($p = 0.1638$); therefore, there was no association between education level and food safety knowledge of this group. In terms of food safety training and food safety knowledge) an independent *t*-test was conducted. The means we 46 ± 12 for the "No" and 54 ± 9 for the "Yes" answers ($p = 0.0040$), thus indicating an association between food safety training and the food handlers' knowledge of food safety.

Food safety attitudes

Table 2 depicts the results of the food safety attitudes questionnaire. About 84% of the food handlers agreed that thoroughly cooked food would be free from contamination while 95%

Questions	Response (%)		
	Correct	Incorrect	Don't know
Thoroughly cooked foods are free from contamination	49 (84%)	4 (7%)	5 (9%)
Proper hand hygiene can prevent foodborne diseases	55 (95%)	2 (3%)	1 (2%)
Can a closed can/jar of cleaning product be stored together with closed cans/jars of food products	32 (55%)	22 (38%)	4 (7%)
Raw and cooked food should be kept separately to reduce the risk for food contamination	57 (98%)	1 (2%)	0 (0%)
It is necessary to check the temperature of refrigerators/freezers periodically to reduce the reduce the risk for food contamination	55 (95%)	1 (2%)	2 (3%)
Defrosted foods can be refrozen	42 (72%)	9 (16%)	7 (12%)
The health status of food handlers should be evaluated before employment	57 (98%)	1 (2%)	0 (0%)
The best way to thaw meat is in a bowl of cold water	42 (72%)	14 (24%)	2 (3%)
Wearing masks is an important practice to reduce the risk for food contamination	44 (76%)	9 (16%)	5 (9%)
Wearing gloves is an important practice to reduce the risk for food contamination	39 (67%)	11 (19%)	8 (14%)
Wearing caps is an important practice to reduce the risk for food contamination	57 (98%)	1 (2%)	0 (0%)
The ideal place to store raw meat in refrigerator is in the bottom shelf	49 (84%)	2 (3%)	7 (12%)
Eggs must be washed after purchase	12 (21%)	35 (60%)	11 (19%)
Dish towels can be a source of contamination	56 (97%)	1 (2%)	1 (2%)
Knives and cutting boards should be properly sanitized to prevent cross contamination	58 (100%)	0 (0%)	0 (0%)
Food handlers who have abrasions or cuts on their hands should not touch food without gloves	53 (91%)	3 (5%)	2 (3%)

Table 2.
Food safety attitudes

agreed that foodborne diseases could be prevented by proper hand hygiene. Regarding the personal hygiene aspect, far more than half of the respondents mentioned that wearing masks, gloves and caps is an important practice that can reduce the contamination of food (76%, 67 and 98% respectively). The results corroborate those of Akabanda *et al.* (2017) who found that 60% of the food handlers indicated that the use of caps, masks and gloves can minimize the risk of contamination. However, in the current study only 55% of the respondents had a positive attitude towards proper storage of cleaning products/chemicals and food products. Kunadu *et al.* (2016) found that 93.9% of the respondents in their study had a good attitude towards proper chemical storage**.** This difference may be attributed to the diverse areas in which the two studies were conducted, as the latter authors conducted their study in Accra, Ghana.

The study assessed whether an association existed between food handler attitudes and demographic characteristics was assessed. The median values of both genders were compared using Mann–Whitney *U* Test and found to be Mdn = 81.25 (IQR 81.25–93.75) for males and Mdn = 81.25 (IQR 75.00–87.50) for females ($p = 0.3675$). It was therefore concluded that there was no association between gender and the attitude of food handlers towards food safety. Spearman correlation coefficients also showed that there was little or no relationship between the age ($r = 0.06579$) of food handlers and their attitudes towards food safety ($p = 0.6332$). The Mann–Whitney *U* Test was used to compare median values of those food handler who had received food safety training (Mdn = 81.25; IQR = 75.00–87.50) and those who had not received any food safety training (Mdn = 81.25; IQR 81.25–87.50). No association was found between food safety training and the food handlers' attitudes towards food safety ($p = 0.5373$). The Kruskal–Wallis Test also showed no association between the food handler's education level and their attitudes towards food safety ($p = 0.5209$).

Self-reported food safety practices

Table 3 depicts the food safety practices of street food handlers. All the vendors (100%) reported that they did not use gloves when distributing unwrapped food. About 64% of the vendors stated that they used aprons while working while only 9% used masks when necessary. Furthermore, 25% of the vendors reported that they wore nail Polish while also handling food, but all the respondents (100%) reported that they use sanitizer when cleaning utensils. However, none reported the use of such products for cleaning fruits. Almost all the vendors (98%) prepared their food in advance while 79% adequately cleaned storage areas for safe keep of new products. About 84% of the vendors stated that they checked expiry dates of perishable foods after delivery or before purchasing them. Jubayer *et al.* (2020) found

Table 3.
Self-reported hygiene practices

Questions	Response (%) Yes	No
Do you use gloves during the distribution of unpackaged foods? If not, go to question 3	0 (0%)	58 (100%)
Do you wash your hands properly before or after using gloves?	0 (0%)	0 (0%)
Do you wear an apron while working?	37 (64%)	21 (36%)
Do you wear a mask when you distribute unwrapped foods?	5 (9%)	53 (91%)
Do you eat or drink during work hours?	29 (50%)	29 (50%)
Do you wear nail Polish when handling food?	14 (25%)	43 (75%)
Do you prepare meals in advance (i.e., from one shit to another)	57 (98%)	1 (2%)
Do you properly clean the storage area before storing new products?	46 (79%)	12 (21%)
Do you use a sanitizer when washing service utensils?	58 (100%)	0 (0%)
Do you use a sanitizer when washing fruits	0 (0%)	58 (100%)
Do you check the shelf life of at the time or delivery/purchase?	49 (84%)	9 (16%)

that food safety training effectively improved food safety knowledge and attitudes, but they argue that this did not necessarily guarantee that the knowledge possessed by food handlers would translate into good practices or behaviour. Conversely, a study focusing on food handler KAP in hospices in central South Africa found that food safety training did have notable impact on some food handler practices (Nkhebenyane and Lues, 2020). This further attests to the fact that food handlers do not automatically practice food safety procedures during food handling and preparation, although they may provide answers that imply good food safety knowledge.

Observation checklist

The observation checklist results are presented in Table 4. The predominant food preparation surface in the stalls of vendors who participated in this study was wood, as the majority (79%) used wooden tables, while plastic and zinc/iron tables were used by 2 and 19% of the vendors respectively. Almost all the vendors (98%) prepared their food at the stalls and only one street vendor (2%) who sold porridge ("motoho") and home-made bread ("maqebekoane") prepared the food at home. This seems to be a common practice as studies by Samapundo *et al.* (2015) and Alimi (2016) also found that a few vendors usually prepared their food at home. In the current study, more than half of the stalls (64%) were not properly constructed, and it could be speculated that this was due to a combination of lack of funds and appropriate knowledge. Only 21 (36%) of the stalls were constructed in a way that afforded the vendors protection from the sun, dust and wind, which suggests that microbial transmissions may have occurred from the surrounding environment to the food or preparation surfaces.

It was noted that about 36 stalls (62%) harboured rodents and flies, while no animals or pests were observed around the other 22 (38%) stalls. About 60% of the vending stalls had access to a portable water supply. Thanh (2015) reported a 57% access to portable water supply. None of the stalls that were observed in the current study had adequate hand washing facilities as the vendors used buckets or had someone pour water over their hands to wash them. Moreover, only 43% of the vendors had access to adequate waste and food disposal facilities.

The number of food handlers observed to be washing their hands in clean water each time before handling, preparing or serving food was unsatisfactory (21%), yet all the participants (100%) had earlier confirmed that they washed their hands each time after using the toilet. Further observations regarding vendors' personal hygiene were that 41% worked without using an apron, and 100% handled food with their bare hands. It was observed that 25 (43%) of the participants used the same utensil to chop and cut both raw and cooked foods. This practice enhances cross-contamination and should be discouraged. This is a point that should be emphasized when instructors teach food handlers how to handle food safely.

Consumers' demographics

More male ($n = 59$, 63%) than female ($n = 34$, 37%) consumers participated in the study. The mean age of the consumers was (32 ± 9) and the ages ranged from 18–54. The consumers reported a wide range of occupations, while 17% was unemployed and 18% was self-employed. Only 8% was not willing to disclose their form of employment. The majority of consumers comprised of police officers (24%) and taxi drivers (13%).

The consumers were asked whether they liked or disliked consuming street vended foods and to give reasons for their preference. About 6% of the respondents stated that they never buy street vended foods, their reasons being that street food vendors did not practice good hygiene and that it is a waste of money to buy street vended foods. Some had no specific reasons for not consuming such food.

Construct	No *N*# (%)	Yes *N*# (%)
Facilities		
Food preparation surface material		
Plastic	0 (0%)	1 (2%)
Wooden	0 (0%)	46 (79%)
Zinc/iron	0 (0%)	11 (19%)
Where is the food prepared?		
At home	0 (0%)	1 (2%)
On site	0 (0%)	57 (98%)
Is the vending stall protected from the sun, dust and wind?	37 (64%)	21 (36%)
Environment around the stall		
Are animals, pest (flies etc.) evident around the stall?	22 (38%)	36 (62%)
Is the vending stall maintained in a clean condition?	32 (55%)	26 (45%)
There is portable water at the site or close to the site	23 (40%)	35 (60%)
Are adequate hand washing facilities available?	58 (100%)	0 (0%)
Are adequate waste (water or food) disposal facilities available?	33 (57%)	25 (43%)
Is the environment around the stall clean: Far from rubbish, waste water, toilet facilities, open drains and animals?	57 (98%)	1 (2%)
Personal hygiene		
Does the food handler wash their hands in clean water each time before handling, preparing and serving food?	46 (79%)	12 (21%)
Does the food handler wash their hands each time after visiting the toilet?	0 (0%)	58 (100%)
Are the food handler's clothes clean and presentable?	3 (5%)	54 (95%)
Does the food handler use an apron when handling, preparing and serving food?	24 (41%)	34 (59%)
Does the food handler handle food with bare hands?	0 (0%)	58 (100%)
Does the operator have clean short nails?	6 (10%)	52 (90%)
Is the hair of the operator covered when handling, preparing and serving food?	12 (21%)	46 (79%)
Does the food handler handle money while serving food?	1 (2%)	57 (98%)
If yes, are the hands washed after handling money before handling food again?	57 (100%)	0 (0%)
Does the food handler wear jewellery?	35 (60%)	23 (40%)
If yes, is the jewellery adequately covered?	20 (87%)	3 (13%)
Does the food handler blow air into the polythene bag before use?	53 (91%)	5 (9%)
Is dirt/dust removed by means of apron, dirty cloth or bare hands?	44 (76%)	14 (24%)
Is dust removed by blowing?	57 (98%)	1 (2%)
Does the vendor smoke during handling/preparation of food?	58 (100%)	0 (0%)
Does the food handler use the same utensils (knives, boards etc.) to prepare raw and cooked food products or to cut raw vegetables and fresh meat and poultry?	33 (57%)	25 (43%)
Does the food handler have any unhygienic behaviours like blowing nose or coughing and continuing to prepare food?	56 (97%)	2 (3%)
Food storage		
Is the food displayed/stored		
Openly in stalls	0 (0%)	19 (33%)
In sealed containers	0 (0%)	39 (68%)
Are raw and cooked food kept separately?	10 (17%)	48 (83%)
Are previously cooked foods kept in an ice box or refrigerator?	58 (100%)	0 (0%)
Utensils		
Utensils are cleaned with		
Warm soapy water	0 (0%)	34 (59%)
Cold soapy water	0 (0%)	17 (29%)
Dirty water	0 (0%)	7 (12%)
Are utensils covered	46 (79%)	12 (21%)
Are utensils adequately cleaned every time after use?	35 (60%)	23 (40%)

Table 4.
Observation checklist

Consumer perceptions and experiences regarding street foods

The questionnaire was fully completed by 87 consumers who mentioned that they consumed street vended foods. There were follow-up questions for those who consumed street vended foods in order to obtain more in-depth information regarding their perceptions of and experiences with street vended food. About 74% mentioned that they consume street vended foods occasionally while 26% reported daily consumption of this type of food. Affordability was highlighted as the main reason for daily consumption of street vended food. Only 10% reported that they had become ill from consuming street vended foods and had experienced symptoms such as diarrhoea, vomiting, abdominal pains and allergic reactions. The participants also offered recommendations for the possible improvement the street food industry. For instance, stalls should be clean and be covered (59%), clean environment around the stalls (32%) and proper and adequate cleaning of utensils (32%). These are presented in Figure 1.

Discussions

The socio-demographic data elicited by this study suggests that majority of vendors are females. This finding is corroborated by most studies conducted in African countries as cooking is viewed as a females' responsibility. Moreover, in African communities many females are the breadwinners in their households (Marutha, 2020).

According to Tesfaye and Tegene (2020), the odds of having good food handling practices is four times higher for vendors who had prior food safety training when compared to those who did not. The lack of food safety training among food handlers is seen as a factor that

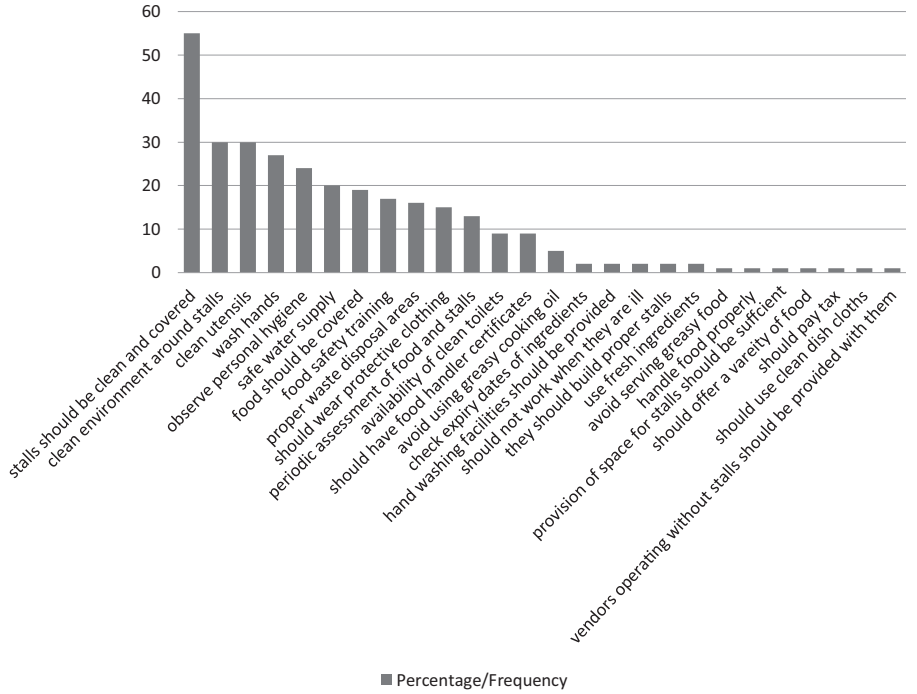

Figure 1.
Consumer recommendations regarding areas of improvement in street food vending (n = 87)

Note(s): It should be noted that the sum of the frequency percentages is higher than 100%. This is because a participant could offer more than one suggestion

contributes to most foodborne disease outbreaks. The implication is that habitual consumers of street food in Maseru could be at risk of contracting foodborne illnesses as it was found that few food handlers had been exposed to food safety training. Teffo and Tabit (2020) highlight that the lack of food safety knowledge poses a threat to food safety establishments.

The World Health Organization often stresses the significance of hand hygiene. One of the five keys to safer food is that food handlers should keep clean at all times (WHO, 2006). This tenet was endorsed by all food handlers involved in this study as all of them (100%) were aware of sanitary practices such as regular hand washing. However, observations proved that this was not a common practice among the respondents. If effectively put into practice, personal cleanliness – and particularly hand washing – could significantly reduce the risk of cross contamination.

Uçar *et al.* (2016) state that thoroughly cooking food reduces the risk of getting infected with foodborne pathogens, and the majority of vendors in this study (84%) endorsed this notion. However, although more than half (55%) of vendors showed positive attitudes towards the safe and appropriate storage of cleaning products/chemicals, the few who did not do so could risk contamination of food thus endangering human health.

For the purpose of this study, data regarding food handling practices were based on self-reported practices while the researcher augmented these with her own recorded observations. This comparative evaluation of the data painted a true picture of the day-to-day activities in the street food markets under study. Unfortunately, what the respondents claimed and what was observed did not always agree. Oludare *et al.* (2016) found that most respondents (80.4%) understood that using personal protective equipment while preparing food can help reduce the risk of contamination. This is similar to what vendors in this study reportedly practiced as 64% claimed that they used aprons while preparing food. However, none of the participants reported that they used gloves when handling food, claiminind instead that they washed their hands every time a customer was served.

About 84% of vendors in this study indicated that they checked the expiry dates on food prior to procuring them. This figure is slightly less than those reported in other studies in it was found that almost all vendors knew the importance of checking expiry dates of ingredients before using them (Marutha, 2020). This practice could help curb the risk of foodborne illnesses caused by spoilage.

Rodents and flies not only constitute a nuisance but are also vectors of diseases. However, 62% of the vending stalls in this study harboured rodents and flies. Mjoka and Selepe (2017) agreed that the presence of animals, rodents, pests and flies in food establishment incites a number of public health risks.

The lack of good sanitation is an observable challenge in a number of studies in the same field (Kok, 2014; Thanh, 2015; Omar 2020). Omar (2020) observed that only 20.2% of the vendors practiced periodic hand washing and that only 15% sanitized their hands after handling finished products. In this study, none of the vending stalls had adequate hand washing facilities, which accounts for the unsatisfactory hand washing practices by 21% of these vendors despite the fact that all indicated that they knew the importance of washing hands when handling food. The CDC (2014) recommends that hands be washed thoroughly before, during and after food preparation, after using the toilet and after touching garbage to prevent disease transmission.

As mentioned earlier, all vendors were observed handling food with bare hands, which is corroborated by another study in which 76.1% of vendors we observed handling food with their bare hands (Marutha, 2020). Additionally, a significant number of vendors was observed to be handling food without proper PPE (such as aprons and gloves). These findings raised concerns because ready-to-eat establishments may be vectors of foodborne pathogens as they have accounted for at least 97% of foodborne illnesses in food retails establishments

(Lambrechts *et al.*, 2014). Thus, an urgent need to sensitize all vendors to adopt sound hygiene practices is highlighted.

According to CDC (2017), contamination during food preparation can occur as a result of using the same utensils (e.g., cutting boards and knives) to prepare raw and cooked food without cleaning them in between. This poor practice was followed by 43% of food handlers in this study. Hossen *et al.* (2020) obtained similar results where only 48% of the vendors in their study adequately cleaned and sanitized their knives after chopping raw food.

When the reasons for purchasing street food were examined, it was found that a study by Singh and Maharaj (2016) reported that 68.9% of consumers purchased street food because they liked the taste, while 90% was influenced by convenience. These reasons, along with affordability, were also mentioned by, consumers in the current study who opted for out-of-home meals.

Conclusions

The involvement of consumers in the food value chain is essential for the improvement of food safety and security of street vended foods. Moreover, their inputs in research studies and policies pertaining to street food vending can also help improve the profitability in this industry.

This study's objectives were to assess food safety knowledge, the attitudes and self-reported practices of street food vendors as well as obtaining the consumers' perceptions and experiences regarding street food vending in Maseru, Lesotho. Although the study was the first of its nature to be conducted in Maseru, Gadaga *et al.* (2014) evaluated the socio-economic and hygiene aspects of street food vending in the same study area. The latter study concluded that consumer health might be compromised due to the unsatisfactory hygiene practices of food vendors, and this notion was corroborated by the current study. Based on the researcher's observations, the lack of food preparation facilities and resources such as safe and clean water supply, could contribute to unsatisfactory hygiene practices. Additionally, the lack of food safety training could be the leading cause of poor food safety knowledge among some of the street food vendors, as the study found an association between the two.

In order to improve the quality and safety of street vended foods in Maseru, it is recommended that the local government entities such as the municipality offer infrastructural support in the form of constructing and allocating proper stalls, installing sewage pipelines for disposal of waste water, providing toilets with adequate hand washing facilities, providing waste disposal bins/skips that are regularly emptied, and ensuring a clean and safe water supply in closeness, proximity to street food stalls. Additionally, street food vendors should be involved in compulsory food safety training followed by routine inspections to ensure that food handlers are effectively translating their food safety knowledge into practice. Food handler certificates, which area prerequisite in Lesotho for any persons intending to work in any food establishment, should have to be acquired by all street food handlers before they can operate. The use of protective clothing such as gloves when handling food, and the limitations of such protective clothing should be highlighted.

The implementation of the above-mentioned recommendations that need to be underscored by the views of consumers has the potential to not only improve the safety and quality of street vended foods, but also improve the socio-economic status of vendors through increased sales and customer satisfaction.

Study limitations

It was envisaged that other areas within Lesotho would be included in the study but due to financial constraints it was not possible. Furthermore, the unwillingness of some vendors and consumers to participate in the study limited the richness of data to some extent.

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