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Full Length Research Paper

A study of cleanliness and sanitary practices of street food vendors in Northern Nigeria

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This study examined the general hygiene and sanitary practices of street food venders in Nigeria. 110 random samples of street food venders were selected to represent 18% of street food venders in the study area. Data was collected using pre-test structured questionnaire and observation checklists. The relationships in the factors studied were determined. Food venders lacked basic training on hygiene and only 2.7% had formal training on food preparation. 63.6% acquired skills from parents while 33.7% acquired skills by self practice. 44.5% of vendors used their mouths to blow air into polythene bags to open, before using it to package foods for customers. 60.0% of the vendors prepared foods in unkempt environment with flies around the foods. The study indicated absence of evidence of relationship between venders' education and vending location as well as between gender and personal hygiene. This study largely suggested non-compliance with the Codex Alimentarius Commission guidelines for street food control in Africa. The non regulation of street food vending business in Africa especially Nigeria portends danger of outbreak of food poisoning.

Key words: Street foods, hygiene, sanitation, vendors, food safety, Kaduna-North Central Nigeria.

INTRODUCTION

Street foods are ready-to-eat foods prepared and/or sold by vendors and hawkers, especially in streets and other similar public places (Codex, 1999). The other public places include schools, markets and motor parks (Muleta and Ashenafi, 2001). A street food vendor is broadly defined as a person who offers foods for sale to the public without a permanent built up structure but with a temporary static structure or mobile stall-head load/wheel-barrow/truck (Janie and Marie, 2010). Street-vended foods provide a source of inexpensive, convenient and often nutritious food for urban and rural poor; a source of attractive and varied food for tourists and the economically advantaged; a major source of income for a vast number of persons, particularly women; and a chance for self-employment and the opportunity to develop business skills with low capital investment (Codex, 1999).

In June 1997, the Codex Alimentarius Commission

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adopted revised basic texts on food hygiene and recommended their wide use and understanding by governments, regulatory authorities, food industries, all food handlers and consumers to ensure that food is safe and suitable for human consumption. The general hygienic requirements and practices to be followed by the vendors was also recommended for translation by the relevant authorities into Codes of practice and this was recognized as cost effective tools for the control of street foods, by fully taking into account local conditions including specific risk factors that are relevant to each operation (Codex, 1999).

In contrast to the potential benefits, it is also recognized that street-food vendors are often poor and uneducated and lack appreciation for safe food handling. Consequently, street foods are perceived to be a major public health risk. If a community is to have the full benefits of street-vended foods with minimal risk of food borne disease, government intervention is required to ensure that the standard of safety for such foods is the best attainable in the context of the prevailing local situation. Therefore, it is recommended that authorities undertake Hazard Analysis and Critical Control Point (HACCP) studies to identify and integrate critical control measures into strategies for improving the safety of street foods (WHO, 1996).

A total of 2.5 billion people all over the world eat street foods everyday (Food and Agriculture Organization (FAO), 2007). The world is becoming rapidly more urban and the population of the developing countries is projected to double from 1.7 to 3.4 billion in 2020. Deprivation in urban areas including poverty, food insecurity and malnutrition is increasing faster and urban growth now presents a serious challenge in developing countries (Maxwell et al., 2000). Sale and consumption of street food are on the increase and this will continue to grow (WHO, 2006). In developing countries especially Nigeria, there is a noticeable increase in the number of street food vendors as a result of dwindling economy and unemployment. According to WHO (1984), Bryan et al. (1992) and Ashenafi (1995), food exposed for sale on the streets may become contaminated either by spoilage or pathogenic micro-organisms. Furthermore, it is also reported that street-vended foods have epidemiological links with illness (El-Sherbeeny et al., 1985; Abdulsalam and Kaferstein, 1993; Muinde and Kuria, 2005).

FAO (1997) asserts that street foods raise concern with respect to their potential for serious food poisoning outbreaks and associated health problems like cholera, diarrhea and stomach upset as a result of unhygienic handling of foods and improper sanitary practices. Numerous studies carried out on street foods revealed their tre-mendous unlimited and unregulated growth which has placed a severe strain on municipal facilities, such as water, sewage system and interference with the city plans through congestion and littering which adversely affect daily life (Canet and N'diaye, 1996; Chaulliac and Gerbouin-Renolle, 1996).

In the face of the rising population of street food vendors in Africa, the present study presents a survey of hygiene and sanitary practices of street food vendors in the central state of northern Nigeria as determinant of compliance with the Codex Alimentarius Commission guidelines for street food control in Africa.

MATERIALS AND METHODS

Study area

This study was carried out in Kaduna, the central state of northern Nigeria (Figure 1). Kaduna is stratified into Kaduna north located to the north of the state and Kaduna south located to the south of the state.

Study population

According to the 2006 Nigeria population census, the total population of people in Kaduna North was 357,694 while the population in the Kaduna south was 402,390. The total population of the street food vendors in the study area was 611, with 315 (51.6%) of them in Kaduna north and 296 (48.4%) in Kaduna south. Agricultural practice is the main stay occupation of the people in these study areas. The sample size (n) for the study was determined as follows:

$$n = \frac{D * Z^2_{1-\alpha/2} * P(1-P) * N}{d^2 * (N-1) + Z^2_{1-\alpha/2} P(1-P)}$$

Where D = design effect = 2.0; Z = standard normal score corresponding to 95% confidence level = 1.96; d = degree of precision = 0.007; P = proportion of people selling street foods in the study area = $[(760{,}084)^{-1}]611 = 0.0008$; N = total population of street foods vendor in the study area = 611; n = sample size. Substitution of the values in the equation for sample size produced n = 113. There were 3 invalid respondents and hence a sample size of 110 was used for the study.

Administration of survey instruments

Prior to commencement of the survey, advocacy visits were made to the selected street vendors to solicit for their support and cooperation. This study was conducted through in-depth interview, administration of questionnaires and observational checklists. Two investigators consisting of one interviewer and an assistant in each location administered a pre-test structured questionnaire to each street food vendor to elicit basic socio-demographic details, food handling practices, personal hygiene practices, types of vending sites, storage of food before selling and serving of food, handling and storage of leftovers, water supply and sanitary practices. Eleven street foods that are commonly sold in the study area were selected purposively for the study. Fifty-five street food vendors were selected from each location, representing 17.5 and 18.6% of the total subjects from Kaduna North and Kaduna South, respectively.

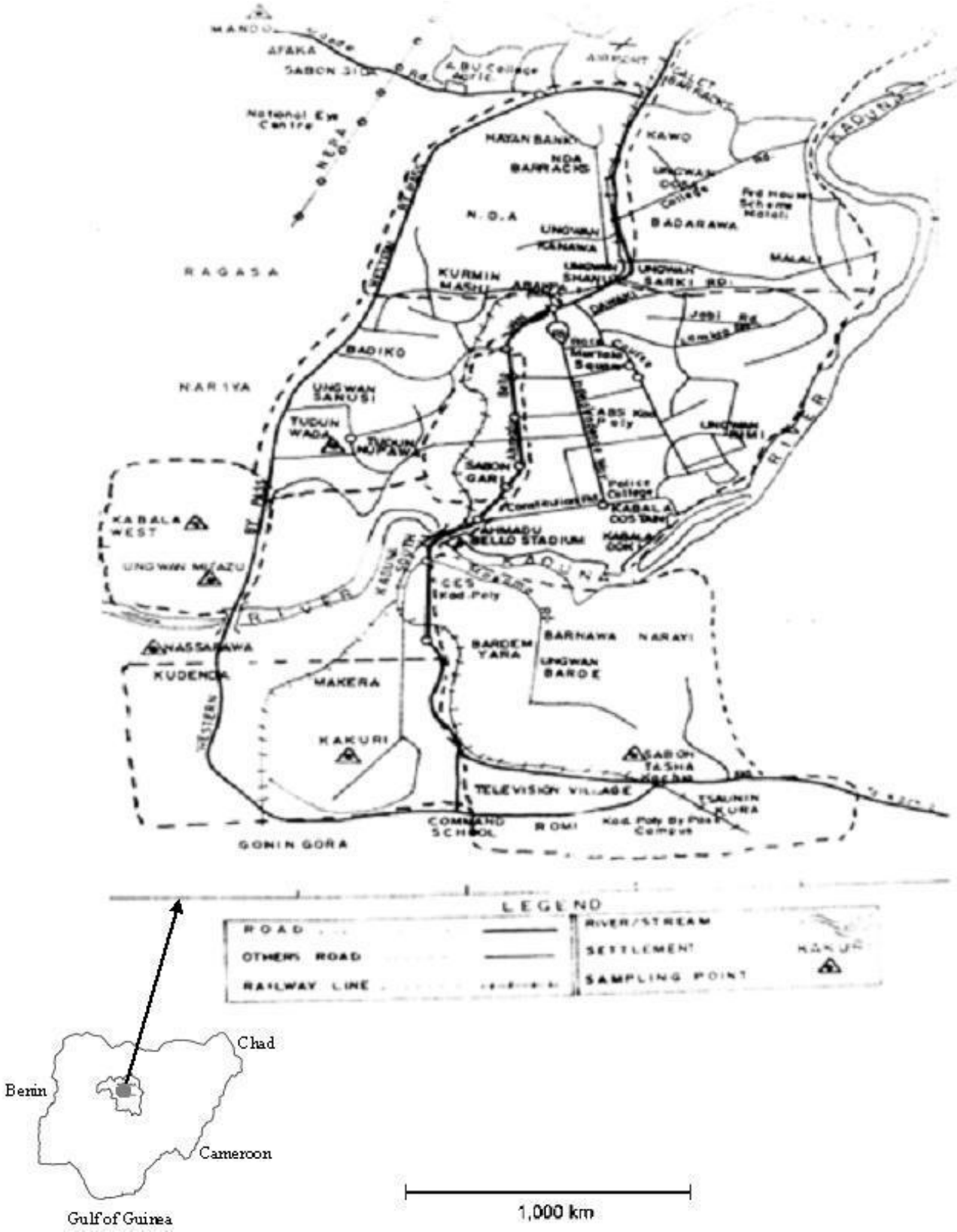

Figure 1. Map of Nigeria showing the Central state of Northern Nigeria and sampling locations

Table 1. Socio-demographic characteristics, Food handling practices, Care of equipment, Vendor type, Water supply and Skill acquisition of street food vendors.

Parameter	Frequency	Percent
Age (years)		
<30	12	10.9
30-39	62	56.4
40-49	27	24.5
≥50	9	8.2
Sex		
Male	21	19.1
Female	91	80.9
Level of Education		
Primary	45	40.9
Secondary	19	17.3
Tertiary	3	2.7
Qur'an	15	13.6
No Education	28	25.5
Serving of food		
Food served with fork/spoon	35	31.8
Food served with bare hands	75	68.2
Total	110	100
Handling of leftovers (n=47)		
Consumed	9	19.1
Stored for use next day	38	80.9
Total	47	100
Storage of leftovers (n=38)		
Cupboard	13	34.2
Plastic container	23	60.5
Refrigerator	2	4.7
Total	38	100
Cleaning of crockery		
Water with oily appearance	9	8.6
Water with dirty appearance	21	19.5
Water with soapy appearance	9	8.6
No soap used	47	42.7
Clean water used with soap	24	21.8
Total	110	100
Type of vendor		
Stationary	91	82.7
Non-stationary	19	17.3
Total	110	100
Type of vending site		
Head load	8	7.3
Concrete	16	14.5
Mud	2	2.8
Wooden	7	6.4
Canopy	28	25.5
Container	16	14.5
Zinc sheet	22	20.0
Wheel barrow	11	10.0
Total	110	100
Water supply		
Tap	12	13.2
Borehole	3	3.3
Water vendor	52	57.6
Protected well	4	4.4
Unprotected well	20	21.9
Total	110	100
Skill acquisition		
Formal training	3	2.7
Self-practice	37	33.7
Parents	43	39.1
Other vendor	27	24.5
Total	110	100

respectively. The administration of questionnaires to about 18% of the study population selected purposively was carried out by trained interviewer and an assistant interviewer recorded the observation checklist on each vendor. Information was obtained on hygiene and sanitary practices of vendors. No incentives were offered to food vendors for participation in the survey.

Statistical analysis

Data collected during field work were entered and analyzed using statistical package for social science (SPSS) for windows version 15.0 (SPSS inc. Chicago, IL, USA) and STATA for windows version 9.0 (STATA 4905 Lakeway, Drive, Texas, 77845, USA) for descriptive statistics (mean, frequency and percentages) of the data. To test the relationship between different sub-groups with respect to hygiene and sanitary practices, χ^2 test was used for categorical variables.

RESULTS

Table 1 shows the socio-demographic characteristics, food handling practices, care of equipment, vendor type, water supply and skill acquisition of street food vendors in the Central State of Northern Nigeria. 56.4% of the street food vendors were within 30 to 39 years. 10.9% were

Table 2. The level of personal hygiene, food handling and sanitary practices among street food vendors.

Parameter	Kaduna North n=55 (%)	Kaduna South n=55 (%)	Total N=110 (%)	P-value
Hygiene Practices				
Apron used	10 (18.2)	23 (41.8)	33 (30.0)	
Hair covered	35 (63.6)	16 (29.1)	51 (46.4)	
Neat/clean finger nails	29 (52.7)	35 (63.6)	64 (58.2)	0.867
Chewing/talking while serving	37 (67.3)	42 (76.4)	79 (71.8)	
Presence of undressed skin lesion	6 (10.9)	2 (3.6)	8 (7.3)	
Food exposed to flies	33 (60.0)	24 (43.6)	57 (51.8)	
Food Handling Practices				
Foodstuff washed once before cooking	34 (61.8)	47 (85.5)	18 (73.6)	
Foodstuff washed properly before cooking	17(30.9)	26(47.3)	43 (39.1)	0.054
Food prepared on same point several times	49 (89.1)	44 (80.0)	93 (84.5)	
Oil re-use for frying several times	15 (27.3)	19 (34.5)	34 (30.9)	
Surrounding of vending site				
Not clean	29 (52.7)	37 (67.3)	66 (60.0)	0.412
Clean	11 (0.2)	14 (0.25)	25 (22.7)	
Waste disposal method				
On the street/road	11 (20.0)	15 (27.3)	26 (23.6)	
Drainage/Gutter	16 (29.1)	15 (27.3)	31 (28.2)	0.151
Bush	3 (5.5)	8 (14.5)	11 (10.0)	
Waste bin	17 (30.9)	25 (45.5)	42 (38.2)	

P-value of <0.05 was considered statistically significant.

less than 30 years and 8.2% of the vendors were above 50 years. Majority of the vendors (80.9%) were women. 66.4% of the street food vendors had either primary or no education. Only 2.7% of them had tertiary education. 19.1% of vendors said leftover foods are consumed by households and only 4.7% of vendors who stored left-over foods for sale kept them in refrigerators. 18.9% kept left over foods in containers and cupboard. 45.5% of the vending sites were canopies with zinc sheet. Only 4% of the vending sites were concrete structures. 14.5 and 8.2% were made of mud and wooden structures, respectively. 57.6% of vendors obtained water from water vendors and only 49.9% of the vendors had access to clean water. 21.8% of them used soap with clean water to wash cooking utensils and plates. 19.5% cleaned their crockery with dirty water and 8.6% of them recycled wash water. 63.6% of vendors acquired skills from parents and other venders while 33.7% acquired skills by self-practice.

Table 2 shows the level of personal hygiene, food handling and sanitary practices among the street food vendors in the central state of northern Nigeria. The data indicate 53.6% of the vendors did not cover their hair, 7.3% had undressed wounds and many of the vendors exposed foods to flies. Vendors used mouth to blow air into polythene to open before using it to package food for their customers and 93.1% of the vendors held money while serving food. More than 50% of the vendors did not use apron. Many of the vendors engaged in chewing and talking while serving food. More than half of the vendors kept their finger nails clean and 60% of the vendors prepared food in an unclean environment with flies all over the place. Some of the vendors' stalls were located close to their dump site. 73.6% of vendors did not wash their foods properly before cooking and less than 40% of the vendors used waste bin to keep their waste while the rest dumped wastes on streets, major roads and drainage channels.

DISCUSSION

During the survey, it was discovered that out of all the 611 total number of street food vendors in the study area,

about 71% of them have been in the food vending trade for about 5 years while in the recent time (less than a year), over 29% of the vendors joined the vending trade. These findings are consistent with the reported noticeable increase in street food vending in developing nations (WHO, 2006). 56.4% of the street food vendors sampled were within the age group of 30 to 39 years while 10.9 and 8.2% of the vendors were less than 30 years and 50^{+} years, respectively. However, this study observed very low involvement of people under the age of 30 years and 50+ years, in the food vending trade. Majority of the vendors were women with mean age of 38.21 years and frequency of 91 (Table 1). This indicates that food vending business is predominantly practiced by women while 19.1% of the street food vendors were men with mean age of 37.43 years and frequency of 21. This is corroborated by the findings of Comfort (2010) and Odonkor et al. (2011).

Educationally, 66.4% of the street food vendors had either primary or no education. Only 2.7% of them had tertiary education qualification, with a frequency of 3 (Table 1). The low level of education is likely to promote lack of appreciation for food handling practices and presents potential risk to food safety.

Type of vendor

Of all the street food vendors interviewed, only 17.3% were mobile with a frequency of 19, while the others maintained temporary static structures or stationary posts as also reported by Janie and Marie (2010).

Vending site type

Almost half (45.5%) of the vending sites were made of either canopy or zinc sheets. Only 4% of the vending sites were made of block structure while 2.8 and 6.4% were made of mud and wooden structure, respectively.

Food handling practices

Hygiene practices of vendors during handling, cooking and serving of foods were monitored. It was observed that 73.6% of vendors did not wash the raw foods properly before cooking (Table 2). Vendors selling grilled fish, roasted meat/chicken and chips washed their raw foods once and no rinsing before cooking, due to shortage of water. Similarly, fruits vendors did not wash their fruits properly and the portability of the purity water they use cannot be guaranteed. It was also observed that 84.5% of food vendors prepared foods on same surface several times without cleaning the surface (Table 2).

Remnants of processed food items were seen on the surfaces even when not in use. Vendors who sold fried yam, fried plantain, bean cakes, maize cake, grilled fish and chips prepared these foods on same surface without regard for hygiene. 30.9% of the vendors embarked on oil re-use practice for several frying incidents (Table 2). This practice may reduce oil nutritional value and also made the oil dark in colour because of the carbon deposit in the cause of frying food stuff and consequently affects the odour and taste of the food. Only 31.8% of the vendors served foods with fork/spoon and 68.2% served their foods with bare hands (Table 1). Some vendors were observed chewing and talking while cooking or serving foods. This act is capable of introducing saliva into foods being cooked or served. Majority (86.5%) of the subjects interviewed were handling money while serving food and this increases the possibility of currencies being rubbed on foods. 60.9% of the vendors did not have provision for heating their foods to keep it warm before serving. Some vendors selling fried yam, plantain and chips served their foods into plates that were not properly washed.

Personal hygiene practices of the vendors

It was found from the data gathered that 53.6% of the vendors did not cover their hair and 7.3% of them had undressed skin lesion (Table 2). 51.8% of the vendors exposed foods to flies. 44.5% of vendors used mouth to blow air into polythene bags to open before using it to package foods for customers. Most of the vendors selling fried yam, plantain and bean cakes packaged the foods in mouth-blown polythene bags that may be contaminated. More than two-third of the vendors interviewed did not use apron. Slightly above half (58.2%) of the respondents kept their finger nails clean (Table 2).

Handling, storage of leftovers

Majority of the vendors displayed foods in trays without cover (Table 2). 42.7% of the street food vendors surveyed revealed that they usually have leftovers. 19.1% of them said the leftover foods are consumed by their households. Only 4.7% of vendors who stored left-over foods for sale next day kept them in refrigerator. 18.9% kept them either in a container or cupboard (Table 1). These poor storage facilities may enhance contamination by pathogenic micro-organisms.

Water supply

The results of the survey indicate supply of municipal water to the study area was not regular and sometimes

not available for days. Hence, accessibility to water source around the vending sites was very poor. 57.6% of the food vendors surveyed obtained water from water vendors who usually carried water from unknown sources in plastic containers of 15 to 20 liters capacity for sale. In attempts to cut cost, food vendors buy limited quantities of water and hence have insufficient water for washing their crockery and food stuff.

Cleaning of crockery

It was observed that due to epileptic water supply in the study area, only 49.9% of the vendors had access to clean water and only 21.8% of them used soap with clean water to wash their cooking utensils and plates. 19.5% of the food vendors cleaned their crockery with dirty water while 8.6% of them reused water (with oily appearance) to wash crockery (Table 1). We also observed the absence of evidence of relationship ($p > 0.05$) between gender and personal hygiene of vendors and this indicates that gender may not determine the level of personal hygiene practices amongst the food vendors surveyed.

Surrounding of vending site

Sixty percent of the interviewed vendors prepared their food in an unclean environment with the presence of flies all over the place and some of the stalls were located very close to dump sites in attempt to avoid obstruction within the vending area (Table 2). The results of this study also indicate absence of evidence of relationship ($p > 0.05$) between the level of education of vendors and sanitation of vending sites. This suggests that the education of the vendors may not impact the sanitary practices of the vendors when compared to their counterpart with lower educational achievement. On knowledge acquisition of food vending practices, the results indicate majority of the food venders lacked basic training on hygiene and only three (2.7%) had formal training on food preparation. Seventy vendors (63.6%) acquired skills from parents and other venders while thirty seven vendors (33.7%) acquired skills by self-practice (Table 1).

Waste disposal method

The method of waste disposal used by the food vendors is deplorable because less than one-quarter of the vendors used waste bin to keep their waste while the rest used streets, major roads and gutters as their waste disposal points. On the relationships between personal hygiene practices, food handling practices, surrounding of vending sites, waste disposal methods and locations of vendors, we obtained the P-value of 0.867, 0.054, 0.412 and 0.151 respectively, which indicates absence of evidence of relationship ($p > 0.05$) between personal hygiene practices, food handling practices, surrounding of vending sites, waste disposal methods and locations of vendors (Table 2).

This study has shown that the street foods in the central state of Northern Nigeria have become popular amongst the urban dwellers because of easy access and their affordability when compared to hotels and restaurants. The many ethnic groups in the study area present varieties of vended foods and thus represent a mixed cuisine. The study revealed that the food vendors served more than 83 different types of foods that cut-cross the major ethnic groups in Nigeria. The customers of street foods in the study area include high class businessmen, office workers, apprentices, low income earners, school children and homeless beggars, popularly known as almagaris. This indicates that a substantial population of the study area depends on street vended foods.

The vendors that were observed to be serving food with bare hands could promote contamination and introduction of pathogenic microbes on foods if their hands were not properly washed. Vendors that were chewing and talking while serving foods stand the risk of introducing harmful micro-organisms that can trigger food-borne infections especially if the vendor is already a carrier of such organisms like tuberculosis bacteria. Money exchanges a lot of hands and as such may be carriers of harmful organisms. The vendors observed handling money while serving food and this may introduce contaminants through hand contact with the food. The presence of undressed skin lesson possessed by some food vendors especially those with discharges are important risk factor in food contamination and occurrence of food poisoning. This is because discharge from this lesion can easily come in contact with the food or utensils that are used to serve foods. The surrounding flies can transfer pathogens from the infected lesion unto food or utensils.

WHO (1984) recommended that no food handlers with skin lesion should be allowed to handle food unless the lesion is aseptically kept or such vendor has had proper medical treatment. Foods were exposed to flies and this could result to epidemiological disease outbreak like cholera (Ashenafi, 2009). Foods that were stored in container/cupboard other than refrigerator are likely to be contamination by pathogenic micro-organisms and associated with reduced quality (WHO, 1984; Bryan et al., 1992; Mensah et al., 2002). The oily appearance of water used for washing the crockery confirms the wash water reuse practice amongst the vendors surveyed. WHO (1996) reported that one of the most critical challenges in street food vending is the supply of water of

acceptable quality and sufficient quantity for drinking, washing of raw food materials, cleaning of crockery and surrounding of the sites. Studies carried out on street food vending in various parts of the world particularly in developing countries, where epileptic water supply is usually observed also reported wash water reuse (Abdul-Salam and Kafarstein, 1993).

All the fruit vendors did not keep their fruits in the refrigerator after preparation and fruits were displayed openly on tray for sale. According to WHO (1996), eating of fruits that are not properly washed or kept in refrigerators often result in food poisoning because fruits stored at ambient temperatures favour the growth of microbes and quickly proliferate to disease producing level.

Conclusion

This study generally observed that food vendors in the central state of northern Nigeria were only concerned with profit making at the expense of standard food hygiene and sanitary practices. The findings of the study largely suggest non-compliance with the Codex Alimentarius Commission guidelines for street food control in Africa. The danger in the event of any outbreak of food related epidemic disease in the central state of northern Nigeria is the ease of spread to other African countries because of proximity. In order to maintain the benefits of street-vended food while assuring the safety of the food sold, authorities must implement policies aimed at assisting, controlling and maintaining the street food sector. The policy should be implemented in relation to an integrated consultation with vendors and consumers in order to meet the needs of government, consumers and vendors. Documentation and licensing of food vendors would enable authorities to identify persons employed in such enterprises and the types of food sold. This effort is likely to enable an opportunity to give food handlers advice and training in food safety.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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