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Original Research Article

Vending environment and hygiene practices of street food vendors in an out of campus food environment in Kenya

Catherine Gichunge*, Solomon Ogachi, Willy Kiboi, Eugine S. Mukhwana

School of Nursing and Public Health, Chuka University, Chuka, Kenya

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***Correspondence:**
Catherine Gichunge,
E-mail: cngichunge@gmail.com

ABSTRACT

Background: Street foods (SF) are ready-to-eat foods and the safety and hygiene practices of street food vendors (SFVs) are important in the prevention of food-borne diseases (FBD). This study assessed the food handling practices and vending environments of SFVs operating outside a public university (Chuka University) in Ndagani, Kenya.
Methods: The study used an observational cross-sectional design where SFVs were observed during data collection. Census sampling was used to recruit 100 SFVs in Ndagani, Kenya. The collected data were summarized using frequencies and percentages. Chi square and regression analysis were used to assess the association and relationship between the SFVs' demographic characteristic (sex) and their food handling practices and vending environment. Statistical significance was set at $p \leq 0.05$.
Results: Of the 100 SFVS who participated in the study 87% (n=87) were female. Only 10% (n=10) of the SFVs were vending in a sanitary environment while 88% (n=88) of the SFVs had sub-optimal food handling practices. There was an association between the SFVs sex and vending environment (p=0.003) and their food handling practices (p=0.008). Compared to male SVFs, female SFVs were 10.1 times more likely to vend in an unsanitary environment (OR: 10.1; C.I, 2.41-42.60, p=0.002) and 7.1 times more likely to have sub-optimal food handling practices (OR: 7.1; C.I, 1.84-27.79, p=0.005).
Conclusions: The majority of SFVs are working in unsanitary environments and not handling SFs safely and hygienically. SFVs need training on food safety to prevent an outbreak of FBD within the university community.

Keywords: Kenya, Out of campus food environment, Street food, SFVs, University food environment, Vending environment

INTRODUCTION

Street foods (SF) are some of the common foods available in the food environment (FE). According to the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), SF are "ready-to-eat foods as well as beverages prepared and/or sold by vendors or hawkers in the streets or similar places".[1] SF are very common in the developing countries as they are easily accessible as well as they provide an inexpensive dietary source for many.[2]

Food safety is gaining global attention due to public health concerns and as a result, the World Health Assembly (WHA) called upon the WHO to develop strategies to reduce FBD.[3] This is in part due to the unsanitary conditions where these foods are prepared, sold and stored.[4,5] This led the WHO to adopt a resolution on recognition of food safety as an integral public health function and priority in preventing FBD.[1] Additionally, the WHO developed guidelines on the safety requirements for street-vended-foods.[1] Despite these efforts several studies have found SFVs to have poor standards of hygiene during and after food preparation

and SF are vended in dirty environments in several countries across the world.[5-7]

SF are popular among university students globally. This is because they are ready to eat hence convenient due to time constraints and are also affordable unlike the healthy options available.[8] University students are young adults with high nutrient and energy requirements hence they need to eat nutritious food.[9] Notably, majority of the foods sold by SFVs are high in calories with low nutrients which exposes students to non-communicable diseases (NCDs).[10,11]

Moreover, some SF have been found to contain disease-causing organisms.[4,7,12] The contaminated food exposes the students to FBD some of which are fatal. This may cause the students to miss classes as they seek medical care which is also an additional cost to them. In Kenya, students in public universities have the option to eat in the university cafeteria, cook their food, or buy their meals elsewhere. A majority of these students buy their food from establishments outside the universities.[13] Some of these out-of-campus establishments include SFVs. It is therefore important that the food handling practices and vending environments of these SFVs are assessed to ensure that the foods consumed by students are not contaminated. Several studies have assessed the practice and vending environments of SFVs but this study looks at SFVs whose major clientele are university students. Various studies have shown that students in tertiary institutions have low knowledge and awareness of food safety, hence there are more likely to consume contaminated foods.[14,15] Few studies have looked at SF within university communities and therefore this study looks at SF and SFVs within a university community. It is against this backdrop that this study assessed the food handling practices and vending environments of SFVs operating outside a public university in the Chuka, Kenya.

METHODS

Study setting

The study was conducted in Ndagani (a neighborhood of Chuka town) located in Tharaka Nithi County. The neighborhood serves Chuka University, a public university with over fifteen thousand students. The study design used was an observational cross-sectional design method where SFVs were observed during the data collection.

Sample recruitment

The target population was SFVs within Ndagani selling ready-to-eat foods. Only SFVs selling foods from trucks, carts, sidewalks, and car trunks were included in the study. Census sampling was used to recruit the SFVs. The study included 100 SFVs.

Data collection

The researchers observed the SFVs and noted their food handling and vending practices as well as the environment in which the SFVs operated. This was done between November 2021 and April 2022. During the observation, the researchers did not interact with the SFVs and the SFVs did not know they were being observed to ensure they did not change their usual practices. In addition, a checklist of nineteen items was developed using WHO guidelines on requirements for street vended foods to examine the SFVs food handling and vending practices and the vending environment.[1] Additionally, one item on the Kenya ministry of health guidelines for food service during the coronavirus disease of 2019 (COVID-19) pandemic was also included in the checklist.[17] In total, the checklist contained twenty indicators. Ten of the indicators examined the vendors' food handling and vending practices. These were: vendor wearing apron, vendor wearing gloves, vendor without long nails, vendor not blowing air/putting a hand in the bag for packing vended food, vendor washing hands in between handling food and money, vendor using different scoops for each food sold, food sold in covered container/s, the vendor having hair covering, food not exposed to flies, wearing a face mask, customers maintaining social distance and frequent disinfection and cleaning of the work surface. A score of 1 was assigned for the correct food handling and vending practice while a score of 0 was assigned for the wrong food handling and vending practice. Total score was expressed as a percentage. In analysis, a score of ≥50% was categorized as optimal handling and vending practice while that of<50% categorized sub-optimal food handling and vending practice.

Ten items examined the vendors' vending environment. These were: vending in a clean area, availability of hand washing container, availability of soap, no presence of garbage, availability of toilet, availability of bin/container for trash, no presence of flies, no presence of rodents, area not smelling from accumulated rubbish and no standing draining water.

A score of 1 was assigned for the presence of the items being assessed while a score of 0 was assigned for their absence. The total score was also expressed as a percentage and a score of ≥50% was categorized as an unsanitary food vending environment while that of<50% was categorized as sanitary food vending environment.

Data analysis

Data were analyzed using SPSS version 24. Frequencies, percentages, and means were used to describe the study population. Chi square and regression analysis were used to assess the association between the SFVs' demographic characteristics (sex) and their food handling practices and vending environment. Statistical significance was set at $p \leq 0.05$.

RESULTS

One hundred vendors participated in the study and the majority (87%) were female as shown in Table 1. Based on the researchers' observation, none of the participants wore any gloves when serving food, only 41% wore aprons as well as 4% had their customers practice social distancing. Eighty-eight percent of the vendors did not wash their hands after touching money, 89% did not cover their hair as well as the 76% did not frequently clean their work surfaces. The mean score for the food handling practices was 18.5. Overall, 88% of the vendors had sub-optimal food handling practices.

Table 1: Food handling behavior of street food vendors.

Variables	N (%)
Wearing gloves	
Yes	0
No	100 (100)
Wearing apron	
Yes	41 (41)
No	59 (59)
Customers practicing social distance	
Yes	4 (4)
No	96 (96)
Wearing gloves	
Yes	0
No	100 (100)
Has long nails	
Yes	0
No	100 (100)
Blowing into food packaging bag	
Yes	5 (5)
No	95 (95)
Wash hands after handling money	
Yes	12 (12)
No	88 (88)
Using different scoops to scoop food	
Yes	73 (73)
No	27 (27)
Hair covered	
Yes	11 (11)
No	89 (89)
Food covered	
Yes	27 (27)
No	73 (73)
Frequent cleaning of work surface	
Yes	24 (24)
No	76 (76)
Food handling behavior	
Optimal	12 (12)
Sub-optimal	88 (88)

As shown in Table 2, only 45% of the vendors were vending in a clean environment, 23% had a hand-washing container and 22% had soap that their customers could use to wash their hands. Only 9% of the vendors had access to a toilet facility, 41% had a dustbin, 31% had flies around their vending area and 25% were vending in an area smelling of accumulated rubbish. The mean score for the vending environment was 24.9. Only 10% of the vendors were vending in a sanitary environment.

Table 2: Vending environment of the street food vendors.

Variables	N (%)
Vending area clean	
Yes	45 (45)
No	55 (55)
Has hand washing container	
Yes	23 (23)
No	77 (77)
Has hand washing soap	
Yes	22 (22)
No	78 (78)
Garbage around vending area	
Yes	29 (29)
No	71 (71)
Has toilet	
Yes	9 (9)
No	91 (91)
Has dustbin	
Yes	41 (41)
No	59 (59)
Flies around vending area	
Yes	31 (31)
No	69 (69)
Rodents around vending area	
Yes	3 (3)
No	96 (96)
Vending area smelling of the accumulated rubbish	
Yes	25 (25)
No	75 (75)
Stagnant water around vending area	
Yes	20 (20)
No	80 (80)
State of vending environment	
Sanitary	10 (10)
Unsanitary	89 (89)

Chi-square test of independence revealed that there was an association between the SFVs sex and vending environment (p=0.003) and their food handling behavior (p=0.008), as shown in Table 3.

Further analysis revealed that females were 10.1 times more likely to vend in an unsanitary environment as compared to males (OR: 10.1; C.I, 2.41-42.60, p=0.002), as shown in Table 4. Furthermore, females were 7.1 times more likely to have sub-optimal food handling practices as compared to males (OR: 7.1; C.I, 1.84-27.79, p=0.005) as shown in Table 5.

Table 3: Association between the SFVs gender and their vending environment and food handling practice.

Variables	Sex		P value
	Female	Male	
Vending environment			
Sanitary vending environment	5 (50)	5 (50)	0.003
Unsanitary vending environment	81 (91)	8 (9)	
Food handling practice			
Optimal handling practice	7 (58.3)	5 (41.7)	0.008
Sub-optimal food handling practice	80 (90.9)	8 (9.1)	

Table 4: Logistic regression model of association between sex of the SFVs and their vending environment.

Sanitary vs un-sanitary[a]		B	Std. error	Wald	Df	Sig.	Exp (B)	95% CI for exp (B)	
								Lower bound	Upper bound
Unsanitary VE	Intercept	0.470	0.570	0.680	1	0.410			
	Female	2.315	0.733	9.974	1	0.002	10.125	2.407	42.595
	Male	0[b]			0				

a. The reference category is: Sanitary VE, b. Base category

Table 5: Logistic regression model of association between sex of SFVs and their food handling practices.

Optimal handling vs sub-optimal handling[a]		B	Std. error	Wald	Df	Sig.	Exp (B)	95% CI for exp (B)	
								Lower bound	Upper bound
Sub-optimal handling practice	Intercept	0.470	0.570	0.680	1	0.410			
	Female	1.966	0.693	8.047	1	0.005	7.143	1.836	27.786
	Male	0[b]			0				

a. The reference category is: Optimal Handling Practice. b. Base category

DISCUSSION

Our study findings resonate well with those of other studies that have found the majority of SFVs are women more so in developing countries.[18,19] Street vending provides a source of income for many in the informal sector more so for women who depend on this sector for their livelihoods.[20,21] Street vending enables women to contribute to their household income contributing to the alleviation of household poverty as well as food insecurity.[22,23] In 2021, Kenya's unemployment rate was 5.7%, thus engaging in street food vending enables the women in this study to be empowered economically which can help the country work towards attaining the SDGs on poverty alleviation, women empowerment, as well as reducing social and economic inequalities.[24]

The majority of our study participants had sub-optimal food handling practices. Many of the vendors were handling food with bare hands, did not cover their food, and did not wear hairnets and aprons, similar findings have been reported elsewhere.[6,18,25] Like in previous studies, many of the vendors did not wash their hands after handling money and yet currency notes and coins have been found to be contaminated with pathogenic bacteria as well as fungi and yeast.[18,26,27] Having uncovered hair is likely to contaminate the SF as hair has been found to harbor *Staphylococcus aureus*.[28] Coupled with the fact that the SFVs in this study did not practice social distancing, lacked personal protective equipment (PPE), and did not wash their hands, while others were blowing air into the food bags and only 24% were cleaning their work surfaces frequently, showed that they did not follow COVID-19 guidelines that were in place during the study period which exposed their customers to respiratory diseases such as colds and COVID-19.[29,30] Wearing PPE when handling food prevents contamination and are listed by WHO as important requirements for SFVs which unfortunately were not adhered to by the study participants.[1] Although there was a significant association between the SFVs sex and food handling practices in this study as reported elsewhere, the number of vendors with sub-optimal food handling practices was very high in both sexes.[31,32] This means that the vendors are contaminating their food through their sub-optimal food handling practices and SFs have been identified as carriers of food-borne pathogens.[4,7,12] This is likely to lead to not only FBD but also respiratory diseases among their customers in this case university students who may have to miss their classes because of these illnesses. In Kenya, FDB is underreported and data is only available at the national level.[33] Nonetheless, FBD is of great public health concern hence the need to address food handling practices of SFVs as a way of mitigating FBD.

Food vending environments should be sanitary to prevent contamination of food but the majority of the study participants' vending environments were unsanitary. The majority were vending in unclean areas and did not have hand washing facilities for themselves and their customers and a dustbin for disposing of their waste.

These findings are similar to those reported among SFVs in other studies.[18,25,34] In addition, the vending sites in this study had garbage, stagnant water, and accumulated rubbish which are breeding sites for microorganisms that increase the risk of contaminating the SF.[35] These could also explain the presence of rodents and flies in some of the vending sites in this study as garbage and accumulated rubbish are also breeding sites for flies and rodents which have been reported to cause contamination of SFVs in other studies.[5,36,37] The presence of rodents and flies is an indication of an unsanitary vending environment. Many studies have reported that SFs are vended in open busy streets and roads near markets, and schools and it was no exception in this study.[5,7] In the current study the SFVs were situated along the streets outside the university gates and students' hostels exposing the SFs to environmental air pollutants from vehicle fumes, dust, and accumulated waste that contaminate the SFs while at the same time affecting the respiratory health of the SFVS.[5,38,39] Female SFVs were more likely to have sub-optimal food handling environment and unsanitary vending environment as seen in the current study which is likely to expose the food to contamination as previous studies have reported that female SFVs are more likely to sell contaminated food compared to male SFVs.[18,40] This exposes the consumers to contaminated SFs and hence the need to enforce these regulations to ensure safe and clean vending environments by SFVs and safe food for the consumers.

Strengths and limitations of the study

The study was a cross-sectional observational study and thus was not able to make casual references based on the results. Secondly, the study did not offer any intervention to the study participants to enable them to improve their vending environment and behaviour. Despite these limitations, the study has some strengths. The first strength of the study is that being an observational study, the researchers were able to observe the actual food handling practices of the SFVS thus providing accurate information. The second strength is that the study raises awareness of the safety of SF based on the practices of SFVs in university food environments.

CONCLUSION

The WHO developed guidelines on the safety requirements for street-vended-foods, however, the study findings are an indication that these guidelines are not being followed by the SFVs. As a result this is likely to lead to FBDs as well as respiratory diseases like COVID-19 and influenza among the university students who are the major consumers of the SFs. Consequently, these may lead to the country's derailment of the achievement of sustainable development goals (SDG) on poverty (SDG1), zero hunger (SDG2), good health and wellbeing (SDG3), decent work and economic growth (SDG8) and reduced inequalities (SDG10). It is therefore important for stakeholders to provide food safety training to both the university students and SFVs to protect both from FBD and respiratory diseases. In addition, further research should be conducted to determine the prevalence of FBDs among university students.

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