



## Food Safety Knowledge and Hygienic Practices among Vendors of Vegetable Salads in Pipeline Ward of Nairobi County, Kenya

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### Abstract

Street vended foods are a source of inexpensive, nutritious food for many people living both in the urban and rural areas. It is also a major source of income for many people, particularly women by providing self-employment and the opportunity to develop business skills with low capital investment. However, ready-to-eat foods are a source of contamination and can transmit food-borne diseases through those handling the salads. Therefore, quantitative cross-sectional survey of exhaustively sampled 120 vendors was carried out to assess food safety knowledge and hygienic practices among vendors of vegetable salads in Nairobi County, Kenya. The study established that majority (60 %) of the respondents were males aged between 26-35 (53 %) and most of them had up to secondary level of education (73 %). Majority of the vendors (59 %) had been trained on food handling practices and therefore had good knowledge of food hygiene, and practiced good hygiene. The results indicate that even though most respondents used gloves and aprons, some did not practice food handling hygienic practices and this could predispose the salads to contamination. The study indicates that majority of the respondents had formal education and were trained on food handling practices, and this may have had an effect on their perception towards hygiene. However, some of the vendors exhibited poor food handling practices and therefore there is need to enhance training and law enforcement governing street food vending business.

**Keywords:** *Cross Contamination; Food Hygiene; Foodborne diseases; Sanitation; Salads*

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### Introduction

Salads are fresh vegetables that require minimal washing and processing, are cut into desired shapes, sizes with knives, and is usually served along with other foods (Mbae *et al.*, 2018). Vegetable salads are ready to eat widely prepared at home and in food, outlets around Kenya and its common fresh ingredients include tomatoes and onion (Mbae *et al.*, 2018). The ingredients may also include capsicum, coriander, and hot green/red chilies. Occasionally, freshly squeezed lemon juice or vinegar is added to enhance the

flavor. To prepare the salads, the vegetables ingredients are washed, chopped or sliced into small pieces, and mixed to produce the salad. Serving the salad as an accompaniment to street food such as boiled eggs, smokies, sausages and even *nyama choma* (roasted meat) is a common practice in Kenya (Reang and Bhattacharjya, 2013).

The food combination is offered in a cross-section of top-class to low-end street-vended food eateries that are common in urban centers and the

countryside and is popular among locals and tourists visiting the country. Street-vended salads are cheap compared to those in the restaurants and supermarkets. These foods are important for many people living in the cities in developing countries both economically and in terms of meeting food demands (Campbell, 2011). They also contribute to economic growth of households headed by female. It is estimated that street foods contribute up to 40 % of the daily diet of urban consumers in developing countries. Salads nutritionally provide vitamins, minerals, proteins for the proper functioning of the human body (Amoah, 2014). However, they could be potential sources of entropathogens and food borne diseases (Mensah *et al.*, 2002). These foods are prepared in informal settings since they are exposed to unsafe water, dumpsites and pests.

Street food sector is, however, confronted by a myriad of challenges such as inadequate supervision, lack of enforcement of hygiene regulations, lack of training for the vendors on areas of food safety and lack of good hygienic practices (Okojie and Isah, 2014). The foods are prepared in dirty places with waste garbage disposed close (Barro *et al.*, 2006). In most cases washing of hands are done in bowls and sometimes without soap since running water is not available at vending sites (Abdalla *et al.*, 2008). These foods have high chances of contamination at all stages of handling with foodborne pathogens.

Poor personal and environmental hygiene contribute significantly to food contaminations and street food are seen as a major contributor to

food borne diseases since they are prepared under filthy environmental conditions (Campbell, 2011). Mishandling of food has been reported to play a significant role in the occurrence of food borne diseases (Grappasonni *et al.*, 2018). These diseases may cause serious problem and cause significant health issues to the communities. When food is mishandled, there is risk of spread and food poisoning since they may be source pathogens during food preparation and processing. Understanding hygienic and safety standards when handling food is imperative as this will ensure safety of street food. Therefore, proper food handling and good knowledge of food safety is important as it will reduce contamination. This study was therefore undertaken to determine hygienic practices and safety knowledge among vendors of vegetable salads in Pipeline Ward of Nairobi County

## **Materials and Methods**

### ***Study area***

The study was conducted in Pipeline Ward of Embakasi South constituency in Nairobi County (Figure 1). There are five wards in Embakasi south sub-county, one of the seventeen sub-counties Capital of Kenya, namely Kwa Reuben, Kware, Kwa Njenga, Imara Daima and Pipeline ward. Pipeline ward was purposively selected because of its affordable housing project for low earning city dwellers and has improved road networks, which provide ideal sites for street food vending. The vendors situated along outer ring road, Taj mall area, stage Mpya and Pipeline who consent to take part in the research were involved.

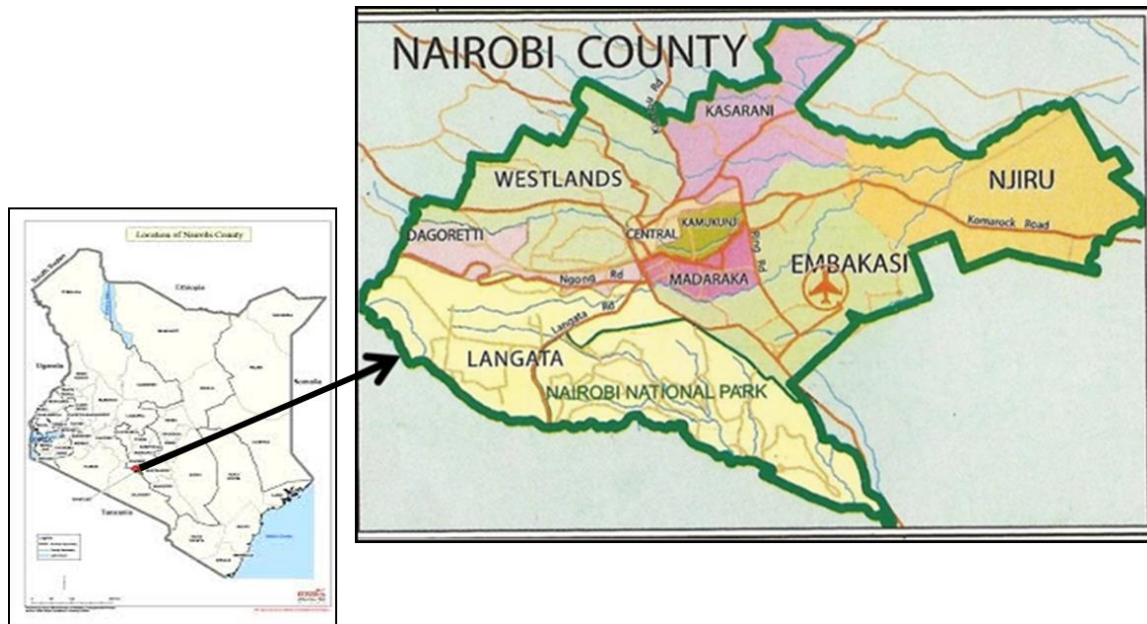


Figure 1: A map of Nairobi showing Embakasi Sub County in Nairobi County, Kenya.

Source: SoftKenya.com 201

### Study Population

The study population consisted of street food vendors selling cooked foods in pipeline Ward, Nairobi. The sampling population consisted of both trained and untrained vendors in Food Hygiene and safety.

### Sample size determination

The targeted sample size of the study population was established using the Fisher formula (Equation 1) as explained by Jung (2014). However, this study exhaustively sampled 120 vendors in the study area.

$$n = \frac{z^2 pq}{d^2}$$

Equation 1

$n = \frac{1.96^2 \times 0.83 \times 0.17}{0.05^2} = 216.81$  (217), Where  $Z$  was the normal deviant at 95% Confidence interval,  $p$  is the proportion of population with the desired characteristic representing the proportion (82.96%) of vendors in informal businesses as determined by KNBS (2020) whereas  $q$  is  $1-p$ , and  $d$  is the degree of precision desirable (5%).

### Sampling

Nairobi County was purposively selected for the study as it is densely populated and has economic diversity of enterprises (KNBS, 2020). The

Embakasi South was selected among the seventeen sub-counties in the county for it was the most populous. Pipeline ward was purposively selected because of availability of mixed vegetable salads sold along its streets. Approximately 120 vendors sell mixed vegetable salads along with egg, smokies and sausages in the study area. Exhaustive sampling technique was employed for data collection. The snowballing sampling technique was used to exhaustively locate all the vendors in the study area.

### Data collection methods and tools

The knowledge and practices of street food vendors regarding food safety was determined by means of a face-to-face interview using a semi-structured questionnaire. Data collected included general information such as demographic information, training and related information, knowledge to regulatory measures, knowledge, and practice to the tenants of food safety such clean, temperature control, cross contamination, and safe ingredients. Possible answers were listed as either "True", "False" or "Don't know" for food safety knowledge questions. Knowledge was scored as "1" for every correct answer and "0" for a wrong answers and the reply of do not know. Knowledge scores were transformed into

percent scores whereby scores below 50% were considered poor knowledge, between 50 and 75% were considered as moderate and above 75% was considered sufficient.

The practices were scored using four point Likert scale as explained by Coban and Bilgin (2015). The scores were given as “4” for always, “3” for sometimes, “2” for rarely and “1” for never for positive practices and the scoring was reversed in the case of negative practices. The scores were transformed into percentages with scores below 50% was unsatisfactory and whereas 50% and above was considered satisfactory.

**Data analysis**

The data collected was coded to facilitate statistical analysis. All statistical analyses were performed using the Statistical Package for the Social Sciences, Version 20.0 (SPSS, Inc., Chicago, IL, USA) and R programming software (R Core Team, 2019). Multivariate analysis was done on the dependent variables separately being food safety knowledge and hygiene practices, whereas the independent variables were socio-

demographic characteristics. Linear regression model of socio-demographic predictors of food safety practices was obtained using the equation 1. Linear modelling was further done for practices scores against knowledge to establish the effect of knowledge on practices. Association of socio-demographics and knowledge was done using chi-square test. Significance was tested at p-value of 0.05.

$$y = a + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n \text{ Equation 1}$$

Whereby  $y$  is the dependent variable food safety practices scores and  $\beta$  and  $x$  ranges from 1 to  $n$  with  $n$  being the total number of independent variables, with  $a$  as the intercept,  $\beta$  as the slope and  $x$  as the socio- demographic factors being evaluated.

**Results**

**Socio-demographic characteristics of the Street Food Vendors**

The demographic characteristics of participants are presented in Table 1.

Table 1. Demographic characteristics of salad vendors in pipeline ward, Nairobi

Characteristics (n=73)	Category	Percentage
Gender	Male	60.3
	Female	39.7
Age (years)	18-25	6.9
	26-35	52.8
	36-55	40.3
Education level	None	2.9
	Primary	20.3
	Secondary	72.5
	Tertiary	4.3
Length in Business (Years)	Less than 1	1.4
	1-5	66.7
	6-10	26.1
	11 -20	5.8
Training	Yes	56.9
	No	43.1

Key: N is the number of respondents

Majority (60 %) of the street salad vendors were males. Many of the interviewed street salad vendors (53 %) were in the age category of 26-35 years followed closely by those in the category of 36-55. Only a few (7 %) were in the category of 18-25 years. The level of education was spread across

all the variables with close to 73 % having attained secondary education. Approximately 3% of the participants had no formal education while 4 % had tertiary level of education. The years of business operations was spread across all the variables with a majority of the interviewed

respondents (67%) having been in the business for about 1-5 years, others had only joined while a few had been in the business for more than 10 years. Interestingly, many of the respondents (57 %) had at least been trained on food safety and hygienic practices.

### *Food safety knowledge*

Table 2 shows results of the participants' awareness on food safety knowledge.

*Table 2. Knowledge assessment among street food vendors on food hygiene and safety*

Statement	Response (n)		
	TRUE	FALSE	DON'T KNOW
Disregarding hygiene rules causes food borne illness	100.0	0.0	0.0
Foodborne diseases transmitted by food contamination	98.6	1.4	0.0
Foodborne diseases from water contamination	97.3	1.4	1.4
Improper heating food causes diseases	80.8	9.6	9.6
People with skin infection take leave from work	78.1	17.8	4.1
Only sick people carry bacteria causing food contamination	2.7	95.9	1.4
Microbes are in the skin, nose and mouth of food handlers	8.2	80.8	11.0
Children, pregnant women, older people at risk	93.2	5.5	1.4
Typhoid fever can be transmitted by food	97.3	1.4	1.4

Results show that all the interviewed participants agreed that poor hygienic practices resulted in food-borne diseases; while about 98 % of the respondents indicated that food borne diseases are transmitted by food contamination. Majority of the interviewed vendors (97 %) also agreed that water contamination may also result in foodborne diseases. When they were asked about heating food, majority of the respondents (81 %) categorically stated that improper heating of food caused diseases while around 10 % indicated this as false and the rest had no idea. On skin infection, majority agreed that when one is infected he/she should not be involved in day to day affair of running the business and therefore should take leave, however, a few thought that taking leave was incorrect. At the same time, when the respondents were asked about whether it's only sick people who carry bacteria, many of the respondents (96 %) did not agree while around 3 % considered this to be true. Moreover, majority of the respondent (81 %) rejected the notion that microbes are mainly found on the skin, nose and mouth, a few (8 %) agreed while around 11 % of the respondents did not know. Majority of the respondent agreed that children, adults, pregnant women, and older people are at risk of being contaminated; also typhoid fever can be transmitted by food.

Over half (53.4 %) of the vendors had moderate level of knowledge with those having satisfactory and unsatisfactory level of knowledge being 42.5 % and 4.1 %, respectively (Table 3). Tests for association between socio-demographic and the level of knowledge revealed that the level of education significantly influenced the level of knowledge ( $p < 0.05$ ,  $\chi^2 = 6$ ). Those who attained tertiary level of education had significantly ( $p < 0.05$ ) more satisfactory level of knowledge compared to those who only attained primary level of education.

Table 3. Association between level of food safety knowledge and socio-demographic characteristics

Socio-demographic characteristics		Level of knowledge			P-value ( $\chi^2$ , df)
		Unsatisfactory (<50%)	Moderate (50-75%)	Satisfactory (>75%)	
Gender	Male	4.5	52.3	43.2	0.954 (0.093, 2)
	Female	3.4	55.2	41.4	
Age (years)	18-25	0	60.0	40.0	0.854 (1.34,4)
	26-35	2.6	55.3	42.1	
	36-55	6.9	48.3	44.8	
Level of education of education	Illiterate	0.0	100.0	0.0	15.6 (0.016, 6)
	Primary	64.3	35.70	0.0	
	Secondary	2.0	56.0	42.0	
	Tertiary	0.0	66.7	33.3	
Years in business	Less than 1	0.0	100.0	0.0	0.891 (2.3, 6)
	1-5	4.3	54.3	41.3	
	6-10	5.6	50.0	44.4	
	11-20	0.0	75.0	25.0	
Undergone food safety training	Yes	4.9	63.4	31.7	5.0 (0.081, 2)
	No	3.2	38.7	58.1	

**Personal hygiene and sanitary knowledge of salad vendors**

Majority of the vendors (90 %) reported that those handling foods should have health check regularly, however, a few thought that regular health check was not important (Table 4).

Majority (75 %) of the respondents disagreed that contaminated food could be detected by taste. However, majority of the vendors reported that washing hands, use of gloves, and use of detergents reduces food contamination. Many of the vendors reported that eating and drinking while preparing food increases chances of

contamination. However, more than 80 % of the vendors rejected the notion that cleaning and sanitation of equipment increased risk of food contamination, chemicals and food ingredients should be stored in store, raw food should be mixed with processed food and salads can be prepared on dirty surfaces.

Majority (97%) of the vendors reported that cleaning equipment should be done at the end of processing, cross contamination with microorganisms is possible and contaminated food have a change in colour.

Table 4: The level of hygienic knowledge among street food vendors

Statement	Response (n)		
	TRUE	FALSE	DON'T KNOW
Food production staff should have health check	90.4	9.6	0
Contaminated food can be detected by taste	15.1	75.3	9.6
Washing hands reduces risk of food contamination	94.5	5.5	0
Working without protective clothing is allowed	11	89	0
Using gloves reduces risk of food contamination	98.6	1.4	0
Eating and drinking while handling food increase contamination	84.9	8.2	6.8
Cleaning and sanitation of equipment increase risk of food contamination	2.8	97.2	0
Working with jewelry is allowed when handling food	2.7	95.9	1.4
Detergents remove contaminations	95.9	2.7	1.4
Clean is the same with sanitized	82.2	6.8	11
Chemicals and food ingredients should be stored in store	1.4	98.6	0
Salads can be prepared on dirty surfaces	8.2	91.8	0
Cleaning equipment should be done at the end of processing	97.2	2.8	0
Cross contamination may occur by keeping clean and unclean foods together	89	11	0
Contaminated food have change in color	79.5	20.5	0
Raw food can be mixed with processed food	2.7	97.3	0
Temperature control is important in storage and processing of food	95.9	4.1	0

However, more than 90 % of the vendors reported that temperature control is important in storage and processing of food. The mean of the percentage scores for the knowledge on food hygiene among the vendors was above average

#### ***Food hygiene practices***

Majority of the respondents (48 %) do not wear jewelry, do not rub their hands on the face and hair (44 %) and over 90 % of the respondents would sometimes smoke or chew gum while

working and serving food to the customers (Table 5). All the respondents washed their hands after visiting toilets, more than 90 % of the respondents used detergents whenever they washed their hands and wore hand gloves when handling and distributing food. However, those who used gloves while handling food, only 10 % washed their hands after using gloves while 68 % only washed sometimes and not often.

Table 5. The level of hygiene practices among street food vendors

Parameter (n-73)	Percent Response			
	ALWAYS	SOMETIMES	RARELY	NEVER
Do you wear jewelry and watch while working	25.0	48.6	15.3	11.1
Do you rub your hands on face, hair while working	11.1	44.4	31.9	12.5
Do you smoke or chew gum while working	8.3	91.7	0.0	0.0
Do you use detergent whenever you wash your hands	98.6	1.4	0.0	0.0
Washing hands after visiting toilet	100.0	0.0	0.0	0.0
Do you use gloves when touching or distributing food	91.7	6.9	1.4	0.0
Do you wash your hands before wearing gloves	73.6	22.2	4.2	0.0
Do you wash your hands after using gloves	9.7	68.1	22.2	0.0
Wear nail polish while handling food	4.2	11.1	48.6	36.1
Apron/ ppe while working	52.8	30.6	9.7	6.9
Use protective clothing	81.9	12.5	5.6	0.0
Do you wash your hands after touching raw food	95.8	2.8	1.4	0.0
Do you wipe your hands with apron	13.9	68.1	15.3	2.8
Do you treat water for cleaning food	5.6	30.6	63.9	0.0
Do you clean working area	93.1	1.4	5.6	0.0
Do you check shelf life of food at delivery	95.8	2.8	1.4	0.0
Do you clean the food storage area before storage	94.4	5.6	0.0	0.0

Many of the respondents (49 %) rarely wore nail polish while handling food while 36 % never wore nail polish. However, majority of the respondents wore protective clothing while handling food. Majority of the vendors (96 %) washed their hands after touching raw food, cleaned their working area (93%), checked shelf life of the products they bought and they cleaned food storage area before storage (94 %). However, a few of the respondents (14 %) agreed to be wiping their hands on the apron while majority of the respondents (68 %) sometimes did that. Only around 3 % never tried to wipe their hands using the apron. Majority of the respondents (64 %) also rarely treated water for preparing food, 31 % of the respondents sometimes treated while

only 6 % ensured water for food preparation was treated.

The linear regression model of socio-demographic characteristics significantly ( $p < 0.001$ ,  $R^2 = 0.422$ ) predicted the food safety practices scores (Table 6). Vendors who had been in business for over 10 years were three times (3.36) more likely to have more satisfactory food safety practices than those than had been in business for less than a year ( $p < 0.05$ ). The linear predictor model of food safety knowledge on food safety practices scores was significant ( $p < 0.001$ ), Figure 2. Variation in knowledge scores accounted for 38.4% variation in food safety and hygiene practices scores.



Table 6. Linear regression model for socio-demographic determinants of food safety practices scores

Socio-demographic characteristics		Beta	Std. Error	t value	odds ratio	p-value
Intercept		75.41	2.99	25.22		<0.001
Gender	Female <sup>R</sup>				1.00	
	Male	-0.39	1.08	-0.36	0.68	0.719
Age (years)	18-25 <sup>R</sup>				1.00	
	26-35	3.37	1.95	1.73	29.13	0.089
	36-55	3.58	2.08	1.72	35.75	0.092
Level of education	Illiterate <sup>R</sup>				1.00	
	Primary	-2.69	3.16	-0.85	0.07	0.398
	Secondary	-2.64	2.92	-0.90	0.07	0.371
	Tertiary	-7.44	3.78	-1.97	0.00	0.054
Years in business	Less than 1 <sup>R</sup>				1.00	
	1 to 5	-9.04	4.00	-2.26	0.00	0.334
	6 to 10	-0.83	2.88	-0.29	0.44	0.775
	>10 years	1.22	1.25	0.97	3.39	0.028
Has food safety training	No <sup>R</sup>				1.00	
	Yes	1.45	1.13	1.29	4.26	0.204

<sup>R</sup> denotes the reference category for a specific variable. R<sup>2</sup> is 0.422

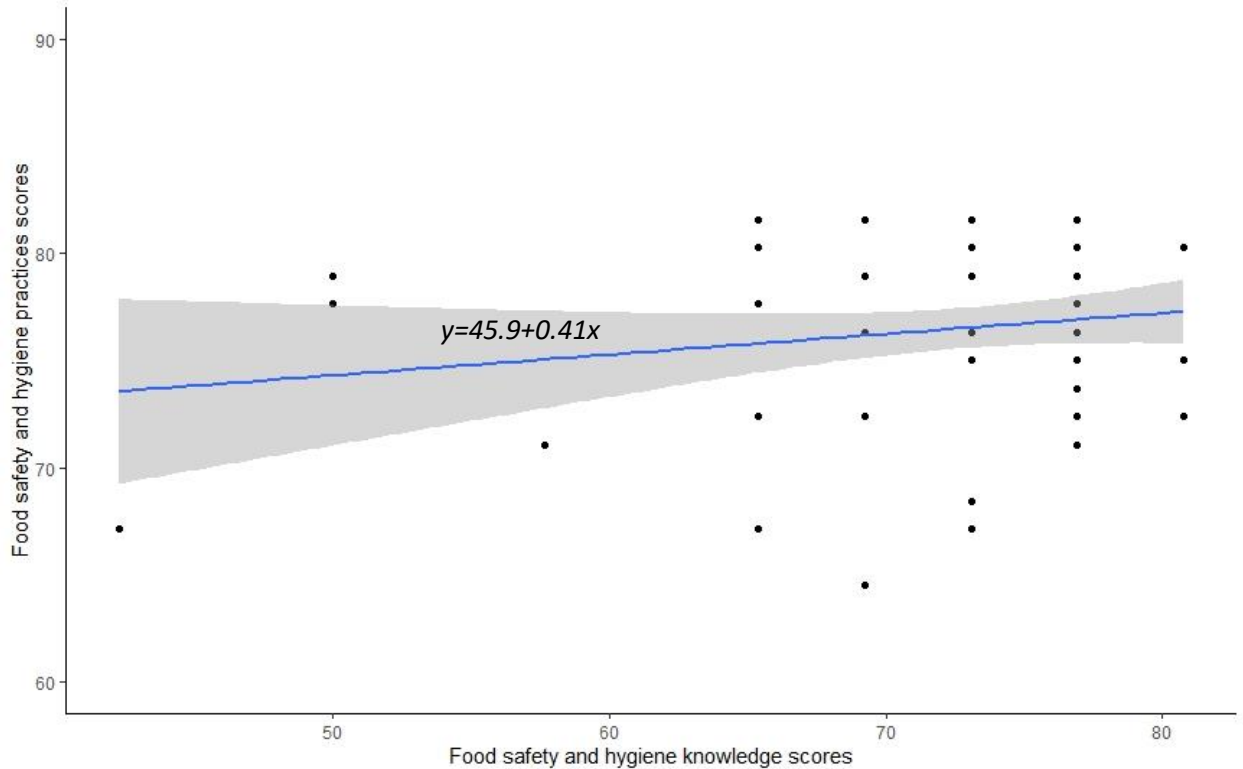


Figure 1. Linear regression predictor model of food safety and hygiene practices scores by knowledge scores.  
 $R^2=0.384$

**Discussion**

The study established that majority of the vendors were males and most were in the age category of 26- 35 years. There has been an increase in number of men selling street vended food which for a long time has been a preserve of women and this is because of lack of employment. These results are in accordance with those reported in Kenya and South Africa by Duse et al. (2003) and Muindi and Kuria (2005), respectively, where majority of the vendors were reported to be males. The results, however, contradict many of the research findings where many of the vendors have predominantly been women as they use it to supplement family income (Okojie and Isah, 2014; Nurudeen *et al.*, 2014), as well as contributing significantly to the informal sector of the economies (Abakari *et al.*, 2018). Majority of the vendors also have been in the food vending trade for about 5 years. More experience in street vending business gives one age over the others however, according to Parajuli, (2013) street vending business is one of the most vulnerable business due to pollution,

natural calamities and health. These findings are consistent with those reported by Nurudeen *et al.*, (2014). In their findings, they reported that over 70 % of the interviewed vendors had been in the business for about one to five years and according to Muzaffar and Malik (2009) there has been clear increase in the number of people vending foods in the streets.

The vendors had various levels of education, with majority having the basic level of education in Kenya. This is because street vending of food is seen as belonging to those who are economically disadvantaged and the people engaged in this business lack opportunity to further their education (Okojie and Isah, 2014). Low educational levels and lack of employment contributes to increase in number of vendors in street food entrepreneurship (Muzaffar and Malik 2009). A study done in South Africa by Martins, (2006) documented similar findings where majority of the vendors had attained a secondary education, however, the results contradicts other studies where many of the respondents had only a primary level of

education (Georges, 2000). The level of education had effects on food handling practices, as majority understood the need for hygiene while handling foods. More than half of the respondents had some training on food safety handling practices. These results, however, contradicts findings by Okojie and Isah (2014) who reported lesser number of people as having been trained on food handling practices. The Kenyan bylaws advocate that food handlers should have training on food handling practices.

All those interviewed agreed that poor hygienic practices resulted in food-borne diseases, while majority of the respondents indicated that contamination through water and food may result in foodborne diseases. Poor hygienic practices promote contamination and introduction of pathogenic microbes in foods (Velero *et al.*, 2016). Therefore, routine hygiene is important as it reduces risks associated with food poisoning (Czarniecka-Skubina *et al.*, 2018). These results are in agreement with those reported by Nurudeen *et al.* (2014). In their results they pointed that poor hygienic practices or lack of it results in food borne diseases. These results also confirm that because the vendors understood poor hygienic practices are source of food borne diseases, an improvement in hygiene within the surrounding where the food are sold may lead to relatively safe food which are less contaminated with pathogenic microbes (Leus *et al.*, 2006). Food safety also depends on both personal and environmental hygiene; many vendors agreed that skin infections may not force one to take leave from work while only a few respondents reported that only sick carry pathogens causing foodborne diseases and they are mostly found on the skin, nose and mouth. According to Nurudeen *et al.* (2014), vendors with undressed skins that discharge are important risk factors in food contamination that may result in food poisoning. The occurrence of these pathogens within the sites is a health risk to children, adults and even older people, an aspect that more than 90 % of respondents agreed with.

About 53 of the vendors had moderate level of knowledge with those having satisfactory and unsatisfactory level of knowledge being 43% and 4.1%, respectively. The level of education significantly influenced the level of knowledge

( $p < 0.05$ ,  $\chi^2 = 6$ ) and is consistent with other studies which reported a significant association between education and knowledge score (Zyoud *et al.*, 2019). Respondents with a high level of education reported higher knowledge scores than those with a lower level. According to Johnson *et al.* (2003) there is a direct relationship between education level and experience on food safety knowledge. Education level, residential area, age, gender, socio-economic status and employment status have been shown to affect food safety knowledge, attitude, behaviors, perception and practice (Soon *et al.*, 2012; Zyoud *et al.*, 2019). Food safety knowledge has been found to increase with increase in length of practice and training. Food safety improvement is imperative and can be realized when those involved in handling it acquire safety knowledge through education. According to Roberts *et al.*, (2008) when food handlers have training, they are better placed to respond to questions on food safety and knowledge than those without training.

Majority of the respondents agreed that various sanitary practices are important in ensuring safety of the food vended in the street and those handling food should occasionally have health check, wash their hands using detergents to reduce food contamination. Also it is important that equipment is washed at the end of every process. Hand washing is effective way in preventing the spread of foodborne diseases. Good hand washing technique is significant in reducing spread of infectious food borne diseases (Boshell, 2013). However, these results contradict those reported by Lubos, (2014) where majority of the respondents had little knowledge on the importance of hand washing when handling foods and very few (24 %) were aware that it is necessary to wash hands after using handkerchief. In fact, high risk areas such as where vendors prepare and sale their food require the highest level of food hygiene and safety compliance

Many of the respondents agreed that cross contamination of the pathogens is possible and this may occur when harmful micro-organisms are spread between food, surfaces and equipment. Cross contamination is possible through mixing raw and cooked food during

storage, however, this practiced was not common among the interviewed vendors. This result agrees with those reported by Campbell, (2011) where it was possible that cross contamination was due to use of same chopping board for cutting salads and raw meats as well. For instance salad is prepared on a chopping board and the board is not washed well before preparing or chopping other salads. The cross contamination by the pathogens is a concern since major disease outbreaks are associated with cross contamination (Park *et al.*, 2010; Grappasoni *et al.*, 2018). However, according to Campbell, (2011) the risk of posed by cross contamination when food is prepared may not be very high since very few salads accompaniments. Therefore, cleaning using detergents to wipe out places of work and to clean the boards for chopping salads can prevent cross contamination.

Many of the respondents reported that sometimes they wore jewelry, rubbed their hands on the face and hair while working, however, many did not smoke or chew gum while working. This implies that the chances of cross contamination with various pathogens are high since many if not all of the jewelry worn are neither washed or sanitized or even removed during food preparation. This contradicts the results reported by Czarniecka-Skubina *et al.* (2018) whereby majority of the vendors did not wear any jewelry on their heads or hands, hand clean and safe hands and did not have any skin problem. Majority of the respondents wore aprons to cover their clothes. The results agree with those reported by Czarniecka-Skubina *et al.* (2018) and Tiisekwa, (2013) where vendors used aprons either with long or short sleeves. This action is taken to help in preventing contaminants in their clothes from being transferred into the salads. The results are in agreement with a similar one where 69 % of respondents wore aprons to reduce contamination of cut fruits (Cuprasitrut *et al.*, 2011). It is important that any one preparing food

## References

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should wear protective clothing such as apron, and head covering. Many respondents complied with certain aspects directly related to personal hygiene. In all cases, the vendors washed their hands after visiting toilets, nearly all the vendors used gloves while handling food, and washed their hands before putting on a glove. The findings are in agreement with those reported by Reang and Bhattacharjya (2013). Many of the respondents agreed that temperature control is important in storage and processing food. According to Campbell (2013) temperature abuse may occur when food is stored at wrong temperatures for long time. Again when food is not adequately cooked in the correct temperature they may enhance contamination of food by pathogens and therefore cross contamination may easily occur. Education level of the vendors was found not to be significantly related to food safety and hygiene practices. This is probably because majority of the respondents had at least basic education of the Kenyan system. This contradicts findings by Faremi *et al.*, (2018) where education level of food vendors was significant related to food safety and hygiene. Water contamination was found to be related to food contamination, contaminated water contains pathogenic microbes which can contaminate food prepared for consumption. The linear regression model of socio-demographic characteristics significantly ( $p < 0.001$ ,  $R^2 = 0.422$ ) predicted the food safety practices scores. Vendors who had been in business for long had satisfactory food safety practices than those than had been in business for less than a year. Being long in business, level of education and training was a strong predictor for food safety practices level

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