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Original Article

Knowledge of Personal Hygiene Among Street Food Vendors and Canteen Food Handlers in Kano: A Mixed Methods Study

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Abstract

Background: The burden of food-borne diseases is becoming a global problem. The aim of this study was to assess and compare personal hygiene knowledge among street food vendors and canteen food handlers in the Kano metropolis.

Methodology: An explanatory sequential mixed methods study was carried out using a structured interviewer-administered questionnaire, focus group discussion guide and observation checklist, to assess and compare personal hygiene knowledge among street food vendors and canteen food handlers in Kano metropolis, Nigeria. Quantitative data was analyzed at univariate, bivariate and multivariate levels using SPSS version 20.0 at a 5% α level of significance. Thematic analysis was used to analyze verbatim transcripts from qualitative interviews.

Results: The response rates were 305/310 (98.4%) and 288/310 (92.9%) among street food vendors and canteen food handlers, respectively. The proportions of street food vendors and canteen food handlers with poor, fair and good knowledge of personal hygiene were (29.5% versus 19.8%), (51.8% versus 54.2%) and (18.7% versus 26.0%), respectively (p=0.009). There was a statistically significant association between education and knowledge of personal hygiene among street food vendors (p=0.03) and canteen food handlers (p=0.04). Though slightly better among canteen food handlers, narratives by the two groups of food handlers pointed to the general lack of awareness of basic personal hygiene which was supported by the findings from observation.

Conclusion: Personal hygiene knowledge was poor among the two groups of food handlers; therefore, the Government should ensure legislation and enforcement involving training of food vendors, periodic medical examination, and issuance of fitness certificate to all food vendors.

Keywords: Personal Hygiene; Knowledge; Food Safety; Food Vendors; Kano; Nigeria.

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Introduction

Food borne illness is a global public health challenge and therefore food safety is important to the general health, economic prosperity, and social development, of any nation and its government.[1] Foodborne disease epidemics are mostly due to sub-optimal personal hygiene among food vendors.[2] Although some efforts have been in place to promote various food hygiene standards including training of food vendors as well as consumer education, food-borne diseases still remain a public health concern in many developing countries.[2-10]

In many parts of the world, vended food makes a significant contribution to the informal food sector, an important support to employment, household revenue and household food security.[3]Nearly two thirds (74%) of the member states of the World Health Organization (WHO) have reported vended food to be a significant part of food supply.[7]This signifies that, while vended foods are important source of ready-to-eat food and provides inexpensive food for the people, those involved in food preparation and service have a vital role to play in the prevention of food borne disease and their actions regarding personal hygiene can be critical in preventing an outbreak of infections. The importance of effective cleaning and disinfection of food surfaces for reducing the potential of cross-contamination is well recognised and is an important component of food safety management systems globally.[5]

The food vendors are often poor, uneducated and untrained.[7] They are often ignorant about basic personal hygiene, which are the principles necessary to maintain the safety of food.[7] Lack of proper personal hygiene can lead to food-borne diseases and other consequences due to poor food handling practices, [7]for example, poor personal hygiene including hand hygiene was reported to contribute to 42% of food-borne outbreaks in the United States in the period of 1975–1998.[2] Generally, personal hygiene covers the aspect of hand hygiene, clean attire, personal health and personal habit or behavior.[2]

As a part of world-wide strategy to decrease the burden of foodborne diseases, the WHO in 2006 brought the concept of five keys to safer food : keeping clean, separating raw and cooked food, cooking thoroughly, keeping food at safe temperatures and using safe water and raw materials and the messages were developed in 87 languages based on scientific evidences to provide guide in training food handlers on personal hygiene and food safety.[3] Further, due to the challenges of food safety, WHO dedicated the World Health Day theme 2015‘‘From farm to plate, make food safe ’’ targeted to ensure that safe food are consumed and emphasize the roles of food handlers, food business operators(FBO), consumers, policy makers and the government in reducing the foodborne diseases.[7]

The fact that food vendors possess the poor infrastructure, lack sanitary facilities, have no proper training on food hygiene, poor sanitation, qand lack of knowledge of personal hygiene have posed significant problems.[8] This is not different from what is obtainable in Nigeria and in Kano with increasing popularity of vended food. This problem is further confounded by paucity of reported or documented evidence of foodborne diseases,[7] perhaps the conditions are either missed by the clinicians or not reported. Therefore, there is an urgent need for vendors to be knowledgeable about personal hygiene,[10] while some studies assessed the food vendor’s knowledge of personal hygiene as either street food vendors or canteen food handlers, this study set out to assess and compare the personal hygiene knowledge among the two categories of food vendors. In addition, focus group discussions were intended to explore their understanding of personal hygiene and complement the findings from quantitative arm of the study. To minimize observation bias, an observation checklist was also used to observe all the food vendors and their vending sites. There have been reports of inadequate supervision and monitoring of food vendors by the food safety officers, and the enforcement of food hygiene regulation has been weak in developing countries[10] and therefore the finding can provide policy makers with a possible guide on the need for reviewing and enforcing the available policy and guideline on personal hygiene for food safety among food vendors.

Materials and Methods

Study design and settings

A comparative cross-sectional study design that utilized mixed methods of data collection (An explanatory sequential mixed methods) using interviewer-administered questionnaire, Focus Group Discussion (FGD)Guide and an adopted observation checklist, [11] to assess personal hygiene knowledge among street food vendors and canteen food handlers was conducted between November 2018 and April 2019.The street food vendors and canteen food handlers in Kano metropolis, registered and un-registered who have been in the food vending business for six or more months were included while food handlers responsible for administrative duties only were excluded. Kano State is one of the northwestern states of Nigeria. It had a projected population of 13,605,021 in 2019 based on 2006 Nation Population Census growth rates of 3.1% per annum.[12] Kano is referred to as the center of commerce in the country due to national and international marketing activities. There are many well-known major markets of different categories of commodities within the metropolis; most of the markets operate daily.[12] Several mobile food vendors and food canteens are clustered around the markets which serve as a major source of food supply with different levels of hygiene for the busy marketers.

Ethical approval

The approval for this study was obtained from the Health Research Ethics Committee of the Kano State Ministry of Health (with approval number: MOH/OFF/797/T1/733) and Aminu Kano Teaching Hospital (with approval number: NHREC/21/08/2008/AKTH/EC/2260). Informed consent was obtained from the food vendors selected for participation in this study using consent forms. All provisions of Helsinki Declaration were strictly ensured during the study.

Sample size estimation

For the Quantitative arm, the sample size was determined using the formula for comparing two proportions.[13]With Z_α = 1.96, $Z_{1-\beta}$ = The probability of type II error (β)of Power at 80%=0.84 P_1 = Proportion of street food vendors in Kano with good food safety practices= 93.2%= 0.932.[14] P_2 =Proportion of canteen food handlers in Sokoto with good food safety practices= 86.3%= 0.863.[15]Using non-response rate of 10% from previous study[6] n=310 per group were studied. The food vendors interviewed were observed using the observation checklist. For the qualitative arm, respondents for FGD were purposively selected at different locations for the groups of street food vendors and canteen food handlers until saturation was reached. The groups (street food vendors and canteen food handlers) consisted of 8-11 discussants per FGD session.

Sampling procedure

Multistage sampling technique involving three (3) stages was used to study the eligible food vendors in the quantitative arm. In stage (one selection of markets), the list of all the major markets in Kano metropolis was obtained, [11] from which ten (10) out of forty (40) markets were randomly selected. In stage two (selection of canteens / selection of cluster of street food vendors), census was done in the selected major markets to obtain the total lists of canteens, and numbers were allocated to all the canteens. For street food vendors, mapping and numbering of all the clusters of street food vendors was done and the average number of street food vendors in each cluster of the selected markets was obtained. The sampling frame of food vendors in each of the selected cluster was generated and respondents were proportionately allocated. In stage three (selection of food vendors(canteen/ street vendors),the canteens for the study (310) were proportionately allocated based on the total number of canteens in each of the four (4) selected markets and were selected randomly by balloting technique using the numbers assigned to the canteens during the census, mapping and numbering respectively, one food vendor was interviewed in each of the selected canteen, by balloting after generating a list of eligible food handlers in each of the canteens. For street food vendors, proportionately allocated respondents were picked and studied (310) using simple random sampling technique. If the number of street food vendors in the cluster did not meet up the proportionately assigned numbers, the next available clusters were studied in similar pattern until the proportionately allocated sample size was obtained.

For the qualitative arm, the street food vendors and canteen food handlers were purposively selected for Focus group discussion.

Procedure of data collection

A pre-tested structured interviewer-administered adapted questionnaire, [12-16] observation checklist [11] and FGD guide were used to collect data from the respondents. The questions were based on the recommended WHO concept of five keys to safer foods. Twenty research assistants were identified and trained. Training sessions lasted for three days and covered the areas: overview of the research and questionnaire administration, how to administer the observation checklist, how to obtain informed consent, communication skills among others. The observation checklist was administered to the food vending sites immediately after the questionnaire administration; food vendors were blinded to the observation and cover five key areas (observation for personal hygiene of the food vendors, hygiene of the food room/areas and equipment, food hygiene practice, pest control and waste control respectively). Up to 31 street food vendors and canteen food handlers were studied in pretesting the data collection tool outside Kano metropolis.

Data analysis and measurement of variables

The Quantitative data were analyzed using SPSS Statistical software version 20.0 (IBM Corp., Armonk, NY, USA) after appropriate cleaning. Respondents' knowledge and practice were scored and graded using a system adapted from three previous studies. [14-16] There were 17 questions that assessed respondent's knowledge of personal hygiene, each correct spontaneous response to questions assessing knowledge of personal hygiene was given one point while assisted or probed responses were scored half a point, wrong response was awarded zero point and total scores were summed up. Respondents with scores ≥12 points for knowledge of personal hygiene were considered as having a ''good'' knowledge, whereas those who score 6–11 or <6 were considered as having a ''fair'' or ''poor'' knowledge, respectively.[16] The observation component was presented in frequencies and percentages. The outcome variable was knowledge of personal hygiene while the independent variables were (age group, sex, duration in food vending among others). The Chi-square test was used for comparison of proportions at ≤5% α- level of significance. The factors associated with personal hygiene knowledge or with a value of ≤ 0.1 at bivariate level were entered into a logistic regression model to adjust for confounding.[17]

For qualitative arm, thematic analysis was used for qualitative data analysis. Tape recordings from the FGD were transcribed verbatim including pauses and interruptions. It was then combined with the field notes and analyzed. For every FGD, the transcribed data were reviewed, and each discussant's comment or quote was given an identifier based on the focus group number (x) and the tag-number for the participants (y) as follows "x.y". These labelled quotes for each FGD were entered into separate excel sheets for easy coding and identifying the emerging themes. The coding involved codes ascription to relevant quotes identified (open coding), the coded items were grouped into categories and the themes were then identified. All connected themes were thoroughly reviewed, which were organized, interpreted and then triangulated with results of quantitative data and that from observation checklist.

Results

Socio-demographic characteristics of street food vendors and canteen food handlers

Out of the total of the 310 questionnaires distributed, 305 and 288 questionnaires were retrieved from the street food vendors and canteen food handlers giving response rates of 98.4% and 92.9%, respectively. The mean ages (±Standard Deviation, SD) of street food vendors and canteen food handlers were 24.6±9.1 and 32.1±10.3 years, respectively. About two-fifths (46.6%) of the street food vendors were in the second decade of life compared to less than one fifth (15.2%) of canteen food handlers. Females were the majority among both street food vendors 66.2% and female canteen food handlers (61.5%.) Nearly two-thirds of the street food vendors (62.0%) and half of canteen food handlers (51.4%) learnt food vending business from their parents, respectively. Similarly, over one-half of street food vendors (56.4%) and canteen food handlers (56.6%) often worked ≥35 hours per week in food vending business with median work duration of 35 and 42 hours, respectively. Further, about one-third of street food vendors (35.0%) and canteen food handlers

(35.8%) were vaccinated against either hepatitis A or typhoid respectively as shown in Table 1.

Knowledge of personal hygiene

The personal hygiene knowledge scores among street food vendors and canteen food handlers ranged from 0 to 16 in the two groups with mean scores ±SD of 8.0±3.8 and 9.0±3.6. Figure 1 depicted that a higher proportion of canteen food handlers (26.0%) had good knowledge of personal hygiene compared to 18.7% among street food vendors. Similarly, table 2 shows that regular baths were mentioned as a method of enhancing personal hygiene by most street food vendors 70.2% and canteen food handlers 75.0%. However, less than a quarter of street food vendors (22.6%) were aware of the important role of aprons in ensuring personal hygiene compared to over a third of canteen food handlers (41.3%). The ill effects of serving food with bare hands were correctly recognized by about one-third of both street food vendors (35.7%) and canteen food handlers (35.4%).

Factors associated with knowledge of personal hygiene among respondents.

Table 3 shows that street food vendors and canteen food handlers with secondary level of education were found to have significantly good knowledge of personal hygiene (24.0%, p=0.03) and (27.8%, p=0.03) respectively. In addition, working for less than 35 hours per week was significantly associated with good knowledge of personal hygiene among street food vendors (23.3%, p<0.001) while among the canteen food handlers, working for more than or equal to 35 hours per week was significantly associated with good knowledge of personal hygiene (29.4%, p<0.001). Street food vendors who were vaccinated against typhoid/hepatitis were found to have significantly good personal hygiene knowledge (20.6%, p<0.001) compared with canteen food handlers, those not vaccinated were found to have significantly good knowledge of personal hygiene (40.5%, p<0.001).Table 4 shows that, working hours of food vending per week significantly predicted knowledge of personal hygiene among street food vendors {aOR=0.3, 95% CI=0.3(0.2-0.6)}. Street food vendors working less 35 hours per week were 70% less likely to have good knowledge of personal hygiene than those working for ≥35 hours.

Themes from focus group discussions

Circumstances and number of times needed for hand washing during food vending.

Unlike the street food vendors, all the canteen food handlers narrated that hand washing is very important in ensuring safety of foods as illustrated by a narration by a 30-year-old canteen food handler: *"Hand washing by those selling the food is very important because when you want to prepare any kind of food we have different kind of soap that we use to wash our hands with, before preparing the food items. Sometimes we put what we called hand gloves or nylon in form of hand gloves before preparing the food, so is important to our health also to the health of the customer."*

A 24-year-old canteen food handler emphasized the importance of hand hygiene and narrated thus: *"Normally first of all in terms of washing your hands at least 4 times but most of the times we are preparing food, some of us don't use our hands directly, we use to put hand gloves or nylon. We are not using our hands seriously. Sometimes every 10-20 minutes we wash our hands with a liquid soap like omo, morning fresh etc.*"In comparison with what most of the street food vendors narrated that *"Yes, apart from washing my hands after collecting money to serve foods to my customers, it is also safer to wash my hands when they are dry and dusty."* And narrated the use of *"We sometime use klin, car wash or water only to wash our hands."*

Personal and environmental hygiene

Personal and environmental hygiene were emphasized as the measures by all the street food vendors to prevent food contamination but a 29-year-old discussant narrated that *"I think just what you have said, one, you need to have detergent for washing of hands and those detergents should be something that can disinfect any contaminations or anything that you have in your hands because is not every soap that can easily disinfect. There is specific soap that can easily disinfect. Two, there is a degree of temperature that food ought to undergo at that level of degree so that there is no macro-organisms that can survive that process.*

So our standard restaurant for instance, we need to take up our food to that degree because once there is anything it will not be effective because of heat, must have had an impact on it. Then other safety measures that need to be presence, we need to have a fire extinguisher in the premises you also need to look at the health of other people who are patronizing us that is why we are handling these tests. The workers also have cut their beards and hairs and the rest. So, all these are measures that can help to prevent or improve safety as regards processes of preparing food."

All the discussants mentioned personal hygiene as important in preventing food contamination.

All the canteen food handlers agreed that hand hygiene is compulsory with facilities for sanitary disposal of waste, having regular supply of electricity with refrigerators to ensure food safety; A 28-year-old street food vendor narrated that *"If I have many people to attend I don't wash my hands until I finish attending to them."* and when asked what should be available in your canteen to ensure food safety a 33-year-old street food vendor explained that *"We always remain clean and tidy so that people will buy food from us. We also make sure that the environment is always clean."* And that disposal is done around the premises of food vending as narrated by a 37-year-old street food vendor *"We have a disposal area here where we dispose our refuse."* And recommended that *"The government should make sure that refuse disposal areas are clean and taken away for disposal on time."*

Food safety and hygiene training and supervision

In addition to recommendation by another 24- and 37-year-old *"Is very important for the government to train us on how to ensure food safety."* *"I am calling for other food sellers to cooperate with government in order to ensure that we learn from them."*

All the canteen food handlers believed supervision by government will promote food safety and hygiene practice as narrated by on 39-year-old discussant "*Issue of supervision of food handlers is very important because once the food handlers know that they have to come and see what they are doing they may be doing good thing seriously."*

Periodic medical examination

All the canteen food handlers mentioned periodic medical examination and agreed that it is not done routinely to assess their health status with none of them having a medical certificate. Moreover, all the street food vendors did not have any idea of medical examination and a narration by a 24-year-old street food vendor*" I don't know anything about medical examination for food workers. But I will make sure that everything is clean, the containers, utensils and our hands must also be cleaned. From time to time also we should be cleaning the dust from away the containers, eating plates to avoid been contaminated with any bacteria".*

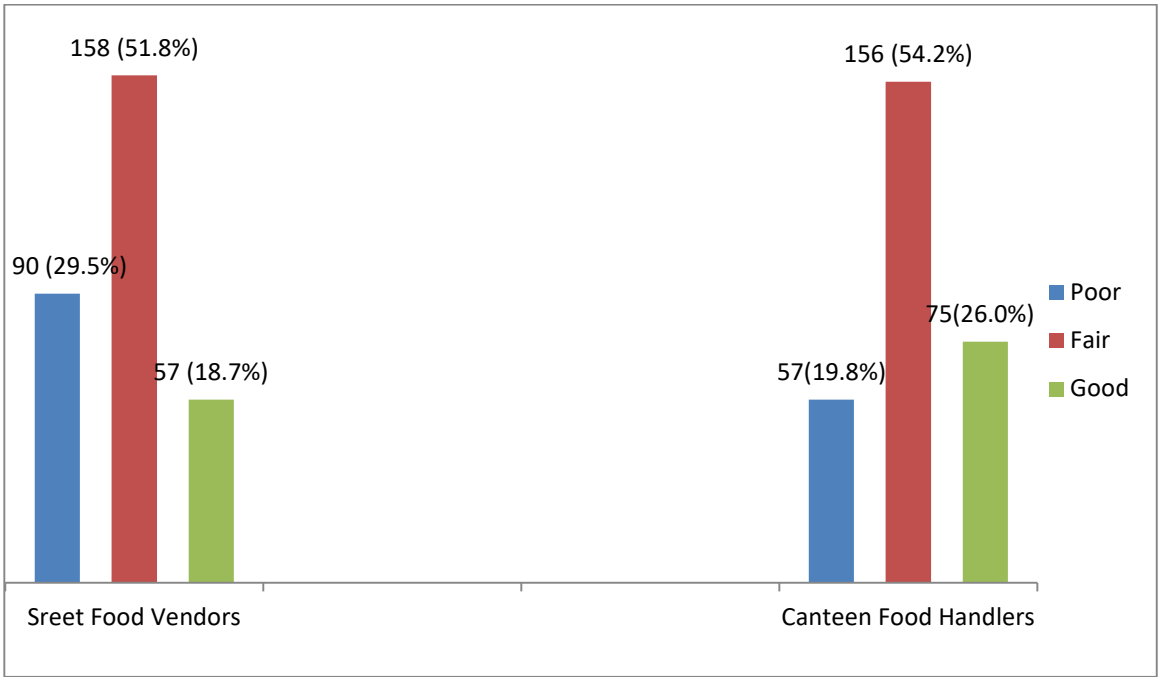
Observation for personal hygiene

The observation conducted revealed that none of the street food vendors interviewed had a refrigerator at the food vending site. In contrast, 93(32.3%) of the food canteens observed had food appropriately covered and refrigerated. Suitable cleaning clothes were also observed. They were regularly cleaned, disinfected, and properly used among 30(9.8%) street food vendors in comparison with 50(17.4%) canteens studied. In addition, only 35(11.5%) and 117(40.6%) street food vendors and canteen food handlers displayed food using screens as shown in Table 5.

Table 1: Socio-demographic characteristics of respondents

Socio-demographic characteristics	Street Food Vendors	Canteen Food Handlers			Socio-demographic characteristics	Street Food Vendors	Canteen Food Handlers		
Variables	**n=305 (%)**	**n=288 (%)**	**χ^2**	**p-value**	**Variables**	**n=305 (%)**	**n=288 (%)**	**χ^2**	**p-value**
Age (years)									
Less than 20	142(46.6)	44 (15.2)	79.6	<0.001*	**Duration in Business (years)**				
21-30	101 (33)	109(37.9			<5	162(53.0)	93 (32.3)	26.2	<0.001*
31-40	42 (13.8)	82 (28.5)				143(47.0)	195 (67.7)		
41-50	17 (5.6)	42 (14.6)			**Where food Preparation was learnt**				
51-60	3 (1.0)	11 (3.8)			Catering School	28 (9.0)	45(15.6)	11.8	0.008*
					Parents	189(62.0)	148(51.4)		
Sex					Friends	34 (11.0)	49 (17.0)		
Male	103(33.8)	111(38.5)	1.5	0.23	Self	54 (18.0)	46 (16.0)		
Female	202(66.2)	177(61.5)			**Hours of work (week)**				
					<35	133(43.6)	125(43.4)	0.003	0.96
Ethnic group						172(56.4)	163(56.6)		
Hausa	216(70.8)	191(66.3)	12.3	0.02*	**Job Description**				
Fulani	53(17.4)	36(12.5)			Food Preparation	6 (2.0)	33(11.5)	25.1	<0.001*
Yoruba	14(4.6)	32(11.1)			Food Serving	125(41.0)	87 (30.2)		
Igbo	15(4.9)	20(7.0)			Food Preparation and Serving	174(57.0)	168(58.3)		
Others	7(2.3)	9(3.1)							
					Monthly income(Naira)				
Religion					<18,000	233(73.1)	144(50.0)	36.9	<0.001*
Christianity	29 (9.5)	44 (15.3)	4.6	0.03*		82(26.9)	144 (50.0)		
Islam	276(90.5)	244(84.7)			**Vaccinated against hepatitis/typhoid**				
					Yes	107(35.0)	103(35.8)	1.5	0.5
Educational status					No	112(37.0)	116(40.2)		
None	58(19.0)	65 (22.5)	7.5	0.06	Don't Know	86 (28.0	69 (24.0)		
Primary	70 (23.0)	42 (14.6)							
Secondary	146(48.0)	144(50.0)							
Tertiary	31 (10.0)	37 (12.9)							
Marital status									
Married	63 (20.7)	92 (32.0)	39.4	<0.001*					
Single	208(68.0)	131(45.5)							
Divorced	21 (7.0)	24(8.3)							
Widowed	13 (4.3)	33 (11.4)							
Separated	0(0)	8 (2.8)							

*Statistically significant



χ^2=9.4, p-value=0.009*
*Statistically significant

Figure 1 Personal hygiene knowledge among respondents

About half of the street food vendors 51.8% and canteen food handlers 54.2% had fair knowledge of personal hygiene as shown in figure 2.

Discussion

This study found the proportion of canteen food handlers and street food vendors having good knowledge of personal hygiene to be 26.0% and 18.7% respectively. In comparison with a study conducted in Shah Alam Selangor, Malaysia, among mobile food vendors, although food handlers were aware of the need for personal hygiene, they do not understand critical aspects of personal hygiene.[6]The overall knowledge among the two groups of food handlers was grossly below expected to meet the demand of adequate food safety especially looking at the findings from the observation and the focus group discussions which suggested non-availability of basic equipment and materials needed for personal hygiene at the vending sites and sub-optimal knowledge of when and how to observe personal hygiene. For example, only 35.7% street food vendors and 35.4% canteen food handlers acknowledged that bare hand contact with food is not recommended by food handlers. More so, hand washing after touching the hair was correctly answered by 22.6% and 16.7% street food vendors and canteen food handlers respectively. In addition, only 34.8% and 33.0% knew that hand washing is recommended before commencement of each food preparation which was in keeping with our findings from focus group discussion and the observation for hygiene. We found a better result in terms of hand washing compared with what was obtained by a study conducted in Pakistan, with none of the vendors washing hands in between handling food.[18] This emphasized the importance of training and re-training of food vendors to identify, as a matter of necessity the conditions for observing personal hygiene and food safety. The varied findings may be related to non-availability and/ or enforcement of policies that will require food vendors to be trained and certified before commencing food vending business. This was corroborated by the finding of 9% and 15.6% street food vendors and canteen food handlers to have learnt food preparation in catering school by this study.

Table 2: Parameters used for assessing personal hygiene knowledge of respondents.

s/n	Knowledge of Personal Hygiene	Street Food Vendors n=305 (%)	Canteen Food Handlers n=288 (%)	χ^2	p-value
1.	Taking a bath daily	214 (70.2)	216 (75.0)	1.7	0.2
2.	Use of hair restrain/cap	115 (37.7)	130 (45.1)	3.4	0.07
3.	Using apron	69 (22.6)	119 (41.3)	23	<0.001*
4.	Keeping tidy hair	182 (59.7)	205 (71.2)	8.7	0.003*
5.	Cutting nails regularly	195 (63.9)	207 (71.9)	4.3	0.04*
6.	Bare hand contact with food	109 (35.7)	102 (35.4)	0.01	0.90
7.	Wearing ring/ jewellery	96 (31.5)	108 (37.5)	2.4	0.1
8.	Tidy/clean attire	194 (63.6)	224 (77.8)	14.0	<0.001*
9.	Cleaning anus after using toilet	57 (18.7)	93 (32.3)	14.5	<0.001*
10.	Hand washing using soap and water	158 (51.8)	191 (66.3)	12.9	<0.001*
11.	Hand washing before food preparation	186 (61.0)	165 (57.3)	0.8	0.40
12.	Hand washing after food preparation	129 (42.3)	131 (45.5)	0.6	0.40
13.	Hand washing after visiting the toilet	206 (67.5)	211 (73.3)	2.3	0.10
14.	Hand washing after handling refuse	166 (54.4)	149 (51.7)	0.4	0.5
15.	Hand washing after blowing the nose	139 (45.6)	98 (34.0)	8.2	0.004*
16.	Hand washing before commencement of each food preparation	106 (34.8)	95 (33.0)	0.2	0.6
17.	Hand washing after touching the hair	69 (22.6)	48 (16.7)	3.3	0.07

*Statistically significant

Table 3 Factors Associated with Knowledge of Personal Hygiene among Respondents

	Street Food Vendors Knowledge of Personal Hygiene					Canteen Food Handlers Knowled ge of Personal Hygiene					Overall Values for the two groups	
	Poor	Fair	Good	χ^2	p-value	Poor	Fair	Good	χ^2	p-value	χ^2	p-value
Age (years)												
24-Oct	49 (26.6)	101(54.9)	34 (18.5)	2.2	0.3	12 (16.9)	44 (62.0)	15 (21.1)	2.4	0.3	3.3	0.2
>24	41 (33.9)	57 (47.1)	23 (19.0)			45 (20.7)	112(51.6)	60 (27.6)				
Sex												
Male	38 (36.9)	46 (44.7)	19 (18.4)	4.4	0.1	23 (20.7)	54 (48.6)	34 (30.6)	2.6	0.3	5.3	0.07
Female	52 (25.7)	112(55.4)	38 (18.8)			34 (19.2)	102(57.6)	41 (23.2)				
Ethnic group												
Hausa/Fulani	79 (24.9)	142(52.8)	48 (17.8)	1.3	0.5	45 (19.8)	127(55.9)	55 (24.2)				
Others	11 (30.6)	16 (44.4)	9 (25)			12 (19.7)	29 (47.5)	20 (32.8)	2	0.4	4	0.1
Educational status												
Primary	28 (40.0)	32 (45.7)	10 (14.3)	14.1	0.03*	9 (21.4)	30 (71.4)	3 (7.1)	13.2	0.04*	14	0.03*
Secondary	32 (21.9)	79 (54.1)	35 (24.0)			27 (18.8)	77 (53.5)	40 (27.8)				
Tertiary	11 (35.5)	13 (41.9)	7 (22.6)			9 (24.3)	20 (54.1)	8 (21.6)				
Non	19 (32.8)	34 (58.6)	5 (8.6)			12 (18.5)	29 (44.6)	24 (36.9)				
Marital status												
Married	22 (34.9)	29 (46.0)	12 (19.0)	1.3	0.5	21 (22.8)	39 (42.4)	32 (34.8)	8.1	0.02*	7.5	0.02*
Unmarried	68 (28.1)	129(53.5)	45 (18.6)			36 (18.4)	117(59.7)	43 (21.9)				
Duration in business (Years)												
<5	52 (32.1)	79 (48.8)	31 (19.1)	1.4	0.5	15 (16.1)	58 (62.4)	20 (21.5)	3.7	0.6	1.5	0.5
	38 (26.6)	79 (55.2)	26 (18.2)			42 (21.5)	98 (50.3)	55 (28.2)				
Learnt Food Preparation												
Catering School	9 (32.1)	11 (39.3)	8 (28.6)	6.4	0.4	7 (15.6)	31 (68.9)	7 (15.6)	18.4	0.005*	13.5	0.04*
Parents	53 (28.0)	99 (52.4)	37 (19.6)			28 (18.9)	75 (50.7)	45 (30.4)				
Friends	14 (41.2)	16 (47.1)	4 (11.8)			18 (36.7)	20 (40.8)	11 (22.4)				
Self	14 (25.9)	32 (59.3)	8 (14.8)			4 (8.7)	30 (65.2)	12 (26.1)				
Hours of work (week)												
<35	22 (16.5)	80 (60.2)	31 (23.3)	19.1	<0.01*	20 (16.0)	78 (62.4)	27 (21.6)	6	0.05*	19.3	<0.001*
	68 (39.5)	78 (45.3)	26 (15.1)			37 (22.7)	78 (47.9)	48 (29.4)				

Table 4 Predictors of Personnel Hygiene Knowledge

	Street Food Vendors			Canteen Food Handlers		
	COR	**p-value**	**aOR(95% CI)**	**COR**	**p-value**	**aOR(95%CI)**
Educational status						
Primary	0.1	0.5	1.1(0.8-1.4)	0.2	0.2	1.2(0.9-1.6)
Secondary						
Tertiary						
Non (Reference)			1			1
Marital status						
Married				0.2	0.2	1.2(0.9-1.6)
Unmarried (Reference)			1			1
Learnt Food Preparation						
Catering School				-0.02	0.9	1.01(0.8-1.4)
Parents						
Friends						
Self (Reference)			1			1
Hours of work (week)						
<35	-1.1	<0.001*	0.3(0.2-0.6)	-0.1	0.7	0.9(0.5-1.5)
			1			1
Monthly income (Naira)						
<18,000	0.5	0.1	1.7(0.9-3.2)	-0.3	0.2	0.7(0.4-1.2)
			1			1
Vaccinated against Hepatitis/Typhoid						
Yes	0.2	0.3	1.2(0.9-1.7)	-0.3	0.9	0.97(0.7-1.4)
No						
Don't Know (Reference)			1			1

COR=Crude odd ratio, aOR=Adjusted odd ration, CI=Confidence interval

Having at least a secondary level of education was found to be significantly associated with good knowledge of personal hygiene among both street food vendors and canteen food handlers. Formal education was found to significantly influence the level of hygiene by a study conducted in Owerri, Nigeria among street food vendors, with educated vendors having better knowledge [19] This highlights the need for setting a minimum requirement for certification of food vendors, and that can go a long way in improving the food safety, thereby reducing the public health threat associated with vended food. This may be because, right from primary school, personal hygiene was one of the key topics in health education, and those having formal education can read and write therefore can readily have access to information on personal hygiene including internet services. However, a study conducted in Benin, Nigeria, found no association between educational status and hygiene status of food premises.[20]

Table 5: Observation checklist for hygiene among street food vendors and canteen food handlers

Observation for Hygiene	Street Food vendors	Canteen Food Handlers
	n=305(%)	n=288(%)
HYGIENE OF FOOD ROOM AND EQUIPMENTS		
Food rooms and equipment in good condition and well maintained	170(55.7)	273(94.8)
Food rooms clean and tidy and staff clean as th ey go including difficult areas	114(37.4)	130(41.7)
Equipment easy to clean and kept in a clean condition	210(68.9)	274(95.1)
Food and hand contact surfaces e.g. work surfaces, delivery area, slicers, fridge handles, food probe, in good condition and cleaned/ disinfected regularly	113(37.1)	150(52.1)
Cleaning chemicals available and stored correctly and a re proper cleaning methods used	20(6.6)	35(12.2)
Cleaning cloths suitable for use and regularly cleaned an d disinfected and used properly	30(9.8)	50(17.4)
Ready-to-eat food stored above/ separate from raw food in the fridges and freezers	54(17.7)	167(58.0)
Food in fridges/freezers covered	0(0)	93(32.3)
High risk foods date coded, codes checked daily and stock rotated	0(0)	103(35.8)
Dried goods stored correctly e.g. in suitable room, off t he floor, in covered containers	0(0)	263(91.3)
Freezers working properly	0(0)	132(45.8)
Fridges and freezers defrosted regularly	0(0)	156(54.2)
FOOD HANDLING PRACTICES		
Raw and ready -to-eat foods prepared in separate areas or are the work surfaces cleaned and disinfected between uses	20(6.6)	150(52.1)
Separate complex equipment (e.g. vacuum packing machines, food mixers, etc) are used for raw and ready-to-eat foods	0(0)	92(31.9)
Staff handling food as little as possible	50(16.4)	196(68.1)
Color coded equipment is provided (e.g. choppin g boards), is it correctly used	0(0)	0(0)
High risk foods prepared in small batches and returned to the fridge immediately after handling/preparation	0(0)	174(60.4)
Food cooled as quickly as possible away from raw food and other sources of contamination	0(0)	230(79.9)
Ready to eat fruit/salads/vegetables trimmed and washed thoroughly	227(74.4)	272(94.4)
Food on display screened from customers	35(11.5)	117(40.6)
Adequate clean utensils available for self-service	156(51.2)	177(61.5)
Frozen foods defrosted safely	88(28.9)	140(48.6)
Controls in place to prevent contamination by chemicals/foreign bodies e.g. glass, packaging materials, bolts, rust, cleaning chemicals	50(16.4)	100(34.7)
Staff aware of food allergy hazards	55(18.0)	141(49.0)
Probe thermometers correctly used and cleaned/ disinfected before and after use	34(11.2)	40(13.9)

PERSONAL HYGIENE		
Staff fit to work, wearing clean, suitable protective clothing and following personal hygiene rules particularly hand washing	20(6.6)	38(13.2)
Staff handling food as little as possible	50(16.5)	242(68.1)
Wash hand basins clean with warm water, soap and hygienic hand drying facilities	5(1.7)	137(47.6)
Wash hand basins used for hand washing o nly and used regularly by staff	2(0.7)	152(52.8)
Staff toilets and changing facilities clean and tidy	0(0)	153(53.1)
PEST CONTROL		
Premises pest proofed and free from any signs of pests	120(39.3)	197(68.4)
External doors/ windows fitted with suitable fly screens	0(0)	136(47.2)
Insectocutors (if provided) properly maintained	0(0)	104(36.1)
Food properly protected from risk of contamination by pests	10(3.3)	239(83.0)
WASTE CONTROL		
Waste in food rooms stored correctly	0(0)	272(94.4)
Food waste stored correctly outside and is the refuse area kept clean	149(48.9)	250(86.8)
Unfit food clearly labeled and stored separately from Other foods	0(0)	146(50.7)

A study conducted in Ghana showed almost all of the food handlers were aware of the critical role of general sanitary practices in the workplace, such as hand washing (98.7%), using gloves (77.9%), proper cleaning of the instruments/utensils (86.4%) and detergent use (72.8%).[21]In most of the findings, canteen food handlers were found to have better knowledge of personal hygiene compared with street food vendors.

Focus Group Discussion found that most of the street food vendors and canteen food handlers emphasized the need for attending catering schools before commencing food vending. In comparison with learning food vending by experience among 86% of food vendors in Alexandria,[22] this study found that up to 62% street food vendors and 51.4% canteen food handlers learn food vending business from their parents. This highlighted the importance of improving personal hygiene and food safety knowledge among food vendors. More so, the observational checklist used revealed non-availability of basic materials required for ensuring basic sanitation necessary for good food safety and hygiene, especially among street food vendors with most findings in keeping with what was obtained from both the quantitative and qualitative arms of this study. For example, only 6.6% and 13.2% of street food vendors and canteen food handlers respectively were found to be wearing clean, suitable protective clothing and following personal hygiene rules including hand washing. Similar finding of poor sanitary condition was reported by a study conducted in Sokoto.[15] This may partly be attitudinal or due to limited knowledge as demonstrated during the focus group discussions, moreover, limited focus on regulatory standards for establishing and maintaining food canteen and engaging in street food vending may play significant role in that regard. Narrations by the respondents engaged in Focus Group Discussion and the findings from observation for personal and environmental hygiene by this study pointed out that medical examinations and supervision of food handlers by the designated authorities should be a top priority because of the consistent poor sanitary conditions around the vending sites of the two categories of food vendors.

Conclusions

Personal hygiene knowledge was poor among the two groups of food handlers; therefore, the Government should ensure legislation and enforcement involving training of food vendors, periodic medical examination, and issuance of fitness certificate to all food vendors.

Limitation of the study

This study was limited by social desirability bias which was minimized by educating the food vendors on the need to provide correct information especially related to policy by the relevant stakeholders. In addition, recall bias in the areas of personal hygiene was minimized by using the observation checklist to assess personal and environmental hygiene. The use of observation checklists may affect practice and behaviour of the food vendors which was minimized by blinding them to the observation conducted.

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Conflicts of interest

Nil

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