



Knowledge and Practice of Food Hygiene among Food Vendors in Selected Primary Schools within Sokoto Metropolis

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Authors' contributions

This work was carried out in collaboration among all authors. Author BAI conceived the initial idea for the manuscript. Authors BAI, YM, MMB, AMD, EUY took part in the design of the questionnaire, supervised the data collection and wrote the first draft of the manuscript under the supervision and guidance of authors BAI and YM. All the authors contributed to the revision of the manuscript before submission. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study aims to assess the knowledge and practice of food hygiene among food vendors in primary schools within Sokoto metropolis.

Study Design: A cross-sectional descriptive study.

Place and Duration of Study: The study was conducted in Sokoto metropolis, Northwest Nigeria between June and December 2020.

Methodology: Eighty-seven food handlers were selected from 11 randomly selected primary schools that met the inclusion criteria. Data were collected via the use of interviewer administered questionnaire and observation checklist. and was analyzed using statistical package for social scientists (SPSS) version 23. Descriptive statistics, chi-square tests, and frequencies of the various

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variables were tabulated.

Results: Eighty-seven (87) food handlers with mean age of 31.95 ± 15.12 years were enrolled, out of this, 93.1% were females and only 6.9% were males. Ninety-two percent of the respondents had good knowledge of food hygiene while 78.2% had good practice and 79.3% had good level of neatness. There was no statistically significant association between the knowledge of food hygiene and any of the socio-demographic characteristics of respondents. However, there was statistically significant association between the practice of food hygiene and age category (p -value=0.001) as well as marital status of the respondents (p -value=0.001). There was also statistical significance between the level of neatness of the food handlers and age category (p -value= 0.001), marital status (p -value 0.001) and educational status (p -value 0.001).

Conclusion: Food handlers in primary schools within Sokoto metropolis generally have good knowledge of food hygiene but this was not reflected in their hygiene practices. It is recommended that a massive health education directed at both the general public and food handlers should be provided in such a way that it enables people take necessary steps towards preventing foodborne illnesses.

Keywords: Food hygiene; food vendors; knowledge; practice; primary schools; Sokoto.

1. INTRODUCTION

Food is a nutritive substance, a product that is rich in nutrients required by microorganisms and can therefore be exposed to contamination by these organisms [1]. Street or vended foods are very well patronized in educational institutions including primary schools especially in developing countries because they are affordable and easily accessible by the students and their teachers. However, most of these street foods do not meet proper hygienic standards and therefore can lead to increased morbidity and mortality due to food borne illnesses among consumers [2]. Food hygiene refers to the sum-up of all the conditions and measures necessary to ensure the safety and suitability of food at all stages of food chain including production, collection, transportation, storage, preparation, sale, and consumption [3]. While food safety according to World Health Organization (WHO) entails limiting the presence of acute or chronic hazards that can make food injurious to the health of the consumer. It is about producing, handling, storing, and preparing food in such a way as to prevent infection and contamination in the food production chain, and to help ensure that food quality and wholesomeness are maintained to promote good health [4]. W.H.O recommends "Five keys to safer food" to serve as the basis for designing programs for educating and training of food handlers and for educating the consumers. They include: Keeping food surfaces clean; washing all utensils, plates, platters, and cutlery as soon as used; separating raw food from cooked food; cooking food thoroughly, to the appropriate temperature; keeping food at safe temperatures, both for

serving and storage; and using safe water and raw materials in food preparations [4]. Foodborne diseases are caused by the ingestion of food containing pathogenic microorganisms which multiply within the consumer's gastrointestinal tract, thereby producing widespread of inflammatory processes. Foodborne illness is a growing public health problem in both low- and middle-income as well as high-income countries, causing morbidity and mortality in the general population, especially in vulnerable groups, such as infants, young children, elderly and the immune compromised [5].

Several efforts have been made both nationally and internationally to address the worrying issues relating to food safety and environment, but the problems are persisting as more than two million adults and three million children, including two million in developing countries, are reported to die each year from consumption of contaminated food and water. However, the World Health Organization in 2007 estimated that up to 1.5 billion episodes of diarrhoea and more than three million deaths occur in children every year because of contaminated food and water [5]. The incidence of food- and water-borne diseases is estimated at 3.3 to 4.1 episodes per year in Africa, while food and water-borne diarrheal diseases are estimated to cause between 450,000 to 700,000 deaths in Africa annually [6]. In developing countries, up to 70% of diarrheal episodes are estimated to be associated with the ingestion of contaminated food items, and 10 to 20% of food-borne disease outbreaks resulted from contamination of foods by the food handlers. Several devastating outbreaks of food borne diseases have been

reported in Africa, including acute aflatoxicosis attributed to maize that occurred in Kenya in 2004 and the bromide poisoning associated with the use of sodium bromide as cooking salt in Angola in 2007 [7-8].

School health service is one of the components of school health program and involves all the activities that aimed at maintaining the health of school children including school health medical examination, school clinic, school meals and hygiene, control of communicable disease and playing activities. Food hygiene involves inspection of food sold to school children on the school premises and the kitchen of the food handlers as well as screening of vendors for disease like typhoid fever and tuberculosis [9]. Food handlers are the most common source of food contamination because of their poor personal and environmental hygiene which is associated with the spread of harmful microorganisms through faeco-oral route, skin lesions, or unclean kitchen utensils and kitchen counters. However, the level of unhygienic practices in the food production chain plays an important role in the spreading of harmful organisms and chemicals from the environment to the food items. Therefore, improving the food handlers' knowledge and hygiene practices is crucial in the control of foodborne diseases [10].

Many studies around the globe have assessed different aspect of food hygiene knowledge and hygiene practices among food vendors, some of the findings are similar to each while others are different. A study in Italy, reported that, almost all the 290 selected food handlers were able to identify *Salmonella* species (99.7%) and *Staphylococcus aureus* (98.9%) as being responsible for foodborne disease. Overall, 78.8% of participants were aware of five food-borne pathogens, but only 9.3% of them were able to name five different foods that can transmit the pathogens. However, only 54.9% of those involved in serving unwrapped raw or cooked foods used protective gloves routinely during their working activity; 88% routinely washed their hands before and 91.9% after handling any food; 87.6% of those who used gloves washed their hands before putting them on and 86.5% after removing them [11]. Another study revealed that 36.8% of the 361 selected respondents had good knowledge while 20.5% and 41.6% had poor and average knowledge, respectively. However, only 10.8% had good practice, while 72% had average practice and 16.9% had poor practice [12]. Another study

assessed the knowledge and practice of food hygiene among food handlers working in the mess and hospital canteen reported that 67.5% of the respondents did not had any idea about diseases transmitted through food, only 32.5% knew that food can lead to diarrhea, vomiting and abdominal pain. However, all the respondents knew that hands should be washed with soap and water before food preparation and serving while 58% of males and 27.7% of females correctly knew that licking fingers can contaminate the food. All the respondents said that floor, roof, and walls should be kept clean, hands should be washed after defecation and micturition and persons with skin infection can contaminate the food. Moreover, 95.2% of the respondents washed their hands with soap and water before food preparation and serving; 14.5% of males and 48.2% of females washed utensils daily with hot water; all females and 60.2% males used disinfectants to wash floor and walls; all the females and 57.8% males stored food in clean utensils and covered it; 63.9% stored food in refrigerator and 36.1% at room temperature; all respondents washed their hands with soap and water after defecation and micturition before resuming work; 50.6% males and 22.9% females covered their mouth, nose and hair while handling food [13].

In another study from Africa, the findings revealed that 64.6% of the studied participants had fair knowledge of food hygiene and 63.9% had fair practice on food hygiene measurements [14]. A study from South-eastern Nigeria, revealed that almost half (48.4%) of the respondents had poor knowledge of food sanitation [15]. Another study revealed that about half of the respondents (50.7%) had average knowledge of food borne infection; 41.6% had poor knowledge and only 7.6% had adequate knowledge. However, only 24.7% of the respondents had good practice, 43.8% had average practice and 31.5% had poor practice [5]. In north central Nigeria, the findings revealed that 60.9% of the respondents had good knowledge of food safety and hygiene while 31.9% had poor knowledge and 56.3% had good practice [16].

2. METHODOLOGY

2.1 Study Area

The study was carried out in Sokoto metropolis, Sokoto state. Sokoto state is located to the extreme Northern west of Nigeria between

longitudes 4° E and 7°E and latitudes 12°N and 14°N. It shares boundaries with the republic of Nigeria to the North, Kebbi state to the West and South and Zamfara State to the East [17]. Sokoto state does not provide school feeding for primary school's students, thus the students have to bring their food from home, however majority patronize food vendors in the school premises.

2.2 Study Population

The study was carried out among 87 food handlers from 11 randomly selected primary schools within Sokoto metropolis.

2.2.1 Inclusion criteria

Only food vendors who have been operating at least six months before the study and currently vending food within the primary schools of the study area were included in the study.

2.2.2 Exclusion criteria

Food vendors outside the study area.

2.3 Study Design

Cross-sectional study design.

2.4 Sample Size Determination

A minimum sample size of 87 was used and was calculated using the formula $n = z^2pq/d^2$ using prevalence of good knowledge among food handlers in previous study of 94.3% (p-value 0.943) and a precision of 5% ($d = 0.05$). Eighty-seven (87) respondents were randomly selected and from eleven (11) randomly selected primary schools in Sokoto metropolis.

2.5 Sampling Techniques

A two-staged sampling technique was used to select participants in this study.

Stage 1: selection of primary schools

Simple random sampling was used to select 22 out of 1881 primary schools in Sokoto metropolis by the use of computer-generated random numbers.

Stage 2: selection of respondents

Four food handlers were selected from each of the selected primary schools using simple random sampling by balloting.

2.6 Instrument of Data Collection

A set of structured pretested self-administered questionnaire was used to obtain relevant information from the study participants. The questionnaire had five sections as follows:

A set of structured pretested self-administered questionnaire was used to obtain relevant information from the study participants. The questionnaire had five sections on Sociodemographic characteristics of respondents, knowledge of food hygiene Practices of food hygiene, and level of neatness of food handler

Internal consistency (using Cronbach's alfa) of the instrument (for the Likert scale items) was 0.72.

2.7 Method of Data Collection

Data was collected using pretested semi structured interviewer administered questionnaires and an observation checklist from randomly selected respondents across the metropolis.

2.8 Personnel for Data Collection

Ten research assistants consisting of final year medical students and the students from the Community Health Officer training program in UDUTH Sokoto, were recruited to collect the data in this study.

2.9 Pre-test

The questionnaire was pretested among food vendors in nearby primary schools outside the metropolis. Necessary amendments were made thereafter.

2.10 Data Analysis

The level of knowledge of food hygiene was determined by scoring the questions that assessed knowledge. For any response, a correct answer as scored 1 and a wrong answer was scored 0. The total maximum score for all the correct answers for assessing the level knowledge was 16. The level of practice of food hygiene was determined by scoring questions that assessed practice. For an appropriate practice, a score of 1 was allocated and for an inappropriate practice, a score of 0 was allocated. The total maximum score for all the

appropriate practices was 09. The aggregate score for each respondent according to the level of knowledge, and practice was translated to a proportion and assessed against a scale of $\geq 50\%$ as good and $< 50\%$ as poor. Data was cleaned and analyzed using Software Package for Social Sciences (SPSS) version 23. Descriptive statistics including frequencies, percentages, mean and standard deviation were used to describe the data. Chi square test was used to determine association between socio-demographic characteristics, and the knowledge of food hygiene with the practice of food safety and hygiene among study participants. A 95% confidence level was used, and level of significance was set at $p < 0.05$.

3. RESULTS

3.1 Socio-demographic Characteristics of Respondents

The mean age of the 87 respondents was 31.95 ± 15.12 years. A larger percentage (27.6%) were aged less than 20 years. There was a predominance of females (93.1%), and a majority of the respondents (46%) were single and Hausa (57.5). The most preponderant religion was Islam (87.4%); majority of the respondents had formal education (62.1%) while 37.9% had only Qur'anic education and most of them have worked between 1 to 5 years (57.5%) as shown in Table-1.

3.2 Respondents' Knowledge of Food Hygiene

A majority, 80 (92%) of the 87 respondents had good knowledge of food hygiene. Majority of the respondents were aware of foodborne illnesses (88.5%); 51.7% of them knew how foodborne illnesses are transmitted; 96.6% knew that there is cure for food illnesses and 90.8% knew that food borne illnesses can be prevented (Table-2). There was no significant association ($p > 0.05$) between good knowledge of food hygiene and

any of the sociodemographic variables of respondents (Table-6).

3.3 Food Hygiene Practices among Respondents

More than two-third of the respondents (78.2%) had good practice of food hygiene. Majority of them (79.3%) wash their hands with soap and water before preparing food and about half of them (50.6%) clean and sanitize cutting surface most of the time while preparing their food. Most of the respondents (93.1%) used tap water to prepare the food while only 48.3% served tap water to their customers and 85.1% used soap and water in cleaning their utensils. (Table- 3) There was statistically significant association between the practice of food hygiene and age category ($p=0.001$) as well as marital status of the respondents ($p=0.001$) (Table- 7).

3.4 Level of Neatness of Food Handlers

The self-reported level of neatness was good among 79.3% of the respondents and poor among 20.7% of them. More than half (51.7%) of the respondents practice open dumping as a method of refuse disposal; 24.1% of them wash their hands when they are about to serve food to customers while 18.4% use different dispensers in serving different types of food. (Table 4) However the observed level of neatness using checklist showed that majority of the premises were not neat as at the time of data collection (73.6%); 67.8% of the food handlers had neat clothes; almost all of the food handlers had their hair covered (95.4%); 85.1% had their nails trimmed; 2.3% wore uniform; just a few (32.2%) practices frequent hand washing. The percentages for covered refuse bins, facilities for hand washing and clean equipment were 18%, 27%, and 29% respectively. (Table 6). There was significant association between the neatness of food handlers and age category ($p=0.001$), marital status ($p=0.001$) and educational status ($p=0.001$) (Table 7).

Table 1. Socio-demographic characteristics of respondents

Variable	Frequency (%) n = 87
Age group (years)	
10-19	24(27.6)
20-29	15(17.2)
30-39	19(21.8)
40-49	16(18.4)
≥ 50	13(14.9)
Gender	
Male	6(6.9)

Variable	Frequency (%) n = 87
Female	81(93.1)
Marital Status	
Single	40(46.0)
Divorced/Separated	4(4.6)
Widowed	16(18.4)
Married	27(31.0)
Tribe	
Hausa	50(57.5)
Fulani	10(11.5)
Yoruba	14(16.1)
Igbo	3(3.4)
Others	10(11.5)
Religion	
Islam	76(87.4)
Christian	11(12.6)
Educational Level	
Primary	16(18.4)
Secondary	33(37.9)
Tertiary	5(5.7)
Quranic	33(37.9)
Working experience (in years)	
<1	17(19.5)
1 – 5	50(57.5)
>5	20(23.0)

Table 2. Respondents' knowledge of food hygiene n = 87

Variables	Frequency (%) n=87
Are you aware of food borne illnesses	
Yes	77 (88.5)
No	10(11.5)
Which of the following is/are foodborne disease (S)	
Diarrhea	
Yes	31 (35.6)
No	49 (56.3)
Cholera	
Yes	34(39.1)
No	46 (52.9)
Hepatitis	
Yes	2 (2.3)
No	77 (88.5)
Typhoid	
Yes	21 (24.1)
No	58 (66.7)
Don't know	
Yes	21 (24.1)
No	58 (66.7)
How can somebody get food borne disease	
Food	45 (51.7)
Water	29 (33.3)
Blood	1(1.1)
Don't know	12(13.8)
Where should food be stored	
Anywhere in the kitchen	91 (50.6)
Refrigerator	89 (49.4)

Variables	Frequency (%) n=87
In a big dish	19(21.8)
Wrapped in a polythene	9(10.3)
Others	21(24.1)
What can somebody do if he gets food related illnesses	
Go to a chemist	4 (4.6)
Go to a traditional healer	3 (3.4)
Go to hospital	80(92.0)
Is there cure for food illnesses	
Yes	84 (96.6)
No	3 (3.4)
If yes what is the cure	
Improved personal hygiene	35(40.2)
Use of drugs	47(54.0)
Use of traditional herbs	5(5.7)
Can food related diseases be prevented	
Yes	79(90.8)
No	8(9.2)
How can they be prevented	
Improved personal hygiene	
Yes	54(62.1)
No	26(29.9)
Regular hand washing	
Yes	20(23.0)
No	60(69.0)
Proper washing of food stuffs	
Yes	33(37.9)
No	47(54.0)
Use of clean water	
Yes	7(8.0)
No	73(83.9)
Knowledge grade	
Good	80(92.0)
Poor	7(8.0)

Table 3. Reported practice of food hygiene among respondents n = 87

Variables	Frequency (%)
Do you always wash your hand before preparing food	
Yes	84 (96.6)
No	3 (3.4)
If yes what do you use to wash your hands	
Water	15 (17.2)
Soap and water	69 (79.3)
How often do you wash hands	
Always	13 (14.9)
Most of the time	38 (43.7)
Sometimes	34 (39.1)
Do you clean and sanitize cutting surface	
Yes	67 (77.0)
No	20 (23.0)
If yes how often	
Always	8 (9.2)
Most of the time	44 (50.6)
Sometimes	22 (25.3)

Variables	Frequency (%)
Never	1 (1.1)
If no how often	
Always	4 (4.6)
Most of the time	19 (21.8)
Sometimes	7 (8.0)
What is your major source of water for washing	
Well water	5 (5.7)
Tap water	81 (93.1)
Cooled boiled water	1 (1.1)
What is your major source of drinking water for customer	
Tap water	42 (48.3)
Cooled boiled water	2 (2.3)
Others	15 (17.2)
What do you use in cleaning your cooking utensils and dishes	
Soap and water	74 (85.1)
Water only	9 (10.3)
Tissue paper only	1 (1.1)
Practice grade	
Good	68 (78.2)
Poor	18 (20.7)

Table 4. Neatness of food handlers

Variables	Frequency (%) n= 87
How do you dispose your waste	
Covered dustbin	9 (10.3)
Open dumping	45 (51.7)
Burying	1 (1.1)
Burning	29 (33.3)
Others	2 (2.3)
At what time did you think you should wash your hand as a food handler	
After using toilet	
Yes	24 (27.6)
No	62 (71.3)
Whenever I like	
Yes	18 (20.7)
No	68 (78.2)
After blowing my nose	
Yes	11 (12.6)
No	75 (86.2)
Before I start cooking food	
Yes	53(60.9)
No	33(37.9)
Do you routinely rinse washed and dried plates when you are about to serve food in them to customers	
Yes	21 (24.1)
No	66 (75.9)
Do you routinely use different dispensers in serving different types of prepared food to customers?	
Yes	16(18.4)
No	71(81.6)
Level of neatness grade	
Good	69 (79.3)
Poor	18 (20.7)

Table 5. Observed level of neatness using checklist n= 87

Variables	Frequency (%)
Neatness premises	
Yes	23 (26.4)
No	64 (73.6)
Clothes neatness	
Yes	59 (67.8)
No	28 (32.2)
Hair covered	
Yes	83 (95.4)
No	4 (4.6)
Finger nail trimmed	
Yes	74 (85.1)
No	13 (14.9)
Uniform	
Yes	2 (2.3)
No	85 (97.7)
Frequent hand washing	
Yes	28 (32.2)
No	59 (67.8)
Covered refuse bin	
Yes	18 (20.7)
No	69 (79.3)
Facilities for hand washing	
Yes	27(31.0)
No	60(69.0)
Clean equipment	
Yes	29 (33.3)
No	58 (66.7)

Table 6. Correlate of Good Knowledge of Food Hygiene

Variable	Knowledge of food hygiene (n = 87)		Test of significance
	Good Frequency (%)	Poor Frequency (%)	
Age group			
10-19	21 (24.1)	3 (3.4)	$\chi^2 = 5.28$ p = 0.508
20-29	13 (14.9)	2 (2.3)	
30-39	19 (21.8)	0 (0)	
40-49	15 (17.2)	1 (1.1)	
≥ 50	12 (13.8)	1 (1.1)	
Gender			
Male	5 (5.7)	1 (1.1)	$\chi^2 = 0.647$ P = 0.421
Female	75 (86.2)	6 (6.9)	
Marital status			
Single	36 (41.4)	4 (4.6)	$\chi^2 = 2.518$ p = 0.472
Divorced/Separated	3 (3.4)	3 (3.4)	
Widowed	15(17.2)	1(1.1)	
Married	26(29.9)	1(1.1)	
Religion			
Islam	69 (79.3)	7 (8.0)	$\chi^2 = 1.102$ p = 0.294
Christianity	11 (12.6)	0 (0)	
Educational status			
Primary education	14(16.1)	2(2.3)	$\chi^2 = 2.729$ p = 0.435
Secondary education	32(36.8)	1(1.1)	

Variable	Knowledge of food hygiene (n = 87)		Test of significance
	Good Frequency (%)	Poor Frequency (%)	
Tertiary education	5(5.7)	0(0)	
Qur'anic education	29(33.3)	4(4.6)	
Duration of food handling			
< 1 year	15 (17.2)	2 (2.3)	$\chi^2 = 0.569$ p = 0.753
1 – 5 years	46 (52.9)	4 (4.6)	
> 5years	19 (21.8)	1 (1.1)	

Table 7. Correlates of Good Practice of Food Hygiene

Variable	Practice of food hygiene (n = 87)		Test of significance
	Good Hygiene (%)	Poor Hygiene (%)	
Age group			
10-19	23 (24.1)	1 (1.1)	$\chi^2 = 36.008$ p = 0.001
20-29	14 (16.1)	1 (1.1)	
30-39	19 (21.8)	0 (0)	
40-49	15 (17.2)	9 (10.3)	
≥ 50	12 (13.8)	8 (9.2)	
Gender			
Male	5 (5.7)	1 (1.1)	$\chi^2 = 0.101$ P = 0.751
Female	63 (72.4)	18 (20.7)	
Marital status			
Married	38(43.7)	2 (2.3)	$\chi^2 = 28.392$ p = 0.001
Unmarried	4 (4.6)	0 (0)	
Widowed	5(5.7)	11(12.6)	
Married	21(24.1)	6(6.9)	
Religion			
Islam	57 (65.5)	19(21.8)	$\chi^2 = 3.518$ p = 0.061
Christianity	11 (12.6)	0(0)	
Educational status			
Primary education	16(18.4)	0(0)	$\chi^2 = 0.069$ p = 0.966
Secondary education	33(37.9)	0(0)	
Tertiary education	5(5.7)	0(0)	
Qur'anic education	14(16.1)	19(21.8)	
Duration of food handling			
< 1 year	13 (14.9)	4 (4.6)	$\chi^2 = 0.069$ p = 0.966
1 – 5 years	39 (44.8)	11 (12.6)	
> 5years	16 (18.4)	4 (4.6)	

Table 8. Correlate of Neatness of Food Handlers

Variable	Practice of food hygiene (n = 87)		Test of significance
	Good Frequency (%)	Poor Frequency (%)	
Age group			
10-19	23 (24.1)	1 (1.1)	$\chi^2 = 39.643$ p = 0.001
20-29	15 (17.2)	0 (0)	
30-39	19 (21.8)	0 (0)	
40-49	7 (8.0)	0 (0)	
≥ 50	5 (5.7)	9 (10.3)	
Gender			

Variable	Practice of food hygiene (n = 87)			
	Good Frequency (%)	Poor Frequency (%)	Test of significance	
Male	6 (6.9)	0 (0)	$\chi^2 = 1.681$ P = 0.195	
Female	63 (72.4)	18 (20.7)		
Marital status				
Single	39 (44.8)	1 (1.1)	$\chi^2 = 31.670$ p = 0.001	
Divorced/Separated	4 (4.6)	0(0)		
Widowed	5(5.7)	11(12.6)		
Married	21(24.1)	6(6.9)		
Religion				
=3.285 0.070	Islam	58 (66.7)	18(20.7)	χ^2 p =
	Christianity	11 (12.6)	0(0)	
Educational status				
=31.056 0.001	Primary education	15(17.2)	1(1.1)	χ^2 p =
	Secondary education	33(37.9)	0(0)	
	Tertiary education	5(5.7)	0(0)	
	Qur'anic education	16(18.4)	17(19.5)	
Duration of food handling				
	< 1 year	14 (14.9)	3 (3.4)	$\chi^2 = 0.154$ p = 0.926
	1 – 5 years	39 (44.8)	11 (12.6)	
	> 5years	16 (18.4)	4 (4.6)	

4. DISCUSSION

Eighty-seven food handlers participated in this study and a larger proportion of them (27.6%) were within the age range of 10 – 19 years, with a mean age of 31.95 ± 15.12 years. This is similar to a study conducted among food handlers in Zaria [3] and Sokoto [18] where 36.2% and 43.3%, respectively were between the ages of 15 – 29 years; however, contrary to the findings of studies done in Ilorin, Nigeria, where majority of the respondents were older and within the range of 30 – 39 years (38.4%), and in Brazil where the mean age of respondents was 50 years [19-20]. This may indicate that younger populations are more involved in food handling in Northern Nigeria as compared to other part of the country.

Females were predominant (93.1%) among the respondent that participated in this study. This is similar to studies conducted in Ilorin where 98.4% of the respondents were females; in another place 66.4% were females and in other different parts of Nigeria [3,18-19]. The preponderance of female food handlers in this study may be due to the fact that women are more involved in food preparation and serving in this our society and are more involved in street food vending, on which they depend as their

means of complementing family income. More than half of the respondents (67.0%) were not married. This could be related to the cultural practices in northern part of Nigeria where activities of married women are mostly limited to the home environment. (since most of the food handlers in this study were females).

Majority of respondents in this study had no formal education at all (37.9%), this is in line with the findings obtained in studies in Ilorin (56.9%), and Ghana (26%), where most of the respondents had no formal education [18-19,21]. However, more than half of food handlers in this study had working experience of 1-5 years (57.5%), similar to Kenyan study (60.4%) but contrary to the study conducted in Malaysia where 95% of respondents had working experience of more than 5 years [22-23].

In this study, majority (88.5%) of the food handlers were aware of food borne illnesses and 51.7% of them knew how food borne illnesses are transmitted. This is in consonance with the finding of a study in Kenya [22]. However, only 24.1% knew that Typhoid is a foodborne disease and 39.1% knew Cholera as foodborne disease. This contrasts the finding of another study where 74% knew Cholera as food borne disease [18].

A large proportion of food handlers in this study had good knowledge of food hygiene (92%) and only 8% of them had poor knowledge. This finding agrees with that of other studies carried out in many parts of this country [3,5,18]. However, this study found that there was no statistically significant association between good knowledge of food hygiene and any of the socio-demographic variables ($p > 0.05$). This is in line with the findings of another study done in Sokoto and that carried out in Davao's city, which found no association between education and knowledge of food hygiene [18,24].

Majority of respondents in this study engaged in good hygienic practice (78.2%) such as washing of hands and utensils during the process of food preparation while 21.8% had poor food hygiene practices. These findings are in keeping with other findings from different studies including a study carried out in Jos where 56.3% of the respondents had good safety and hygiene practice; Malaysian study where 54.7% had good food handling practices and a study done in Abuja which reported 61.3% of respondents as having good hygiene practice [23,25]. The level of food hygiene practices found in this study among food vendors does not reflect their level of knowledge of food hygiene. This means that knowledge does not always translate into appropriate practice. Similar findings were reported in studies conducted in Ghana, and Malaysia, where poor practice of food hygiene was observed despite excellent knowledge of food hygiene among respondents [12,26].

Majority of the premises (73.6%) were dirty and not fit for food serving; however, most (67.8%) of the food handlers were neatly dressed while 32.2% were not neat enough. This is in contrast with the study done among canteen workers of government medical college, Solapur Indian, where they noted that only 28.9% had good personal hygiene [27]. Almost all the food handlers (95.4%) had their hair covered, majority (85.1%) had their fingernails trimmed and only 2.3% wore uniform. This finding is similar to the finding reported from Zaria, Nigeria where 75.9% of food handlers cover their hair and 94.8% trimmed their fingernails [3]. However, the finding contradicts that of a Kenyan study where only 11% of the respondents had their hair covered, 44% had their fingernails trimmed and 52% wore uniform [22]. Majority (67.8%) did not practice frequent hand washing; just a few 32.2% practice frequent hand washing; the proportion of respondents with covered refuse bin, facilities for

hand washing and clean equipment were 18%, 27%, and 29%, respectively. This is not in consistence with the finding of a study done in Zaria where the food handlers had higher percentages of neat premises (95.5%), and facility for hand washing (77.3%) [3].

It was worrisome that very few primary schools had neat premises, this could probably be because the school managements did not place a high premium on the importance of sanitation in ensuring that food served to school children is safe and it is worthy of note that diarrheal disease is one of the leading causes of death in children below the age of five years. In a bid to maintain good health, the schools should provide covered refuse bins, facilities for hand washing and train the food handlers on good hygienic practices with emphasis on ideal hand washing practices.

5. CONCLUSION

Food handlers in primary schools within Sokoto metropolis generally have good knowledge of food hygiene but this was not reflected in their hygiene practices. Regular inspection and education of food handlers in the schools across the state is therefore advised in order to protect the children pending the implementation of regular school feeding and school feeding for primary schools' students to be considered in to prevents the children from patronizing the unhygienic food vendors. There is a need for a hygienic school feeding program to be implemented to replace the vendors.

6. STRENGTH AND LIMITATIONS

The study was able to identify the problems associated with food hygiene in the primary schools of the metropolis and the needs for routine inspection of food vendors and implementation of school feeding program.

Self-reporting of practices may have led the food handlers report an ideal or acceptable hygienic practice rather than their actual practices. Guessing is a possibility when answering the questions. This may introduce recall bias measure of food hygiene knowledge.

CONSENT

Permission was received from the headmasters of the selected schools. The information sheet explaining the purpose and what the study

entails was read and explained to the respondents to make an informed decision. The respondents were informed that they have the right to withdraw at any stage of the study if they so wish. They were informed that the research has no harm to their health, neither does it have any effect on the security of their job if they choose to participate or not to participate in the research. They were made to understand that they were selected only by the fact that their profession is directly related to the topic under research. The informed consent was read to each participant in their preferred language of interview before questionnaires were administered.

ETHICAL APPROVAL

Ethical approval for this study was obtained from Sokoto State research and ethics committee through the state Ministry of Health, Ministry of education and from the headmasters/mistresses of the selected primary schools.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Rogers K. Food [Internet]. Encyclopaedia Britannica, Inc. 2019. Available: <https://www.britannica.com/topic/food>. [Last accessed: 10/7/2019]
2. Monney I, Agyei D, Owusu W. Hygienic practices among food vendors in educational institutions in Ghana: The Case of Konongo. *Foods*. 2013;2: 282-94.
3. Otu SS. Food hygiene practices among food handlers in Ahmadu Bello University, Zaria: Ahmadu Bello University, Zaria; 2014.
4. World Health Organization. Food Safety: What you should know [Internet]. Geneva: World Health Organization. 2015. Available: www.searo.who.int/entity/world_health_day/2015/whd-what-you-should-know/en/. [Last accessed: 20/7/2019]
5. Adebukola OC, Opeyemi AO, Ayodeji AI. knowledge of food borne infection and food safety practices among local food handlers in Ijebu-Ode local government area of Ogun state. *Journal of Public Health and Epidemiology*. 2015;7(9):268-73.
6. Sabir M, Ennaji MM, Cohen N. *Vibrio Alginolyticus*: An emerging pathogen of foodborne diseases. *Int J Sci Technol*. 2013;2(4):302-9.
7. Gizaw Z, Gebrehiwot M, Teka Z. Food safety practice and associated factors of food handlers working in substandard food establishments in Gondar Town, Northwest Ethiopia. *Int J Food Sci Nutr Diet*. 2014;3(7):138-46.
8. World Health Organization. WHO initiative to estimate the global burden of foodborne diseases [Internet]. Geneva, Switzerland: World Health Organization. 2008. Available: https://www.who.int/foodsafety/publications/foodborne_disease/FERG_Nov07.pdf. [Last accessed: 23/7/2019].
9. Azubuike JC, Nkanginieme K. Paediatrics and child health in a tropical region. 2 ed: African Educational resources; 2007.;47.
10. Campos AKC, Cardonha ÂMS, Pinheiro LBG, Ferreira NR, Azevedo PRM, Stamford TLM, et al. Assessment of personal hygiene and practices of food handlers in municipal public schools of Natal, Brazil. *Food Control*. 2009;20(9):807-10.
11. Angelillo IF, Viggiani NMA, Greco RM, Rito D. HACCP and food hygiene in hospital: Knowledge, attitudes, and practices of food- services staff in Calabria, Italy. *Infection Control and Hospital Epidemiology*. 2001;22(6):363-9.
12. Rahman MM, Arif MT, Bakar K, Tambi ZB. Food safety knowledge, attitude and hygiene practices among the street food vendors in Northern Kuching City, Sarawak. *Borneo Sciences*. 2012;31: 107-16.
13. Kasturwar MB, Mohammad S. Knowledge, practice and prevalence of MRSA among food handlers. *International Journal of Biomedical Research*. 2011;2(4):889-94.
14. Nigusse D, Kumie A. Food hygiene practices and prevalence of intestinal parasites among food handlers working in Mekelle university student's cafeteria, Mekelle. *Global Advanced Research Journal of Social Science*. 2012;1(4):65-71.
15. Chukwuocha UM, Dozie IN, Amadi AN, Nwankwo BO, Ukaga CN, Aguwa OC, et al. The knowledge, attitude and practices

- of food handlers in food sanitation in a metropolis in South Eastern Nigeria. *East African Journal of Public Health*. 2009;6(3):240-3.
16. Afolaranmi TO, Hassan ZI, Bello DA, Misari Z. Knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau State, North Central Nigeria. *Journal of Medical Research*. 2015;4(2):16-22.
 17. MOE. State Strategic Education Sector Plan 2011–2020 [Internet]. Sokoto, Nigeria: Ministry of Education Sokoto. 2010. Available: [https://www.globalpartnership.org/2010-10-gpe-nigeria-sokoto-esp-2011-2020\(1\).pdf](https://www.globalpartnership.org/2010-10-gpe-nigeria-sokoto-esp-2011-2020(1).pdf). [Last accessed: 16/8/2019]
 18. Ahunna ZE, Awosan KJ, Oche MO, Makusidi MA, Abubakar BG, Raji IA. Knowledge and practices related to food hygiene among food handlers in Sokoto, Nigeria. *International Journal of Tropical Disease and Health*. 26(1):1-16.
 19. Musa OI, Akande TM. Food hygiene practices of food vendors in secondary schools in Ilorin. *The Nigerian Postgraduate Medical Journal*. 2003;10(3):192-669.
 20. Bertin PFHC, Rezende MA, Sigulem DM, Morais TB. Hurdles at work: Perceptions of hospital food handlers. *Human Res Hlth*. 2009;7:63.
 21. Donkor ES, Kayang BB, Quaye J, Akyeh ML. Application of the WHO keys of safer food to improve food handling practices of food vendors in a poor resource community in Ghana. *Int J Environ Res Public Hlth*. 2009;6(11):2833-42.
 22. Margaret G, Judith K, Paul O. Knowledge in food hygiene and hygienic practices differ- in food handlers at a hospital in Nairobi, Kenya. *African Journal of Food Science and Technology*. 2013;4(1):19-24.
 23. Mizanur R, Muhammad TA, Kamaluddin B, Zainab T. Food safety knowledge, attitude and hygiene practices among the street food vendors in Northern Kuching city, Sarawak, Malaysia. *Borneo Sciences*. 2012(3):95-103.
 24. Molina JO. Food safety knowledge, attitude and practice of hospital food handlers in Davao city. *UIC Res J*. 2012;18:89-102.
 25. Afolaranmi TO, Hassan ZI, Bello DA, Misari Z. knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau state. *European Journal of Medical Research*. 2015;4(2):016-22.
 26. Rheinlander T, Olsen M, Bakang JA, Takyi H, Konradsen F, Samuelsen H. Keeping up appearances: Perceptions of street food safety in Urban Kumasi. *J Urban Hlth*. 2008;5(6):952-64.
 27. Anant AT, Anjali PK. Assessment of personal hygiene of canteen workers of government Medical College and Hospital, Solapur, India. *National Journal of Community Medicine*. 2011;2(3):448.

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