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FOOD HYGIENE AND SAFETY PRACTICES AND ASSOCIATED FACTORS AMONG RESIDENTS OF SEMI-URBAN COMMUNITY IN SOUTH-SOUTH, NIGERIA

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Abstract

Food hygiene and safety are essential for preventing foodborne diseases and promoting public health. In Nigeria, poor sanitation, inadequate access to clean water, and improper food handling continue to contribute to the burden of foodborne illnesses. This study assessed food hygiene and safety practices and the factors associated with these practices among residents of Okada, Edo State.

Methodology:

A descriptive cross-sectional study was conducted among adults responsible for food preparation in their households. A multistage sampling technique was used to recruit 367 respondents between July and December 2025. Data were collected using a structured interviewer-administered questionnaire assessing socio-demographic characteristics, knowledge, perception, food hygiene and safety practices, and associated factors. Data were analyzed using IBM SPSS Statistics version 27. Descriptive statistics were summarized using frequencies and percentages. Chi-square test and binary logistic regression were used to identify factors associated with good food hygiene and safety practices. Statistical significance was set at $p < 0.05$.

Results:

Of the 367 respondents, 312 (85.0%) had prior awareness of food hygiene and safety and were included in the practice assessment. Overall, 224 (71.8%) demonstrated good food hygiene and safety practices. Hand washing before food preparation (88.5%) and after toilet use (91.0%) was commonly reported. The major barriers to good practice were lack of clean water (45.5%), inadequate storage facilities (41.0%), and the cost of soap and cleaning materials (37.8%). Educational attainment, monthly income, knowledge, and perception were significant independent predictors of good food hygiene and safety practices. Respondents with good knowledge (AOR = 4.30; 95% CI: 2.34–7.89) and positive perception (AOR = 3.98; 95% CI: 2.18–7.26) were significantly more likely to demonstrate good practices.

Conclusion:

Although most respondents demonstrated good food hygiene and safety practices, unsafe behaviours and environmental barriers remain. Strengthening community health education and improving access to potable water, sanitation, and food storage facilities are necessary to enhance safe food handling and reduce the risk of foodborne diseases.

Keywords: Food hygiene, food safety, food handling practices, foodborne diseases, knowledge, perception, Okada, Edo State, Nigeria.

Introduction

Food hygiene and safety are fundamental components of public health, ensuring that food is handled, prepared, stored, and consumed in ways that prevent contamination and foodborne diseases. The World Health Organization (WHO) estimates that approximately 600 million people worldwide suffer from foodborne illnesses annually, resulting in about 420,000 deaths, with the greatest burden occurring in low- and middle-income countries. Unsafe food contaminated with pathogenic microorganisms, harmful chemicals, or environmental contaminants contributes significantly to diarrhoeal diseases, malnutrition, and other preventable health conditions.

In Nigeria, foodborne diseases remain a persistent public health challenge due to inadequate sanitation, poor personal hygiene, and limited access to clean water, improper food storage, and weak enforcement of food safety regulations. Rapid urbanization, increasing patronage of street-vended foods, and inadequate public awareness further heighten the risk of food contamination. Although national policies and public health campaigns have emphasized safe food handling, compliance with recommended food hygiene practices among households and food handlers remains inconsistent.

Food hygiene and safety practices are influenced by several factors, including educational attainment, socioeconomic status, access to potable water and sanitation facilities, knowledge of food safety principles, cultural beliefs, and environmental conditions. Understanding these determinants is essential for designing effective interventions aimed at reducing the burden of foodborne illnesses. While numerous studies in Nigeria have focused on food vendors and institutional food handlers, relatively few have examined food hygiene and safety practices among community residents, who are responsible for food preparation and storage within households.

Okada, the headquarters of Ovia North-East Local Government Area of Edo State, is a rapidly growing semi-urban community with increasing population density and diverse food sources. Despite this growth, there is limited evidence on the food hygiene and safety practices of its residents and the factors influencing these practices. Assessing these practices and their determinants will provide valuable evidence for public health planning, guide targeted health education initiatives, and inform interventions aimed at promoting safe food handling and reducing the incidence of foodborne diseases within the community.

Methodology

The study was conducted in Okada, the headquarters of Ovia North-East Local Government Area, Edo State, Nigeria. Located at approximately 6°44'N and 5°23'E, the area covers about 2,302 km² and comprises two administrative wards: Okada East and Okada West. Okada has a tropical climate with distinct wet and dry seasons, annual rainfall of about 150 cm, and temperatures ranging from 27°C to 44°C. The Bini are the predominant ethnic group, alongside Yoruba, Urhobo, Isoko, Hausa, Igbo, Ijaw, and Fulani. Farming and trading are the major occupations, while Christianity is the dominant religion. According to the 2006 national census, Okada has an estimated population of 153,849 and hosts Igbinedion University and Igbinedion University Teaching Hospital.

Study Design

A descriptive cross-sectional study was conducted to assess food hygiene and safety practices and the factors associated with these practices among residents of Okada.

Study Population

The study population comprised adults aged 18 years and above who were primarily responsible for food preparation in their households.

Eligibility Criteria

Residents aged 18 years and above who had lived in Okada for at least one year and provided written informed consent were included in the study. Individuals who declined participation or were too ill or mentally incapacitated to respond were excluded.

Study Duration

The study was conducted between July and December 2025, encompassing protocol development, data collection, data analysis, and report writing.

Sample Size Determination

The minimum sample size was determined using Cochran's formula for single proportions:

$$n = Z^2pq/d^2$$

where n is the minimum sample size, Z is the standard normal deviate at the 95% confidence level (1.96), p is the estimated prevalence of good food safety practices (31.2%), as reported among community residents in a previous Nigerian study,¹⁰ $q = (1 - p)$, and d is the desired precision (0.05).

Substituting the values:

$$n = (1.96^2 \times 0.312 \times 0.688)/(0.05^2) = (3.8416 \times 0.2147)/0.0025 = 330$$

After adjusting for a 10% non-response rate, the minimum required sample size was 367 respondents. Accordingly, 367 eligible respondents were recruited and included in the final analysis.

Sampling Technique

A multistage sampling technique was employed. Enumeration areas in Okada East and Okada West served as the sampling frame. Seven communities were initially selected proportionately from both wards using simple random sampling. These communities were subsequently stratified into urban and rural settlements, from which four communities (Igbinedion Estate, Evbomodu, Uhen, and Ovia Camp) were randomly selected. Each community constituted a cluster. Eligible households were identified through household listing, and one eligible respondent, who was primarily responsible for food preparation, was selected from each household. Where more than one eligible respondent was present, simple random sampling by balloting was used. Recruitment continued until the final sample size of 367 respondents was achieved.

Data Collection Instrument

Data were collected using a structured interviewer-administered questionnaire adapted from relevant literature. The questionnaire collected information on socio-demographic characteristics, food hygiene and safety practices, and factors associated with safe food handling. It also assessed respondents' knowledge and perception of food hygiene and safety.

Knowledge was assessed using 10 items with a maximum score of 20, and scores of 10 or more ($\geq 50\%$) were classified as good knowledge. Perception was assessed using 10 Likert-scale items with a maximum score of 50, and scores of 25 or more ($\geq 50\%$) were classified as a positive perception. Food hygiene and safety practices were assessed using 15 items with a maximum score of 30, and respondents scoring 15 or more ($\geq 50\%$) were classified as having good practice.

Pre-testing

The questionnaire was pre-tested among 34 respondents (approximately 10% of the minimum sample size) in Aghanokpe community, Ovia South-West Local Government Area, Edo State.

Necessary modifications were made before commencement of the main study.

Data Analysis

Data were entered and analyzed using IBM SPSS Statistics version 27. Descriptive statistics were summarized using frequencies and percentages. Associations between food hygiene and safety practices and independent variables were assessed using the chi-square test. Variables that were statistically significant at the bivariate level were entered into binary logistic regression to identify independent predictors of good food hygiene and safety practices. Statistical significance was set at $p < 0.05$.

Data Presentation

Results were presented using tables, charts, and narrative text.

Ethical Considerations

Ethical approval was obtained from the Ethics and Research Committee of Igbinedion University Teaching Hospital (Ref: IUTH/R.24/VOL.I/207). Written informed consent was obtained from all participants before data collection. Confidentiality was maintained by assigning unique identification numbers instead of names, and all hard-copy and electronic data were securely stored with access restricted to the research team.

Results

A total of 371 questionnaires were administered, of which 367 were correctly completed and returned, giving a response rate of 98.9%. Of the respondents, 312 (85.0%) had prior awareness of food hygiene and safety and were included in the assessment of food hygiene and safety practices and associated factors.

Socio-demographic Characteristics of Respondents (Table 1)

More than one-third, 133 (36.2%), of the respondents were aged 25–34 years, while 106 (28.9%) were aged 35–44 years. Ninety-four (25.6%) respondents were aged 24 years or younger and 34 (9.3%) were aged 45 years and above. The mean age of the respondents was 33.2 ± 9.4 years. Females constituted the majority of the respondents, 262 (71.4%), while 105 (28.6%) were males. Most respondents were married, 231 (62.9%), whereas 123 (33.5%) were single and 13 (3.6%) were divorced or separated.

Regarding educational attainment, 128 (34.9%) respondents had secondary education, 104 (28.3%) had primary education, 79 (21.5%) had tertiary education, while 56 (15.3%) had no formal education. Trading/business was the commonest occupation, accounting for 116 (31.6%) respondents, followed by farming, 90 (24.5%), artisan work, 66 (18.0%), civil service, 46 (12.5%), and other occupations, 49 (13.4%).

One hundred and forty-one (38.4%) respondents earned less than ₦50,000 monthly, 107 (29.2%) earned ₦50,000–₦99,999, 75 (20.4%) earned ₦100,000–₦199,999, while 44 (12.0%) earned ₦200,000 or more. The majority, 303 (82.6%), were Christians, while 52 (14.2%) were Muslims and 12 (3.2%) practised traditional or other religions. Household sizes of 5–8 persons were reported by 171 (46.6%) respondents, while 151 (41.1%) had 1–4 persons and 45 (12.3%) had nine or more persons.

Food Hygiene and Safety Practices (Table 2; Figures 1 and 2)

Most respondents washed their hands before food preparation, 276 (88.5%), and after using the toilet, 284 (91.0%). A total of 268 (85.9%) respondents washed fruits and vegetables before use, while 256 (82.1%) covered food to prevent contamination. Safe food handling practices included separating raw and cooked foods, reported by 238 (76.3%), reheating leftover food before consumption, reported by 244 (78.2%), and cleaning food storage areas before use, reported by 246 (78.8%).

Unsafe practices were also identified. Ninety-two (29.5%) respondents prepared food while sick or with wounds, 98 (31.4%) handled food and money simultaneously, and 44 (14.1%) never cleaned kitchen surfaces regularly. Overall, 224 (71.8%) respondents had good food hygiene and safety practices, while 88 (28.2%) had poor practices.

Barriers to Food Hygiene and Safety Practices (Table 3; Figure 3)

Lack of clean water was the commonest barrier to practising good food hygiene and safety, reported by 142 (45.5%) respondents. Other commonly reported barriers included lack of refrigerator or storage facilities, 128 (41.0%), cost of soap or cleaning materials, 118 (37.8%), lack of knowledge on safe practices, 102 (32.7%), and inadequate waste disposal, 96 (30.8%). Thirty-four (10.9%) respondents reported other barriers.

Factors Associated with Food Hygiene and Safety Practices (Table 4; Figure 4)

Age was not significantly associated with food hygiene and safety practices ($p = 0.301$). Educational level was significantly associated with practice ($p < 0.001$). After adjustment, respondents with secondary education (AOR = 4.13; 95% CI: 1.83–9.30; $p = 0.001$) and tertiary education (AOR = 8.25; 95% CI: 2.63–25.90; $p < 0.001$) were significantly more likely to have good food hygiene and safety practices than respondents with no formal education.

Monthly income also remained a significant predictor of good practice. Respondents earning ₦100,000–₦199,999 per month were about twice as likely to have good food hygiene and safety practices compared with those earning less than ₦50,000 (AOR = 2.41; 95% CI: 1.10–5.29; $p = 0.028$).

Knowledge and perception were independently associated with food hygiene and safety practices. Respondents with good knowledge were over four times more likely to have good practices than those with poor knowledge (AOR = 4.30; 95% CI: 2.34–7.89; $p < 0.001$). Similarly, respondents with positive perceptions were approximately four times more likely to have good practices than those with negative perceptions (AOR = 3.98; 95% CI: 2.18–7.26; $p < 0.001$).

Table 1: Socio-Demographic Characteristics of Respondents (N = 367)

Variable	Frequency (n = 367)	Percentage (%)
Age Group (years)		
≤24	94	25.6
25–34	133	36.2
35–44	106	28.9
≥45	34	9.3
Sex		
Female	262	71.4
Male	105	28.6
Marital Status		
Married	231	62.9
Single	123	33.5
Divorced/Separated	13	3.6
Level of Education		
No formal education	56	15.3
Primary education	104	28.3
Secondary education	128	34.9
Tertiary education	79	21.5
Occupation		
Trading/Business	116	31.6
Farming	90	24.5
Artisan	66	18.0
Civil servant	46	12.5
Others	49	13.4
Monthly Income (₦)		
< ₦50,000	141	38.4
₦50,000–₦99,999	107	29.2
₦100,000–₦199,999	75	20.4
₦200,000 and above	44	12.0
Religion		
Christianity	303	82.6
Islam	52	14.2
Traditional/Others	12	3.2
Household Size		
1–4 persons	151	41.1
5–8 persons	171	46.6
≥9 persons	45	12.3

Mean age $\pm$ SD = 33.2 $\pm$ 9.4 years.

Table 2: Item-Level Food Hygiene and Safety Practices and Overall Classification (n = 312)

Practice Item	Response	Frequency	Percentage (%)
Wash hands before food preparation	Yes	276	88.5
	No	36	11.5
Wash hands after using toilet	Yes	284	91.0
	No	28	9.0
Cleaning kitchen surfaces	Always	162	51.9
	Sometimes	106	34.0
	Never	44	14.1
Separate raw and cooked foods	Yes	238	76.3
	No	74	23.7
Reheat leftover food before eating	Yes	244	78.2
	No	68	21.8
Prepare food when sick or with wounds	Yes	92	29.5
	No	220	70.5
Cover food to prevent contamination	Yes	256	82.1
	No	56	17.9
Wash fruits and vegetables before use	Yes	268	85.9
	No	44	14.1
Touch food and money simultaneously	Yes	98	31.4
	No	214	68.6
Clean storage areas before use	Yes	246	78.8
	No	66	21.2
Overall Practice Score			
Good practice (≥ 15 of 30 points)		224	71.8
Poor practice (< 15 of 30 points)		88	28.2

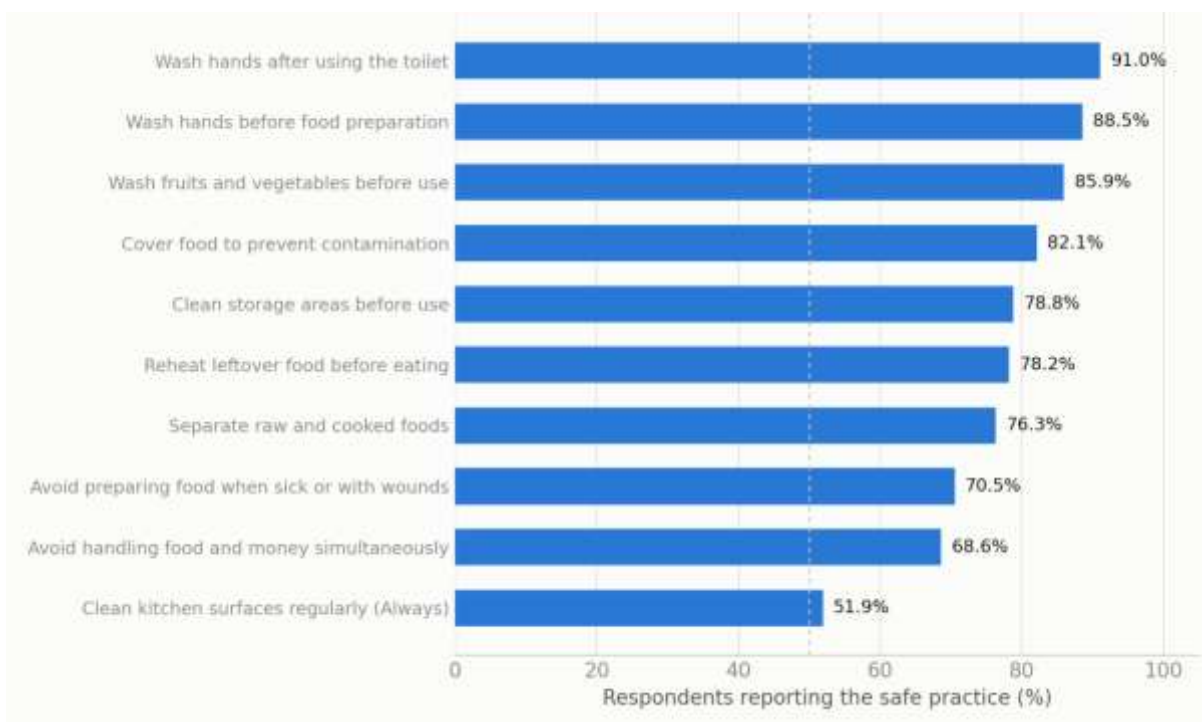
**Figure 1: Item-Level Food Hygiene and Safety Practices among Respondents (n = 312)**



Figure 2: Overall Food Hygiene and Safety Practice Classification of Respondents (n = 312)

Table 3: Barriers to Food Hygiene and Safety Practices Reported by Respondents (n = 312)

Factor	Frequency	Percentage (%)
Lack of clean water	142	45.5%
Lack of refrigerator/storage facilities	128	41.0%
Cost of soap/cleaning materials	118	37.8%
Lack of knowledge on safe practices	102	32.7%
Inadequate waste disposal	96	30.8%
Others	34	10.9%

Multiple responses were permitted; percentages do not sum to 100%.

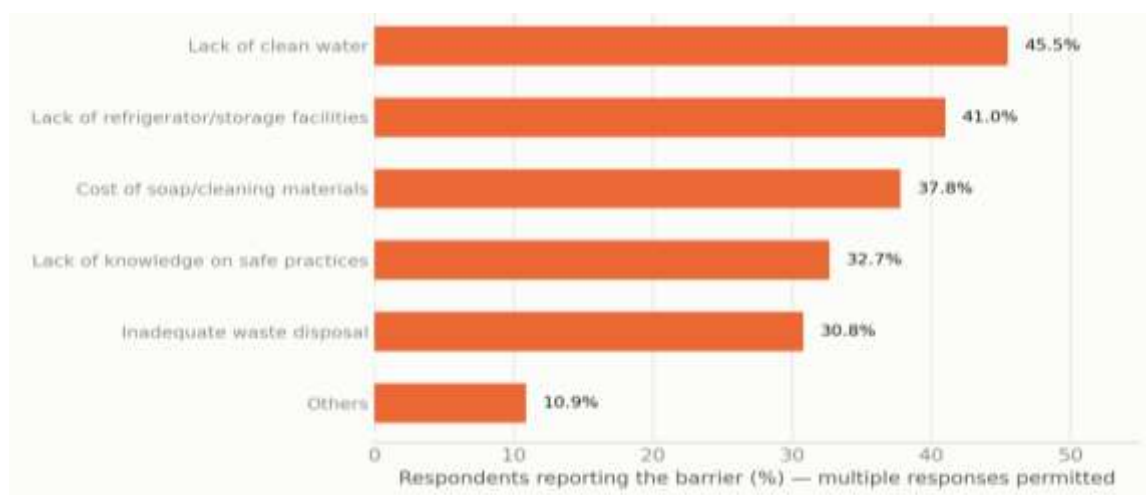


Figure 3: Barriers to Food Hygiene and Safety Practices Reported by Respondents (n = 312)

Table 4: Factors Associated with Food Hygiene and Safety Practice, Bivariate and Multivariate Analysis (n = 312)

Variable	Good n (%)	Poor n (%)	COR (95% CI)	Adj OR (95% CI)	p (adj.)
Age Group (years)					
≤24 (Ref)	62 (66.0%)	32 (34.0%)	1.00	–	–
25–34	102 (76.7%)	31 (23.3%)	1.70 (0.94–3.05)	–	–
35–44	80 (75.5%)	26 (24.5%)	1.59 (0.86–2.94)	–	–
≥45	20 (71.4%)	8 (28.6%)	1.29 (0.49–3.38)	–	–
Age, per additional year†	–	–	–	1.02 (0.98–1.05)	0.312
Level of Education					
No formal (Ref)	20 (45.5%)	24 (54.5%)	1.00	1.00	–
Primary	60 (65.2%)	32 (34.8%)	2.25 (1.08–4.68)	2.05 (0.92–4.57)	0.078
Secondary	102 (79.7%)	26 (20.3%)	4.71 (2.27–9.79)	4.13 (1.83–9.30)	0.001
Tertiary	42 (87.5%)	6 (12.5%)	8.40 (2.94–23.9)	8.25 (2.63–25.9)	<0.001*
Marital Status					
Single (Ref)	68 (66.7%)	34 (33.3%)	1.00	Not retained‡	–
Married	162 (78.3%)	45 (21.7%)	1.80 (1.07–3.03)	Not retained‡	–
Divorced/Separated	2 (50.0%)	2 (50.0%)	0.50 (0.07–3.72)	Not retained‡	–
Monthly Income					
< ₦50,000 (Ref)	64 (62.1%)	39 (37.9%)	1.00	1.00	–
₦50,000–₦99,999	72 (72.0%)	28 (28.0%)	1.57 (0.88–2.80)	1.46 (0.76–2.81)	0.253
₦100,000–₦199,999	56 (80.0%)	14 (20.0%)	2.43 (1.17–5.03)	2.41 (1.10–5.29)	0.028*
≥ ₦200,000	32 (72.7%)	12 (27.3%)	1.63 (0.72–3.72)	2.10 (0.86–5.14)	0.104
Knowledge Level					
Poor (Ref)	50 (51.0%)	48 (49.0%)	1.00	1.00	–
Good	174 (81.3%)	40 (18.7%)	4.18 (2.44–7.17)	4.30 (2.34–7.89)	<0.001*
Perception Level					
Negative (Ref)	36 (47.4%)	40 (52.6%)	1.00	1.00	–
Positive	188 (79.7%)	48 (20.3%)	4.36 (2.51–7.59)	3.98 (2.18–7.26)	<0.001*

Statistically significant at $p < 0.05$ (adjusted model). †Age was entered as a continuous variable in the multivariate model. ‡Marital status was tested at the bivariate stage but not retained in the final multivariate model.

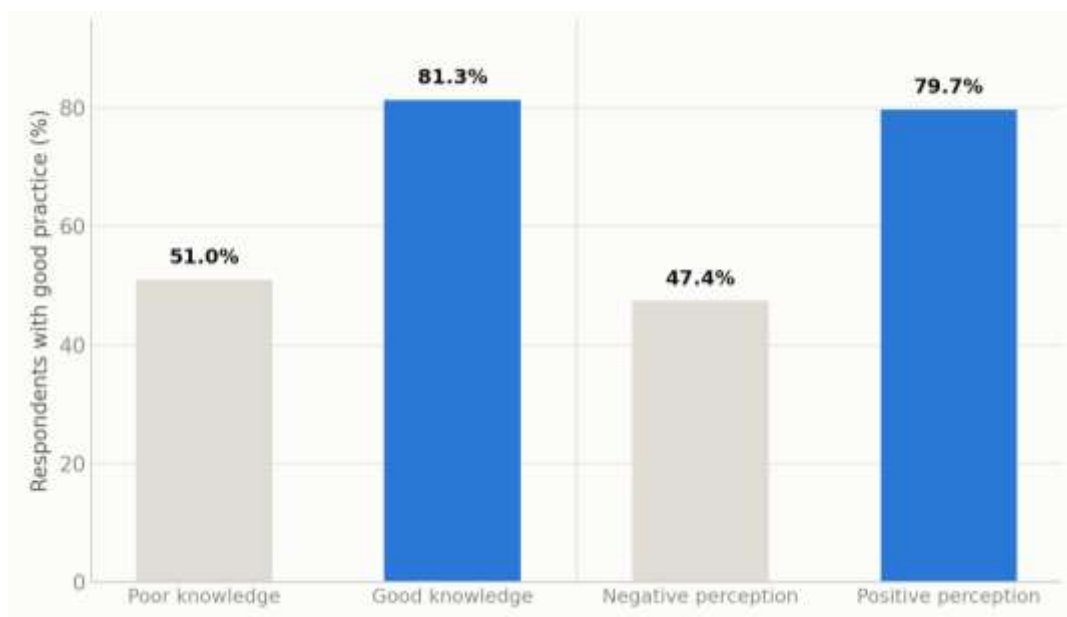


Figure 4: Food Hygiene and Safety Practice by Knowledge and Perception Level ($n = 312$)

Discussion

This study assessed food hygiene and safety practices and the factors associated with these practices among residents of Okada, Edo State. Nearly three-quarters of respondents demonstrated good food hygiene and safety practices, although unsafe behaviours and environmental barriers were identified. Educational attainment, monthly income, knowledge, and perception were each independently associated with good practice, whereas age was not.

The proportion of respondents with good practice is comparable to that reported among food handlers in Enugu and Ondo State, Nigeria, and higher than levels documented in south-eastern Nigeria and in Ethiopia. It is, however, considerably higher than that reported among community residents in other Nigerian settings, where good knowledge and favourable perception coexisted with poor practice and where household water and waste disposal practices were inadequate. The difference may reflect variation in scoring thresholds and in the specific practices assessed, as well as differences in access to water and sanitation between communities. The presence of a university and a teaching hospital in Okada may also improve access to health information relative to comparable rural settings.¹⁸ Nevertheless, more than a quarter of respondents demonstrated poor practice, and all findings were based on self-report.

Hand hygiene practices were encouraging, and most respondents also reported washing fruits and

vegetables, covering food, reheating leftovers, separating raw and cooked foods, and cleaning food storage areas. These findings are consistent with WHO recommendations on the Five Keys to Safer Food, an approach shown to improve food handling practices when applied in low-resource African communities.^{19,20} Unsafe practices nevertheless persisted, with nearly one-third of respondents preparing food while ill or with open wounds and a similar proportion handling food and money simultaneously. Both behaviours are recognized risks for microbial contamination, and currency notes recovered from Nigerian food vendors have been shown to carry bacterial contamination. That such practices persist alongside adequate knowledge is consistent with Nigerian studies in which knowledge of food safety did not translate into appropriate behaviour.

Four of the five barriers reported by respondents were structural rather than informational: lack of clean water, absence of refrigeration or storage facilities, the cost of soap and cleaning materials, and inadequate waste disposal. Only limited knowledge of safe practices is directly addressable through education. This distribution is consistent with work describing the difficulty of implementing recommended food safety measures in resource-limited settings and with studies of barriers to compliance in Edo State markets. The importance of water is well established, as the availability of running water has been significantly associated with good practice in Nigeria and

inadequate water storage has been identified as an independent determinant of poor practice elsewhere in the region. Storage capacity is equally important, since temperature-related knowledge cannot be acted upon in the absence of refrigeration.

Educational attainment was significantly associated with food hygiene and safety practices, with respondents who had secondary and tertiary education demonstrating higher odds of good practice than those with no formal education. This agrees with previous studies that have consistently identified education as an important determinant of healthy behaviours, although the relationship is not universal. In some Nigerian settings, education showed no significant association with practice once the availability of running water or of formal food safety training was taken into account. Education therefore appears to matter most where the material means of safe food handling are already available, and its promotion should be accompanied by improvements in household infrastructure.

Monthly income also emerged as an independent predictor of good food hygiene and safety practices, although the association was not consistent across all income categories and the estimate for the highest band was imprecise. The likely mechanism is purchasing power over the specific items respondents identified as barriers. Comparable Nigerian evidence has shown income and educational level to be significantly related to food safety practices, with inadequate finance reported as a constraint and continental evidence places socioeconomic position among the determinants of household food safety practice more broadly. Interventions should therefore address economic as well as behavioural barriers to safe food handling.

Knowledge and perception were the strongest independent predictors of good food hygiene and safety practices, with respondents in both categories approximately four times more likely to practise well than their counterparts. This is consistent with Nigerian and international evidence in which knowledge and favourable attitude were significantly associated with safe food handling. The finding supports established behavioural theory, in which knowledge improves awareness while positive perception promotes the adoption and maintenance of healthy practices, although work testing the Knowledge–Attitude–Practice model formally suggests that the pathway operates through attitude rather than directly. The cross-sectional design cannot establish the direction of these relationships, and reverse causation cannot be

excluded. Sustained public health education aimed at improving both knowledge and risk perception nonetheless remains warranted.

Age was not significantly associated with food hygiene and safety practices in this study, whether analysed categorically or as a continuous variable. Comparable null findings have been reported among food handlers in Nigeria, although some studies have identified significant associations with age and other demographic characteristics. On balance, the determinants that recur across these studies are educational, economic, and environmental rather than demographic. Public health interventions should therefore target all adult food preparers, with emphasis on the storage and temperature knowledge gaps identified in this study and on the water and storage constraints that limit what residents are able to act upon.

Conclusion

The majority of residents of Okada demonstrated good food hygiene and safety practices. However, unsafe practices such as preparing food while ill and handling food and money simultaneously were still reported. Educational attainment, monthly income, knowledge, and perception were significant predictors of good food hygiene and safety practices, while lack of clean water, inadequate storage facilities, and the cost of cleaning materials were the major barriers. Improving public awareness alongside access to basic water and sanitation facilities will help promote safer food handling practices in the community.

Recommendations

1. Community-based health education on food hygiene and safety should be strengthened, with emphasis on preventing food contamination and promoting safe food handling.
2. Government should improve access to potable water, sanitation, and food storage facilities to address identified barriers.
3. Food hygiene education should be integrated into routine primary healthcare and community health promotion programmes.
4. Further studies using observational or longitudinal designs are recommended to validate these findings.

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