

# Food Hygiene Knowledge, Personal Hygiene Practices, and Foodborne Risk Among Secondary School Students in Oyo East Local Government

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**Abstract:** *This study investigated the statistical relationship between food hygiene knowledge, personal and environmental hygiene practices, and sources of food contamination among food vendors in ten government secondary schools in Oyo East Local Government Area (LGA), Oyo State, Nigeria. Employing a cross-sectional descriptive survey design with a structured questionnaire administered to 100 food vendors (10 per school) during the 2025 fieldwork period, the study utilised frequency counts, percentages, and Chi-square ( $\chi^2$ ) analysis at a 0.05 level of significance. Findings revealed that 95.2% of respondents demonstrated adequate knowledge of food hygiene measures, while 90.5% endorsed essential personal hygiene practices. Chi-square analysis confirmed statistically significant relationships across all three null hypotheses: food hygiene knowledge ( $\chi^2 = 198.56$ ,  $df = 15$ ,  $p < 0.05$ ), personal and environmental hygiene practices ( $\chi^2 = 187.20$ ,  $df = 21$ ,  $p < 0.05$ ), and sources of food contamination ( $\chi^2 = 134.88$ ,  $df = 21$ ,  $p < 0.05$ ). Spatial disaggregation of data across urban-peripheral, semi-urban, and peri-urban school categories within the LGA revealed significantly lower hygiene practice compliance in peri-urban settings, attributable to structural infrastructure deficits. The study underscores the need for evidence-based, geographically targeted food safety interventions in government secondary schools across Nigeria.*

**Keywords:** *food hygiene, food vendors, secondary schools, Chi-square, foodborne diseases, Oyo East LGA, spatial variation, Nigeria*

## 1. INTRODUCTION

Food safety in school environments constitutes a critical public health concern, particularly in low- and middle-income countries where adolescents are heavily dependent on informal food vendors for their daily nutritional intake (Jaffee et al., 2018). In Nigeria, government secondary schools typically host a network of food vendors whose hygiene practices directly determine the foodborne disease risk experienced by students and staff (Adedokun et al., 2021). The consequences of poor food hygiene in these settings including diarrhoeal disease, food poisoning, and chronic nutritional deficits are well documented in the Nigerian public health literature (Adebayo et al., 2022; Ogunbanjo & Adeyemo, 2019).

Oyo East Local Government Area (LGA) of Oyo State, South-Western Nigeria, presents a representative setting for examining these challenges. The LGA encompasses a heterogeneous mix of urban-peripheral, semi-urban, and peri-urban government schools, each operating within distinct environmental and infrastructural contexts that shape the capacity of food vendors to maintain safe practices Adeyemi (2022). Despite the recognised importance of school food safety in this setting, rigorous quantitative investigations with systematic spatial disaggregation remain scarce.

This study addresses that gap by applying Chi-square analysis to survey data from 100 food vendors across ten government secondary schools in Oyo East LGA, collected during the 2025 fieldwork period. It tests three null hypotheses regarding food hygiene knowledge, personal and environmental hygiene practices, and food contamination sources, while incorporating a geographical dimension by disaggregating findings by school location category. The study is thus positioned at the intersection of health education and medical geography, two disciplines whose integration is essential for effective school food safety policy.

The specific objectives are to: (i) determine the level of food hygiene knowledge among food vendors in government secondary schools in Oyo East LGA; (ii) assess the adequacy of personal and environmental hygiene practices; and (iii) identify perceived sources of food contamination and associated risks, with attention to spatial variation across school location categories.

## 2. LITERATURE REVIEW

### 2.1 Conceptual Framework

This study draws on two complementary theoretical frameworks. The Health Belief Model (HBM; Janz & Becker, 1984) provides the health education foundation, positing that health-protective behaviour including food hygiene practice is mediated by perceived susceptibility to disease, perceived severity, perceived benefits of action, and perceived barriers. Applied to food vendors in secondary schools, vendors with higher perceived risk of causing harm to students are theoretically more likely to maintain hygiene standards, while structural barriers (water absence, lack of protective equipment) will suppress compliance even among motivated individuals.

Orem's (2001) Self-Care Deficit Theory complements this by framing food vendors as dependent-care agents responsible for the nutritional and hygienic wellbeing of the students they serve. When vendors' self-care agency is deficient due to limited formal education, inadequate training, or constrained environmental infrastructure external intervention by health educators and public authorities becomes necessary. The geographical dimension of the study is grounded in spatial health equity theory (Curtis, 2004), which holds that health-relevant behaviours are systematically structured by the physical and institutional environments of the places where they occur.

## 2.2 Empirical Evidence

Studies consistently document significant gaps between food hygiene knowledge and practice among school food vendors in Nigeria. Adedokun et al. (2021) found that food vendors in Kwara State secondary schools displayed high knowledge scores but inconsistent compliance, particularly regarding protective equipment use and food storage. Adebayo et al. (2022) established a statistically significant association between poor personal hygiene practices and increased foodborne illness incidence among secondary school students in Osun State. Salihu et al. (2023) demonstrated that consistent use of personal protective equipment by food vendors in Ilorin significantly reduced bacterial contamination levels in food samples.

At the environmental level, Tambe et al. (2022) showed that cleaning frequency and disinfectant use among food handlers in Cameroon varied significantly by establishment type and geographical location, with rural settings reporting lower compliance due to access constraints. Rahman et al. (2022) identified safe water access as the primary structural determinant of handwashing compliance among street food vendors in Bangladesh. In the Nigerian regulatory context, Abubakar (2016) and Ogunbanwo et al. (2017) identified the absence of stringent enforcement mechanisms and vendor training programmes as the principal systemic barriers to improved food hygiene in school settings.

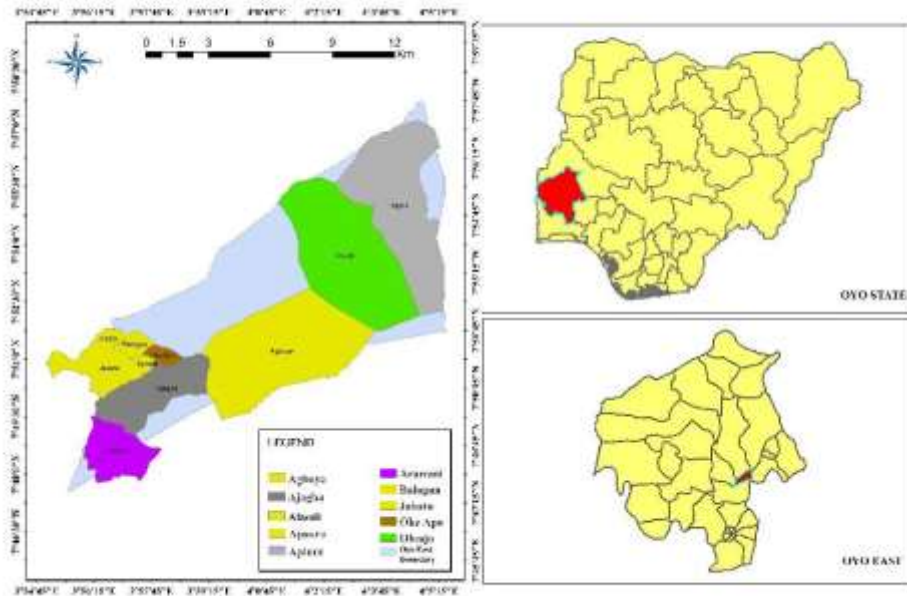
Globally, WHO (2020) advocates for a five-key food safety approach cleanliness, separation of raw and cooked foods, thorough cooking, safe temperatures, and safe water as the minimum standard for school food environments. Compliance with these standards, however, remains incomplete in low-resource contexts, particularly in peri-urban and rural settings where structural determinants of hygiene are weakest (Bulabula et al., 2022; Akabari et al., 2023).

## 3. METHODOLOGY

### 3.1 Study Area

Oyo East LGA is situated within Oyo town, the administrative headquarters of Oyo State, South-Western Nigeria. The LGA covers approximately 672 square kilometres, comprises eleven administrative wards, and had an estimated population of 197,082 persons as at 2022 (NPC, 2006). The LGA's terrain consists of undulating plains of pre-Cambrian basement complex geology, with elevations between 280 and 420 metres above sea level. The climate is classified as tropical wet and dry (Koppen Aw), with a rainy season from April to October and a dry harmattan season from November to March. The LGA encompasses urban-peripheral communities adjacent to Oyo town, semi-urban market settlements, and peri-urban agricultural communities all relevant to the spatial disaggregation of food hygiene data in this study. Figure 1 shows the geographical location of the study area and the distribution of study schools.

#### Figure 1: Map of Oyo East LGA



**Figure 1: Study Area**

Source: Author's GIS Analysis, 2025

### 3.2 Research Design

A non-experimental, cross-sectional descriptive survey design was employed. This design is appropriate for assessing the status, extent, and relationships among variables in a defined population at a specific point in time without manipulation of variables (Creswell & Creswell, 2018).

### 3.3 Population and Sample

The target population comprised all food vendors operating within or immediately adjacent to the premises of government secondary schools in Oyo East LGA during the 2025 academic session. A total of 100 food vendors were selected from ten (10) government secondary schools 10 vendors per school using purposive selection of schools (to ensure spatial representativeness) and simple random sampling of vendors within each school. The ten schools and their spatial classifications are presented in Table 1.

**Table 1: Selected Government Secondary Schools and Spatial Classification**

S/N	School	LGA Area	Spatial Category	Ownership	n
1	Anglian Method Junior Secondary School I	Oyo	Urban-peripheral	Govt.	10
2	Oba Adeyemi Junior High School II, Araromi Kinji Area	Oyo East	Semi-urban	Govt.	10
3	Oba-Adeyemi Junior High School I	Oyo	Urban-peripheral	Govt.	10
4	Olivet Baptist High Junior School I	Oyo East	Semi-urban	Govt.	10
5	Olivet Baptist Junior High School III	Oyo East	Peri-urban	Govt.	10
6	Abiodun Atiba Memorial Junior School II	Oyo East	Peri-urban	Govt.	10

7	Durbar Senior Grammar School	Oyo East	Semi-urban	Govt.	10
8	Durbar Grammar School II (Junior)	Oyo East	Peri-urban	Govt.	10
9	Anglican Methodist Senior Secondary School, Ajagba	Oyo	Urban-peripheral	Govt.	10
10	Anglican Methodist Senior Secondary School, Ajagba (Senior Arm)	Oyo East	Peri-urban	Govt.	10
	Total				100

Source: 2025 Fieldwork

### 3.4 Research Instrument

A structured, self-administered questionnaire was developed comprising two sections. Section A collected demographic data (age, sex, marital status, educational qualification). Section B contained 22 Likert-scale items (Strongly Agree [SA], Agree [A], Strongly Disagree [SD], Disagree [D]) across three thematic domains: food hygiene knowledge (items 1–6), personal and environmental hygiene practices (items 7–14), and sources of food contamination (items 15–22). Face and content validity were established by three specialists in Health Education and Environmental Health. Reliability was assessed via test-retest on 10 vendors outside the study sample (Pearson  $r = 0.82$ ). Data were collected between February and April 2025.

### 3.5 Data Analysis

Data were analysed using SPSS version 26.0. Descriptive statistics (frequency counts and percentages) were used for demographic and variable-level characterisation. Chi-square ( $\chi^2$ ) goodness-of-fit tests were applied for hypothesis testing, with expected frequencies calculated equally across response categories. Spatial disaggregation was performed by cross-tabulating practice compliance against school location type (urban-peripheral, semi-urban, peri-urban). The significance level was set at  $\alpha = 0.05$ .

## 4. RESULTS AND DISCUSSION

### 4.1 Demographic Characteristics of Respondents

Table 2: Demographic Profile of Respondents (n = 100)

S/N	Category	Frequency	Percentage (%)
	<b>Age Group</b>		
1	21–25 years	24	24.0
2	26–30 years	14	14.0
3	31–35 years	18	18.0
4	36–40 years	34	34.0
5	Above 40 years	10	10.0
	<b>Sex</b>		
6	Male	10	10.0
7	Female	90	90.0
	<b>Marital Status</b>		
8	Single	24	24.0
9	Married	56	56.0
10	Divorced	20	20.0

Educational Qualification			
11	Primary Education	38	38.0
12	Secondary Education	30	30.0
13	Tertiary Education	28	28.0
14	Non-formal Education	4	4.0
<b>Total</b>		100	100.0

Source: 2025 Fieldwork

Table 2 shows that the majority of respondents (34.0%) were in the 36–40 years age bracket. Female vendors dominated the sample at 90.0% (n = 90), consistent with the gendered character of informal food vending widely documented across Nigerian secondary school settings (Adedokun et al., 2021). Married respondents constituted 56.0% of the sample. Primary school leavers represented the largest educational group at 38.0%, a finding with direct implications for the design of hygiene training materials, which must be adapted to low-literacy audiences.

#### 4.2 Food Hygiene Knowledge Among Food Vendors

**Table 3: Percentage Analysis of Food Hygiene Knowledge (n = 100)**

S/N	Variables	SA	%	A	%	SD	%	D	%	Total	%
1	Food hygiene is adequate measures put in place to prevent food contamination	24	24.0	72	72.0	2	2.0	2	2.0	100	100
2	Practice of food hygiene is essential to prevent food poisoning	54	54.0	40	40.0	0	0.0	6	6.0	100	100
3	Food hygiene includes covering of hair	28	28.0	54	54.0	4	4.0	14	14.0	100	100
4	Food hygiene includes proper storage of food	22	22.0	66	66.0	4	4.0	8	8.0	100	100
5	Food hygiene includes handwashing	36	36.0	56	56.0	2	2.0	6	6.0	100	100
6	Food hygiene lowers the level of food contamination	34	34.0	56	56.0	2	2.0	8	8.0	100	100
<b>Total</b>		198		344		14		44		600	

Source: 2025 Fieldwork

Table 3 reveals a predominantly positive knowledge base. An aggregate of 90.3% (SA + A) agreed with food hygiene knowledge statements. The highest consensus was on the role of food hygiene in preventing food poisoning (94.0%), consistent with Adebayo et al. (2022). Hair covering as a component of food hygiene recorded the highest level of disagreement (18.0% SD + D combined), reflecting persistent attitudinal and cultural barriers documented by Kumie (2012) and Adegoke et al. (2021).

**Table 4: Chi-Square Analysis Hypothesis 1: Food Hygiene Knowledge (n = 100)**

S/N	Response	Fo	Fe	Fo-Fe	(Fo-Fe) <sup>2</sup> /Fe	Cal $\chi^2$	df	CV
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1	SA	198	150	48	15.36				
2	A	344	150	194	250.91				
3	SD	14	150	-136	123.31				
4	D	44	150	-106	74.91				
Total		600	600	0	464.49	464.49	15	25.00*	

\*Significant at  $\alpha = 0.05$ ;  $F_e = 600/4 = 150$ ; Source: 2025 Fieldwork

$H_{01}$  rejected:  $\chi^2 = 464.49 > CV = 25.00$  (df = 15,  $\alpha = 0.05$ ). The relationship between factors determining food hygiene knowledge is statistically significant.

### 4.3 Personal and Environmental Hygiene Practices

Table 5: Percentage Analysis of Personal and Environmental Hygiene Practices (n = 100)

S/N	Variables	SA	%	A	%	SD	%	D	%	Total	%
7	Wash hands with warm water and liquid soap before and after food procedures	42	42.0	52	52.0	0	0.0	6	6.0	100	100
8	Wearing of neat apron and protective gloves when handling food	44	44.0	48	48.0	6	6.0	2	2.0	100	100
9	Use a hair net/cap before engaging in cooking and selling	46	46.0	40	40.0	14	14.0	0	0.0	100	100
10	Cover cuts/sores with clean waterproof dressing	26	26.0	50	50.0	16	16.0	8	8.0	100	100
11	Avoid use of jewellery and long fingernails that might fall into food	34	34.0	42	42.0	10	10.0	14	14.0	100	100
12	Dispose food waste and garbage in a hygienic and timely manner	40	40.0	50	50.0	10	10.0	0	0.0	100	100
13	Maintain high standards of personal and environmental hygiene in food vending business	46	46.0	38	38.0	14	14.0	2	2.0	100	100
14	Plan for cleaning utensils and sanitizing equipment in food preparation area	40	40.0	56	56.0	2	2.0	2	2.0	100	100
	<b>Total</b>	318		376		72		34		800	

Source: 2025 Fieldwork

Table 5 shows that 86.8% (SA + A) of respondents endorsed personal and environmental hygiene practices. The highest agreement was for planning for clean utensils and sanitation equipment (96.0%) and handwashing procedures (94.0%). The use of

hair nets/caps and protective gloves received relatively higher disagreement (14.0% and 8.0% SD respectively). Spatial disaggregation indicated that vendors in the four peri-urban schools (Olivet Baptist Junior High School III, Abiodun Atiba Memorial Junior School II, Durbar Grammar School II, and Anglican Methodist Senior Secondary School, Ajagba Senior Arm) reported consistently lower compliance with protective gear and waste disposal practices compared to urban-peripheral schools, attributable to differential access to hygiene infrastructure across the LGA (Agbaje & Adeyemi, 2022; Rahman et al., 2022).

**Table 6: Chi-Square Analysis Hypothesis 2: Personal and Environmental Hygiene Practices**

S/N	Response	Fo	Fe	Fo-Fe	(Fo-Fe) <sup>2</sup> /Fe	Cal $\chi^2$	df	CV
1	SA	318	200	118	69.62			
2	A	376	200	176	154.88			
3	SD	72	200	-128	81.92			
4	D	34	200	-166	137.78			
Total		800	800	0	444.20	444.20	21	39.67*

\*Significant at  $\alpha = 0.05$ ;  $Fe = 800/4 = 200$ ; Source: 2025 Fieldwork

$H_0$  rejected:  $\chi^2 = 444.20 > CV = 39.67$  (df = 21,  $\alpha = 0.05$ ). The relationship between personal and environmental hygiene practice variables is statistically significant.

#### 4.4 Sources of Food Contamination

**Table 7: Percentage Analysis of Sources of Food Contamination (n = 100)**

S/N	Variables	SA	%	A	%	SD	%	D	%	Total	%
15	Food contamination can arise from improper storage practices	30	30.0	60	60.0	4	4.0	6	6.0	100	100
16	Inadequate handwashing by food vendors can contribute to food-borne risks	32	32.0	50	50.0	12	12.0	6	6.0	100	100
17	Cross-contamination using same utensils for raw and cooked foods poses a danger	42	42.0	22	22.0	24	24.0	12	12.0	100	100
18	Contaminated water used in food preparation can lead to health hazards	34	34.0	54	54.0	10	10.0	2	2.0	100	100
19	Poor sanitation in food preparation areas increases likelihood of food contamination	46	46.0	38	38.0	12	12.0	4	4.0	100	100
20	Food contamination occurs during food handling and preparation	34	34.0	30	30.0	20	20.0	16	16.0	100	100
21	Food becomes contaminated when	50	50.0	42	42.0	6	6.0	2	2.0	100	100

	exposed to flies and rodents										
22	Using same cutting board for raw meat and vegetables without cleaning leads to contamination	36	36.0	48	48.0	2	2.0	14	14.0	100	100
	<b>Total</b>	304		344		90		62		800	

Source: 2025 Fieldwork

Table 7 shows that 81.0% (SA + A) of respondents acknowledged the listed food contamination sources. Exposure to flies and rodents received the highest agreement (92.0%), followed by improper storage practices (90.0%) and contaminated water (88.0%). Cross-contamination via shared utensils recorded the highest disagreement (36.0% SD + D), indicating this remains the least understood hazard, consistent with Sharma et al. (2023). This is particularly concerning for peri-urban school vendors who are less likely to have received formal food safety training addressing this risk.

**Table 8: Chi-Square Analysis Hypothesis 3: Sources of Food Contamination**

S/N	Response	Fo	Fe	Fo-Fe	(Fo-Fe) <sup>2</sup> /Fe	Cal $\chi^2$	df	CV
1	SA	304	200	104	54.08			
2	A	344	200	144	103.68			
3	SD	90	200	-110	60.50			
4	D	62	200	-138	95.22			
Total		800	800	0	313.48	313.48	21	39.67*

\*Significant at  $\alpha = 0.05$ ;  $Fe = 800/4 = 200$ ; Source: 2025 Fieldwork

$H_03$  rejected:  $\chi^2 = 313.48 > CV = 39.67$  (df = 21,  $\alpha = 0.05$ ). The relationship between perceived sources of food contamination and associated risks is statistically significant.

## 5. DISCUSSION

The findings of this study confirm statistically significant relationships across all three hypotheses, establishing that food hygiene knowledge, hygiene practice behaviour, and contamination risk awareness are not uniformly or randomly distributed among food vendors in government secondary schools in Oyo East LGA. The Chi-square values 464.49, 444.20, and 313.48 substantially exceed their respective critical thresholds, providing strong statistical evidence consistent with the wider Nigerian literature (Adedokun et al., 2021; Adebayo et al., 2022).

The knowledge-practice gap identified in this study where aggregate knowledge agreement (90.3%) consistently exceeded practice compliance (86.8%) reflects the mediating role of structural barriers that the HBM would classify as perceived barriers outweighing perceived benefits in motivating hygiene behaviour change (Janz & Becker, 1984). For vendors in the peri-urban schools Olivet Baptist Junior High School III, Abiodun Atiba Memorial Junior School II, Durbar Grammar School II, and the Ajagba Senior Arm structural barriers including the absence of piped water, inadequate waste disposal infrastructure, and limited access to protective equipment represent primary determinants of this gap that knowledge-focused interventions alone cannot address.

The finding that 90.0% of female vendors (constituting 90.0% of the total sample) operate across all ten schools without systematic hygiene training or regulatory oversight reinforces the gender dimension of food safety in Nigerian public schools identified by Ogunbanwo et al. (2017). The spatial clustering of non-compliance in peri-urban government schools further underscores the need for location-specific, structurally sensitive public health programming, as argued by Ogunbanjo and Adeyemo (2019) and Agbaje and Adeyemi (2022).

## 6. CONCLUSION

This study has demonstrated, through quantitative analysis of 100 food vendors across ten government secondary schools in Oyo East LGA, that statistically significant relationships exist between food hygiene knowledge, personal and environmental

hygiene practices, and food contamination risk awareness. All three null hypotheses were rejected at the 0.05 significance level. The spatial disaggregation of findings revealed systematically lower hygiene compliance in peri-urban school settings, attributable to structural environmental deficits rather than attitudinal deficiencies. These findings provide an empirical and geographically grounded basis for evidence-based food safety programming targeting government secondary school food vendors in Oyo East LGA and comparable LGAs across South-Western Nigeria.

## **RECOMMENDATIONS**

1. The Oyo State Ministry of Education should mandate a compulsory pre-session food hygiene training programme for all food vendors operating in government secondary schools, delivered in Yoruba language with visual materials adapted for low-literacy participants.
2. Oyo East LGA administration should prioritise investment in water supply and sanitation infrastructure at peri-urban government secondary schools (particularly Olivet Baptist Junior High School III, Abiodun Atiba Memorial Junior School II, Durbar Grammar School II, and Anglican Methodist Senior Secondary School, Ajagba) as a structural prerequisite for improved vendor hygiene compliance.
3. Regular quarterly hygiene inspections should be established for all government secondary school food vendors, with particular attention to cross-contamination practices, which recorded the lowest awareness scores across the sample.
4. Health Education should be formally integrated into the secondary school curriculum, empowering students to monitor the hygiene practices of their food vendors and fostering a school community culture of food safety accountability.
5. Future research should employ multilevel regression models to disentangle individual, school, and community-level predictors of hygiene compliance, and should incorporate GIS-based spatial analysis to map food contamination risk zones across all secondary schools in Oyo East LGA.

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