

Assessment of the Knowledge, Attitudes and Practices on Hygiene and safety of foods by Food Handlers in Restaurants and local food Vendors in Aba, Abia State, Nigeria

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DOI: <https://doi.org/10.5281/zenodo.20455947>

Received: 15 April 2026, Accepted: 14 May 2026, Online First: 30 May 2026

ABSTRACT:

Despite the prevalence of food-borne diseases in many low and middle income economies due to poor food hygiene practices, little seems to have been done to educate food handlers on proper food handling techniques to avoid such incidences. In an effort to gauge knowledge, attitudes and practices on hygiene and safety of foods, a cross-sectional descriptive study was carried out amongst 120 Food Handlers in Restaurants and food Vendors in Aba, Abia State. Data were collected using a structured questionnaires and observational check-list were also employed to assess the knowledge, attitudes and practices (KAP) of the vendors. The result revealed that hygiene practices significantly influenced contamination rates, with vendors practicing poor hygiene accounting for the highest number of contaminated samples (36), followed by moderate (24) and good hygiene practices (14). Relative risk analysis showed that samples from vendors with moderate hygiene had a 1.29 times higher contamination risk, while those from vendors with poor hygiene had a 1.54 times higher risk, compared to those with good hygiene. The absolute increase in contamination risk was 13.3% for moderate hygiene and 25.3% for poor hygiene relative to good hygiene. It is recommended to intensify educational efforts on food safety practices, particularly targeting the minority who may not adhere to ideal standards. This is crucial as insufficient knowledge can hinder the adoption of appropriate food safety practices.

Keywords: Knowledge, Attitudes, Practices, Hygiene, Food Handlers, Aba

INTRODUCTION:

Food safety refers to the assurance that food will not cause any harm to consumers upon preparation and consumption based on its intended use (FAO/WHO, 2003). Alternatively, food safety may refer to the protection of human beings from dangers posed by hazardous foods by reducing risks posed by the hazards or by avoiding risks to consumers from food. Measures put in place in ensuring food is safe, wholesome and suitable throughout the process of production up to the point of consumption are referred to as food hygiene. Food can be described as a substance that one consumes to stay alive and grow. Food is made up of naturally available elements referred to as nutrients, which are required by the human body to keep healthy and active. Food is essential for human survival, growth and

development, activities, and overall well-being. Our body requires food for energy generation, survival and sustenance. Foods may be from animal origin, plant origin, animal products, plant products and reproductive material (Singh et al 2019). The importance of understanding food hygiene practices by food handlers cannot be underestimated since most unsafe practices are as a result of ignorance. A study on perspectives regarding food safety in Nigeria revealed that 66.7% relied on knowledge while 12.6% evaluated practices by observation (GAIN, 2022). There is a great need for the conducting of the study as a result of the knowledge and practice gaps. Various factors affect food handlers' knowledge such as receiving formal training in food safety, having access to information through media, among other factors (Barnabas et al 2024). The global

IJMSCRR: May-June, 2026

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prevalence of food-borne illnesses especially in developed countries where such data is available has seen food safety emerge as a growing global concern among the many problems facing developed nations. According to the CDC's estimate, around (48 million people) contract food-borne illnesses annually. The estimates indicate around 128,000 are hospitalized and 3,000 are killed (CDC, 2020). The 31 known pathogens cause an estimated 9.4 million cases per year, 55,961 hospitalizations, and 1,351 deaths. Unspecified agents contribute to 38.4 million cases per year, 71,878 hospitalizations, and 1,686 deaths. The CDC stresses the importance of good food hygiene practices to avoid contaminating foods before they are served. Street foods have been shown as being responsible for foodborne illnesses in developing countries with consumption from outside sources posing more risks. Food safety is an important area of science that ensures quality maintenance of foods and their safety from contaminants. The WHO reports millions fall ill annually in developing countries suffering from foodborne illnesses as a result of poor food safety practices (WHO, 2015). The knowledge, attitudes, and practices of vendors have been shown to be critical to food safety, where poor practices lead to increased incidences of foodborne illnesses (Sharif and Al-Dalalah, 2013). Even though there are documented cases of foodborne diseases in Nigeria, little research exists that focuses on the actual practices of food hygiene in relation to food safety and uses prediction techniques (Odo et al 2021). Very little has also been done on the

subject matter focusing on local governments and the predictors of food hygienic practice using multivariate analysis (Danimoh et al 2022; Emmanuel, 2016). There is very little evidence from Aba, in particular, despite being one of the most prevalent locations in terms of informal and semi-formal food vending systems. This poses a problem for formulating appropriate intervention measures. Therefore, the study assessed the Knowledge, Attitudes and Practices on Hygiene and Safety of foods by Food Handlers in Restaurants and Local food Vendors in Aba, Abia State, Nigeria.

MATERIALS AND METHODS:

Descriptions of the Study Area:

This study was conducted in Aba, the commercial hub of Abia State, Nigeria. Aba town of Abia State, located in the South East geopolitical zone of Nigeria, lies within longitude 5° 7' 0.00"N and latitude 7° 22' 0.00"E. Aba hosts a large population, estimated at over 2 million, with dense markets, informal settlements, and diverse economic activities. Its climate is tropical, with a rainy season between April and October, which influences water quality via runoff and potential fecal contamination (Ogbuagu et al., 2019). Water sources in Aba include municipal pipe-borne water, boreholes, wells, and water supplied by private vendors. The selection of Aba as the study site is due to its high concentration of food establishments and limited documented information on water quality and hygiene practices in these sectors.

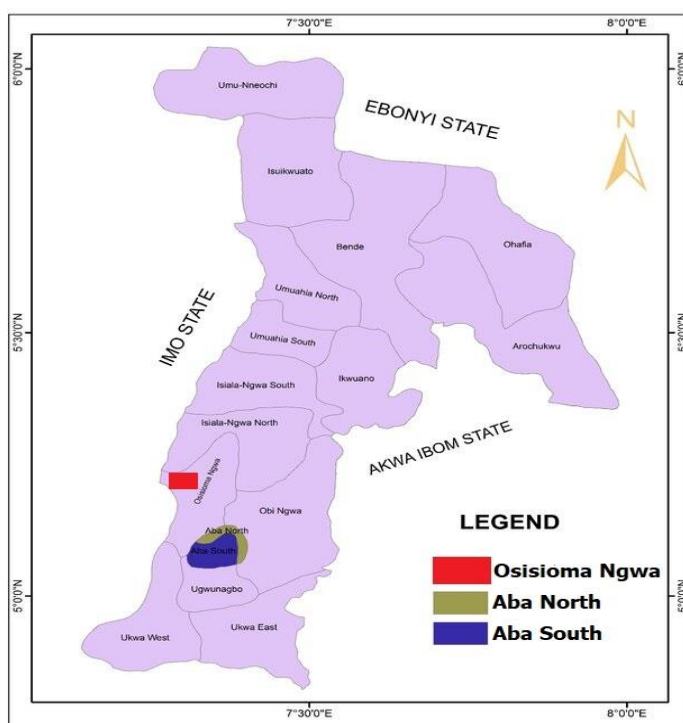


Figure 1: Map of Abia State showing the sampling locations (Source: Google Map)

Ethical Considerations:

Ethical approval was obtained from Abia State Ministry of Health and Imo State University Ethical Review Committee. Written consent was obtained from restaurant owners and food vendors. Data confidentiality and anonymity were maintained.

Study Design and Administration of Questionnaires:

The study made up of cross-sectional study with laboratory, questionnaire survey, and observation components. Questionnaires with an in-depth interview were used to assess knowledge, attitude and practices (KAP) of food safety/hygiene while an observation check-list was employed to evaluate the hygiene conditions of vending sites among randomly selected food vendors restaurants.

Sample Size Determination:

In this work, the formula of Nwana 1981 was adopted. Nwana in his work on educational research observe that “if the population is a few hundred, 40% or more sample will do; if many hundreds a 20% sample will do; if a few thousand 10% sample will do and if several thousand a 5% or less will do”. In the present work, there are 300 restaurants and feeding centers in Aba, Abia State and by Nwana 1981, the sample size for the present work is going to be 20 of 300, which 60.

Study Population:

The population of this study comprised of restaurant and local food vendors involved in food preparation and sales within Aba metropolis. A total of 60 sampling sites were selected from the three L.G.A of Aba (Aba South, Aba North and Osisioma). The target population included both registered and unregistered food establishments operating within Aba metropolis. These establishments vary in size and structure, ranging from small roadside food stalls and informal local vendors to larger, formal sit-down restaurants. Individuals considered part of the population included food handlers, water handlers, and managerial or supervisory staff responsible for food preparation and hygiene practices within these establishments. Including these categories of personnel allowed the study to capture a comprehensive view of water use practices, sanitation conditions, and hygiene management within the food vending sector. This approach ensured that the study population adequately represented the diversity of food service operations present within Aba metropolis and provided relevant insights into the potential public health risks associated with water use in food preparation environments.

Data Analysis:

Data from the field surveys and laboratory results were analyzed using simple frequencies and percentages for hygiene practices, water source types, and contamination levels. While Chi-square test was used to determine the associations between hygiene practices and water contamination.

RESULTS:

Table 1 shows respondents' knowledge of food safety and hygiene practices, with varying levels of awareness across indicators. It was observed that only 41.7% of respondents were aware of food safety laws, while 23.3% were not and 35.0% did not know. The respondents' (61.7%) indicated higher knowledge of hand hygiene agreeing that washing hands with soap and water before handling food is necessary; however, 31.7% disagreed and 6.7% were unsure. In the same vein, half of the respondents (50.0%) knew that wiping cloths can spread microorganisms, while 35.0% disagreed and 15.0% did not know. Similarly, 50.0% recognized that raw food should be stored separately from cooked food, whereas 33.3% disagreed and 16.7% were unsure. As regard reheating, 48.3% agreed that cooked foods do not need thorough reheating, while only 26.7% disagreed and 25.0% did not know. A majority (73.3%) correctly stated that cooked food should be kept very hot before serving; 20.0% disagreed and 6.7% were unsure. Also, 58.3% agreed that safe, properly plumbed water should be used for food preparation, while 38.3% disagreed and 3.3% did not know. The highest awareness was on disease transmission by pests, with 91.7% agreeing that insects and rodents can spread disease; only 3.3% disagreed and 5.0% were unsure. Table 2 presents respondents' knowledge of food safety and hygiene practices based on years of experience in food handling (<5 years and >5 years), showing some differences between the groups. Among respondents with <5 years of experience, 33.3% were aware of food safety laws, 22.2% said no, and 44.4% did not know, while among those with >5 years of experience, 45.2% were aware, 23.8% were not, and 73.8% did not know. Knowledge of handwashing was similar in both groups, with 61.1% (<5 years) and 61.9% (>5 years) agreeing that washing hands with soap and water before handling food is advocated; 33.3% and 30.9% disagreed, while 5.6% and 7.1% were unsure, respectively. Half of respondents in both groups (50.0%) knew that wiping hands with cloths can spread microorganisms; however, 44.4% (<5 years) and 30.9% (>5 years) disagreed, while 5.6% and 19.4% were unsure. On food separation, only 27.0% of respondents with <5 years of experience and 35.7% of those with >5 years agreed that raw food should be stored separately from cooked food; 50.0% and 26.2% disagreed, while 22.2%

and 38.1% were unsure, respectively. On reheating practices, 50.0% (<5 years) and 47.6% (>5 years) agreed that cooked foods do not need thorough heating, while 38.9% and 21.4% disagreed, and 11.1% and 30.9% were unsure. A higher proportion of respondents with <5 years of experience (72.2%) correctly stated that cooked food should be kept very hot before serving, compared to 30.9% of those with >5 years; 11.1% and 23.8% disagreed, while 16.7% and 2.4% were unsure. Knowledge of safe water use was higher among those with <5 years (55.6%) compared to those with >5 years (35.7%); however, 27.8% and 42.9% disagreed, while 16.7% and 21.4% were unsure. Finally, knowledge that insects and rodents can spread disease was high in both groups, with 72.2% (<5 years) and 97.6% (>5 years) agreeing; 11.1% and 2.4% disagreed, while 16.7% and 0.0% were unsure. Table 3 shows respondents' attitudes towards food hygiene practices. A majority (76.67%) believed in the importance of food hygiene, while 23.33% did not. Also, 68.33% agreed that poor environmental conditions constrain business, including catering, whereas 31.67% disagreed. On hand hygiene, 65.00% believed in hand washing, and a higher proportion (81.67%) agreed that frequent handwashing during food preparation is important; however, 35.00% and 18.33% respectively did not share these views. In addition, 58.33% agreed that keeping kitchen surfaces clean reduces the risk of illness, while 41.67% disagreed. Opinions were evenly divided on whether water used for washing utensils should be disposed of after each use, with 50.00% agreeing and 50.00% disagreeing. A large majority (83.33%) agreed that raw and cooked food should not be stored together, while 16.67% disagreed. Furthermore, 66.67% believed that water used for cooking must be colorless and odorless, whereas 26.67% did not. Table 4 presents respondents' attitudes towards food hygiene practices based on formal training in food safety and hygiene, showing clear differences between trained and untrained respondents. A higher proportion of trained respondents (95.83%) believed in the importance of food hygiene compared to 63.89% of untrained respondents. Similarly, 87.50% of trained respondents agreed that poor environmental conditions constrain business, including eateries, compared to 55.56% of those not trained. All trained respondents (100.00%) believed in hand washing, compared to only 41.67% of untrained respondents, and likewise, 100.00% of trained respondents agreed that frequent hand washing during food preparation is important, compared to 69.44% of untrained respondents.

In addition, 79.17% of trained respondents agreed that keeping kitchen surfaces clean reduces the risk of illness, compared to 44.44% of untrained respondents. All trained respondents (100.00%) agreed that water used for washing utensils should be disposed of after each use, compared to only 16.67% of untrained respondents. Similarly, 100.00% of trained respondents agreed that raw and cooked food should not be stored together, compared to 72.22% of untrained respondents. Finally, all trained respondents (100.00%) agreed that water used for cooking must be colorless and odorless, compared to 55.56% of untrained respondents. Table 5 presents respondents' attitudes towards food hygiene practices based on years of experience in food handling (<5 years and >5 years), showing some variation between the groups. A higher proportion of respondents with >5 years of experience (80.9%) believed in the importance of food hygiene compared to those with <5 years (66.7%). However, more respondents with <5 years of experience (77.8%) agreed that poor environmental conditions constrain business, including eateries, compared to 64.3% of those with >5 years. Belief in handwashing was higher among respondents with >5 years of experience (71.4%) than those with <5 years (50.0%), and the same pattern was observed for frequent handwashing during food preparation, with 90.5% (>5 years) compared to 61.1% (<5 years). Observations on kitchen hygiene, 72.2% of respondents with <5 years of experience agreed that keeping kitchen surfaces clean reduces the risk of illness, compared to 52.4% of those with >5 years. Opinions were equal on the disposal of water used for washing utensils, with 50.0% agreement in both groups. A higher proportion of respondents with <5 years of experience (94.4%) agreed that raw and cooked food should not be stored together, compared to 78.6% of those with >5 years. Finally, 77.8% of respondents with <5 years and 71.4% of those with >5 years agreed that water used for cooking must be colorless and odorless. Table 6 shows that food vendors in Aba demonstrated moderate compliance with food hygiene standards. Result revealed that 41.7 wore clean aprons and 33.3% had their hair properly covered, indicating partial adherence to personal hygiene practices. Hand hygiene was better, with 75% having hand-washing facilities and 70% having soap available. For food storage, 48.33% kept raw and cooked foods separately, and 61.7% had covered waste bins. Only 30% of vendors had flies or pests, showing good pest control, but just 53.3% had functional refrigerators.

Table 1: Knowledge of Food Safety and Hygiene practices by Respondents

Variables	Yes (%)	No (%)	Don't Know
Are there laws on food safety?	25(41.7)	14(23.3)	21(35.0)
Washing hands with water and soap before handling food advocated	37(61.7)	19(31.7)	4(6.7)
Wiping cloths can spread microorganisms	30(50.0)	21(35.0)	9(15.0)
Raw food needs to be stored separately from cooked food	30(50.0)	20(33.3)	10(16.7)
Cooked foods do not need to be thoroughly reheated	29(48.3)	16(26.7)	15(25.0)
Cooked food should be kept very hot before serving	44(73.3)	12(20.0)	4(6.7)
Safe and plumbing, water must be used for preparing and cooking	35(58.3)	23(38.3)	2(3.3)
Insects (e.g flies) and rodents (e.g rats) can cause and spread disease	55(91.7)	2(3.3)	3(5.0)

Table 2: The knowledge of food safety and hygiene practices based on years of experience in food handling

Variables	YEARS OF EXPERIENCE (%)					
	< 5(%) n=18			>5 (%) n=42		
	Yes	No	Don't know	Yes (%)	No	Don't know
Are there laws on food safety?	6(33.3)	4(22.2)	8(44.4)	19(45.2)	10(23.8)	13(73.8)
Washing hands with water and soap before handling food is advocated	11(61.1)	6(33.3)	1(5.6)	26(61.9)	13(30.9)	3(7.1)
Wiping hands with cloths can spread microorganisms	9(50.0)	8(44.4)	1(5.6)	21(50.0)	13(30.9)	8(19.4)
Raw food needs to be stored separately from cooked food	5(27.0)	9(50.0)	4(22.2)	15(35.7)	11(26.2)	16(38.1)
Cooked foods do not need to be thoroughly heated	9(50.0)	7(38.9)	2(11.1)	20(47.6)	9(21.4)	13(30.9)
Cooked food should be kept very hot before serving	13(72.2)	2(11.1)	3(16.7)	31(30.9)	10(23.8)	1(2.4)
Safe and plumbing water must be used for preparing and cooking	10(55.6)	5(27.8)	3(16.7)	15(35.7)	18(42.9)	9(21.4)
Insects (e.g. flies) and rodents (e.g. rats) can cause and spread disease	13(72.2)	2(11.1)	3(16.7)	41(97.6)	1(2.4)	0(0.0)

Table 3: Attitude towards Food Hygiene practices by the Respondents n=60

Variables	Yes (%)	No (%)
Believe in the importance of food hygiene	46(76.67)	14(23.33)
Poor Surrounding environmental conditions constrain business including catering	41(68.33)	19(31.67)
Believe in hand washing	39(65.00)	21(35.00)
Frequent hand washing during food preparation is important	49(81.67)	11(18.33)
Keeping kitchen surfaces clean, reduces the risk of illness	35(58.33)	25(41.67)
Water used for washing utensils should be disposed of after each use	30(50.00)	30(50.00)
Raw and cooked food should not stored together	50(83.33)	10(16.67)
Water used for cooking must be colorless and odorless	44(66.67)	16(26.67)

Table 4: Attitude towards food hygiene practices by the respondents on formal training in food safety/hygiene

variables	Yes Response (%)	
	Trained n=24	Not trained n=36
Believe in the importance of food hygiene	23(95.83)	23(63.89)
Poor Surrounding environmental conditions constraints business including eateries.	21(87.50)	20(55.56)
Believe in hand washing?	24(100.00)	15(41.67)
Frequent hand washing during food preparation is important.	24(100.00)	25(69.44)
Keeping kitchen surfaces clean reduces the risk of illness	19(79.17)	16(44.44)
Water used for washing utensils should be disposed of after each use	24(100.00)	6(16.67)
Raw and cooked food should not store together.	24(100.00)	26(72.22)
Water used for cooking must be colorless and odorless	24(100.00)	20(55.56)

Table 5 Attitude towards food hygiene and practices based on years of experience in food handling

Variables	Yes Response (%) age (years)	
	<5 n=18	>5 n=42
Believe in the importance of food hygiene	12(66.7)	34(80.9)
Poor surrounding environmental conditions constraints business including eateries.	14(77.8)	27(64.3)
Believe in hand washing	9(50.0)	30(71.4)
Frequent handwashing during food preparation is important.	11(61.1)	38(90.5)
Keeping kitchen surfaces clean reduces the risk of illness	13(72.2)	22(52.4)
Water used for washing utensils should be disposed of after each use	9(50.0)	21(50.0)
Raw and cooked food should not store together.	17(94.4)	33(78.6)
Water used for cooking must be colorless and odorless	14(77.8)	30(71.4)

Table 6: Researcher's Observational Checklist of Food Hygiene Practices

Observed Item	Yes (%)	No (%)
Vendor wearing clean apron	25(41.7)	35(58.3)
Hair properly covered	20(33.3)	40(66.7)
Handwashing facility available	45(75.0)	15(25.0)
Soap available	42(70.0)	18(30.0)
Separate storage for raw/cooked food	29(48.33)	31(51.67)
Waste bin with cover available	37(61.7)	23(38.3)
Presence of flies/pests	18(30.0)	42(70.0)
Refrigerator functional	32(53.3)	28(46.7)

DISCUSSION:

The findings on Knowledge of Food Safety and Hygiene practices by Respondents reveal that respondents possessed moderate but uneven knowledge of food safety and hygiene practices, with noticeable gaps in key areas such as regulatory awareness, cross-contamination prevention, and reheating practices. The relatively low awareness of food safety laws (41.7%) suggests limited exposure to formal regulatory frameworks guiding food hygiene. This finding is concerning because knowledge of

food safety regulations is fundamental to compliance and safe food handling practices. Similar results were reported by Okojie and Isah (2020), who found that food handlers in Nigeria had poor awareness of food safety legislation, which contributed to unsafe food practices in informal food establishments. Knowledge of personal hygiene practices, particularly handwashing, was comparatively higher, with 61.7% of respondents recognizing the importance of washing hands with soap and water before handling food. This aligns with the findings of *Sharif et*

al. (2013), who reported that hand hygiene is often one of the most widely understood food safety practices among food handlers due to repeated public health messaging. However, the presence of a substantial proportion of respondents who either disagreed (31.7%) or were unsure (6.7%) indicates persistent gaps in translating awareness into universal practice. This inconsistency may increase the risk of food contamination, as inadequate hand hygiene remains one of the primary routes of foodborne disease transmission (WHO, 2022).

The knowledge of food safety and hygiene practices based on years of experience in food handling indicate that years of experience in food handling showed an inconsistent relationship with knowledge of food safety and hygiene practices. Awareness of food safety laws was slightly higher among respondents with more than five years of experience (45.2%) compared to those with less than five years (33.3%), suggesting that prolonged exposure to food handling activities may increase awareness of regulatory issues. However, the relatively high proportion of respondents in both groups who either did not know or had incorrect understanding indicates that experience alone is insufficient for adequate knowledge development. This supports the view of Rifat *et al.* (2022), who emphasized that food safety knowledge is more strongly influenced by structured education and training than by experience alone. For hand hygiene, both groups demonstrated almost identical levels of awareness (61.1% and 61.9%), indicating that knowledge of handwashing practices is widely disseminated among food handlers regardless of experience. Nevertheless, the presence of respondents who still disagreed or were unsure highlights persistent gaps in understanding and possibly in compliance. Mensah *et al.* (2002) similarly reported that although food handlers may be aware of hygiene practices, actual understanding and consistent application often remain inadequate without formal reinforcement. A substantial majority of respondents (76.67%) acknowledged the importance of food hygiene, indicating a generally positive disposition toward safe food handling. This aligns with findings by Barnabas *et al.* (2024), who reported that most food vendors in Nigeria exhibited positive attitudes toward food safety despite gaps in actual practice. However, the presence of 23.33% who did not recognize its importance suggests that attitudinal gaps still exist, potentially undermining compliance with hygiene standards. On the environmental conditions, 68.33% of respondents agreed that poor environmental conditions constrain catering businesses, while 31.67% disagreed. This suggests that although most respondents recognize the role of environmental hygiene, a significant minority may underestimate its impact. Attitudes toward hand hygiene were relatively positive but not universal. While 65.00% believed in hand washing, a higher proportion (81.67%) agreed that

frequent hand washing during food preparation is important. Nevertheless, 35.00% and 18.33% of respondents, respectively, did not share these views, indicating a disconnect between general belief and specific practice. Attitude towards food hygiene practices by the respondents on formal training in food safety/hygiene showed that a significantly higher proportion of trained respondents (95.83%) believed in the importance of food hygiene compared to 63.89% of untrained respondents. This suggests that formal training enhances awareness of the relevance of hygiene in food handling. Similarly, Monney *et al.* (2013) reported that food handlers who received training were more likely to demonstrate positive attitudes toward food hygiene compared to those without training. In terms of environmental hygiene, 87.50% of trained respondents agreed that poor environmental conditions constrain catering businesses, compared to only 55.56% of untrained respondents. This indicates that trained individuals are more likely to recognize the broader environmental factors affecting food safety. Attitudes toward hand hygiene showed one of the most striking differences between the two groups. All trained respondents (100.00%) believed in handwashing and also agreed on the importance of frequent handwashing during food preparation, compared to only 41.67% and 69.44% of untrained respondents, respectively. This finding highlights the effectiveness of training in reinforcing critical hygiene practices. Attitudes toward food hygiene practices based on years of experience in food handling, revealing mixed patterns that suggest experience alone does not consistently predict positive attitudes toward food safety. While respondents with more than five years of experience (>5 years) demonstrated stronger attitudes in certain areas, those with less experience (<5 years) performed better in others. This finding aligns with recent studies indicating that experience, without continuous training, may not guarantee improved food safety attitudes or practices. A higher proportion of respondents with >5 years of experience (80.9%) believed in the importance of food hygiene compared to 66.7% of those with <5 years. This suggests that prolonged exposure to food handling environments may enhance general awareness of hygiene importance. Similarly, respondents with more experience showed better attitudes toward hand hygiene, with 71.4% believing in handwashing and 90.5% supporting frequent handwashing during food preparation, compared to 50.0% and 61.1% among less experienced respondents. Observational Checklist of Food Hygiene Practices indicated that moderate compliance with food hygiene standards among food vendors in Aba. The use of clean aprons (41.7%) and proper hair covering (33.3%) indicates partial adherence to personal hygiene practices. Similar findings were reported by Akinbola, (2023) in Ilorin, Nigeria, where

compliance with protective clothing was inconsistent among vendors. Likewise, Mensah *et al* (2022) in Ghana observed that although vendors were aware of hygiene requirements, regular use of protective attire was not universal. Hand hygiene practices were relatively better, as 75% of vendors had handwashing facilities and 70% had soap available. This aligns with previous study by Cortese *et al* (2021), who noted that provision of handwashing materials positively influenced hygiene practices among food vendors in Ghana. The World Health Organization (2022) also emphasizes that proper handwashing with soap is essential in preventing foodborne diseases. Regarding food storage, 48.33% of vendors separated raw and cooked foods, which aligns with recommended food safety guidelines to prevent cross-contamination (WHO, 2022). However, 53.3% had functional refrigerators, raising concerns about safe storage of perishable foods. Odo *et al* (2020) reported that inadequate refrigeration among vendors in Nigeria contributed to microbial contamination of foods. The presence of covered waste bins in 61.7% of vending sites and the relatively low occurrence of flies or pests (30%) suggest fair environmental sanitation. Similar observations were made by Akalu *et al* (2020) in African urban food vending environments, where improved waste management reduced contamination risks.

CONCLUSION:

It has been revealed through the research that many food handlers have a good knowledge about personal hygiene. Indeed, this is an encouraging base on which one could develop more knowledge. Nevertheless, the lack of information regarding important aspects of food safety has been found, namely cross contamination, temperature control, and food pathogens. This problem should definitely be considered as worrying since it concerns food safety directly. The attitudes displayed by food handlers are rather positive, thus showing their interest in food safety issues. Positive attitudes are a great benefit, for these are motivating factors for applying safe practices. At the same time, attitudes do not constitute everything, so one should remember about other things which are needed as well, for example, proper training. The practices used by food handlers are quite controversial since while being satisfactory regarding personal hygiene, some problems are present, for instance, cross contamination and improper temperature control.

LIMITATIONS OF THE STUDY:

This study had some limitations. First, the study was conducted only among food handlers and vendors in Aba metropolis, which may limit the generalizability of the findings to other regions of Nigeria. Second, the data on knowledge, attitudes, and practices were obtained through

self-reported questionnaires, which may be subject to response bias and social desirability bias. Third, the cross-sectional design of the study does not allow for the establishment of causal relationships between knowledge, attitudes, and food hygiene practices. Despite these limitations, the study provides valuable insights into food safety knowledge, attitudes, and practices among food handlers in Aba and highlights areas requiring intervention.

RECOMMENDATIONS:

Based on the findings of this study, the following recommendations are made:

- Regular food safety and hygiene training programs should be organized for food handlers and vendors to improve their knowledge and encourage the adoption of safe food handling practices.
- Government health agencies and relevant regulatory authorities should conduct routine inspections and monitoring of food establishments to ensure compliance with food safety standards.
- A mandatory certification system for food handlers should be implemented to ensure that individuals involved in food preparation possess adequate knowledge of food hygiene and safety practices.
- Public awareness campaigns should be intensified through the media, community outreach programs, and educational institutions to promote food safety awareness among both food handlers and consumers.
- Food vendors should be encouraged to maintain proper sanitation, including regular handwashing, safe food storage, proper waste disposal, and effective pest control measures.
- Further studies involving larger populations and different geographical locations should be conducted to provide more comprehensive information on food safety practices and associated risk factors in Nigeria.

DATA AVAILABILITY STATEMENT:

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The datasets generated and/or analyzed during the current study are not publicly available due to privacy and confidentiality considerations but can be made available for academic and research purposes upon request.

CONFLICT OF INTEREST:

None

FUNDING:

None

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