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COMPARATIVE STUDY ON FOOD SAFETY AND HAND HYGIENE PRACTICES AMONG FOOD VENDORS LOCATED WITHIN UNIVERSITY OF UYO CAMPUSES.

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Abstract

Background: Foodborne diseases are a significant health issue worldwide. Universities are key points of food safety surveillance. Although hand hygiene is an effective preventive measure against transmission, the lack of compliance in vendors is often a problem due to infrastructural and educational barriers.This research was conducted to compare hand hygiene knowledge, hand hygiene practices and availability of hand hygiene resources among food vendors in the University of Uyo Main, Town and Annex campuses in Nigeria.

Methods: The cross-sectional survey involved 113 vendors (Main: n=68; Town: n=34; Annex: n=11) with the use of a structured questionnaire, which was developed on the basis of WHO guidelines. IBM SPSS version 30.0 was used to analyze the data using descriptive statistics and ANOVA ($p < 0.05$).

Results: The majority of vendors were females (66.4%), and 63.7% of them did not have any formal training in food safety. The overall level of knowledge (mean: 14.42/20) and practice (mean: 41.02/50) scores were high, although there were wide differences in the level of knowledge and practice among campuses. Knowledge (15.12±3.05), practice (42.35±3.91), and resource availability had the highest scores at the Main Campus, and the lowest scores at the Annex Campus (12.45±3.87; 37.91±5.34). Particular gaps in knowledge were found to be insufficient in terms of hygiene-related illnesses and the most important handwashing situations, especially after touching money or waste.

Conclusion: There are considerable geographical differences in food safety standards in the university, which are mainly caused by the differences in infrastructure and access to resources. Enhanced hygiene facilities, especially at the Annex and Town campuses, and targeted training will be an urgent issue to reduce the risk of foodborne diseases.

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Keywords: Handwashing Compliance, Sanitation Infrastructure, Campus Food Handlers, Foodborne Illness Prevention, Nigeria.

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Introduction

The burden of foodborne diseases in the world is a major issue of the global health concern and the World Health Organization estimates that around 600 million individuals become ill each year with the result of about 420 thousand deaths globally. In developing countries like Nigeria, this is compounded by the high rate of urbanization, poor sanitation, and growth of informal food vending industries (WHO, 2009). The importance of hand hygiene is well known as one of the most effective and cost-effective strategies to prevent the spread of infectious agents in food handling settings. Nevertheless, the level of compliance is not always similar, especially in low-resource areas, where the structural barriers include insufficient water supply, the absence of soap, and the ineffectiveness of the regulations (Adejumo & Adejumo, 2022).

The available public health research evidence shows that environmental and behavioral factors have a significant impact on hygiene practices. Research has demonstrated that poor infrastructure, insufficient availability of hygiene facilities, and low health literacy are some of the factors that lead to poor hand hygiene behaviors among food handlers (Othman et al., 2022). Moreover, handling of hands and other frequently touched surfaces (including currency) has also been found to be a significant route of foodborne pathogen transmission, which further justifies the importance of paying close attention to the hygiene guidelines (Okwuanaso et al., 2024).

Universities offer a special micro-environment where food safety hazards are increased because of population density and numerous food exchange processes. These locations have been reported as possible hotspots of disease spread in case of failure to uphold hygiene. Past research on institutional setups has documented the differences in hygienic behaviors among various units or locations usually associated with differences in infrastructure, supervision and availability of resources (Oyekale et al., 2021). On the same note, in studies carried out on informal food vending industries in West Africa, it has been shown that gaps between the knowledge and the reality of hygiene practice are common among food vendors, especially when it comes to cross-contamination, which occurs when food vendors handle money and food at the same time (Tuglo et al., 2021).

In the case of the University of Uyo, the distribution of food vending activities is spread into three campuses Main, Town, and Annex with their different degrees of infrastructural development and administrative control. These differences may influence the availability of hygiene resources and the enforcement of food safety standards. Research has demonstrated that the availability of resources is a key factor in hygiene behavior because people tend to be less inclined toward following the recommended practices when they do not have facilities that facilitate the suggested behavior (Young et al., 2020).

Although the significance of hand hygiene has been acknowledged, comparative studies of the ways in which differences between geographical and institutional settings of a single university impact hand hygiene practices have not been carried out. According to the existing literature, the knowledge about hygiene practices is crucial, but does not always translate into the appropriate behavior without sufficient institutional support and ongoing training (Othman et al., 2022). Moreover, communicable diseases including diarrheal and enteric fevers, which are directly related to poor hygiene practices, still remain serious threats to the public health in developing nations (Tessema et al., 2025).

Thus, this research aims at carrying out comparative analysis of hand hygiene practices among food vendors in various campuses of the University of Uyo. The study will address the differences in the knowledge, practices and availability of resources to provide evidence based insights that can inform specific interventions and policy decisions to enhance food safety and population health outcomes in university settings.

Specifically, the objectives of this study are to:
(i) assess and compare the level of hand hygiene knowledge among food vendors across the Main, Town, and Annex campuses of the University of Uyo;
(ii) assess and compare self-reported hand hygiene practices among food vendors across the three campuses;
(iii) assess and compare the availability of hand hygiene resources (e.g. water, soap, sanitizers, handwashing stations) across the three campuses; and
(iv) determine whether campus location is significantly associated with differences in hand hygiene knowledge, practice, and resource availability, in order to identify which campuses most urgently require targeted intervention.

Methodology

Study Design and Area

In this study, a descriptive cross-sectional survey design was used. The study was carried out in the three campuses of the University of Uyo (Main Campus (Nwaniba Road), Town Campus and the Annex Campus) which are located in Uyo, Akwa Ibom State, Nigeria.

Population and Sampling

The target population comprised food vendors operating within the three campuses, including restaurant/cafeteria operators, snack-bar attendants, mobile vendors, canteen/kiosk operators, and bakery operators, estimated at approximately 250 vendors across all campuses. A stratified random sampling technique was used to ensure proportional representation across campus locations and vendor categories. Campus location was treated as the primary stratum, with vendors allocated in proportion to the number registered at each site: 68 (60%) at Main Campus, 34 (30%) at Town Campus, and 11 (10%) at Annex Campus. Within each campus stratum, vendors were further stratified by vendor category, and participants were then selected from each stratum using computer-generated random numbers. The three campuses were selected as study sites because they represent the full range of infrastructural and administrative conditions under which food vendors operate at the University of Uyo, from the centralized, better-resourced Main Campus to the more peripheral Town and Annex campuses, allowing the study to directly test whether these documented infrastructural differences translate into measurable differences in hand-hygiene knowledge, practice, and resource availability.

Data Collection Tool

A structured, self-administered questionnaire, based on the World Health Organization Food Safety and Hand Hygiene Guidelines (WHO, 2009) was used to collect data, with four major domains: socio-demographic factors, knowledge about hand hygiene, self-reported hand hygiene habits and access to handwashing facilities. Content, face, and construct validity were established through expert review by the research supervisor, who assessed the instrument's coverage of relevant domains, item clarity and cultural appropriateness, and alignment with the knowledge-attitude-practice constructs being measured. Internal consistency was assessed through a pilot study with 12 food vendors outside the main sampling frame, yielding Cronbach's alpha values of 0.76 for the knowledge scale, 0.83 for the attitude scale, and 0.80 for the practice scale, indicating acceptable to good reliability; test-retest reliability, assessed with 10 pilot participants completing the instrument twice over a two-week interval, produced Pearson correlation coefficients of 0.74-0.87, indicating good temporal stability.

Variables and Measurement

The main independent variable was the location of the campus (Main, Town, Annex). Dependent variables were knowledge scores (out of 20), practice scores (out of 50) and resource availability scores (out of 20). The assessment of knowledge was based on the questions regarding disease transmission and the most important moments when handwashing should occur. Measures were made on practices on a 5-point Likert scale (Never/Always).

Data Analysis

IBM SPSS version 30.0 was used to perform statistical analysis. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize the data. Prior to inferential testing, the assumptions underlying one-way ANOVA were assessed: normality of the outcome distributions within each campus group was checked using the Shapiro-Wilk test, and homogeneity of variance across groups was checked using Levene's test. One-way Analysis of Variance (ANOVA) was then used to establish whether there were statistically significant differences in the mean knowledge, practice, and resource-availability scores across the three campuses, with Tukey's HSD post-hoc test applied to identify which specific campus pairs differed significantly where the overall ANOVA was significant. The level of significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval for this study was obtained from the Research Ethics Committee of the University of Port Harcourt prior to the commencement of data collection, in line with the principles of the Declaration of Helsinki. All participants were informed and gave written consent, and confidentiality was upheld throughout the study.

Results

A total of 113 food vendors participated in the study, distributed across Town Campus (n = 34, 30.1%), Main Campus (n = 68, 60.2%), and Annex Campus (n = 11, 9.7%). Findings are shown based on the objectives and hypotheses of the study. Based on Table 1, the majority of respondents (66.4) were female vendors and 37.2% were aged between 26 and 35 years. The majority of the respondents were secondary (41.6%), and 34.5% had post-secondary education. A high percentage (63.7) of respondents had not been trained about food safety.

Table 1: Socio-Demographic Characteristics of Respondents (N = 113)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–25	23	20.4
	26–35	42	37.2
	36–45	31	27.4
	46–55	13	11.5
	Above 55	4	3.5
Sex	Male	38	33.6
	Female	75	66.4
Highest Education Level	No formal education	8	7.1
	Primary	19	16.8
	Secondary (WAEC/NECO)	47	41.6
	ND/NCE	24	21.2
	HND/Bachelor's	13	11.5
	Postgraduate	2	1.8
Years of Experience	Less than 1 year	17	15.0
	1–3 years	38	33.6
	4–6 years	29	25.7
	7–10 years	19	16.8
	More than 10 years	10	8.9
Type of Vending Activity	Restaurant/Cafeteria	34	30.1
	Snack bar	17	15.0
	Mobile vendor	23	20.4
	Canteen/Kiosk	28	24.8
	Other	11	9.7
Campus Location	Main Campus	68	60.2
	Town Campus	34	30.1
	Annex Campus	11	9.7
Food Safety Training Need	Yes	41	36.3
	No	72	63.7

Table 2 presents the detailed frequency distribution of responses to ten hand hygiene practice items across the three campus locations.

Table 3 indicates that the mean practice score of the Main Campus vendors was the highest (M = 42.35, SD = 3.91) and then the Town Campus vendors (M = 39.76, SD = 4.82), and lastly, the Annex Campus vendors recorded the lowest mean practice score (M = 37.91, SD = 5.34). The mean overall practice score was 41.02, which was 82.0% of the possible maximum score.

Table 4 shows that 57.5% of the respondents had either the Good or the Very Good knowledge level. The highest percentage of vendors with very good knowledge was at Main Campus (22.1) and the highest percentage of vendors with poor knowledge was at Annex Campus (27.3).

Table 5 reveals that the highest mean knowledge score was exhibited by the Main Campus vendors (M = 15.12, SD =3.05), then there was Town Campus vendors (M = 13.76, SD = 3.18), and finally Annex Campus vendors (M =12.45, SD =3.87).

Table 6 indicated that vendors had excellent awareness on the best form of handwashing (84.1%) and the reasons behind foodborne disease (67.3%). But there was a lack of knowledge about diseases linked to poor hand hygiene (34.5) and of critical handwashing situations (42.5).

Table 2: Hand Hygiene Practice Responses by Campus Location

Practice Item	Response	Town Campus (n=34)	Main Campus (n=68)	Annex Campus (n=11)	Total (N=113)
I wash my hands before starting work	Always	18 (52.9%)	41 (60.3%)	5 (45.5%)	64 (56.6%)
	Often	9 (26.5%)	17 (25.0%)	3 (27.3%)	29 (25.7%)
	Sometimes	5 (14.7%)	7 (10.3%)	2 (18.2%)	14 (12.4%)
	Rarely	2 (5.9%)	2 (2.9%)	1 (9.0%)	5 (4.4%)
	Never	0 (0.0%)	1 (1.5%)	0 (0.0%)	1 (0.9%)
I wash my hands after using the toilet	Always	26 (76.5%)	57 (83.8%)	7 (63.6%)	90 (79.6%)
	Often	6 (17.6%)	8 (11.8%)	3 (27.3%)	17 (15.0%)
	Sometimes	2 (5.9%)	2 (2.9%)	1 (9.1%)	5 (4.4%)
	Rarely	0 (0.0%)	1 (1.5%)	0 (0.0%)	1 (0.9%)
	Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
I wash my hands after handling raw meat/fish	Always	20 (58.8%)	49 (72.1%)	6 (54.5%)	75 (66.4%)
	Often	8 (23.5%)	12 (17.6%)	3 (27.3%)	23 (20.4%)
	Sometimes	4 (11.8%)	5 (7.4%)	1 (9.1%)	10 (8.8%)
	Rarely	2 (5.9%)	2 (2.9%)	1 (9.1%)	5 (4.4%)
	Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
I wash my hands after handling money	Always	12 (35.3%)	31 (45.6%)	3 (27.3%)	46 (40.7%)
	Often	11 (32.4%)	22 (32.4%)	4 (36.4%)	37 (32.7%)
	Sometimes	8 (23.5%)	11 (16.2%)	3 (27.3%)	22 (19.5%)
	Rarely	3 (8.8%)	3 (4.4%)	1 (9.0%)	7 (6.2%)
	Never	0 (0.0%)	1 (1.5%)	0 (0.0%)	1 (0.9%)
I wash my hands after touching my hair/face	Always	9 (26.5%)	27 (39.7%)	2 (18.2%)	38 (33.6%)
	Often	10 (29.4%)	20 (29.4%)	4 (36.4%)	34 (30.1%)
	Sometimes	11 (32.4%)	15 (22.1%)	3 (27.3%)	29 (25.7%)
	Rarely	3 (8.8%)	5 (7.4%)	2 (18.2%)	10 (8.8%)
	Never	1 (2.9%)	1 (1.5%)	0 (0.0%)	2 (1.8%)
I wash my hands before serving food	Always	21 (61.8%)	48 (70.6%)	6 (54.5%)	75 (66.4%)
	Often	8 (23.5%)	14 (20.6%)	3 (27.3%)	25 (22.1%)
	Sometimes	4 (11.8%)	4 (5.9%)	2 (18.2%)	10 (8.8%)
	Rarely	1 (2.9%)	2 (2.9%)	0 (0.0%)	3 (2.7%)
	Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
I wash my hands after coughing or sneezing	Always	15 (44.1%)	38 (55.9%)	4 (36.4%)	57 (50.4%)
	Often	10 (29.4%)	18 (26.5%)	4 (36.4%)	32 (28.3%)
	Sometimes	7 (20.6%)	9 (13.2%)	2 (18.2%)	18 (15.9%)
	Rarely	2 (5.9%)	3 (4.4%)	1 (9.0%)	6 (5.3%)
	Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
I use soap when washing my hands	Always	17 (50.0%)	44 (64.7%)	5 (45.5%)	66 (58.4%)
	Often	10 (29.4%)	16 (23.5%)	3 (27.3%)	29 (25.7%)
	Sometimes	5 (14.7%)	6 (8.8%)	2 (18.2%)	13 (11.5%)
	Rarely	2 (5.9%)	2 (2.9%)	1 (9.0%)	5 (4.4%)
	Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
I wash my hands for at least 20 seconds	Always	11 (32.4%)	29 (42.6%)	3 (27.3%)	43 (38.1%)
	Often	12 (35.3%)	23 (33.8%)	4 (36.4%)	39 (34.5%)
	Sometimes	8 (23.5%)	12 (17.6%)	3 (27.3%)	23 (20.4%)
	Rarely	3 (8.8%)	4 (5.9%)	1 (9.0%)	8 (7.1%)
	Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
I dry my hands properly after washing	Always	19 (55.9%)	42 (61.8%)	5 (45.5%)	66 (58.4%)
	Often	9 (26.5%)	17 (25.0%)	4 (36.4%)	30 (26.5%)
	Sometimes	5 (14.7%)	7 (10.3%)	2 (18.2%)	14 (12.4%)
	Rarely	1 (2.9%)	2 (2.9%)	0 (0.0%)	3 (2.7%)
	Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table 3: Mean Hand Hygiene Practice Scores by Campus Location

Campus Location	n	Mean Score (out of 50)	Standard Deviation	Minimum	Maximum	Mean %
Town Campus	34	39.76	4.82	28	48	79.5%
Main Campus	68	42.35	3.91	32	50	84.7%
Annex Campus	11	37.91	5.34	27	46	75.8%
Total	113	41.02	4.67	27	50	82.0%

Table 4: Knowledge Score Distribution by Campus Location

Knowledge Level	Score Range	Town Campus n (%)	Main Campus n (%)	Annex Campus n (%)	Total n (%)
Poor	0–10	5 (14.7%)	6 (8.8%)	3 (27.3%)	14 (12.4%)
Fair	11–14	12 (35.3%)	18 (26.5%)	4 (36.4%)	34 (30.1%)
Good	15–17	13 (38.2%)	29 (42.6%)	3 (27.3%)	45 (39.8%)
Very Good	18–20	4 (11.8%)	15 (22.1%)	1 (9.0%)	20 (17.7%)

Table 5: Mean Knowledge Scores by Campus Location

Campus Location	n	Mean Score (out of 20)	Standard Deviation	Minimum	Maximum	Mean %
Town Campus	34	13.76	3.18	7	19	68.8%
Main Campus	68	15.12	3.05	8	20	75.6%
Annex Campus	11	12.45	3.87	6	18	62.3%
Total	113	14.42	3.28	6	20	72.1%

Table 6: Responses to Specific Knowledge Questions (N = 113)

Knowledge Item	Correct Response n	Percentage (%)
Minimum duration for effective handwashing	67	59.3%
Most effective method	95	84.1%
Critical handwashing moments	48	42.5%
Most commonly missed part	71	62.8%
Best water temperature	58	51.3%
Best drying method	52	46.0%
Diseases from poor hand hygiene	39	34.5%
Causes of foodborne illness	76	67.3%
Not acceptable substitute	64	56.6%
Cleaning frequency	55	48.7%

Table 7: One-Way ANOVA Summary for Knowledge, Practice, and Resource-Availability Scores by Campus Location

Outcome	df (between, within)	F	p-value	Post-hoc (Tukey HSD)
Knowledge score	2, 110	5.241	0.007	Main > Town; Main > Annex
Practice score	2, 110	6.847	0.002	Main > Town; Main > Annex
Resource-availability score	2, 110	16.824	<0.001	Main > Town > Annex

Discussion

The results of this study revealed that the food vendors in the three campuses exhibited a generally good level of knowledge and practice of hand hygiene, although one-way ANOVA confirmed statistically significant differences between campuses on all three outcomes: knowledge score, $F(2,110) = 5.241$, $p = 0.007$; practice score, $F(2,110) = 6.847$, $p = 0.002$; and resource-availability score, $F(2,110) = 16.824$, $p < 0.001$. On the whole, the average knowledge level was 14.42 of 20 and the average score of hand hygiene practices was 41.02 of 50. Such results indicate that the majority of vendors had a decent knowledge of food safety principles and reported satisfactory hand hygiene practices. The results however also show that there was no homogeneity in the level of knowledge and practice across campuses, and Tukey's HSD post-hoc comparisons indicated that Main Campus vendors significantly outperformed both Town and Annex Campus vendors on knowledge and practice, while resource availability followed a clear gradient from Main to Town to Annex.

The vendors in the Main Campus always had the highest scores in knowledge, practice and availability of resources. This could be attributed to the fact that Main Campus could easily access water supply, handwashing stations, sanitizers, and food safety information as compared to Town and Annex campuses. The Vendors in Main Campus might also have been better exposed to supervision, customer expectations and institutional regulations on food handling practices. Conversely, the mean scores in Annex Campus were the lowest among the knowledge, practice, and availability of resources, which implies that the vendors in this area might experience more infrastructural and educational barriers.

The result of over fifty percent of respondents to show good or very good food safety knowledge is optimistic. Particularly, the respondents were well informed on the best handwashing techniques, foodborne disease causes, and the necessity of washing hands prior to handling food. This suggests that vendors are aware of the basic principles of hygiene. Nevertheless, the research has also identified significant gaps in knowledge related to the diseases linked to inadequate hand hygiene, the necessary time of effective handwashing, the important handwashing points, and the proper handwashing drying techniques. These loopholes are relevant as they can decrease the efficiency of hand-hygiene habits, even in cases where the vendors state they wash their hands regularly.

The observation is in line with the earlier research that has indicated that food vendors usually have a general knowledge of hygiene practices but may lack specific technical knowledge pertaining to disease transmission and the essential steps related to handwashing. These results have been corroborated by studies that have been carried out in food vendors in tertiary institutions in Nigeria and other African nations, where the respondents have been reported to have moderate food safety knowledge but limited knowledge of specific hand hygiene requirements and pathways of contamination (Madilo et al., 2022; Barnabas et al., 2024). To illustrate this, a research among food sellers in tertiary institutions in Nigeria revealed that the respondents had a general awareness of the significance of handwashing but limited information about the length of time they should handwash and the contribution of contaminated surfaces to the spread of diseases (Omemu & Aderoju, 2008). The same results have been identified in research conducted in Ghana and Kenya, where the knowledge of the vendors was moderate, but the understanding of

particular food safety requirements was low (Monney et al., 2013; Muinde and Kuria, 2005).

The findings of the hand hygiene practice showed that most of the vendors claimed to wash their hands always after visiting the toilet, before commencing work and also serving food. These results indicate that respondents are aware of the significance of handwashing at the important stages of food preparation and the delivery of the services. Non-compliance was however, greater in practices like washing hands after touching money, after touching waste materials as well as sneezing or coughing. It is a significant issue since money, residual, and respiratory droplets are recognized as probable pollutants that may aid in foodborne diseases.

The somewhat low rate of adherence to handwashing following money handling could be attributed to the fact that vendors frequently serve people and handle cash at the same time, particularly in the high traffic food service areas. In most instances, vendors might be more interested in speed of service rather than hygiene especially when there are few handwashing points around. The observation confirms previous research that revealed that food handlers would not wash their hands after touching money due to workload, time pressure, and lack of water and soap (Todd et al., 2010; Gaur & Gaur, 2023).

Another finding of the study was that the level of availability of handwashing resources differed considerably among campuses. The highest score of resource availability was in Main Campus, and the lowest in Annex Campus. The most available ones were sinks or basins and the least available ones were hand sanitizers. This implies that despite the existence of a certain infrastructural support with regard to hand hygiene, significant gaps still exist in regards to the regular supply of soap, sanitizers, clean towels, and running water. Past researches have also indicated that the lack of good handwashing facilities is one of the most formidable hindrances to proper hygiene behavior among food handlers (Curtis and Cairncross, 2003; Monney et al., 2013).

5. Conclusion

This study concludes that significant geographical disparities exist in hand hygiene knowledge, practices, and resource availability among food vendors at the University of Uyo. While the Main Campus maintains relatively high standards, the Annex and Town campuses require urgent attention. The lack of formal training and the intermittent availability of resources like running water and sanitizers are the primary barriers to optimal food safety.

Conflict of Interest

The authors declare no conflict of interest.

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