Original

Knowledge and Attitudes Toward Food Safety Among Food Handlers: A Cross-Sectional Study in a Nigerian Tertiary Institution.

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ABSTRACT

Background: Foodborne diseases remain a significant public health issue, with sub-Saharan Africa bearing a disproportionate burden. In Nigeria, many students rely on institutional food services, making the safe handling of food a crucial concern.

Objective: This study assessed the knowledge and attitudes of food handlers towards food safety at Babcock University, Ogun State, Nigeria.

Methods: This cross-sectional survey was carried out among 80 food handlers using a multistage sampling technique. Data were collected using a pre-tested, structured, self-administered questionnaire and analysis using IBM SPSS version 24.0. Relevant descriptive and inferential statistics were calculated, with results presented in tables. The chi-square test was used to assess the associations between the independent and dependent variables. The significance level was set at a 95% confidence interval with a p-value ≤ 0.05.

Results: Respondents had a mean age of 27.4 ± 7.8 years, and most were female (57.5%). Overall, 60% showed good knowledge of food safety and about 70% demonstrated a positive attitude. The level of education was significantly associated with knowledge (χ^2=12.861, p=0.005), while ethnicity was associated with attitudes (χ^2=12.798, p=0.005).

Conclusion: Respondents generally had good knowledge and attitudes toward food safety, suggesting that training and awareness programs may be making an impact. The association between level of education and knowledge of food safety underscores the importance of continuous training programs for food handlers. The association between ethnicity and attitudes highlights the importance of culturally sensitive approaches in food safety education.

Keywords: Food safety, Food handlers, Tertiary Institution, Knowledge, Attitude, Nigeria

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INTRODUCTION

Each year, unsafe food is linked to 600 million cases of foodborne illnesses and 420,000 fatalities.[1,2] According to WHO research from 2019, ninety-one million people in Africa eat contaminated food annually—that is, food that contains dangerous germs, viruses, parasites, or chemicals—which makes them sick and causes over 137,000 deaths.[3] Over 200,000 Nigerians die from foodborne illnesses every year.[4] Food safety encompasses the conditions and measures necessary to ensure food is safe, wholesome, and suitable from production to consumption.[5] It assures that food does not harm consumers when prepared and consumed as intended.[6–8] Implementing effective food safety practices is crucial in mitigating foodborne illnesses, which remain a significant public health challenge globally.[9,10] The burden of foodborne diseases (FBDs) is substantial, especially in low- and middle-income nations, where food safety problems rival major infectious diseases such as malaria, HIV/AIDS, and tuberculosis.[9] The World Health Organization (WHO) estimates that developing nations bear 98% of the burden of foodborne illnesses globally, with Africa having disproportionately high hospitalizations and fatalities due to food safety-related conditions.[6,9,10]

In many developing nations, including Nigeria, food contamination is exacerbated by inadequate food safety measures, unsanitary environments, and improper handling practices.[9] Markets and food vendors often lack sufficient knowledge and infrastructure to ensure food hygiene, leading to widespread contamination and increased health risks.[9,11,12] In tertiary institutions where self-catering is restricted, students' dependence on commercially prepared meals raises significant concerns regarding food safety. Food handlers in such institutions must be knowledgeable about food safety procedures because this affects their capacity to handle food with a low risk of contamination.[13] They can potentially jeopardize food safety and hygiene standards when handling food during processing, packaging, refrigeration, transportation, and storage.[14] They must also ensure that food is prepared hygienically and remains safe for consumption when it gets to the consumer.[15]

Despite numerous studies conducted regarding food handlers' knowledge and attitudes towards food safety in various locations, few of these studies have focused on tertiary institutions.[9,16–18]

Existing studies have not provided recent data from tertiary institutions in southwestern Nigeria. This limits the understanding of the knowledge and attitudes towards food safety among food handlers in this region. This study assessed the knowledge and attitude towards food safety among food handlers in a tertiary institution in southwestern Nigeria.

METHODOLOGY

Location of study

Babcock University, a private institution in Ilishan-Remo, Ogun State,[19] Nigeria, employs approximately 207 food handlers across its main and Iperu campuses. On the main campus, food service points include the Guest House, University Cafeteria, Students' Association building, Superstore, and Andrew's Park. The Iperu campus hosts additional food handlers at the Cafeteria, Students' Association building, and Superstore.

Study design

This was a descriptive cross-sectional study.

Study population

The study population consisted of food handlers at Babcock University.

Eligibility criteria

The study included food handlers aged 18 years and above who were currently employed at registered food service points within Babcock University and had at least three months' experience in food handling. Individuals who were either too ill to participate or unwilling to provide consent were excluded from the study.

Sample size determination

The sample size was determined using Cochran's formula.

$$n = \frac{Z^2 p(1-p)}{e^2}$$

Where:

n= minimum sample size

Z = standard normal deviate set at 1.96, which matches the 95% desired confidence level

p = proportion of respondents with good knowledge of food safety in a previous study in Cross River state, Nigeria[20]

q= 1-p

e= e is the desired level of precision set at 0.05

p= 86.6[20] =0.866

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$n = \frac{1.96^2 \times 0.866\ (1-0.866)}{0.05^2} = 178$

Applying the finite population correction:

$n = n_0 / (1 + (n_0 - 1) / N)$

where:

n=Minimum sample size

n_0= calculated sample size-178

N= Total population size=207

$n = 178 / (1 + (178 - 1) / 207)$ n=96.2

Accounting for a 10% non-response:

96.1/1-0.9 = 107

Therefor the minimum sample size =107

Sampling technique:

Multistage sampling was used in the selection of participants. In the first stage of sampling, a comprehensive list of all food handlers employed at Babcock University was obtained from the respective administrative heads, forming the sampling frame. These food handlers were then stratified according to their designated service points (e.g., Cafeteria, Babcock Investment Group [BIG], Babcock Guest House [BGH], and Babcock University Students Association [BUSA] House). In the second stage, the minimum required sample size was allocated proportionately to each service point, based on the number of food handlers in each stratum as shown below:

For the main campus,

BGH = $\frac{28}{207} \times 80 = 10.8$ (11 respondents)

Cafeteria = $\frac{86}{207} \times 80 = 33.2$ (33 respondents)

BUSA = $\frac{25}{207} \times 80 = 9.6$ (10 respondents)

Babcock Superstore = $\frac{14}{207} \times 80 = 5.4$ (5 respondents)

Andrew's Park = $\frac{10}{207} \times 80 = 3.8$ (4 respondents)

For the Iperu Campus,

Cafeteria = $\frac{20}{207} \times 80 = 7.7$ (8 respondents)

BUSA = $\frac{17}{207} \times 80 = 6.5$(7 respondents)

Babcock Superstore = $\frac{6}{207} \times 80 = 2.3$ (2 respondents)

In the final stage, study participants from each service point were selected through simple random sampling using the balloting method (the names of eligible food handlers were placed in a container and drawn).

Data collection tool:

The data collection tool was a pre-tested, structured, self-administered questionnaire adapted from previous studies.[21,22] Data were collected by trained research assistants over one month. The training of the research assistants gave insights on the study, its objectives, the questions in the data collection tool and the sources of error during data collection.

Measurement of the variables:

Knowledge was scored based on response to eight (8) questions, with each positive response carrying one point, yielding a maximum obtainable score of 8 points. Attitude was measured using a five-point Likert scale (Strongly Agree = 5 to Strongly Disagree = 1), yielding a maximum obtainable score of 50. For each domain, respondents scoring above 50% of the maximum obtainable score were classified as having good knowledge and attitude. In contrast, those scoring equal to or below 50% of the maximum obtainable score were classified as having poor knowledge and attitude.

Statistical analysis:

Data was analyzed using IBM SPSS Statistics version 24.0. Frequencies and proportions were obtained using descriptive statistics. Associations between the independent and dependent variables were assessed using the chi-square test at a 95% confidence level. The level of significance was set at $p < 0.05$.

Ethical consideration: Ethical approval was obtained from Babcock University Health Research Ethics Committee (BUHREC 966/24). Verbal and written informed consent was obtained from respondents, who were assured of their privacy and confidentiality. Questionnaires were anonymized, data were used solely for research purposes and securely stored in password-protected devices.

Duration of Study

This study was conducted between December 2024 and May 2025.

RESULTS

Eighty food handlers responded to our questionnaire giving a response rate of 75%.

Table 1 presents the socio-demographic characteristics of the respondents. There were more females than males. The mean age of respondents was 27.4 ± 7.8 years. The majority of respondents were of the Yoruba tribe (51.3%) and were Christians (95.0%). Most respondents had at least a secondary education, with 47.5% completing senior secondary levels and 36.3% having tertiary education.

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Table 1: Socio-demographic characteristics of respondents

Variable	F (n=80)	Percentage (%)
Age (years)		
18-19	18	22.5
20-24	16	20.0
25-29	11	13.8
30-34	12	15.0
>35	23	28.8
Mean ± SD 27.4 ± 7.8		
Sex		
Male	34	42.5
Female	46	57.5
Tribe		
Yoruba	41	51.3
Hausa	6	7.5
Igbo	28	35.0
Others	5	6.3
Religion		
Christianity	76	95.0
Islam	3	3.8
Others	1	1.3
Highest level of education		
Primary	8	10.0
Junior secondary	5	6.3
Senior secondary	38	47.5
Tertiary	29	36.3

Table 2 presents respondents' knowledge of food safety. Most recognized the importance of handwashing with soap, glove use in food handling, and safe water for preparation. All acknowledged the role of the food preparation environment in determining quality. Overall, a majority demonstrated good knowledge of food safety.

Table 2: Knowledge of food safety among respondents (n=80)

Variable	Yes n(%)	No n(%)	I don't know n(%)
Washing hands with water and soap before handling food is important	78(97.5)	2(2.5)	0(0.0)
Using gloves while handling food reduces the risk of food contamination.	74(92.5)	6(7.5)	0(0.0)
Proper cleaning and sanitization of utensils reduces the risk of food contamination.	56(70.0)	24(30.0)	0(0.0)
Safe water must be used for preparing and cooking food	79(98.8)	0(0.0)	1(1.3)
A sick worker should not be allowed to handle food	76(95.0)	4(5.0)	0(0.0)
The same cutting board can be used for raw and cooked foods, provided it looks clean	43(53.8)	37(46.3)	0(0.0)
Cans that are swollen may contain bacteria	76(95.0)	0(0.0)	4(5.0)
The environment the food is prepared in affects the food	80(100.0)	0(0.0)	0(0.0)
Knowledge Score	**n (%)**		
Good Knowledge (> 50%)	48 (60.0)		
Poor knowledge (≤50%)	32 (40.0)		
Mean Score=9.9±1.15			

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Table 3 shows the attitude of respondents towards food safety. Overall, 56 (70.0%) had a good attitude, while 24 (30.0%) had a poor attitude.

Table 3: Attitude towards food safety among respondents (n = 80)

Variable	SA (%)	Agree (%)	Neutral (%)	Disagree (%)	SD (%)
Frequent hand-washing during food preparation doesn't waste time	55(68.8)	20(25.0)	3(3.8)	2(2.5)	0(0.0)
Store raw and cooked foods separately to prevent contamination	73(91.3)	5(6.3)	0(0.0)	2(2.5)	0(0.0)
It is important to throw away expired food	67(83.8)	9(11.3)	2(2.5)	0(0.0)	2(2.5)
Wearing appropriate protective clothing minimizes food contamination	65(81.3)	12(15.0)	0(0.0)	1(1.3)	2(2.5)
Distinguishing safe foods from spoiled ones by looking at them is not a reliable method.	47(58.8)	15(18.8)	6(7.5)	8(10.0)	4(5.0)
Safe food handling is an important part of my job responsibility	69(86.3)	7(8.8)	1(1.3)	3(3.8)	0(0.0)
Attitude Score		**n (%)**			
Good Attitude (>50%)		56 (70.0)			
Poor Attitude (≤50%)		24 (30.0)			

Mean Score=45.5±4.30

Table 4 shows the factors associated with the knowledge and attitude towards food safety among food handlers. The result shows that educational status ($\chi2=12.861$, $p=0.005$) was significantly associated with participants' knowledge of food safety and tribe ($\chi2=12.798$, $p=0.005$) was significantly associated with participants' attitude towards food safety.

Table 4: Factors associated with Knowledge and Attitude towards food safety among respondents

Variable	Knowledge χ2 (p value)	Attitude χ2 (p value)
Gender	0.418 (0.338)	0.01 (0.921)
Age	5.764 (0.217)	6.602 (0.158)
Tribe	11.006 (0.012)	12.798 (0.005)*
Religion	1.564 (0.457)	2.389 (0.303)
Educational status	12.861 (0.005)*	6.686 (0.083)

*Statistically significant at $p < 0.05$

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DISCUSSION

This study examined food safety knowledge and attitudes among food handlers in a Nigerian tertiary institution.

The mean age of 27.4 ± 7.8 years, suggesting a relatively young population of food handlers, which aligned with a previous study where the majority of respondents were young.[14] The predominance of young to middle-aged adults suggests a population that is likely active in food purchasing, preparation, and consumption. In this study, there were more females than males, which also aligned with previous studies.[11,14,23] This is however, not surprising as women are often primarily responsible for food handling even in household settings.

Most respondents demonstrated good knowledge, particularly in areas such as hand hygiene, glove use, and the importance of clean environments. This suggests that existing food safety training and policies in the study area, may have been effective. These findings are consistent with earlier studies in Saudi Arabia,[24] Bangladesh[23] and Nigeria[13] that reported generally high awareness of food safety principles among food handlers. However, the findings from this study, particularly in utensil sanitization and the separation of raw from cooked foods, are concerning because they represent critical points where foodborne contamination can occur.

Attitudes toward food safety were largely positive, with 70% of participants scoring above the mean. This aligns with previous studies in Tehran[22] and Ethiopia.[25,26] However, the finding that nearly one-third of respondents (about 30%) had a poor attitude suggests that good knowledge alone may not be enough to drive safe behaviour. The association between education and knowledge, as well as between ethnicity and attitudes, highlights how socio-demographic factors shape food safety behaviour. Studies in other settings,[14,23,27] have reported that food handlers who are educated and have had a formal food safety training tend to demonstrate better knowledge. The findings from the current study suggest that cultural and educational backgrounds influence how food safety information is understood and applied. This indicates that interventions should be context-specific, since strategies effective for one group may not necessarily be effective for another. The association between ethnicity and the attitudes of food handlers toward food safety is however not surprising as cultural beliefs, traditional food practices and language differences, may shape how individuals perceive the importance of food hygiene and safety.

Tertiary institutions must treat food safety as a policy priority. Ongoing refresher training, sustained supervision, and culturally responsive education initiatives are essential to minimize the likelihood of foodborne outbreaks within the university community.

Study Limitations: The cross-sectional study design limits the ability to infer causality. The relatively small sample size may limit the generalizability of the findings to other settings. In addition, data on knowledge and attitudes were based on self-reported information, which may be subject to self-report bias.

CONCLUSION

Respondents generally had good knowledge and attitudes toward food safety, suggesting that training and awareness programs may be making an impact. The association between level of education and knowledge of food safety underscores the importance of continuous training programs for food handlers. The association between ethnicity and attitudes highlights the importance of culturally sensitive approaches in food safety education. It is recommended that continuous and culturally sensitive food safety training programs for food handlers be strengthened.

DECLARATIONS

Authors' contribution: NOA, the first author, conceived the research idea and wrote the first draft. All authors critically revised the content of the manuscript. DOT, HAO, NEO, CN-N and OE aided in the acquisition of data. The data was interpreted by NOA, DOT and OE. All authors reviewed the manuscript, approved the final submission and agree to be accountable for all aspects of the work

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