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Empirical Examination of Food Safety Governance, Cognitive Biases, and Training Translation Disparities Across High-Volume Metropolitan and Regional Aviation Gateways

A Comparative Study of Murtala Muhammed International Airport (Lagos) and General Tunde Idiagbon International Airport (Ilorin), Nigeria

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ABSTRACT

International airports function as primary frontlines for global public health security and foodborne disease containment. Under the International Health Regulations (IHR, 2005), designated points of entry must maintain permanent sanitary capacities. This study empirically evaluated and compared food safety Knowledge, Attitudes, and Practices (KAP) among airport food handlers at Nigeria's primary metropolitan aviation hub and an emerging regional gateway.A cross-sectional comparative design was conducted between September 2024 and June 2026 across Murtala Muhammed International Airport (MMIA, Lagos; n=38) and General Tunde Idiagbon International Airport (GTIIA, Ilorin; n=55) (N=93). Data were collected using a validated 74-item structured KAP questionnaire (Cronbach's α = 0.81–0.88). Inferential analyses utilized Welch's t-tests, Mann-Whitney U tests, and Chi-square tests at $p < 0.05$.Food handlers at MMIA achieved a significantly higher composite KAP score (85.49% ± 3.32%) than those at GTIIA (73.67% ± 4.26%; $t = 15.01$, $p < 0.001$). While positive attitudes were high at both airports (MMIA: 86.1%, GTIIA: 83.7%), a severe knowledge-to-practice gap was identified at the regional gateway. 100.0% of GTIIA food handlers fell strictly into the 'Moderate' practice bracket, with zero workers reaching 'Good' compliance (≥80%), compared to 78.9% 'Good' practice compliance at MMIA. This operational collapse was driven by systemic training access gaps (63.6% lacking airport-specific Port Health training at GTIIA) and cognitive 'false optimism' bias.Positive hygiene attitudes and theoretical knowledge do not automatically translate into safe food handling in regional aviation canteens. Bridging this compliance gap requires Port Health Services to enforce mandatory behavioral simulation drills, infrastructure hardware upgrades, and unannounced multi-item checklist audits with public placards.

Keywords: *Aviation Hygiene, Food Handlers, KAP Model, International Health Regulations (IHR 2005), Points of Entry, False Optimism Bias, Port Health Governance*

1. Introduction and Conceptual Framework

1.1 Global Public Health Security, Aviation Supply Chains, and Points of Entry

Foodborne infectious diseases remain a persistent global public health challenge, imposing significant economic burdens, healthcare expenditures, and preventable morbidity and mortality worldwide. Within the globalized transport ecosystem, international aviation represents a uniquely high-velocity vector for pathogen dissemination. Commercial aircraft move millions of passengers across international borders within timeframes significantly shorter than the incubation periods of most enteric bacterial, viral, and parasitic pathogens. Consequently, food and water supply chains operating within airport terminals, flight catering facilities, VIP lounges, and transit canteens constitute critical control points in global biosecurity.

Recognizing this vulnerability, the International Health Regulations (IHR, 2005)a legally binding international legal framework promulgated by the World Health Organization (WHO)explicitly mandates that State Parties maintain permanent core public health capacities at designated points of entry (PoE). Under Article 22 and Annex 1B of the IHR (2005), airport authorities and Port Health Services are legally obligated to ensure that facilities delivering food, drinking water, and environmental sanitation to transit passengers and crew maintain rigorous, verified sanitary standards (WHO, 2022, 2024). Frontline food service personnel working in airport food establishments constitute the primary operational barrier against foodborne disease transmission. Minor breaches in personal hygiene, cross-contamination prevention, or thermal control can trigger widespread gastroenteritis outbreaks across multiple continents simultaneously.

1.2 Institutional Duality in Emerging Aviation Systems: Metropolitan Hubs vs. Regional Gateways

In developing economies such as Nigeria, food safety governance across international airports exhibits a stark institutional duality. On one hand, primary metropolitan hubsexemplified by Murtala Muhammed International Airport (MMIA) in Lagoshandle millions of passengers annually, house multi-national flight catering operators (e.g., ASL, Servair), and are subjected to continuous regulatory oversight from national aviation and public health authorities. These metropolitan facilities benefit from substantial capital investment, structured hazard analysis and critical control point (HACCP) programs, and regular corporate and municipal health inspections (Onyeaka et al., 2021; NCAA, 2025).

On the other hand, regional aviation gatewayssuch as General Tunde Idiagbon International Airport (GTIIA) in Ilorinoperate under vastly different socio-technical and institutional conditions. While designated as international points of entry, regional airports primarily manage domestic commercial traffic, seasonal charter operations, and pilgrimage flights. These fields frequently operate under severe fiscal constraints, fragmented regulatory supervision, informal food vending concessions, and inadequate sanitation infrastructure (Adiama et al., 2023). While international literature extensively examines food hygiene in high-volume catering kitchens, empirical research evaluating behavioral compliance gaps and institutional disparities between metropolitan hubs and regional aviation gateways remains notably sparse.

1.3 Theoretical Framework Integration

To rigorously analyze the underlying causes of food safety compliance variation among airport food handlers, this study integrates four complementary conceptual frameworks:

- **Socio-Technical Systems (STS) Theory:** STS theory posits that occupational health and safety outcomes emerge from the joint optimization of social subsystems (human skills, organizational culture, cognitive perceptions) and technical subsystems (physical infrastructure, handwashing facilities, standardized equipment, written SOPs). In airport canteens, behavioral failures rarely occur in isolation; they are deeply tied to technical friction, such as missing running water or absent temperature probes.

- **James Reason's Swiss Cheese Model of Systemic Failures:** This organizational risk model demonstrates that foodborne contamination incidents occur when latent administrative weaknesses (unfunded training programs, lax Port Health oversight) align with active human errors on the kitchen floor (bare-hand contact with ready-to-eat food, simultaneous currency handling).
- **Knowledge-Attitude-Practice (KAP) Model:** The classic KAP paradigm assumes a linear trajectory: acquiring cognitive knowledge fosters positive affective attitudes, which directly translates into safe psychomotor practices. However, contemporary food safety literature highlights a profound 'knowledge-to-practice' translation gap (Kwol et al., 2020), where high awareness fails to yield safe habits under operational pressure.
- **Cognitive Bias and 'False Optimism' Theory:** Cognitive bias theory explains how food handlers develop illusory superiority regarding their personal hygiene habits. As conceptualized by Madu and Madu (2025), 'false optimism' creates a psychological buffer wherein workers rate their personal safety practices as exceptionally high despite routinely engaging in severe hygiene breaches.

1.4 Statement of the Problem and Research Hypotheses

Despite formal regulatory mandates, regional airport food establishments in Nigeria face persistent operational vulnerabilities. While food handlers may demonstrate adequate theoretical knowledge during classroom inspections, their day-to-day behavioral compliance during peak flight operations remains unverified. To address this critical gap, this empirical study evaluates and compares food safety Knowledge, Attitudes, and Self-Reported Practices among food service personnel at MMIA Lagos and GTIIA Ilorin.

The study was structured to rigorously test the following non-directional research hypotheses at an alpha level of $p < 0.05$:

Null Hypothesis (H_0): There is no statistically significant difference in food safety Knowledge, Attitude, Practice scores, or overall KAP compliance levels between food service personnel operating at Murtala Muhammed International Airport (Lagos) and General Tunde Idiagbon International Airport (Ilorin).

Alternative Hypothesis (H_a): There is a statistically significant difference in food safety Knowledge, Attitude, Practice scores, and overall KAP compliance levels between food service personnel operating at Murtala Muhammed International Airport (Lagos) and General Tunde Idiagbon International Airport (Ilorin).

2. Materials and Methods

2.1 Study Settings and Research Design

This study utilized a cross-sectional analytical and comparative research design. Primary data collection was executed over a 21-month period spanning September 2024 through June 2026. The empirical investigation focused on two contrasting international aviation portals in Nigeria:

1. Murtala Muhammed International Airport (MMIA), Lagos: Located in Ikeja, Lagos State (Latitude 6.5774° N, Longitude 3.3213° E), MMIA is Nigeria's flagship aviation hub, processing over 7 million passengers annually. The airport complex encompasses high-capacity flight catering facilities, international franchise restaurants, executive passenger lounges, and terminal canteens.

2. General Tunde Idiagbon International Airport (GTIIA), Ilorin: Located in Ilorin, Kwara State (Latitude 8.4402° N, Longitude 4.4939° E), GTIIA serves as a major regional gateway in north-central Nigeria, managing commercial domestic passenger routes, seasonal agricultural cargo, and annual international Hajj pilgrimage flights.

2.2 Population, Eligibility Criteria, and Multi-Stage Stratified Sampling

The target population comprised frontline food service personnelincluding head chefs, line cooks, kitchen assistants, food servers, dishwashers, and canteen concessionairesactively engaged in preparing, holding, or serving food within the terminal boundaries of MMIA and GTIIA. Eligibility criteria required participants to be at least 18 years of age, actively employed at their respective airport food establishment for a minimum of three consecutive months, and willing to provide voluntary written informed consent.

A multi-stage stratified random sampling procedure was deployed to ensure proportional representation across establishment types:

Stage 1 (Purposive Gateway Selection): Selection of MMIA Lagos and GTIIA Ilorin to contrast a tier-1 metropolitan hub against a tier-2 regional airport.

Stage 2 (Establishment Stratification): Categorization of food premises into three distinct operational strata: (a) Airport Restaurants & Franchises, (b) Cafés, Snack Bars & VIP Lounges, and (c) Local Canteens & Informal Food Vendors.

Stage 3 (Random Personnel Selection): Complete employee rosters were obtained from facility managers and Port Health registration records. Simple random sampling using computer-generated random numbers was applied within each stratum to select individual food handlers proportionally.

The final validated study sample comprised N = 93 participants, consisting of n = 38 handlers from MMIA Lagos and n = 55 handlers from GTIIA Ilorin. This sample size achieved adequate statistical power (>0.80) for detecting medium-to-large effect sizes in two-tailed independent group comparisons at $p < 0.05$.

2.3 Data Collection Instrument and Structure

Data were collected using a structured, administrator-assisted 74-item Food Safety KAP Questionnaire adapted from World Health Organization (WHO) food hygiene benchmarks, FAO guidelines, and IHR (2005) point-of-entry inspection tools. The instrument was organized into four thematic modules:

1. Section A: Sociodemographic and Occupational History (12 items): Capturing biological sex, age bracket, formal educational attainment, establishment type, job title, years of food handling experience, health clearance certification history, formal food safety training, and airport-specific Port Health hygiene instruction.

2. Section B: Food Safety Knowledge (26 items): Evaluating factual understanding of foodborne pathogens, cross-contamination mechanisms, temperature danger zone dynamics (5°C–60°C), handwashing protocols, personal protective equipment (PPE), high-risk food storage, and symptom reporting. Items were scored dichotomously (1 = Correct, 0 = Incorrect / Don't Know), yielding a maximum knowledge score of 26 points.

3. Section C: Food Safety Attitudes (18 items): Measuring psychological disposition, affective commitment, and perceived responsibility toward hygiene standards using a 5-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1), yielding a maximum attitude score of 90 points.

4. Section D: Self-Reported Food Safety Practices (30 items): Assessing routine psychomotor behaviors, operational compliance, sanitization habits, and handling methods on a 5-point Likert scale ranging from Always (5) to Never (1), yielding a maximum practice score of 150 points.

2.4 Psychometric Validation, Pre-Testing, and Instrument Reliability

To establish content and face validity, the draft questionnaire was subjected to rigorous expert evaluation by a panel of five senior environmental health scientists, public health epidemiologists, and Port Health officers. Based on expert feedback, four ambiguous items were rephrased and technical terminology was standardized.

A pilot pre-test was conducted among n = 15 food vendors operating at an independent regional transit terminal in Kwara State (excluded from the final sample). Internal consistency and reliability were evaluated using Cronbach's alpha coefficient (α). The psychometric analysis yielded robust reliability estimates across all three domains:

- Knowledge Subscale: Cronbach's α = 0.84 (High internal consistency)
- Attitude Subscale: Cronbach's α = 0.81 (Good internal consistency)
- Practice Subscale: Cronbach's α = 0.88 (High internal consistency)

2.5 Performance Classification Framework (Bloom's Cut-Off Scores)

Participants' composite scores across Knowledge, Attitude, and Practice subscales were converted into percentage scores and categorized using Bloom's standardized cut-off score framework, a widely validated benchmark in public health research:

- Good Performance: Score ≥ 80.0% of the maximum possible domain points.
- Moderate Performance: Score between 60.0% and 79.9% of the maximum domain points.
- Poor Performance: Score < 60.0% of the maximum domain points.

2.6 Data Processing and Inferential Statistical Analysis

Raw survey data were coded, double-entered into Microsoft Excel to ensure verification, and subsequently analyzed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY). Descriptive statisticsincluding frequencies, percentages, mean scores, and standard deviations—were computed for all demographic, occupational, and KAP items.

Continuous KAP score distributions were evaluated for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests. While score distributions exhibited approximate normality, group variances were unequal. Consequently, independent Welch's t-tests (which do not assume equal population variances) were employed as the primary parametric test for comparing mean domain scores between MMIA Lagos and GTIIA Ilorin. Non-parametric Mann-Whitney U tests were executed in parallel to confirm parametric test robustness. Categorical performance classifications and demographic proportions were compared using Pearson's Chi-square (χ^2) tests and Fisher's Exact tests where expected cell counts fell below 5. All statistical tests were two-tailed, with statistical significance defined at $p < 0.05$.

2.7 Ethical Considerations and Administrative Approvals

The study protocol received formal ethical approval from the Institutional Ethical Review Committee (IERC) of Kwara State University, Malete, Nigeria. Administrative research permits and site clearance were obtained from the Federal Airports Authority of Nigeria (FAAN) and the Port Health Services division of the Federal Ministry of Health at both MMIA Lagos and GTIIA Ilorin. All participants were provided with written information sheets detailing the study objectives, rights to voluntary participation, and guaranteed anonymity. Signed or thumbprinted informed consent was obtained prior to survey administration.

3. Empirical Results and Data Analysis

3.1 Sociodemographic and Occupational Profiles

The final analyzed sample comprised N = 93 food handlers (n = 38 at MMIA Lagos; n = 55 at GTIIA Ilorin). Table 1 presents a detailed comparative breakdown of the sociodemographic and occupational characteristics of food handlers across both aviation gateways.

Female workers constituted the majority of the food service workforce at both facilities (63.2% at MMIA and 72.7% at GTIIA). The age distribution was concentrated among young and middle-aged adults, with 73.7% of MMIA handlers and 69.1% of GTIIA handlers aged between 20 and 39 years. However, profound structural disparities emerged in educational attainment and operational establishment types. While 60.5% of MMIA handlers possessed tertiary educational qualifications

(OND, HND, or B.Sc. degrees), 61.8% of GTIIA workers had achieved only primary or secondary education.

Furthermore, operational premises at MMIA were dominated by structured airport restaurants and international franchises (47.4%), whereas 50.9% of food service premises at GTIIA operated as local canteens and informal food stands. Training exposure revealed critical institutional gaps: 38.2% of GTIIA workers had never received formal general food safety training, and an alarming 63.6% lacked specific airport or Port Health hygiene instruction, compared to 28.9% at MMIA.

Table 1: *Sociodemographic and Occupational Profiles of Food Handlers across MMIA Lagos (n=38) and GTIIA Ilorin (n=55) (N=93).*

Demographic / Job Variable	MMIA (n=38)	%	GTIIA (n=55)	%
Biological Sex				
Male	14	36.8%	15	27.3%
Female	24	63.2%	40	72.7%
Age Bracket				
< 20 years	2	5.3%	4	7.3%
20–29 years	16	42.1%	22	40.0%
30–39 years	12	31.6%	16	29.1%
40–49 years	6	15.8%	10	18.2%
≥ 50 years	2	5.3%	3	5.5%
Educational Attainment				
Primary / Secondary Education	15	39.5%	34	61.8%
Tertiary Education (OND/HND/B.Sc)	23	60.5%	21	38.2%
Establishment Category				
Airport Restaurant / Franchise	18	47.4%	12	21.8%
Café / Snack Bar / VIP Lounge	12	31.6%	15	27.3%
Local Canteen / Food Vendor	8	21.1%	28	50.9%
Formal Food Safety Training				
Yes (Formally Trained)	30	78.9%	34	61.8%
No (Untrained)	8	21.1%	21	38.2%
Airport Port Health Specific Hygiene Training				
Yes (Received PoE Training)	27	71.1%	20	36.4%
No (Lacks PoE Training)	11	28.9%	35	63.6%

3.2 Inferential Analysis of Composite KAP Domain Scores

Statistical comparisons of composite Knowledge, Attitude, Practice, and overall KAP index scores between the two airports are detailed in Table 2. Food handlers at MMIA Lagos outperformed their regional counterparts at GTIIA Ilorin across every evaluated dimension.

The mean Knowledge score at MMIA was 22.71 ± 2.03 out of 26 (87.3%), compared to 17.98 ± 3.14 (69.2%) at GTIIA. Welch's t-test demonstrated that this knowledge gap was highly statistically significant ($t = 8.83$, $p < 0.001$; Mann-Whitney $U = 1892.5$, $p < 0.001$). Attitude scores were highly positive at both locations, reflecting strong theoretical commitment to passenger health, although MMIA maintained a statistically significant edge (77.50 ± 3.73 vs. 75.31 ± 3.92 out of 90; Welch's $t = 2.73$, $p = 0.008$).

The most pronounced divergence occurred in self-reported daily Food Safety Practices. MMIA handlers achieved a mean practice score of 124.53 ± 5.50 out of 150 (83.0%), whereas GTIIA handlers scored only 102.25 ± 5.02 (68.2%). This 14.8 percentage-point behavioral deficit was highly significant (Welch's $t = 19.88$, $p < 0.001$; Mann-Whitney $U = 2089.0$, $p < 0.001$). Overall composite KAP scores averaged 85.49% ± 3.32% at MMIA versus 73.67% ± 4.26% at GTIIA ($t = 15.01$, $p < 0.001$). Based on these inferential results, the Null Hypothesis (H_0) is decisively rejected, confirming significant behavioral and governance disparities between metropolitan and regional airport food establishments.

Table 2: *Inferential Comparison of Composite KAP Domain Scores between MMIA Lagos (n=38) and GTIIA Ilorin (n=55). *Statistically significant at p < 0.05.*

KAP Dimension	MMIA Mean	MMIA SD	GTIIA Mean	GTIIA SD	Welch's t	p-value
Knowledge Score (0–26)	**22.71**	2.03	**17.98**	3.14	**8.83**	**< 0.001***
Attitude Score (18–90)	**77.50**	3.73	**75.31**	3.92	**2.73**	**0.008***
Practice Score (30–150)	**124.53**	5.50	**102.25**	5.02	**19.88**	**< 0.001***
Overall KAP Composite (%)	**85.49%**	3.32%	**73.67%**	4.26%	**15.01**	**< 0.001***

3.3 Categorical Performance Breakdown and Compliance Collapse

Applying Bloom's cut-off score classification (Good ≥80%, Moderate 60%–79.9%, Poor <60%) revealed a dramatic structural compliance failure at the regional airport, as shown in Table 3.

At MMIA Lagos, 92.1% of food handlers achieved 'Good' knowledge ratings and 78.9% demonstrated 'Good' practice compliance. In contrast, GTIIA Ilorin exhibited a severe compliance collapse: despite 92.7% of regional food handlers maintaining 'Good' hygiene attitudes, only 21.8% achieved 'Good' knowledge, and an unprecedented 100.0% (n = 55) of GTIIA workers fell strictly into the 'Moderate' practice bracket, with zero personnel achieving 'Good' daily practice compliance.

Table 3: *Categorical Performance Classifications (Bloom's Cut-Off Scores) among MMIA and GTIIA Food Handlers.*

KAP Domain	MMIA Good	MMIA Mod	MMIA Poor	GTIIA Good	GTIIA Mod	GTIIA Poor
Knowledge Level	92.1% (35)	7.9% (3)	0.0% (0)	21.8% (12)	74.5% (41)	3.6% (2)
Attitude Level	97.4% (37)	2.6% (1)	0.0% (0)	92.7% (51)	7.3% (4)	0.0% (0)
Practice Level	78.9% (30)	21.1% (8)	0.0% (0)	**0.0% (0)**	**100.0% (55)**	0.0% (0)

3.4 Visualizations of Empirical Findings

To provide clear visual representation of these quantitative disparities, Figures 1 and 2 illustrate the comparative normalized mean KAP domain scores and the categorical performance breakdowns across both aviation gateways.

Figure 1: Comparative Mean KAP Domain Scores (MMIA vs. GTIIA)

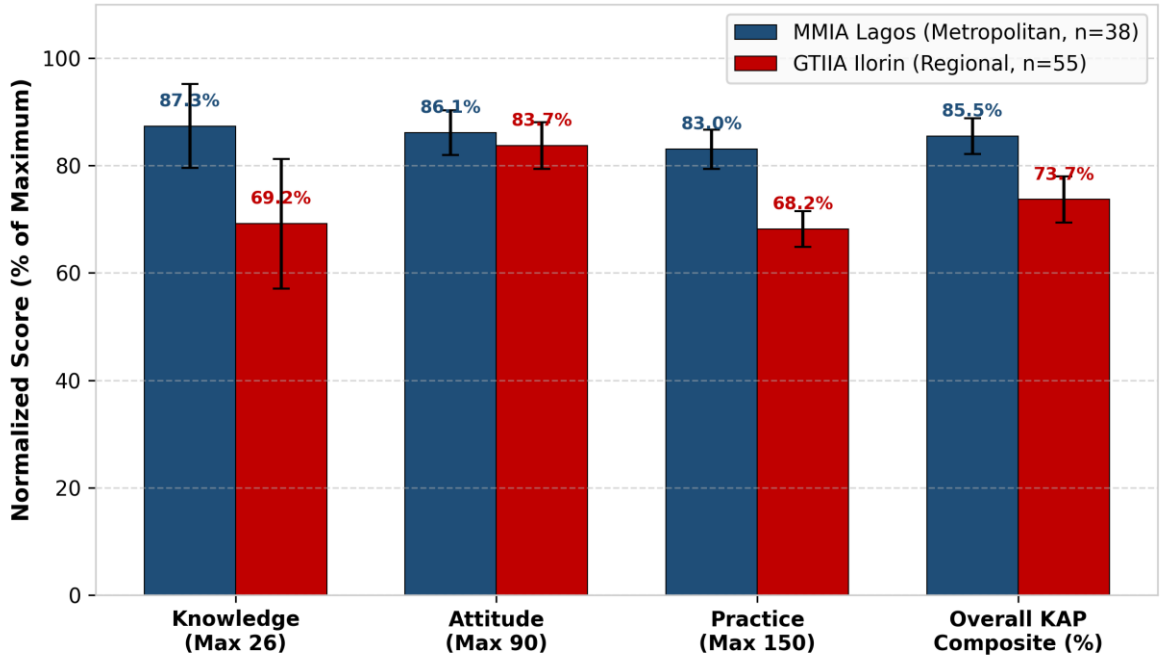


Figure 1: *Comparative Normalized Mean KAP Domain Scores between MMIA Lagos (n=38) and GTIIA Ilorin (n=55). Error bars denote standard deviations.*

Figure 2: Categorical Compliance Breakdown by Bloom's Cut-Off Classificatio

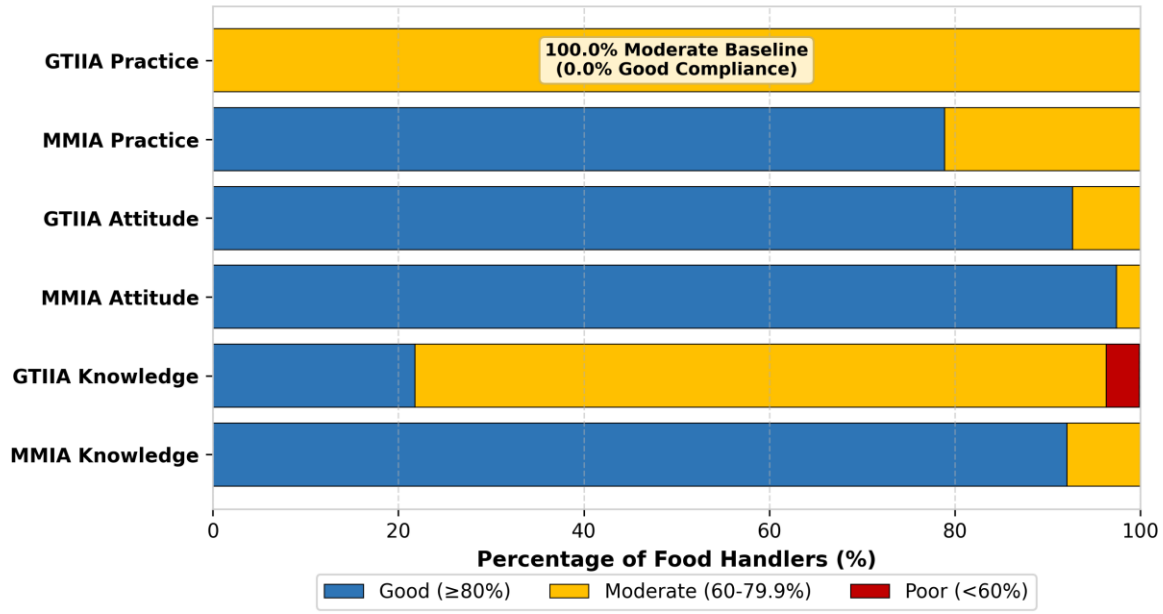


Figure 2: *Stacked Categorical Performance Breakdown (Good ≥80%, Moderate 60–79.9%, Poor <60%) highlighting the 100.0% moderate practice baseline at GTIIA Ilorin.*

3.5 Granular Item-Level Behavioral Compliance Failure Modes

A detailed line-by-line diagnostic of specific questionnaire items illuminated the key operational failure modes impeding behavioral compliance at the regional airport:

1. Handwashing vs. Glove Misconceptions: While 98.2% of GTIIA workers recognized that hands must be washed after restroom usage, only 41.8% reported consistently washing hands prior to handling ready-to-eat (RTE) foods (versus 89.5% at MMIA). A primary driver was a widespread hygiene myth: 34.5% of GTIIA staff explicitly believed that wearing disposable gloves completely eliminates the need for handwashing.

2. Currency Handling and Cross-Contamination: Simultaneous handling of physical paper currency and open food served as a major contamination pathway. While 84.2% of MMIA staff enforced strict separation between cash transaction and food serving, 61.8% of GTIIA handlers routinely handled money and food concurrently without changing gloves or sanitizing hands.

3. Temperature Monitoring and Thawing Protocols: Digital probe thermometers and refrigerator temperature logs were utilized by 81.6% of MMIA kitchens. In contrast, 76.4% of GTIIA handlers relied entirely on visual guesswork. Furthermore, thawing frozen raw meat at ambient room temperature was correctly identified as a critical hazard by 89.5% of MMIA staff, but by only 43.6% of GTIIA workers.

4. Sickness Reporting Disincentives: While 90.9% of GTIIA handlers theoretically agreed that gastrointestinal symptoms (vomiting, diarrhea) must be reported immediately, only 38.2% actually reported illnesses to supervisors. Qualitative follow-up indicated that wage penalties and shift forfeiture served as powerful economic disincentives against voluntary sickness disclosure.

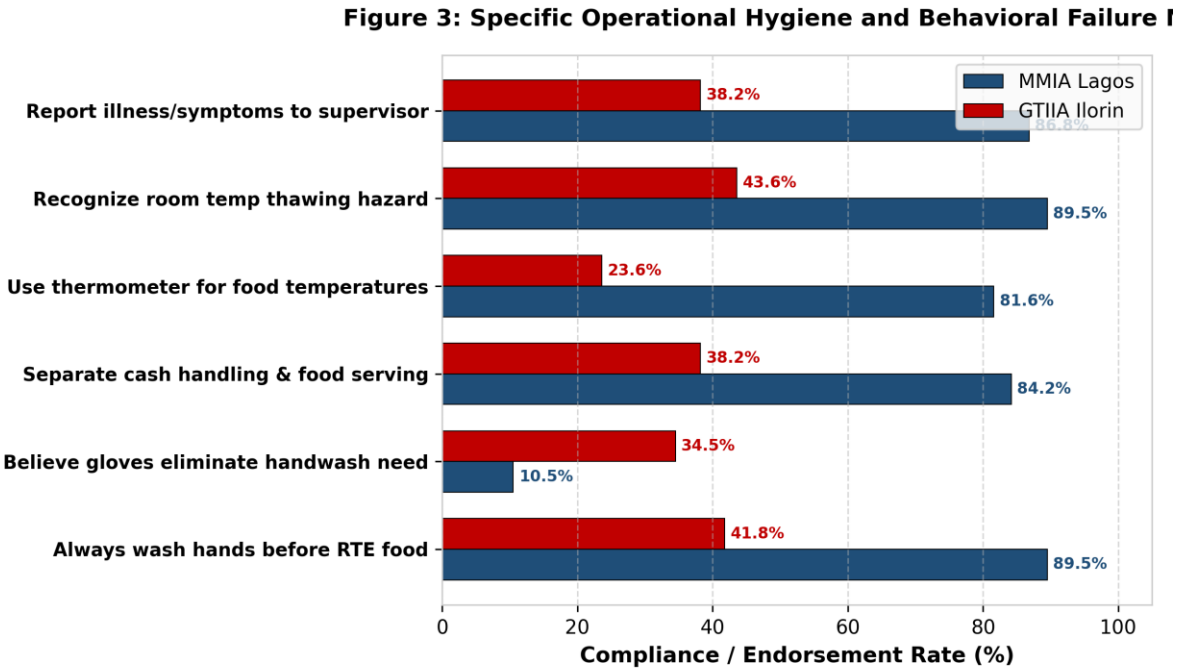


Figure 3: *Specific Operational Hygiene and Behavioral Failure Modes across MMIA Lagos and GTIIA Ilorin.*

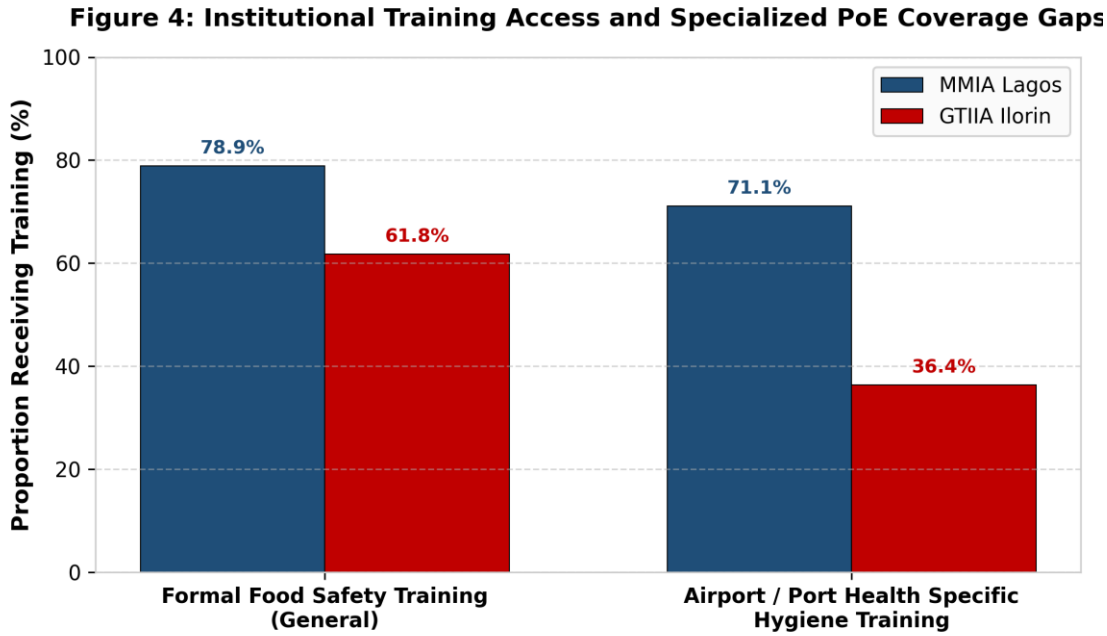


Figure 4: *Institutional Training Access Disparities highlighting the severe 63.6% Port Health training deficit at GTIIA Ilorin.*

4. Discussion

4.1 Deconstructing the Knowledge-to-Practice Gap in Aviation Food Service

The empirical findings of this study uncover a striking operational paradox within Nigeria's aviation food supply chain. While food handlers at the regional General Tunde Idiagbon International Airport (GTIIA) demonstrated highly positive affective attitudes toward food safety (83.7% mean score; 92.7% 'Good' classification), their daily physical compliance collapsed into a 100.0% 'Moderate' practice baseline, with zero handlers achieving 'Good' practice compliance. This contrasts sharply with Murtala Muhammed International Airport (MMIA) in Lagos, where 78.9% of handlers maintained 'Good' psychomotor practice habits.

These empirical results strongly reinforce the theoretical observations of Kwol et al. (2020) and Adebayo et al. (2021), who demonstrated that cognitive awareness and positive attitudes are necessary but insufficient prerequisites for establishing physical compliance in commercial kitchens. Knowing a safety rule does not automatically resolve operational barriers on the kitchen floor. In regional airport canteens, positive intent is routinely derailed by technical and environmental friction—such as non-functional handwash sinks, missing liquid soap, absent temperature sensors, and extreme time pressure during rapid domestic flight turnarounds. This behavioral mismatch mirrors domestic empirical studies by Uzoama et al. (2023) in Abuja hospitality canteens and Odipe et al. (2019) in Ondo State, where food vendors routinely bypassed handwashing and personal protective equipment despite holding formal health clearance certificates.

4.2 Institutional Deficits, Specialized Aviation Training, and Cognitive 'False Optimism' Bias

A principal explanatory mechanism for this behavioral collapse is the profound institutional training deficit identified at the regional gateway. While 78.9% of MMIA handlers had completed formal food safety training and 71.1% received airport-specific Port Health hygiene instruction, 38.2% of GTIIA workers had never attended a formal food safety course, and 63.6% lacked specific point-of-entry regulatory hygiene training.

As established by Adebayo et al. (2021) and Alemayehu et al. (2021), general municipal food hygiene training differs fundamentally from aviation catering health governance. Airport food service

environments operate under unique operational constraints, including rapid passenger transit, high-density terminal seating, extended cold-chain storage requirements, and international point-of-entry legal liability under the International Health Regulations (IHR, 2005). Standard municipal training fails to equip regional vendors with specialized competencies in critical hazard analysis, cold-chain maintenance, or point-of-sale sanitation.

Furthermore, our empirical findings provide striking field validation of the 'false optimism' cognitive bias model formulated by Madu and Madu (2025). Regional food handlers demonstrated high self-reported attitude ratings (92.7% 'Good' attitude category), reflecting a genuine subjective belief that they were actively safeguarding passenger health. However, their actual kitchen practices were marred by severe operational errorssuch as handling paper currency and open food concurrently (61.8%) and relying on visual guesswork for internal cooking temperatures (76.4%). This cognitive bias generates a dangerous illusion of safety: food handlers believe their personal hygiene habits are flawless, rendering them unmotivated to adjust their behavior in the absence of objective, external audit feedback and practical simulation training.

4.3 Global Health Security Implications Under IHR (2005) Article 22 and Annex 1B

From a global health security perspective, the 100.0% moderate practice baseline at regional aviation gateways represents a significant operational vulnerability in international disease containment networks. Under Article 22 and Annex 1B of the International Health Regulations (IHR, 2005), State Parties are legally bound to ensure that designated airports maintain continuous core public health capacities to keep facilities free of sources of infection and contamination (WHO, 2022, 2024; Cooper et al., 2020).

Aviation transit points handle high-speed human mobility. An enteric bacterial pathogen (e.g., Salmonella enterica, Shigella flexneri, enterotoxigenic E. coli) or viral agent (e.g., Norovirus) introduced into an airport canteen in Ilorin can be ingested by transit passengers and transported across domestic, regional, or international borders within hourswell before clinical symptoms manifest (Boughattas et al., 2019; Mouchtouri et al., 2019). Systemic hygiene gaps at regional points of entry weaken national biosecurity defenses and undermine global disease surveillance networks.

4.4 Methodological Strengths and Limitations

A major strength of this study lies in its comparative empirical design, robust sample size across two distinct aviation operational tiers, high psychometric instrument reliability ($\alpha = 0.81–0.88$), and dual parametric/non-parametric statistical validation. However, two methodological limitations must be acknowledged:

1. Self-Reported Practice Data: Food handling practices were evaluated using structured self-reported survey items, which are inherently subject to social desirability bias (participants over-reporting good behavior). Consequently, actual physical compliance on the kitchen floor may be even lower than captured.

2. Geographic Scope: While MMIA Lagos and GTIIA Ilorin represent premier tier-1 metropolitan and tier-2 regional portals in Nigeria, expanding future research to encompass additional regional airports across West Africa would enhance geographical generalizability.

5. Policy Implications and Strategic Action Plan

To systematically close the knowledge-to-practice gap, eliminate cognitive false optimism, and enforce compliance with International Health Regulations (IHR, 2005) across Nigerian aviation gateways, Port Health Services (PHS), the Federal Airports Authority of Nigeria (FAAN), and the Nigeria Civil Aviation Authority (NCAA) must execute a coordinated, four-tier intervention framework:

5.1 Mandating Hands-On Behavioral Simulation Training

Port Health Services must replace passive classroom lectures with mandatory, hands-on practical simulation training. Food service personnel should undergo bi-annual practical drills focusing on verified 20-second handwashing techniques, color-coded cutting board cross-contamination prevention, digital probe thermometer calibration, safe thawing protocols, and hygienic point-of-sale currency handling. Practicing these behaviors in simulated kitchen environments translates abstract knowledge into automatic physical habits on the job.

5.2 Establishing Mandatory Aviation Point-of-Entry Certification

The Federal Ministry of Health, in collaboration with the NCAA, should institute a mandatory 'Aviation Food Safety Certificate' (AFSC) as a non-negotiable legal prerequisite for operating any food business within airport jurisdiction. Concession leases should strictly require that 100% of kitchen and service staff hold active AFSC certification, updated bi-annually through accredited Port Health training modules.

5.3 Sanitation Hardware and Infrastructure Upgrades

FAAN and airport terminal managers must eliminate technical friction in airport canteens by modernizing physical infrastructure. This requires installing automated sensor-operated handwash taps, continuous hot/cold running water, touchless soap dispensers, single-use paper towels, and digital internal food probe thermometers. To eliminate cash-food cross-contamination, airport authorities should mandate complete division of labor between food servers and cashiers or transition all terminal canteens entirely to electronic Point-of-Sale (POS) touchless payment systems.

5.4 Unannounced Multi-Item Checklist Audits and Transparent Entrance Placards

Port Health officers must transition from scheduled administrative inspections to rigorous, unannounced monthly operational audits using a standardized multi-item observation checklist. To counter false optimism bias, audit results should be linked to mandatory public grading placards (e.g., Color-Coded Grade A/B/C Signs) displayed prominently at restaurant entrances. Transparent public display provides passengers with clear safety data and creates strong economic incentives for concessionaires to maintain strict hygiene compliance.

5.5 Institutional Roles and Strategic Implementation Matrix

Table 4: *Strategic Implementation Matrix for Airport Food Safety Governance in Nigeria.*

Strategic Pillar	Action / Intervention	Lead Agency	Timeline
Behavioral Training	Implement mandatory bi-annual simulation kitchen drills on handwashing and thermal control	Port Health Services (PHS)	Immediate (0–3 Mos)
Regulatory Licensing	Enforce Aviation Food Safety Certificate (AFSC) as a condition for concession lease renewal	NCAA & FAAN	Short-Term (3–6 Mos)
Hardware Upgrades	Install sensor handwash taps, paper towels, probe thermometers, and mandatory POS payment units	FAAN & Concessionaires	Medium-Term (6–12 Mos)
Compliance Audits	Execute unannounced monthly inspections with mandatory public entrance grading placards	Port Health Services (PHS)	Continuous / Monthly

6. Conclusion

This empirical study provides an in-depth comparative evaluation of food safety governance and behavioral compliance across high-volume metropolitan (MMIA Lagos) and regional (GTIIA Ilorin) aviation gateways in Nigeria. The empirical findings demonstrate significant public health disparities between aviation portal tiers, culminating in the rejection of the Null Hypothesis (H_0) (composite KAP: 85.49% vs. 73.67%; $t = 15.01$, $p < 0.001$).

Crucially, the research uncovers a profound knowledge-to-practice compliance collapse at the regional gateway, where 100.0% of food handlers operate at a 'Moderate' practice baseline despite expressing highly positive health attitudes (83.7%). This behavioral gap is driven by systemic Port Health training deficits (63.6% untrained), cognitive false optimism bias, and inadequate terminal sanitation infrastructure. Strengthening global health security at regional aviation points of entry requires moving beyond passive classroom lectures to enforce mandatory behavioral simulation drills, modern sanitation hardware upgrades, and unannounced audit surveillance under the International Health Regulations (IHR, 2005).

Declarations

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